Appendix A

Species Considered

Table A-1. MRHCP Wildlife Species Evaluation and Screening Process

Taxa	Scientific Name	Common Name	Status	Range	Sacramento Valley	Foothills	North Coast	Central Coast	Impact	Data	Recommended Coverage in HCP	Rational for Exclusion
Amphibians	*Bufo californicus*	Arroyo toad	E	Y	–	–	–	X	N	Y	N	Species generally occurs outside of utility corridors of the plan area. It is considered unlikely to be encountered and is avoidable with AMMs.
	Rana draytonii	California red-legged frog	T	Y	X	X	–	X	Y	Y	Y	
	Ambystoma californiense	California tiger salamander	T	Y	X	X	–	X	Y	Y	Y	
	Rana boylii	Foothill yellow-legged frog	–	Y	X	X	X	X	Y	Y	Y	Though not listed, likely to be listed in the near future. Occurs within utility corridors and may be affected.
	Hydromantes brunus	Limestone salamander	–	Y	–	X	–	–	N	Y	N	Not federally listed.
	Ambystoma macrodactylum croceum	Santa Cruz long-toed salamander	E	Y	–	–	–	X	Y	Y	Y	
	Hydromantes shastae	Shasta salamander	–	Y	X	–	–	–	N	Y	N	Not federally listed. Limited distribution around Shasta Lake with limited PG&E facilities.
	Rana sierrae	Sierra Nevada yellow-legged frog	E	Y	–	X	–	–	Y	Y	Y	

Table A-1. Continued

Taxa	Scientific Name	Common Name	Status	Range	Sacramento Valley	Foothills	North Coast	Central Coast	Impact	Data	Recommended Coverage in HCP	Rational for Exclusion
	Rana muscosa	Mountain yellow-legged frog	E	Y	–	X	–	–	Y	Y	Y	
	Batrachoseps stebbinsi	Tehachapi slender salamander	–	Y	–	–	–	–	Y	Y	N	Not federally listed.
	Bufo canorus	Yosemite toad	T	Y	–	X	–	–	Y	Y	Y	
	Spea hammondii	Western spadefoot	–	Y	–	X	–	–	N	N	N	Not federally listed.
	Rhyacotriton variegatus	Southern torrent salamander	–	Y	–	–	–	–	Y	N	N	Not federally listed.
Birds	*Falco peregrinus anatum*	American peregrine falcon	Delisted	Y	X	X	X	X	N	Y	N	Not federally listed.
	Haliaeetus leucocephalus	Bald eagle	Delisted	Y	X	X	X	X	Y	Y	N	Not federally listed.
	Riparia riparia	Bank swallow	–	N	–	–	–	X	N	Y	N	Not federally listed.
	Laterallus jamaicensis coturniculus	Black rail (CA)	–	Y	X	–	–	–	N	Y	N	Not federally listed.
	Branta hutchinsii leucopareia	Cackling (=Aleutian Canada) goose	Delisted	Y	–	–	–	–	N	Y	N	Not federally listed.
	Pelecanus occidentalis californicus	California brown pelican	E	Y	–	–	–	–	N	Y	N	Not federally listed.
	Rallus longirostris obsoletus	California clapper rail	E	N	–	–	–	–	N	Y	N	Not federally listed.
	Gymnogyps californianus	California condor	E	Y	–	–	–	X	N	Y	N	Species is considered avoidable; setback distances will be used for nesting birds.

Table A-1. Continued

Taxa	Scientific Name	Common Name	Status	Range	Sacramento Valley	Foothills	North Coast	Central Coast	Impact	Data	Recommended Coverage in HCP	Rational for Exclusion
	Sternula antillarum browni	California least tern	E	N	–	–	–	–	N	Y	N	Species occurs outside of utility corridors of the plan area.
	Aquila chrysaetos	Golden eagle	–	Y	X	X	X	X	Y	Y	N	Not federally listed.
	Strix nebulosa	Great gray owl	–	Y	X	X	X	X	N	Y	N	Not federally listed.
	Grus canadensis tabida	Greater sandhill crane	–	N	X	–	–	–	N	N	N	Not federally listed
	Vireo bellii pusillus	Least Bell's vireo	E	Y	–	X	–	X	N	Y	N	Species is considered avoidable; setback distances will be used for nesting birds.
	Brachyramphus marmoratus	Marbled murrelet	T	Y	–	–	X	–	Y	Y	Y	
	Strix occidentalis caurina	Northern spotted owl	T	Y	X	–	X	–	Y	Y	Y	
	Progne subis	Purple martin	–	Y	X	X	X	X	N	Y	N	Not federally listed.
	Empidonax traillii extimus	Southwestern willow flycatcher (CA)	E	Y	X	–	–	X	N	Y	N	Not federally listed
	Buteo swainsoni	Swainson's hawk	–	Y	X	–	–	X	Y	Y	N	Not federally listed.
	Agelaius tricolor	Tricolored blackbird	–	Y	X	–	–	X	Y	Y	N	Not federally listed; species is considered avoidable.
	Athene cunicularia	Western burrowing owl	–	Y	X	–	–	X	Y	Y	N	Not federally listed.
	Charadrius alexandrinus nivosus	Western snowy plover	T	N	–	–	X	X	N	Y	N	Species occurs outside of utility corridors of the plan area.
	Coccyzus americanus occidentalis	Western yellow-billed cuckoo	Candidate	Y	X	–	–	–	N	Y	N	Species is considered avoidable; setback distances will be used for nesting birds.

Table A-1. Continued

Taxa	Scientific Name	Common Name	Status	Range	Sacramento Valley	Foothills	North Coast	Central Coast	Impact	Data	Recommended Coverage in HCP	Rational for Exclusion
	Rallus longirostris levipes	Light-footed Ridgway rail	E	Y	X	–	–	–	N	Y	N	Species is considered avoidable; setback distances will be used for nesting birds.
	Elanus leucurus	White-tailed kite	–	Y	X	X	X	X	N	Y	N	Not federally listed.
	Empidonax traillii	Willow flycatcher	–	Y	–	–	–	X	Y	Y	N	Not federally listed.
Invertebrates	*Euphydryas editha bayensis*	Bay checkerspot butterfly	T	N	–	–	–	–	N	Y	N	Occur in counties outside of the HCP area.
	Speyeria zerene behrensii	Behren's silverspot butterfly	E	Y	–	–	–	–	N	Y	N	Species generally occurs outside of utility corridors of the plan area and is considered unlikely to be encountered.
	Syncaris pacifica	California freshwater shrimp	E	N	–	–	–	–	N	Y	N	Very specific distribution in locations outside study area.
	Speyeria callippe callippe	Callippe silverspot butterfly	E	N	–	–	–	–	N	Y	N	Occur in counties outside of the study area.
	Branchinecta conservatio	Conservancy fairy shrimp	E	Y	X	–	–	–	Y	Y	Y	
	Elaphrus viridis	Delta green ground beetle	T	N	–	–	–	–	N	Y	N	Occurs in Solano County which is not in the study area.
	Euproserpinus euterpe	Kern primrose sphinx moth	T	Y	–	–	–	X	N	Y	N	Distribution and habitat for this species is very limited within the plan area.
	Apodemia mormo langei	Lange's metalmark butterfly	E	N	–	–	–	–	N	Y	N	Occur in counties outside of the study area.
	Branchinecta longiantenna	Longhorn fairy shrimp	E	N	–	–	–	X	Y	Y	Y	Species range is outside of the study area.

Table A-1. Continued

Taxa	Scientific Name	Common Name	Status	Range	Sacramento Valley	Foothills	North Coast	Central Coast	Impact	Data	Recommended Coverage in HCP	Rational for Exclusion
	Lycaeides argyrognomon lotis	Lotis blue butterfly	E	Y	–	–	X	–	Y	Y	N	Speices has not been observed since 1983 and is considered unlikely to be encounterd.
	Helminthoglypta walkeriana	Morro shoulderband (=banded dune snail)	E	Y	–	–	–	X	Y	Y	Y	
	Polyphylla barbata	Mount Hermon (=barbate) June beetle	E	Y	–	–	–	X	Y	Y	Y	
	Cicindela ohlone	Ohlone tiger beetle	E	Y	–	–	–	X	Y	Y	Y	
	Pacifastacus fortis	Shasta crayfish	E	Y	X	–	–		N	Y	N	Covered activities are unlikely to impact the species.
	Euphilotes enoptes smithi	Smith's blue butterfly	E	Y	–	–	–	X	Y	Y	Y	
	Desmocerus californicus dimorphus	Valley elderberry longhorn beetle	T	Y	X	X	–	–	Y	Y	Y	
	Branchinecta lynchi	Vernal pool fairy shrimp	T	Y	X	–	–	X	Y	Y	Y	
	Lepidurus packardi	Vernal pool tadpole shrimp	E	Y	X	–	–	X	Y	Y	Y	
	Branchinecta mesovallensis	Midvalley fairy shrimp	-		X	X	–	X			N	Not federally listed.
	Trimerotropis infantilis	Zayante band-winged grasshopper	E	Y	–	–	–	X	Y	Y	Y	

Table A-1. Continued

Taxa	Scientific Name	Common Name	Status	Range	Sacramento Valley	Foothills	North Coast	Central Coast	Impact	Data	Recommended Coverage in HCP	Rational for Exclusion
Mammals	*Sorex ornatus relictus*	Buena Vista Lake shrew	E	N	–	–		–	N	Y	N	Species range is outside of the study area.
	Canus lupis	Grey wolf	E	Y	X	–	X	–	N	Y	N	Species avoids human activity and impacts are unlikely.
	Gulo gulo	California wolverine	PT	N	–	–	–	–	N	Y	N	Species is rare in California, avoids human activity and impacts are unlikely.
	Dipodomys nitratoides exilis	Fresno kangaroo rat	E	N	–	–	–	–	N	Y	N	Species range is outside of the study area.
	Dipodomys ingens	Giant kangaroo rat	E	Y	–	–	–	X	Y	Y	Y	
	Xerospermophilus mohavensis	Mohave ground squirrel	–	N	–	–	–	X	Y	Y	N	Not federally listed.
	Dipodomys heermanni morroensis	Morro Bay kangaroo rat	E	Y	–	–	–	X	N	Y	N	Unlikely to be affected.
	Ammospermophilus nelsoni	Nelson's antelope squirrel	–	Y	–	–	–	X	Y	Y	N	Not federally listed.
	Martes americana humboldtensis	Humbolt marten	-	Y	–	–	X	–	N	N	N	Not federally listed.
	Martes pennanti	Pacific fisher	-	Y	–	X	X	–	N	Y	N	Not federally listed.
	Aplodontia rufa nigra	Point Arena mountain beaver	E	Y	–	–	X	–	Y	Y	Y	
	Neotoma fuscipes riparia	Riparian (San Joaquin Valley) woodrat	E	N	–	–	–	–	N	Y	N	Species range is outside of the study area.
	Sylvilagus bachmani riparius	Riparian brush rabbit	E	Y	–	–	–	–	N	Y	N	Species range is outside of the study area.

Table A-1. Continued

Taxa	Scientific Name	Common Name	Status	Range	Sacramento Valley	Foothills	North Coast	Central Coast	Impact	Data	Recommended Coverage in HCP	Rational for Exclusion
	Reithrodontomys raviventris	Salt marsh harvest mouse	E	N	–	–	–	–	N	Y	N	Species range is outside of the study area.
	Vulpes macrotis mutica	San Joaquin kit fox	E	Y	–	–	–	X	Y	Y	Y	
	Ovis canadensis sierrae	Sierra Nevada bighorn sheep	E	N	–	–	–	–	N	Y	N	Species range is outside of the study area.
	Vulpes vulpes necator	Sierra Nevada red fox	PT	Y	–	X	–	–	N	Y	N	Species avoids human activity and impacts are unlikely.
	Enhydra lutris nereis	Southern sea otter	T	N	–	–	–	–	N	Y	N	Species range is outside of the study area.
	Dipodomys nitratoides nitratoides	Tipton kangaroo rat	E	N	–	–	–	–	N	Y	N	Species range is outside of the study area.
Reptiles	*Masticophis lateralis euryxanthus*	Alameda whipsnake	T	N	–	–	–	–	N	Y	N	Species range is outside of the study area.
	Gambelia sila	Blunt-nosed leopard lizard	E	Y	–	–	–	X	Y	Y	Y	
	Gopherus agassizii	Desert tortoise	T	Y	–	–	–	X	Y	Y	N	Species range is outside of the study area.
	Thamnophis gigas	Giant garter snake	T	Y	X	X	–	–	Y	Y	Y	
	Thamnophis sirtalis tetrataenia	San Francisco garter snake	E	N	–	–	–	–	N	Y	N	Species range is outside of the study area.
	Charina umbratica	Southern rubber boa	–	N	–	–	–	–	N	Y	N	Not federally listed.
	Actinemys marmorata	Western pond turtle	–	Y	–	–	–	–	Y	Y	N	Not federally listed.
							Species Proposed for Coverage				24	

Table A-2. MRHCP Plant Species Evaluation and Screening Process

Region/ Species Group	Scientific Name	Common Name	Status	Range	Impact	Data	Federal Lands	Critical Habitat?	Critical Habitat (ac)	Recommended for Coverage in the HCP?	Rationale for Inclusion or Exclusion[a]
Sacramento Valley/Foothills											
Shrubs	*Arctostaphylos myrtifolia*	Ione manzanita	FT	Y	Y	Y	Y	N	0.0	Y	ED & ET lines cross 2 occurrence on federal lands (BLM), in part, Apricum Hill Ecological Reserve (CDFW), in part.
	Ceanothus roderickii	Pine Hill ceanothus	FE	Y	Y	Y	Y	N	0.0	Y	ED & ET lines cross 2 occurrences on federal lands (BLM), in part, Pine Hill ER (CDFW, CDF).
	Fremontodendron decumbens	Pine Hill flannelbush	FE	Y	Y	Y	Y	N	0.0	Y	ED lines cross 1 occurrence on federal lands (BLM), in part.
Perennials	*Calystegia stebbinsii*	Stebbins' morning-glory	FE	Y	Y	Y	Y	N	0.0	Y	ED lines cross 4 occurrences and GT lines cross 1 occurrence on federal lands (BLM), in part.
	Packera layneae	Layne's ragwort	FT	Y	Y	Y	Y	N	0.0	Y	ED & ED lines cross many occurrences, including 5 occurrences on federal lands (BLM, USFS), at least in part.
Annuals	*Chloropyron palmatum*	palmate-bracted salty bird's-beak	FE	Y	N	Y	N	N	0.0	N	GT line crosses City preserve; population proposed for coverage under Yolo County HCP/NCCP. Avoidance is possible.

Table A-2. Continued

Region/ Species Group	Scientific Name	Common Name	Status	Range	Impact	Data	Federal Lands	Critical Habitat?	Critical Habitat (ac)	Recommended for Coverage in the HCP?	Rationale for Inclusion or Exclusion[a]
Vernal Pool Annuals	*Euphorbia hooveri*	Hoover's spurge	FT	Y	N	Y	N	Y	36.8	N	Facilities cross critical habitat. Avoidance is possible.
	Limnanthes floccosa ssp. californica	Butte County meadowfoam	FE	Y	N	Y	N	Y	1,247.6	N	Facilities cross Stone Ridge ER (CDFW), critical habitat; species proposed for inclusion in Butte County RCP.
	Neostapfia colusana	Colusa grass	FT	Y	N	Y	N	Y	35.9	N	Facilities cross critical habitat. Avoidance is possible.
	Orcuttia pilosa	hairy Orcutt grass	FE	Y	N	Y	N	Y	14.4	N	Facilities cross critical habitat. Avoidance is possible.
	Orcuttia tenuis	slender Orcutt grass	FT	Y	N	Y	N	Y	2,957.1	N	Facilities cross critical habitat. Avoidance is possible.
	Orcuttia viscida	Sacramento Orcutt grass	FE	Y	N	Y	N	Y	291.1	N	Facilities cross critical habitat. Avoidance is possible.
	Tuctoria greenei	Greene's tuctoria	FE	Y	N	Y	N	Y	56.1	N	Facilities cross critical habitat. Avoidance is possible.
	Tuctoria mucronata	Crampton's tuctoria or Solano grass	FE	Y	N	Y	N	Y	16.6	N	Facilities cross critical habitat. Avoidance is possible.

Table A-2. Continued

Region/ Species Group	Scientific Name	Common Name	Status	Range	Impact	Data	Federal Lands	Critical Habitat?	Critical Habitat (ac)	Recommended for Coverage in the HCP?	Rationale for Inclusion or Exclusion[a]
North Coast											
Perennials	*Erysimum menziesii*	Menzies' wallflower	FE	Y	N	Y	Y	N	0.0	N	ED & ET lines cross 1 occurrence on federal lands (BLM), in part but can be avoided.
	Noccaea fendleri ssp. californica	Kneeland Prairie pennycress	FE	Y	N	Y	N	Y	10.7	N	Facilities cross critical habitat, but species can be avoided.
Annuals	*Layia carnosa*	beach layia	FE	Y	Y	Y	Y	N	0.0	Y	ED & ET lines cross 1 occurrence on federal lands (USFWS, BLM), in part.
Vernal Pool Annuals	*Lasthenia conjugens*	Contra Costa goldfields	FE	Y	N	Y	N	Y	148.6	N	Facilities cross critical habitat, but species can be avoided.
Central Coast											
Shrubs & Trees	*Arctostaphylos morroensis*	Morro manzanita	FT	Y	N	Y	N	N	0.0	N	ED lines cross 2 occurences partly on State Park lands but impacts can be avoided.
	Eriodictyon capitatum	Lompoc yerba santa	FE	Y	N	Y	N	Y	113.1	N	Facilities cross critical habitat. Avoidance is possible.
	Hesperocyparis abramsiana var. abramsiana	Santa Cruz cypress	FT	Y	N	Y	N	N	0.0	N	ED lines cross 2 occurrences partly on State lands (Big Basin SP, Bonnie Dune ER). Avoidance is possible.

Table A-2. Continued

Region/ Species Group	Scientific Name	Common Name	Status	Range	Impact	Data	Federal Lands	Critical Habitat?	Critical Habitat (ac)	Recommended for Coverage in the HCP?	Rationale for Inclusion or Exclusion[a]
Perennials	*Chlorogalum purpureum var. purpureum*	Santa Lucia purple amole	FT	Y	N	Y	Y	Y	127.5	N	ED lines cross 1 occurrence on federal lands (DOD), facilities cross critical habitat. Avoidance is possible.
	Chlorogalum purpureum var. reductum	Camatta Canyon amole	FT	Y	N	Y	N	Y	100.8	N	Facilities cross critical habitat. Avoidance is possible.
	Cirsium scariosum var. loncholepis	La Graciosa thistle	FE	Y	N	Y	N	Y	983.1	N	Facilities cross critical habitat. Avoidance is possible.
	Piperia yadonii	Yadon's rein orchid	FE	Y	Y	Y	Y	Y	117.7	Y	ED lines cross 1 occurrence on federal lands (DOD), facilities cross critical habitat.
Annuals	*Camissonia benitensis*	San Benito evening-primrose	FT	Y	Y	Y	Y	N	0.0	Y	ED lines cross 4 occurrences on federal lands (BLM).
	Caulanthus californicus	California jewelflower	FE	Y	N	Y	Y	N	0.0	N	ET lines cross 1 occurrence on federal lands (BLM). Avoidance is possible.
	Chorizanthe pungens var. hartwegiana	Ben Lomond spineflower	FE	Y	N	Y	N	N	0.0	N	ED lines cross 1 occurrence at Bonnie Doon ER (CDFW). Avoidance is possible.
	Chorizanthe pungens var. pungens	Monterey spineflower	FT	Y	Y	Y	Y	Y	321.0	Y	ED, ET, GD, GT lines cross 2 occurrences on federal lands (BLM, DOD), ED lines cross occurrences at Point Lobos SR and Manzanita Park (Monterey Co.); facilities cross critical habitat.

Table A-2. Continued

Region/ Species Group	Scientific Name	Common Name	Status	Range	Impact	Data	Federal Lands	Critical Habitat?	Critical Habitat (ac)	Recommended for Coverage in the HCP?	Rationale for Inclusion or Exclusion[a]
	Chorizanthe robusta var. hartwegii	Scotts Valley spineflower	FE	Y	N	Y	N	Y	31.8	N	ED line crosses one occurrence on city property (Scotts Valley); facilities cross critical habitat. Avoidance is possible.
	Chorizanthe robusta var. robusta	robust spineflower	FE	Y	Y	Y	Y	Y	21.0	Y	ED lines cross 1 occurrence on federal lands (Ellicot Slough NWR), ED lines crosses 1 occurrence at Sunset SB (DPR), other facilities cross city and county lands; facilities cross critical habitat.
	Deinandra increscens ssp. villosa	Gaviota tarplant	FE	Y	N	Y	Y	Y	6.3	N	ED crosses one occurrence, occurrence partly on federal lands (DOD); facilities cross critical habitat. Avoidance is possible.
	Diplacus vandenbergensis	Vandenberg monkeyflower	FE	Y	N	Y	N	Y	230.8	N	Facilities cross critical habitat. Avoidance is possible.
	Eremalche parryi ssp. kernensis	Kern mallow	FE	Y	Y	Y	Y	N	0.0	Y	ET lines cross 5 occurrence on federal lands (BLM), GT crosses 1 occurrence on federal lands (BLM), ED & ET lines cross three occurrences on Carrizo Plain ER (CDFW).

Table A-2. Continued

Region/ Species Group	Scientific Name	Common Name	Status	Range	Impact	Data	Federal Lands	Critical Habitat?	Critical Habitat (ac)	Recommended for Coverage in the HCP?	Rationale for Inclusion or Exclusion[a]
	Gilia tenuiflora ssp. arenaria	Monterey gilia	FE	Y	Y	Y	Y	N	0.0	Y	ED, ED, GT lines cross 5 occurrences on federal lands (BLM, DOD), ET line crosses Fort Ord NR (UCNRS).
	Holocarpha macradenia	Santa Cruz tarplant	FE	Y	N	Y	N	Y	617.8	N	Facilities cross critical habitat. Avoidance is possible.
	Lupinus tidestromii	Tidestrom's lupine	FE	Y	N	Y	N	N	0.0	N	ED lines cross one occurrence partly on state lands (Asilomar SB - DPR). Avoidance is possible.
	Polygonum hickmanii	Scotts Valley polygonum	FE	Y	N	Y	N	Y	31.8	N	Facilities cross critical habitat. Avoidance is possible.
Other Species Considered											Rationale for Exclusion
	Brodiaea pallida	Chinese Camp brodiaea	FT	Y	N	Y	N	N	0.0	N	No occurrences on federal lands, critical habitat not affected. Avoidance is possible.
	Calyptridium pulchellum	Mariposa pussypaws	FT	Y	N	Y	N	N	0.0	N	No occurrences on federal lands, critical habitat not affected. Avoidance is possible.
	Chloropyron molle ssp. molle	soft salty bird's-beak	FE	Y	N	Y	N	Y	0.0	N	No occurrences on federal lands, critical habitat not affected. Avoidance is possible.
	Eriogonum apricum var. apricum	Ione buckwheat	FE	Y	N	Y	N	N	0.0	N	No occurrences on federal lands, critical habitat not affected; GT crosses occurences in Caltrans ROW.

Table A-2. Continued

Region/ Species Group	Scientific Name	Common Name	Status	Range	Impact	Data	Federal Lands	Critical Habitat?	Critical Habitat (ac)	Recommended for Coverage in the HCP?	Rationale for Inclusion or Exclusion[a]
	Eriogonum apricum var. prostratum	Irish Hill buckwheat	FE	Y	N	Y	N	N	0.0	N	No occurrences on federal lands, critical habitat not affected. Avoidance is possible.
	Galium californicum ssp. sierrae	El Dorado bedstraw	FE	Y	N	Y	N	N	0.0	N	No occurrences on federal lands, critical habitat not affected. Avoidance is possible.
	Ivesia webberi	Webber's ivesia	FT	Y	N	Y	N	N	0.0	N	No occurrences on federal lands, critical habitat not affected. Avoidance is possible.
	Oenothera deltoides ssp. howellii	Antioch Dunes evening-primrose	FE	Y	N	Y	N	N	0.0	N	No occurrences on federal lands, critical habitat not affected; facilities cross state park lands at a transplantation site.
	Pseudobahia bahiifolia	Hartweg's golden sunburst	FE	Y	N	Y	N	N	0.0	N	No occurrences on federal lands, critical habitat not affected. Avoidance is possible.
	Verbena californica	Red Hills vervain	FT	Y	N	Y	N	N	0.0	N	No occurrences on federal lands, critical habitat not affected. Avoidance is possible.
	Arabis mcdonaldiana	McDonald's rockcress	FE	Y	N	Y	N	N	0.0	N	No occurrences on federal lands, critical habitat not affected. Avoidance is possible.
	Chorizanthe howellii	Howell's spineflower	FE	Y	N	Y	N	N	0.0	N	No occurrences on federal lands, critical habitat not affected. Avoidance is possible.

Table A-2. Continued

Region/ Species Group	Scientific Name	Common Name	Status	Range	Impact	Data	Federal Lands	Critical Habitat?	Critical Habitat (ac)	Recommended for Coverage in the HCP?	Rationale for Inclusion or Exclusion[a]
	Eryngium constancei	Loch Lomond button-celery	FE	Y	N	Y	N	N	0.0	N	No occurrences on federal lands, critical habitat not affected. Avoidance is possible.
	Howellia aquatilis	water howellia	FT	Y	N	Y	N	N	0.0	N	No occurrences on federal lands, critical habitat not affected. Avoidance is possible.
	Lasthenia burkei	Burke's goldfields	FE	Y	N	Y	N	N	0.0	N	No occurrences on federal lands, critical habitat not affected. Avoidance is possible.
	Navarretia leucocephala ssp. pauciflora	few-flowered navarretia	FE	Y	N	Y	N	N	0.0	N	No occurrences on federal lands, critical habitat not affected. Avoidance is possible.
	Sedella leiocarpa	Lake County stonecrop	FE	Y	N	Y	N	N	0.0	N	No occurrences on federal lands, critical habitat not affected. Avoidance is possible.
	Sidalcea keckii	Keck's checkerbloom	FE	Y	N	Y	N	N	0.0	N	No occurrences on federal lands, critical habitat not affected. Avoidance is possible.
	Arenaria paludicola	marsh sandwort	FE	Y	N	Y	N	N	0.0	N	No occurrences on federal lands, critical habitat not affected. Avoidance is possible.
	Astragalus tener var. titi	coastal dunes milk-vetch	FE	Y	N	Y	N	N	0.0	N	No occurrences on federal lands, critical habitat not affected. Avoidance is possible.

Table A-2. Continued

Region/ Species Group	Scientific Name	Common Name	Status	Range	Impact	Data	Federal Lands	Critical Habitat?	Critical Habitat (ac)	Recommended for Coverage in the HCP?	Rationale for Inclusion or Exclusion[a]
	Chloropyron maritimum ssp. maritimum	salt marsh bird's-beak	FE	Y	N	Y	N	N	0.0	N	No occurrences on federal lands, critical habitat not affected. Avoidance is possible.
	Cirsium fontinale var. obispoense	San Luis Obispo fountain thistle	FE	Y	N	Y	N	N	0.0	N	No occurrences on federal lands, critical habitat not affected. Avoidance is possible.
	Clarkia speciosa ssp. immaculata	Pismo clarkia	FE	Y	N	Y	N	N	0.0	N	No occurrences on federal lands, critical habitat not affected. Avoidance is possible.
	Eriodictyon altissimum	Indian Knob mountainbalm	FE	Y	N	Y	N	N	0.0	N	No occurrences on federal lands, critical habitat not affected. Avoidance is possible.
	Erysimum menziesii (Central Coast populations)	Menzies' wallflower	FE	Y	N	Y	N	N	0.0	N	No occurrences on federal lands, critical habitat not affected. Avoidance is possible.
	Erysimum teretifolium	Santa Cruz wallflower	FE	Y	N	Y	N	N	0.0	N	No occurrences on federal lands, critical habitat not affected. Avoidance is possible.
	Hesperocyparis goveniana	Gowen cypress	FT	Y	N	Y	N	N	0.0	N	No occurrences on federal lands, critical habitat not affected. Avoidance is possible.
	Lasthenia conjugens	Contra Costa goldfields	FE	Y	N	Y	N	N	0.0	N	No occurrences on federal lands, critical habitat not affected. Avoidance is possible.

Table A-2. Continued

Region/ Species Group	Scientific Name	Common Name	Status	Range	Impact	Data	Federal Lands	Critical Habitat?	Critical Habitat (ac)	Recommended for Coverage in the HCP?	Rationale for Inclusion or Exclusion[a]
	Layia carnosa	beach layia	FE	Y	N	Y	N	N	0.0	N	No occurrences on federal lands, critical habitat not affected. Avoidance is possible.
	Lupinus nipomensis	Nipomo Mesa lupine	FE	Y	N	Y	N	N	0.0	N	No occurrences on federal lands, critical habitat not affected. Avoidance is possible.
	Monolopia congdonii	San Joaquin woollythreads	FE	Y	N	Y	N	N	0.0	N	No occurrences on federal lands, critical habitat not affected. Avoidance is possible.
	Nasturtium gambelii	Gambel's water cress	FE	Y	N	Y	N	N	0.0	N	No occurrences on federal lands, critical habitat not affected. Avoidance is possible.
	Navarretia fossalis	spreading navarretia	FT	Y	N	Y	N	N	0.0	N	No occurrences on federal lands, critical habitat not affected. Avoidance is possible.
	Pentachaeta bellidiflora	white-rayed pentachaeta	FE	Y	N	Y	N	N	0.0	N	No occurrences on federal lands, critical habitat not affected. Avoidance is possible.
	Potentilla hickmanii	Hickman's cinquefoil	FE	Y	N	Y	N	N	0.0	N	No occurrences on federal lands, critical habitat not affected. Avoidance is possible.
	Suaeda californica	California seablite	FE	Y	N	Y	N	N	0.0	N	No occurrences on federal lands, critical habitat not affected. Avoidance is possible.

Table A-2. Continued

Region/ Species Group	Scientific Name	Common Name	Status	Range	Impact	Data	Federal Lands	Critical Habitat?	Critical Habitat (ac)	Recommended for Coverage in the HCP?	Rationale for Inclusion or Exclusion[a]
	Trifolium trichocalyx	Monterey clover	FE	Y	N	Y	N	N	0.0	N	No occurrences on federal lands, critical habitat not affected. Avoidance is possible.
	Navarretia leucocephala ssp. plieantha	many-flowered navarretia	FE	Y	N	Y	N	N	0.0	N	No occurrences on federal lands, critical habitat not affected; ED lines cross part of 1 occurrence in Boggs Lake Preserve (TNC), not part in Boggs Lake ER (CDFW).
							Species Proposed for Coverage			12	

[a] For species where avoidance is possible, the primary reasons include: 1. Additional surveys would be conducted for large activities to ensure impacts are avoided. 2. Facilities span habitat and direct impacts can be avoided. 3. Work areas can be cited to avoid impacts on plant populations. 4. Wetland species will require avoidance or additional permitting.

Appendix B

Species Accounts

Invertebrates

Conservancy Fairy Shrimp (*Branchinecta conservatio*)

Status

State: None

Federal: Endangered

Critical Habitat: Yes

Recovery Planning: *Recovery Plan for Vernal Pool Ecosystems of California and Southern Oregon* (U.S. Fish and Wildlife Service 2005)

Critical Habitat

The U.S. Fish and Wildlife Service (USFWS) designated 161,786 acres (65,473 hectares) of critical habitat for the Conservancy fairy shrimp (71 Federal Register [FR] 7118-7316). Eight critical habitat units have been delineated for Butte, Colusa, Mariposa, Merced, Solano, Stanislaus, Tehama, and Ventura Counties. These units contain primary constituent elements of critical habitat characterized by mounds, swales, and depressions or pools connected by continuously or intermittently flowing water that must be retained in the pools for at least 19 days. Organic detritus in the pools is required for feeding, and inorganic detritus is required to provide shelter (U.S. Fish and Wildlife Service 2005).

Range

The historical distribution of the Conservancy fairy shrimp is not known. However, the distribution of vernal pool habitats in the areas where the species is now known to occur was once more contiguous and larger in area than it is today. It is likely the Conservancy fairy shrimp once occupied suitable vernal pool habitats throughout a large portion of the Central Valley and southern coastal regions of California. USFWS is aware of ten Conservancy fairy shrimp populations, all of which are located in California: Vina Plains in Butte and Tehama Counties; Sacramento National Wildlife Refuge (NWR) in Glenn County; Mariner Ranch in Placer County; Yolo Bypass Wildlife Area in Yolo County; Jepson Prairie in Solano County; Mapes Ranch in Stanislaus County; University of California (UC) Merced area in Merced County; the State Route (SR) 165 area in Merced County; Sandy Mush Road in Merced County; and Los Padres National Forest in Ventura County (U.S. Fish and Wildlife Service 2012). The referenced "populations," don't necessarily represent biological populations or individual CNDDB occurrences. Rather the "populations" described by USFWS represent an effective means of characterizing the general regions where Conservancy fairy shrimp are known to occur (U.S. Fish and Wildlife Service 2012).

Habitat Requirements

Conservancy fairy shrimp are found in clay-bottomed vernal pools that form in depressions in grassland habitats (Helm 1998). The Conservancy fairy shrimp lifecycle occurs entirely within vernal pools, necessitating pools that fill frequently and hold water for long periods. The pools inhabited by Conservancy fairy shrimp are usually large, 1 to 2 acres, and often have turbid water. These pools are known to occur on a range of different soil and geologic formations. (U.S. Fish and Wildlife Service 2005). Occupied habitats range in size from claypan vernal pools as small as 324 square feet (30 square meters) to large vernal pools up to 89 acres (36 hectares). The maximum potential water depth of occupied habitat ranges from 5 to 19 inches (13–48 centimeters). On average, Conservancy fairy shrimp occupy larger seasonal wetlands than other endemics (Helm 1998; Eriksen and Belk 1999; U.S. Fish and Wildlife Service 2007).

Movement

Conservancy fairy shrimp cysts can be dispersed over short distances through wetland hydrologic connectivity and dispersed over longer distances via wildlife. Conservancy fairy shrimp are dispersed locally between pools when individual pools overflow with water and become connected with adjacent pools. Because the cysts are passed undamaged through the intestinal tracts of most animals, fecal matter deposited as the animal moves can result in the spread of populations to new sites. Cysts can also be transported in mud carried on the feet and feathers of birds as well as the hooves and hair of livestock that may wade through the habitat (Eriksen and Belk 1999).

Table B1-1. Documented Conservancy Fairy Shrimp Movement

Type	Distance/Area	Location of Study	Source
Home range	324 sq. ft.– 89 acres (30 sq. m–36 ha)	Butte, Glenn, Merced, Solana, Tehama, Ventura and Yolo Counties	Helm 1998; Eriksen and Belk 1999; U.S. Fish and Wildlife Service 2007
Breeding	Limited to vernal pool	Butte, Glenn, Merced, Solana, Tehama, Ventura and Yolo Counties	Helm 1998; Eriksen and Belk 1999; U.S. Fish and Wildlife Service 2007
Dispersal	Cysts dispersed by wind and animals		

Reproduction

Conservancy fairy shrimp adults occur in vernal pools as they fill with rainwater. Adult populations are typically present from mid-December through mid-March (Eriksen and Belk 1999). Individuals hatch from cysts during cold-weather winter storms, as they require water temperatures of 50°F (10°C) or lower to hatch (Helm 1998; Eriksen and Belk 1999). The time to maturity and reproduction is temperature dependent, varying between 18 and 147 days, with a mean of 39.7 days (Helm 1998).

Population Trends and Threats

As of 2018, USFWS had not implemented the monitoring program as described in the 2005 USFWS Recovery Plan for the Conservancy fairy shrimp; therefore, detailed information regarding the growth or decline in overall numbers of this species is unavailable at this time. Threats to

Conservancy fairy shrimp include the conversion of vernal pool habitat to agricultural lands and urban development, and stochastic extinction because of the small and isolated nature of remaining populations (U.S. Fish and Wildlife Service 2005). The limited and disjunct distribution of vernal pools, coupled with the even more limited distribution of the Conservancy fairy shrimp, means that any reduction in vernal pool habitat quantity could adversely affect this species.

Species Management

The overarching recovery strategy for Conservancy fairy shrimp is habitat protection and management. As of 2018, USFWS had not implemented a standardized monitoring protocol for Conservancy fairy shrimp. However, the 2005 USFWS Recovery Plan criterion for adaptive management and monitoring has been partially satisfied as the following locations are known to manage vernal pool species under various forms of management plans: Vina Plains Preserve, Meridian Ranch, Mariner Ranch, Wilcox Ranch, Muzzy Ranch, Elsie Gridley Conservation Bank, Montezuma Wetlands Preserve, Potrero Hills Landfill, Yolo Basin Wildlife Area, Sacramento NWR, Great Valley Grasslands State Park, Viera-Sandy Mush Road Conservation Bank, and Deadman's Creek Conservation Bank (U.S. Fish and Wildlife Service 2012). Threats to conservancy fair shrimp are not likely managed on most private, unprotected land. Other management actions, as defined by the 2005 USFWS Recovery Plan for vernal pool ecosystems, which would beneficially impact the Conservancy fairy shrimp include the following provision:

> [E]stablishing a range-wide recovery implementation team; establishing working groups and developing participation plans for each vernal pool region; developing and implementing adaptive management plans based on monitoring data and best available science; assisting local governments in developing habitat conservation plans and developing land use protection measures; assisting private landowners in developing landowner agreements; acquiring habitat, where necessary; tracking losses and protection of suitable habitat and occurrences within core areas; and ensuring mechanisms are in place that 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 (U.S. Fish and Wildlife Service 2005).

Habitat Model Development

To conservatively capture this habitat type, the National Hydrography Dataset (NHD) waterbodies lake/pond (U.S. Geological Survey 2013) were added to the model. Specifically, the model includes waterbodies lakes/ponds within or adjacent to the vernal pools mapped by Witham et al. (2014) and comprising an area less than or equal to 50 acres. Vernal pools vary in size, from several square feet to 1 hectare or more (U.S. Fish and Wildlife Service 2005). Although there are instances of large vernal features such as Olcott Lake in Jepson Prairie (90 acres) or Table Mountain Lake in Tehama County (180 acres) (Barry 1995; U.S. Fish and Wildlife Service 2005), 50 acres was a conservative maximum size to apply to the NHD waterbodies lake/pond data in the regional study area to identify potential deep pool habitat not included in the vernal pool mapping effort by Witham et al. (2014).

Potential suitable habitat can be found in the following land-cover types: annual and perennial grasslands; blue oak, coastal oak and valley oak woodlands; and vernal pool complexes. A combination of the following datasets were utilized to develop the Conservancy fairy shrimp habitat model:

- *Changes in the Distribution of Great Valley Vernal Pool Habitats from 2005 to 2012* (Witham et al. 2014).
- Vernal Pool Core Areas (U.S. Fish and Wildlife Service 2005).

- NHD Waterbodies (U.S. Geological Survey 2013): "Lake/ponds equal to or less than 50 acres when they are within or adjacent to (touching) the vernal pool map by Witham et al. (2014)
- Recovery Plan for Vernal Pool Ecosystems of California and Southern Oregon (U.S. Fish and Wildlife Service 2005)
- Vernal Pool Regions: Northwestern Sacramento Valley, Northeastern Sacramento Valley, Southeastern Sacramento Valley, Solano-Colusa, San Joaquin Valley, Livermore, Lake-Napa, Santa Barbara, Southern Sierra Foothills, Central Coast, Carrizo Plains, and Western Riverside County vernal pool regions. (U.S. Fish and Wildlife Service 2005)

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Vernal Pool Fairy Shrimp (*Branchinecta lynchi*)

Status

State: None

Federal: Threatened

Critical Habitat: Yes

Recovery Planning: *Recovery Plan for Vernal Pool Ecosystems of California and Southern Oregon* (U.S. Fish and Wildlife Service 2005)

Critical Habitat

In 2006, USFWS designated critical habitat for vernal pool fairy shrimp in the following counties in California: 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 (71 FR 7118-7316). There are 597,821 total acres (241,929 hectares) of critical habitat designated for vernal pool fairy shrimp in California.

Range

The vernal pool fairy shrimp is found from southern Oregon to southern California, throughout the Central Valley, and west to the central Coast Ranges (U.S. Fish and Wildlife Service 2007). Disjunct populations occur in Monterey, San Luis Obispo, Santa Barbara, Ventura, Los Angeles, and Riverside Counties. This species has also been observed in Napa County and the eastern portions of Alameda and Contra Costa Counties (U.S. Fish and Wildlife Service 2005; California Department of Fish and Wildlife 2018).

Habitat Requirements

This species is usually associated with vernal pools, but can also be found in association with other ephemeral habitats including alkali pools, seasonal drainages, stock ponds, vernal swales, rock outcrops, and artificially created ephemeral habitats such as railroad toe-drains, roadside ditches, abandoned agricultural drains, ruts left by heavy construction vehicles, and depressions in firebreaks (Eng et al. 1990; Vollmar 2002).

Vernal pools are subject to seasonal variations, and vernal pool fairy shrimp are dependent on the ecological characteristics of those variations. These characteristics include duration of inundation

and presence or absence of water at specific times of the year (59 FR 48136). The vernal pool fairy shrimp is capable of living in Central Valley vernal pools of relatively short duration (ponds 6–7 weeks in winter and 3 weeks in spring) (Eriksen and Belk 1999). Other factors contributing to the suitability of pools for vernal pool fairy shrimp include alkalinity (22–274 parts per million [ppm]), total dissolved solids (TDS) (48–481 ppm), and pH (6.3–8.5) (59 FR 48136; Eriksen and Belk 1999). Water in pools occupied by vernal pool fairy shrimp typically has low conductivity and chloride (59 FR 48136). Vernal pool fairy shrimp typically occupy smaller and shallower pools of approximately 6 inches in depth (Helm 1998). Vernal pool fairy shrimp are omnivorous filter-feeders that indiscriminately filter particles from the surrounding water including bacteria, unicellular algae, and micrometazoa (Eriksen and Belk 1999).

Vernal pool fairy shrimp are a component of the planktonic crustacea within seasonal temporary pools and can occur in densities as high as 200 per liter of water. Beyond inundation of the habitat, the specific cues for hatching are unknown, although temperature is believed to play a large role (Eriksen and Belk 1999). Vernal pool fairy shrimp commonly co-occur with California linderiella *(Linderiella occidentalis*) and have also been reported to co-occur with midvalley pool fairy shrimp (*Branchinecta mesovallensis*) (Eriksen and Belk 1999). In most cases, vernal pool fairy shrimp do not co-occur with other fairy shrimp species and are not numerically dominant when other fairy shrimp species are present (Eng et al. 1990).

Movement

Vernal pool fairy shrimp do not migrate. Predator consumption of fairy shrimp cysts (resting eggs) aids in distributing populations of fairy shrimp. Predators expel viable cysts in their excrement, often at locations other than where they were consumed. If conditions are suitable, these transported cysts may hatch at the new location and potentially establish a new population. Cysts can also be transported in mud carried on the feet of animals, including livestock that may wade through the habitat. Vernal pool fairy shrimp may also disperse between habitats during flooding events (U.S. Fish and Wildlife Service 2007).

Reproduction

Individuals hatch from cysts during cold-weather winter storms, as they require water temperatures of around 10°C to hatch (Eriksen and Belk 1999). The time to maturity and reproduction is temperature dependent, varying between 18 and 147 days, with a mean of 39.7 days (Helm 1998).

Population Trends and Threats

USFWS does not have information to indicate population or abundance trends for the vernal pool fairy shrimp, although the number of recorded observations has increased due to project-related surveys for federally listed species. Because surveys and monitoring of vernal pool fairy shrimp generally only record presence or absence in pools and do not provide information on shrimp abundance within pools, overall species abundance is, and will likely continue to be, difficult to determine. (U.S. Fish and Wildlife Service 2007).

Vernal pool fairy shrimp are threatened by the same activities as other vernal pool invertebrates. Consistent with the 1994 listing rule, the largest continuing threat to this species is the loss and modification of habitat due to urban development, agricultural conversion, and infrastructure

construction, especially along the periphery of urban areas. Other specific threats identified were inbreeding depression, genetic drift, and stochastic (random) extinction due to isolation of remaining populations. The effects of off-road vehicle use and contaminants on vernal pool habitat were also considered potential threats. Although the spread of invasive plants, grazing cessation, and drought and climate change were not identified as threats at the time of 1994 listing, these factors have since been identified as threats to the species. (U.S. Fish and Wildlife Service 2007).

Species Management

Conservation of the vernal pool fairy shrimp is directly tied to conservation of suitable vernal pool habitat. The 2005 Recovery Plan and the 2007 *5-Year Review: Summary and Evaluation* identify recommendations for vernal pool fairy shrimp management and conservation. These measures include researching the demographics, egg bank dynamics, effects of altered hydrology, and probability of detecting shrimp under current survey guidelines; preserving known extant populations in large blocks of habitat; developing and implementing a standardized formal monitoring program; and developing management indicators for managing vernal pool landscapes (U.S. Fish and Wildlife Service 2007).

Habitat Model Development

The development of the habitat model for vernal pool fairy shrimp was the same as for the Conservancy fairy shrimp.

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Vernal Pool Tadpole Shrimp (*Lepidurus packardi*)

Status

State: None

Federal: Endangered

Critical Habitat: Yes

Recovery Planning: *Recovery Plan for Vernal Pool Ecosystems of California and Southern Oregon* (U.S. Fish and Wildlife Service 2005)

Critical Habitat

USFWS has designated critical habitat for vernal pool tadpole shrimp in Alameda, Amador, Butte, Colusa, Fresno, Kings, Madera, Mariposa, Merced, Sacramento, Shasta, Solano, Stanislaus, Tehama, Tulare, Yolo, and Yuba Counties in California (U.S. Fish and Wildlife Service 2006, 71 FR 7118-7316). There are 228,785 total acres (92,586 hectares) of critical habitat designated for vernal pool tadpole shrimp in California.

Range

Vernal pool tadpole shrimp are distributed across the Central Valley of California from Shasta County southward to northwestern Tulare County, with isolated occurrences in Alameda and Contra Costa Counties (U.S. Fish and Wildlife Service 2007).

Habitat Requirements

Vernal pool tadpole shrimp occur in ephemeral freshwater habitats, including alkaline pools, clay flats, vernal lakes, vernal pools, vernal swales, and other seasonal wetlands in California (Helm 1998). These habitats typically contain clear to highly turbid water, with temperatures ranging from 50 to 84° F (10 to 29° C) and pH ranging from 6.2 to 8.5 (U.S. Fish and Wildlife Service 2007).

Movement

Vernal pool tadpole shrimp do not migrate. Vernal pool tadpole shrimp cysts (eggs) and adults are carried from one wetland to another by a variety of methods, the most important likely being overland flooding from rainstorms, as well as by waterfowl and other migratory birds (on the bird's feet or in its gut) (U.S. Fish and Wildlife Service 2007).

Reproduction

Vernal pool tadpole shrimp cysts lie buried in dry soil through the summer and hatch when exposed to rainwater during the following fall. Vernal pool tadpole shrimp generally take 3 to 4 weeks to mature. Reproduction begins after individuals reach 0.4 inch (1 centimeter) or more in carapace length. Large females, greater than 0.8 inch (0.2 centimeter) in carapace length, can deposit as many as 6 clutches, ranging from 32 to 61 eggs per clutch, in a single wet season. Multiple hatching within

the same wet season allows vernal pool tadpole shrimp to persist within pools as long as these habitats remain inundated, sometimes for 6 months or more (U.S. Fish and Wildlife Service 2007).

Population Trends and Threats

No long-term population trend information exists for this species because formal status surveys and habitat monitoring generally have not been implemented on occupied sites, with the exception of annual monitoring of some vernal pool tadpole shrimp populations at USFWS-approved conservation banks. However, many of these banks were established only recently and long-term data are not yet available (U.S. Fish and Wildlife Service 2007).

Vernal pool tadpole shrimp are threatened by the same activities as other vernal pool invertebrates. These threats include habitat destruction, degradation, and fragmentation. These threats are typically associated with urban development and the lack of appropriate habitat management of vernal pools to be protected from development. Other anthropogenic threats to this species include conversion of land to agriculture, off-road vehicle use, and changes in hydrologic patterns in areas where vernal pool invertebrates occur. Other more recently identified threats to the species include contaminants, invasive plants, drought, and climate change (U.S. Fish and Wildlife Service 2007).

Because of the isolated nature of habitat for this species (due to habitat fragmentation) and species occurrences, this species is particularly susceptible to extinction from random environmental disturbance. Recolonization opportunities also diminish when physical barriers, such as urban development or lack of vernal pool habitat, isolate populations from one another or inhibit the transportation of cysts (U.S. Fish and Wildlife Service 2007).

Species Management

Conservation of the vernal pool tadpole shrimp is directly tied to conservation of suitable vernal pool habitat. The 2005 Recovery Plan and the 2007 *5-Year Review: Summary and Evaluation* identify recommendations for vernal pool tadpole shrimp management and conservation. These measures include preserving additional known extant occurrences on private lands, developing a standardized formal monitoring program, researching distribution patterns (why some habitats are occupied and others are not), improving guidelines and success criteria for monitoring constructed and restored pools, and improving presence-absence survey guidelines (U.S. Fish and Wildlife Service 2007).

Habitat Model Development

The development of the habitat model for vernal pool tadpole shrimp was the same as for the Conservancy fairy shrimp.

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Longhorn Fairy Shrimp (*Branchinecta longiantenna*)

Status

State: None

Federal: Endangered

Critical Habitat: Yes

Recovery Planning: *Recovery Plan for Vernal Pool Ecosystems of California and Southern Oregon* (U.S. Fish and Wildlife Service 2005)

Critical Habitat

USFWS critical habitat administrative revisions dated from February 2006 (71 FR 7118-7316) designated 13,557 acres (5,486 hectares) of critical habitat for longhorn fairy shrimp (*Branchinecta longiantenna*). Three critical habitat units have been delineated for Alameda, Contra Costa, Merced, and San Luis Obispo Counties. These units contain primary constituent elements of critical habitat characterized by depressions or pools connected by continuously or intermittently flowing water that must be retained in the pools for at least 19 days. Organic detritus in the pools is required for feeding and inorganic detritus is required to provide shelter (70 FR 46924-46999).

Range

Longhorn fairy shrimp are endemic to California vernal pool habitat and are only known to occur in the Central Valley At the time of listing in 1994, the longhorn fairy shrimp was only known from four widely separated populations (U.S. Fish and Wildlife Service 2005). Since the time of listing in 1994, additional localities of longhorn fairy shrimp have been detected within all four previously known populations and an additional population was identified (California Natural Diversity Database 2018). The five known populations of longhorn fairy shrimp consist of (1) areas within and adjacent to the Carrizo Plain National Monument, San Luis Obispo County; (2) areas within the San Luis (NWR Complex, Merced County; (3) areas within the Brushy Peak Preserve, Alameda County; (4) areas within the Vasco Caves Preserve, near the town of Byron in Contra Costa County; and (5) the most recently identified populations within the Alkali Sink Conservation Bank east of Mendota in Fresno County (H.T. Harvey and Associates 2009; U.S. Fish and Wildlife Service 2012). The Brushy Peak and Vasco Caves Preserves are within 3 miles of each other. A single longhorn fairy shrimp was observed in a roadside ditch north of Los Banos in Merced County in 2003 and this occurrence is considered an anomaly.

Habitat Requirements

Typical habitat for longhorn fairy shrimp in California includes vernal pools, seasonally ponded areas, and ephemeral freshwater habitat (68 FR 46684-46867). Other kinds of depressions that hold water of a volume, depth, and area similar to vernal pools may be potential habitat. Examples of artificial habitats that may be suitable for this species are railroad toe-drains, ditches, unused agricultural drains, ruts left by off-road vehicles, and depressions in firebreaks (Eng et al. 1990). Longhorn fairy shrimp in Contra Costa and Alameda Counties generally occur in water that is pooled in sandstone depressions. Other types of vernal pools in which longhorn fairy shrimp have been observed are either sandy loam pools or shallow, alkaline pools (59 FR 48136-48153). The longhorn fairy shrimp can potentially live in vernal pools that exist for fairly short durations (6–7 weeks in winter and 3 weeks in spring) (Eriksen and Belk 1999).

Movement

Longhorn fairy shrimp are dispersed locally between pools when individual pools overflow with water and become connected with adjacent pools, as described in Table B1-2. Cysts can be carried on the wind and on the bodies or in the intestines of larger animals resulting in long distance dispersal. Because the cysts are passed undamaged through the intestinal tracts of most animals, fecal matter deposited as the animal moves can result in the spread of populations to new sites. Cysts can also be transported in mud carried on the feet and feathers of birds, as well as the hooves and hair of livestock that may wade through the habitat (Eriksen and Belk 1999).

Table B1-2. Documented Longhorn Fairy Shrimp Movement

Type	Distance/Area	Location of Study	Source
Home range	Limited to vernal pools	Alameda, Contra Costa, Merced, and San Luis Obispo Counties	68 FR 46684-46867; U.S. Fish and Wildlife Service 2005
Breeding	Limited to vernal pool	Alameda, Contra Costa, Merced, and San Luis Obispo Counties	68 FR 46684-46867; U.S. Fish and Wildlife Service 2005
Dispersal	Unknown		

Reproduction

Longhorn fairy shrimp adults become present in vernal pools as they fill with rainwater. The average longevity for adult longhorn fairy shrimp is approximately 114 days (Helm 1998). Longhorn fairy shrimp require a minimum of 23 days to mature. Resting cysts are present in occupied habitats throughout the year. Individuals hatch from cysts during cold-weather winter storms because cysts require water temperatures of 50°F (10°C) or lower to hatch (Eriksen and Belk 1999; Helm 1998).

Population Trends and Threats

Longhorn fairy shrimp are known from only five widely separated populations (U.S. Fish and Wildlife Service 2005). Since the time of listing in 1994, additional localities of longhorn fairy shrimp have been detected within all four previously known populations (California Natural Diversity Database 2018) as well as in the Alkali Sink Conservation Bank found east of Mendota in Fresno County (U.S. Fish and Wildlife Service 2012). As of 2018, USFWS had not implemented the

monitoring program for longhorn fairy shrimp described in the 2005 Recovery Plan; therefore, detailed information regarding the growth or decline in overall numbers of this species is unavailable at this time. Longhorn fairy shrimp occurrences are rare and highly disjunct with specific pool characteristics largely unknown (U.S. Fish and Wildlife Service 2003). Populations of the species in Alameda County have been known to occur within clear depression pools in sandstone outcrops (Eriksen and Belk 1999). Other populations in the middle and southern range of the species occur in loam and shallow alkaline soil, respectively (U.S. Fish and Wildlife Service 2003). Threats to longhorn fairy shrimp include the conversion of vernal pool habitat to agricultural lands and urban development, and stochastic extinction because of the small and isolated nature of remaining populations (U.S. Fish and Wildlife Service 2005). The limited and disjunct distribution of vernal pools, coupled with the even more limited distribution of longhorn fairy shrimp, means that any reduction in vernal pool habitat quantity could adversely affect this species.

Species Management

The overarching recovery strategy for longhorn fairy shrimp is habitat protection and management. Some of the criteria outlined in the 2005 USFWS Recovery Plan have been met or partially met through the implementation of habitat management and monitoring plans for certain areas and provisions for management in perpetuity for a majority of identified habitat locations (U.S. Fish and Wildlife Service 2007).

Habitat Model Development

The development of the habitat model for longhorn fairy shrimp was the same as for the Conservancy fairy shrimp.

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Smith's Blue Butterfly (*Euphilotes enoptes smithi*)

Status

State: None

Federal: Endangered

Critical Habitat: None

Recovery Planning: *Smith's Blue Butterfly Recovery Plan* (U.S. Fish and Wildlife Service 1984)

Critical Habitat

Critical habitat was proposed in Monterey County, California in areas with an elongate strip of coastal sand dunes, extending 1 kilometer inland in a westward direction from the Pacific Ocean, bounded by Del Rey Creek on the south and the Salinas River on the north (42 FR 7972-7976) but was never finalized. Therefore, no critical habitat is designated for Smith's blue butterfly (U.S. Fish and Wildlife Service 2018).

Range

Historically, Smith's blue butterfly was found in coastal dune habitat in Monterey Bay, plus a few locations along the Big Sur Coast (U.S. Fish and Wildlife Service 2006). More recent historical and current range surveys indicate the species occurs in coastal areas of Monterey, San Mateo, Santa Cruz, and San Luis Obispo Counties (California Department of Fish and Wildlife 2018). USFWS (2006) indicates a two-part disjunct range along an 80-mile (129-kilometer) stretch of coast and in a few places extending as much as 10 miles (16 kilometers) inland. The range is thus substantially less than 800 square miles (2,072 square kilometers). The original range might or might not have been more contiguous within this area. Currently the subspecies persists along Monterey Bay, with an occurrence at the Santa Cruz and San Mateo county border, within the Carmel Valley, along the coast south of the Carmel River, through Big Sur Coast, and into San Luis Obispo County. (U.S. Fish and Wildlife Service 2006).

Habitat Requirements

Smith's blue butterfly primarily inhabits coastal sand dunes and coastal scrub on steep slopes along the coast where coastal sand dune strand and coastal scrub dominates. Less frequently, populations have been documented in chaparral and woodland habitats (California Department of Fish and Wildlife 2018). Smith's blue butterfly has also been found in serpentine grassland areas. The species requires native host plants, coast buckwheat (*Eriogonum latifolium*) and seacliff buckwheat (*E. parvifolium*), for all life stages. Adults feed on nectar and deposit eggs on the flowers. Larvae feed on flowers and seeds and pupate on or beneath the plants. Adults may also feed on naked buckwheat (*E. nudum*), but larvae have not been observed using these plants (U.S. Fish and Wildlife Service 2006).

Movement

Flight season is from mid-June to early September (synchronized with the flowering of buckwheat spp.), and varies from year to year and place to place. USFWS (2006) indicates that in any given year and place activity can range from 4 to 10 weeks; however, distance is unknown.

Reproduction

Females oviposit eggs in flower heads of *Eriogonum* spp., where the larvae hatch in about 4–8 days and mature in approximately 1 month. Most of the year is spent in diapause. Pupae overwinter and emerge as adults during the next flight period (U.S. Fish and Wildlife Service 2006).

Population Trends and Threats

Most populations lack estimates, but there are some for a few colonies in 1 or more years and which indicated roughly 3,000–5,000 adults each in those years. At one site, estimates for three different years ranged from 3,081 to 5,201 adults, which suggest moderate fluctuations in population numbers (U.S. Fish and Wildlife Service 2006).

Threats to the species are habitat degradation and loss due to human activities, such as residential and commercial development, recreation, sand mining, military activities, and possibly livestock grazing (U.S. Fish and Wildlife Service 1984). Habitat fragmentation due to development, ground-disturbing activities, and invasive, nonnative plants causes adults to travel further to other buckwheat strands. The primary threat in the northern part of the range (Monterey Bay area) is loss of habitat due to development. In the southern part of the range (Big Sur/Los Padres National Forest), the primary threat is invasive species colonization (U.S. Fish and Wildlife Service 2006).

Species Management

The strategy for recovery of Smith's blue butterfly involves stabilizing sand dunes and road-cut areas, and replacing nonnative plants with native plants needed to preserve habitat. After these threats have been alleviated, monitoring the size and distribution of populations and increasing public awareness should occur to stabilize the populations (U.S. Fish and Wildlife Service 1984).

Habitat Model Development

Information regarding suitable habitat for Smith's blue butterfly came from both the recovery plan and 5-year status review from U.S. Fish and Wildlife Service (1984 and 2006). Sand dunes habitat is too narrowly distributed to be captured in the mapping datasets used in the habitat modeling and instead, surrogate land cover types that could contain dune inclusions were used in the model. Modeling of Smith's blue butterfly's potential suitable habitat includes the following land cover types:

- Annual and perennial grasslands
- Coastal scrub
- Oak woodlands
- Mixed chaparral

While sand dunes are described as Smith's blue butterfly suitable habitat, Smith's blue butterfly is geographically restricted and the previous outlined land cover types are more expansive and contain a mosaic of sand dunes

GIS Sources

U.S. Fish and Wildlife Service. 1984. *Smith's Blue Butterfly Recovery Plan*. U.S. Fish and Wildlife Service, Portland Oregon.

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Morro Shoulderband Snail (*Helminthoglypta walkeriana*)

Status

State: None

Federal: Endangered

Critical Habitat: Yes

Recovery Planning: *Recovery Plan for the Morro Shoulderband Snail and Four Plants from Western San Luis Obispo County, California* (U.S. Fish and Wildlife Service 1998)

Critical Habitat

Critical habitat (66 FR 9233-9246) was designated for Morro shoulderband snail in Montana de Oro State Park, the city of Morro Bay, and south and northeast Los Osos in San Luis Obispo County. There are 2,566 total acres (1,038 hectares) of critical habitat designated for Morro shoulderband snail in California.

Range

The historic range of snail has been found to be continuously occupied by live individuals. Morro shoulderband snails range from Morro Strand Beach in northern Morro Bay southward to Montana de Oro State Park and inland to at least Los Osos Creek in eastern Los Osos (U.S. Fish and Wildlife Service 2006).

Habitat Requirements

Commonly found in dune scrub habitat, habitat associations have been expanded to include coast live oak woodland, California annual grassland, dune lupine-goldenbush, introduced perennial grassland, and European beachgrass series communities on soils of baywood fine sands, active dune sands, and clay (California Department of Fish and Wildlife 2018) Morro shoulderband snails have been documented at elevations ranging from 10 to 300 feet (California Department of Fish and Wildlife 2018). Morro shoulderband snails are commonly found in association with coastal dune scrub habitat on sandy soils dominated by woody shrubs, especially California goldenbush (*Ericameria ericoides)*, sea cliff buckwheat (*Eriogonum parvifolium)*, giant eriastrum (*Eriastrum densifolium*), blue beach lupine (*Lupinus chamissonis*), coastal sage brush (*Artemisia californica)*, and black sage (*Salvia mellifera*) (U.S. Fish and Wildlife Service 1998). In areas where the snails have been found, mats of sea fig (*Carpobrotus chilensis*) are common, and sand lettuce (*Dudleya caespitosa*) commonly occurs under goldenbush (*Ericameria* sp.*)* shrubs. Away from the immediate coast, immature coastal dune scrub with branches close to the ground may provide canopy shelter (U.S. Fish and Wildlife Service 2006).

Movement

Long distance dispersal of terrestrial gastropods is passive, although short distance dispersal is active involving slow, short distance migration under favorable conditions. Terrestrial gastropods do not move much, usually only to find food or reproduce. Olfaction is the primary sensory behavior utilized to find and move toward a food item (on the scale of centimeters to meters) (NatureServe 2012).

Reproduction

In Morro shoulderband snail, most growth, copulation, and egg-laying occurs during the rainy season (Roth 1985).

Population Trends and Threats

The population trend of Morro shoulderband snail is stable to increasing (U.S. Fish and Wildlife Service 2006). Known threats to Morro shoulderband snails include destruction of habitat due to urban development, degradation of habitat due to invasive nonnative plants and recreation (in the form of heavy off-highway activity). Potential threats include competition with nonnative snails, use of pesticides (i.e., snail baits), and extinction due to small population size (U.S. Fish and Wildlife Service 1998).

Species Management

According to the *Recovery Plan for the Morro Shoulderband Snail and Four Plants from Western San Luis Obispo County, California* (U.S. Fish and Wildlife Service 1998), the strategy for recovery of the

Morro shoulderband snail involves compensating for loss of habitat from housing development through HCPs; protecting habitat through land acquisition or conservation easements; and conducting research focusing on habitat requirements (U.S. Fish and Wildlife Service 1998).

Habitat Model Development

A combination of the following GIS datasets were utilized to develop the model for Morro shoulderband snail:

- Limits of distribution and suitable habitat outlined in the 5-year review (U.S. Fish and Wildlife Service 2006).
- Range depicted in recovery plan (U.S. Fish and Wildlife Service 1998)
- Occurrences with accuracy class no greater than 1/5 miles (California Department of Fish and Wildlife 2018).
- Baywood fine sand soil series.
- Removed areas north of Morro Bay State Park. south of Beach Street, and west of Highway 1 based on USFWS guidance.
- Attributed urban land cover types in these areas as urban habitat.

According to data provided by USFWS (personal communication, April 15, 2019), Morro shoulderband snail has been found during monitoring of the Los Osos Wastewater Treatment Facility Project (sewer pipe installation) where, during pre-construction surveys from 2012 to 2014, numerous Morro Shoulderband snail individuals were identified in yards and landscaping of residential development throughout a large portion of Los Osos-Baywood Park. The Morro shoulderband snail model has been adjusted to accommodate this information.

GIS Sources

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Personal Communications

Julie Vanderwier. 2019. USFWS. Email to Brad Norton, ICF. April, 15, 2019.

Mount Hermon June Beetle (*Polyphylla barbata*)

Status

State: None

Federal: Endangered

Critical Habitat: None

Recovery Planning: *Recovery Plan for Insect and Plant Taxa from the Santa Cruz Mountains in California* (U.S. Fish and Wildlife Service 1998)

Critical Habitat

No critical habitat has been designated for Mount Hermon June beetle.

Range

Historically, the Mount Hermon June beetle's range was in the sandhills of Mount Hermon in Santa Cruz County. The current population of Mount Hermon June beetle is still restricted to the Zayante sandhills ecosystem in Santa Cruz County and primarily distributed over an area approximately less than 10 square miles (U.S. Wildlife Service 2009).

Habitat Requirements

Mount Hermon June beetle inhabits areas characterized by ponderosa pine-chaparral with loose, sandy soil, and open, sparsely vegetated areas. Beetles may also occur in more vegetated areas of chaparral. Common vegetation found in these areas include bracken fern (*Pteridium aquilinum*), monkeyflowers (*Diplaus* sp.*; Mimulus* sp.), grasses, and small annual herbs. Silver-leafed manzanita (*Arctostaphylos silvicola*) is also a good indicator of suitable habitat (U.S. Fish and Wildlife Service 1998).

Movement

Mount Hermon June beetles do not move large distances.

Reproduction

Adult Mount Hermon June beetles are active year-round, but particularly during the summer, May–August (U.S. Fish and Wildlife Service 2009). Males are active at twilight and fly for 60–90 minutes, depending on sunset timing. They fly close to the ground looking for females to mate. Females are thought to remain in burrows, close to the surface (U.S. Fish and Wildlife Service 1998). At the end of each flight period, the males will burrow back under the soil and will emerge each evening until their nutrient reserves are gone (Hazeltine 1993). Females are thought to lay eggs in the bottom of their burrows and die shortly afterwards. Newly hatched larvae tunnel from the burrow in search of roots (U.S. Fish and Wildlife Service 1998). Little is known about the entirety of the life cycle; however, entomologist Dick Arnold believes that it likely is a 2- to 3-year life cycle, with the majority of the time spent underground (U.S. Fish and Wildlife Service 2009).

Population Trends and Threats

Recent survey efforts have identified eight populated areas in the Zayante sandhills of Santa Cruz County. The few population surveys that have been conducted indicate that populations are stable; however, these studies were limited by having data collected only over a few years and a few locations (U.S. Fish and Wildlife Service 2009).

Current threats to Mount Hermon June beetle include habitat loss or alteration due to sand mining, urban development, recreation, and agriculture. Fire suppression has resulted in a larger amount of vegetation and the beetle prefers sparsely vegetated, open areas. Pesticides and collection are also recognized as possible threats (U.S. Fish and Wildlife Service 1998). An additional threat identified in the 5-year review for the species is alteration of habitat as a result of fire suppression, which is considered the most serious threat at the present time (U.S. Fish and Wildlife Service 2009).

Species Management

According to the *Recovery Plan for Insect and Plant Taxa from the Santa Cruz Mountains in California* (U.S. Fish and Wildlife Service 1998), the strategy for recovery of the Mount Hermon June beetle involves minimizing loss of habitat from sand mining and urban development through HCPs for Santa Cruz County and the city of Scotts Valley; protecting habitat through land acquisition or conservation easements; and conducting research focusing on habitat requirements for long-term survival.

Habitat Model Development

Potentially suitable habitat for the Mount Hermon June beetle includes Zayante soils within all land covers excluding urban and cultivated areas (NRCS 2018).

GIS Sources

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Ohlone Tiger Beetle (*Cicindela ohlone*)

Status

State: None

Federal: Endangered

Critical Habitat: None

Recovery Planning: *Recovery Plan for Insect and Plant Taxa from the Santa Cruz Mountains in California* (U.S. Fish and Wildlife Service 1998)

Critical Habitat

No critical habitat has been designated for Ohlone tiger beetle.

Range

While the Ohlone tiger beetle has been reported for a total of 16 occurrences from 11 different properties (U.S. Fish and Wildlife Service 2009), the U.S. Fish and Wildlife Service considers it appropriate to split the occurrences into the following separate geographical areas:

- West of the city of Soquel, the Ohlone tiger beetle was last documented in 2004 on a grassy terrace along Winkle Avenue in a private parcel. However, the species was not observed during multiple visits in 2009. Although CNDDB describes the occurrence as, "Presumed Extant," and U.S. Fish and Wildlife Service specifies additional research is needed because Ohlone tiger beetles are potentially extirpated from this geographic area.
- Within the City of Scotts Valley, the species is known to occur on one parcel owned by the city (U.S. Fish and Wildlife Service 2009). The parcel is managed by the Land Trust of Santa Cruz County for the Ohlone tiger beetle and Scotts Valley spineflower, which is also covered in this HCP.
- North of the City of Santa Cruz, the Ohlone tiger beetle is known from a parcel owned by the city. While the parcel is maintained as an open space preserve, there isn't any management conducted specifically for the benefit of the Ohlone tiger beetle. No Ohlone tiger beetles have been noted at this location since 2004 (Arnold, pers. comm. 2009) and are potentially extirpated.

West of the City of Santa Cruz, the Ohlone tiger beetle was known from seven occurrences on five parcels at the time of the species listing (U.S. Fish and Wildlife Service 2001). The properties are contiguous, but the populations may be isolated due to unsuitable habitat in between occurrences. The properties are owned by the University of California, Santa Cruz, City of Santa Cruz, and private ownership. One occurrence was lost to development for a vineyard. Three occurrences have lacked observation of Ohlone tiger beetles in the last surveys and are potentially extirpated (Arnold, in litt. 2006, Arnold, pers. comm. 2009). Northwest of the City of Santa Cruz, the Ohlone tiger beetles were known to occur on property owned the California Department of Parks and Recreation (one occurrence) and the University of California, Santa Cruz (five occurrences).

Active Ohlone tiger beetles were documented at the California Department of Parks and Recreation property and in one University of California, Santa Cruz Property (Cooper pers. obs. 2009; Arnold, pers. comm. 2009). One property owned by the University contained active Ohlone tiger beetle larval burrows and Ohlone tiger beetles have not been documented at the remaining occurrences at the University. Active Ohlone tiger beetle larval burrows were detected at the California Department of Parks and Recreation property and in one University of California, Santa Cruz property (Cooper pers. obs. 2009). However, active adults were observed at a different occurrence without larval burrows. Each of the occurrences of Ohlone tiger beetle is limited in extent to 5 acres (2 hectares) or less, and is geographically separated from other Ohlone tiger beetle areas (Hayes, pers. comm. 1995; Sculley, pers. obs. 1999 and 2000, U.S. Fish and Wildlife Service 2009). However, potential habitat for the species (i.e., open space on Watsonville loam or similar soils, but with vegetation too dense to support beetles) may link some of the areas currently occupied by Ohlone tiger beetle (Jones & Stokes 2005).

Although the potential exists for this range-limited beetle to occur in other locations in the county supporting similar habitat, the beetle has not yet been found in other similar areas. The Ohlone tiger beetle appears to be presently restricted to coastal terrace habitats, at low to mid-elevations (lower than 1,200 feet [366 meters]), located between the crest of the Santa Cruz Mountains and the Pacific Ocean (Jones & Stokes 2005).

Habitat Requirements

Ohlone tiger beetle inhabits areas characterized by remnant stands of native grassland, in particular coastal terrace prairie. California oatgrass (*Danthonia californica*) and purple needlegrass (*Nasella pulchra*) are two native grasses known to occur at all sites. Within these grasslands, the beetle has been observed primarily on level ground and less frequently on slopes, where the vegetation is sparse or bare ground is prevalent (U.S. Fish and Wildlife Service 2001). The substrate at each known beetle location consists of shallow, poorly drained clay or sandy clay soils that have accumulated over a layer of bedrock known as Santa Cruz Mudstone (Freitag et al. 1993

The diurnally active adults and larvae of the Ohlone tiger beetle are associated with sunny areas of bare or sparsely vegetated ground. Adults run rapidly in and near the larval habitat. They are strong flyers for short distances. Because the tiger beetles are cold-blooded, they are active during the winter and spring months. Adults and larvae typically spend a considerable portion of their daily activity thermo-regulating, so favored microhabitats are sparsely vegetated and become warm during the beetle's activity period (66 FR 50340-50350).

Movement

Collection records indicate that most adult Ohlone tiger beetles are active from mid-January through mid-May, although the duration and timing of the adult activity period can vary from year to year and between places within a particular year. Specific dates when beetles have been observed range from January 17 through May 11 (Freitag et al. 1993). Reproduction, foraging, and dispersal activities occur during this time. If disturbed, Ohlone tiger beetles have been observed flying to densely vegetated areas (Freitag et al. 1993; 66 FR 50340-50350). The movement distance is unknown.

Reproduction

Female Ohlone tiger beetles lay eggs within the soil, specifically in Watsonville loams or Bonnydoon soil series. It is not known how many eggs are laid by the females, but other species within the family lay between 1 and 126 eggs per female (66 FR 50340-50350). Larvae emerge from the egg and harden, enlarging the chamber where the egg was laid into a tunnel (Jones & Stokes 2005; 66 FR 50340-50350). Tunnel length varies depending on the larval development stage, species, season, and substrate, but ranges from approximately 6 to 75 inches (15 to 192 centimeters) (Jones & Stokes 2005).

Larvae are caterpillar-like (campodeiform) and remain within the burrow, coming to the surface to hunt, lunging at and seizing passing invertebrate prey. To aid in hunting, burrows are circular and flat, with no dirt piles or mounds around their edges. Larvae undergo three instars and then plug the entrance to the burrow to create a chamber for pupation. After pupation, the adult Ohlone tiger beetle will dig out of the soil and emerge (66 FR 50340-50350).

The larvae of most tiger beetles occur in a narrower range of microhabitats than their adult stages, probably because they tolerate less variation in many physical factors, especially soil moisture, soil composition, and temperature (Jones & Stokes 2005). Larvae of other tiger beetle species that live in grasslands typically build their tunnels at the edges of the bare or sparsely vegetated portions of the grassland where adult beetles are most commonly observed (Jones & Stokes 2005).

Population Trends and Threats

The UCSC populations of Ohlone tiger beetle represent a significant fraction of the species. In 2003, a count of adults in 8 sites revealed approximately 2,100 individuals. Of these, 792 (approximately 38%) were found on the UCSC campus (Jones & Stokes 2005).

Ohlone tiger beetles are threatened by habitat destruction and fragmentation by development, and habitat degradation from exotic invasive plants. They are vulnerable to local extirpation from catastrophic events or from natural fluctuations in their population because they are limited both geographically on a regional scale and in the extent of local occurrences. Populations are also small and geographically separated. Areas fragmented by urban development prevent natural gene flow between sites. The small size of the habitat and small population size of beetles increases the likelihood that natural occurrences such as erosion may extirpate beetle populations without the possibility of re-colonization (U.S. Fish and Wildlife Service 1998).

Nonnative plants such as French broom (*Cytisus monspessulanus*), velvet grass (*Holcus linatus*), and rattlesnake grass (*Briza major*) convert open areas that provide habitat for burrowing and thermo-regulating into heavily thatched, shaded areas that are inaccessible to beetles and do not provide the sunlight necessary for their thermoregulation. Nonnative plants also can reduce the number, distribution, and diversity of prey species that Ohlone tiger beetles rely on for food (U.S. Fish and Wildlife Service 1998).

Species Management

According to the *Recovery Plan for Insect and Plant Taxa from the Santa Cruz Mountains in California* (U.S. Fish and Wildlife Service 1998), the strategy for recovery of the Ohlone tiger beetle involves minimizing loss of habitat from urban development through HCPs for the city and county of Santa Cruz and the city of Scotts Valley, protecting habitat through land acquisition or conservation easements, and conducting research focusing on habitat requirements for long term survival (U.S. Fish and Wildlife Service 1998).

Habitat Model Development

Habitat modeling for the Ohlone tiger beetle includes CNDDB occurrences recorded in the last 25 years with an accuracy class no greater than 1/5 mile (California Department of Fish and Wildlife 2018), extant occurrences shown in the 5-year review (U.S. Fish and Wildlife Service 2009, Figure 1), and areas within 0.5 mile of BISON records (U.S. Geological Survey 2018). Potentially suitable habitat in the habitat models are contained to the following geologic formations: mustone, purisima sandstones and Zayante soils. Urban areas and developed land cover areas were excluded from the analysis.

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Valley Elderberry Longhorn Beetle (*Desmocerus californicus dimorphus*)

Status

State: None

Federal: Threatened

Critical Habitat: Yes

Recovery Planning: *Recovery Plan for Valley Elderberry Longhorn Beetle* (U.S. Fish and Wildlife Service 1984)

Critical Habitat

Critical habitat has been designated for valley elderberry longhorn beetle (VELB) in the city of Sacramento and the American River Parkway. In Sacramento, critical habitat is 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. On the American River Parkway, critical habitat is designated on the south bank of the American River, bounded on the north by 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 (45 FR 52803 August 8, 1980). There are approximately 515 acres of critical habitat designated for VELB in California.

Range

Historically, VELB ranged throughout the Central Valley from Redding in Shasta County to Bakersfield in Kern County. Evidence of this threatened beetle was observed during surveys between 1984 and 1991 in only 12 patches of natural riparian forests along the Sacramento, American, and San Joaquin rivers and their tributaries (Thelander 1994). An estimated 90% of the Central Valley's riparian habitat has been destroyed over the past 150 years (Barr 1991). It is presumed that with the loss of riparian habitat, the species range is now fragmented and significantly smaller. The age and quality of individual elderberry shrubs/trees (*Sambucus* spp.) may also be a factor in the beetle's limited distribution. Currently, VELB is known to inhabit the Central Valley from southern Shasta County south to Fresno County (79 FR 55879 55917, September 17, 2014; U.S. Fish and Wildlife Service 2006).

Habitat Requirements

The beetle is endemic to moist valley oak woodlands along the margins of rivers and streams in the lower Sacramento and San Joaquin valleys which support its host plant, elderberry. However, the beetle has also been observed in association with scattered elderberries growing along stream banks and floodplains next to agricultural lands (Barr 1991). Adult beetles are active at the peak of the elderberry flowering period, usually between mid-March and mid-June (U.S. Fish and Wildlife Service 2006). Throughout their life cycle, VELBs are dependent on the elderberry and are found on and within the trunks, as well as on leaves and flowers (U.S. Fish and Wildlife Service 1984).

Movement

The VELB does not migrate nor do individuals typically move far from host shrubs.

Reproduction

Following mating, females lay their eggs in the cracks and crevices of bark, on foliage, or on the leaf petioles. The eggs hatch in approximately 10 days. The larvae then bore into the stems or trunk of the elderberry and feed internally on the soft pith. Based on the biology of related beetles, it is believed that the larvae require two years to mature. Prior to pupation, the larvae chew through the woody tissues and bark, creating an exit hole for the adult stage (U.S. Fish and Wildlife Service 1984).

Population Trends and Threats

Because most surveys count exit holes rather than actual individuals, current population estimates are unknown. Exit holes can be misidentified and result in either an inflated or low count (U.S. Fish and Wildlife Service 2006).

More than 90% of streamside woodlands have been destroyed by stream and river channelization, removal of riparian vegetation, riprapping of shoreline, loss and alteration of habitat by agricultural conversion, and the use of insecticides and herbicides. Urban expansion has also impacted the beetle. The *Valley Elderberry Longhorn Beetle Recovery Plan* (U.S. Fish and Wildlife Service 1984) stresses protection of habitat along the American, Sacramento, Feather, Tuolumne, Stanislaus, Mokelumne, Calaveras, Cosumnes, and San Joaquin Rivers. Also stressed is additional survey work to identify VELB presence in appropriate habitat. Restoration of impacted sites, including the removal of exotic nonnative species will be required. Minimizing herbicide and insecticide use, preventing riparian vegetation removal, and preventing habitat site riprapping are specific management needs. Mitigation commonly features planting additional elderberry shrubs in impacted areas (U.S. Fish and Wildlife Service 1984).

Species Management

Due to limited knowledge of the species requirements, recovery objectives were restricted to: 1) preserve and protect known habitat sites to provide adequate conditions for the species; 2) survey riparian vegetation along certain Central Valley rivers for remaining colonies and habitat; 3) determine ecological requirements and management needs; 4) preserve and protect newly discovered habitat to provide suitable conditions for the species; 5) reestablish the species at rehabilitated habitat sites within the presumed historical range; 6) increase public awareness of the

species through education and information programs; and 7) enforce laws and regulations to protect the species (U.S. Fish and Wildlife Service 1984).

Habitat Model Development

A model was prepared to illustrate the extent of riparian habitat types with which beetle-occupied elderberry is most commonly associated. The model is based on the current range of the species (79 FR 55879 55917, September 17, 2014), at elevations below 500 feet, and within landcover containing Oak woodland that is within 100 m of Valley Foothill Riparian or Riverine, or Valley Foothill Riparian. Urban areas and developed land cover areas were excluded from the analysis.

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Zayante Band-Winged Grasshopper (*Trimerotropis infantilis*)

Status

State: None

Federal: Endangered

Critical Habitat: Yes

Recovery Planning: *Recovery Plan for Insect and Plant Taxa from the Santa Cruz Mountains in California* (U.S. Fish and Wildlife Service 1998)

Critical Habitat

Critical habitat has been designated for Zayante band-winged grasshopper (66 FR 9219-9233) between Highways 9 and 17 in Santa Cruz County, California. Most of the lands designated as critical

habitat occur from the southeastern portion of Henry Cowell Redwoods State Park west to the City of Scotts Valley and north to the communities of Ben Lomond, Lompico, and Zayante. A small area designated as critical habitat is located east of Zayante in the vicinity of Weston Road (66 FR 9219-9233). There are 10,560 total acres (4,274 hectares) of critical habitat designated for Zayante band-winged grasshopper in California.

Range

The Zayante band-winged grasshopper is known only from the Zayante sandhills of Santa Cruz County, California, where extant occurrences are distributed over an area of less than 4 square miles (10 square kilometers). Within this area, populations are concentrated between the communities of Mt. Hermon to the southwest, Scotts Valley to the east, and Quail Hollow County Park to the north. It has been estimated that historically there had been 1,000 acres (405 hectares) of sand parkland habitat (which includes both high and low-quality habitat) for Zayante band-winged grasshopper (U.S. Fish and Wildlife Service 2009). However, the habitat occupied by this species, open sand parkland, makes up only a small portion of sand parkland (McGraw 2004). Recent estimates put the remaining open sand parkland habitat at 57 acres (23 hectares) (U.S. Fish and Wildlife Service 2009).

Habitat Requirements

Zayante band-winged grasshopper is found in the Zayante sandhills in Santa Cruz County, which are comprised of sandy soils of the Zayante series derived from marine deposits. Habitat is open, sparsely vegetated sandy parklands (commonly known as open sand parklands) among chaparral or ponderosa pine (*Pinus ponderosa*) stands on the Zayante sand hills of Santa Cruz County (U.S. Fish and Wildlife Service 2009). Open sand parkland is characterized by sparsely vegetated, sandstone dominated ridges and saddles that support scattered ponderosa pines and a wide array of annual and perennial herbs and grasses. Recent studies indicate that the Zayante band-winged grasshopper occurs primarily in early successional sand parkland with widely scattered tree and shrub cover, extensive areas of bare or sparsely vegetated ground, loose sand, and relatively flat relief (McGraw 2004). However, Zayante band-winged grasshoppers have also recently been observed in areas with a well-developed ground cover and in areas with sparse chaparral mixed with patches of grasses and forbs (McGraw 2004), indicating that Zayante band-winged grasshoppers are not restricted solely to sand parkland (66 FR 9219). Open sand parkland is considered to be high-quality habitat, and areas with higher density of ponderosa pines and other trees with a fairly continuous understory of grass are considered to be low-quality habitat (U.S. Fish and Wildlife Service 2009). Adults are found either directly on sandy soil or on the foliage of the silver bush lupine (*Lupinus albifrons*), which makes up over 60 percent of their diet (U.S. Fish and Wildlife Service 2009).

Movement

Zayante band-winged grasshoppers typically do not move large distances. The flight season for adult Zayante band-winged grasshopper extends from July until the first ground-soaking rains of the winter (usually around early November) (U.S. Fish and Wildlife Service 2009). When flushed, individuals generally fly 3–7feet (1–2 meters), producing a buzzing sound while in flight (McGraw 2004). Band-winged grasshoppers often alight on bare ground, and are conspicuous in flight because of the color of their hind wings and the buzzing sound made by the wings (Borror et al. 1976). Entomologist Dick Arnold found that almost half of individuals recaptured during a mark-and-recapture study were located on the same transect interval as the previous capture, although

some longer dispersals of up to 930 feet (284 meters) did occur (U.S. Fish and Wildlife Service 2009).

Table B1-3. Documented Zayante Band-winged Grasshoppers Movement

Movement	Distance/Area	Location of Study	Source
Breeding	Up to 930 ft. (284 m)	Santa Cruz County	U.S. Fish and Wildlife Service 2009

Reproduction

Reproductive biology of Zayante band-winged grasshopper is unknown.

Population Trends and Threats

Specific population trend information is lacking, but entomologist Dick Arnold reported to the U.S. Fish and Wildlife Service that he believed Zayante band-winged grasshopper populations are in a serious decline and that the reduction in available habitat due to successional processes may drive this species to eventual extinction (U.S. Fish and Wildlife Service 2009).

The primary threat to the Zayante band-winged grasshopper is loss of habitat. Historically, approximately 1,000 acres (405 hectares) of sand parkland habitat occurred in Santa Cruz County. Approximately 95% of high-quality habitat (open sand parkland) has been lost or altered due to human activities. These activities include sand mining, urban development, recreational activities, agriculture, and fire suppression (U.S. Fish and Wildlife Service 2009).

Species Management

According to the *Recovery Plan for Insect and Plant taxa from the Santa Cruz Mountains in California* (U.S. Fish and Wildlife Service 1998), the strategy for recovery of the Zayante band-winged grasshopper involves: 1) minimizing loss of habitat from sand mining and urban development through Habitat Conservation Plans for Santa Cruz County and the City of Scotts Valley, 2) protecting habitat through land acquisition or conservation easements, and 3) conducting research focusing on habitat requirements for long term survival (U.S. Fish and Wildlife Service 1998).

The 2009 5-year review and evaluation summary for Zayante band-winged grasshopper recommends: 1) update the recovery plan with measurable recovery criteria, 2) actively manage habitats to prevent encroachment of plants in fire suppressed habitats, 3) monitor known populations and potentially suitable areas, 4) demographic studies, and 5) completion of Interim Programmatic Habitat Conservation Plan and Regional Habitat Conservation Plan.

Habitat Model Development

Development of the habitat model and identification of potentially suitable habitat for the Zayante band-winded grasshopper utilized the same methodology for the Mount Hermon June Beetle described above.

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Amphibians

California Red-Legged Frog (*Rana draytonii*)

Status

State: None

Federal: Threatened

Critical Habitat: Yes

Recovery Planning: *Recovery Plan for the California Red-Legged Frog* (U.S. Fish and Wildlife Service 2002)

Critical Habitat

Critical habitat for California red-legged frog was established by U.S. Fish and Wildlife Service in a final rule on April 13, 2006 (71 FR 19244-19346). Revised critical habitat was designated March 2010 (75 FR 12816 -12958). Presently, there are 1,636,609 total acres (6,623 square kilometers) of critical habitat designated for California red-legged frog in California.

Range

The historic range of the California red-legged frog extends along the Coast Range from Mendocino County south to Riverside County, as well as south to Baja California, Mexico. They are also found from Calaveras County to Butte County in the Sierra Nevada Mountains. Red-legged frogs only remain as isolated populations which have been documented in the Sierra Nevada, northern Coast, and northern Transverse ranges. It is believed to have been extirpated from both the southern Transverse and Peninsular ranges, but remains present in Baja California, Mexico (U.S. Fish and Wildlife Service 2007).

Recent genetic findings show that the northern coastal distribution of the species extends into southern Mendocino County (75 FR 12816 - 12958). They occur in wetlands at elevations of up to 5,000 feet (1500 meters) (U.S. Fish and Wildlife Service 2002).

California red-legged frogs remain locally abundant within portions of the San Francisco Bay Area including Marin County, and the central coast of California. Within the remaining distribution, only isolated populations have been found in the Sierra Nevada, northern Coast, and northern Transverse ranges. The species is probably extirpated from the southern Transverse and Peninsular ranges, but persists in Baja California, Mexico (U.S. Fish and Wildlife Service 2002).

Habitat Requirements

Within their range, California red-legged frogs occur from sea level to about 5,000 feet (1500 meters) above sea level (U.S. Fish and Wildlife Service 2002). Aquatic sites include a variety of habitats—larvae, tadpoles, and metamorphs use streams, deep pools, backwaters within streams and creeks, ponds, marshes, sag ponds, dune ponds, and lagoons. Breeding adults are commonly found in deep (more than 2 feet, or 0.6 meters) still or slow-moving water with dense, shrubby riparian or emergent vegetation (U.S. Fish and Wildlife Service 2002) . Adult frogs have also been observed in shallow sections of streams that are not covered by riparian vegetation (U.S. Fish and Wildlife Service 2002). Generally, streams with high flows and cold temperatures in spring are unsuitable for eggs and tadpoles (U.S. Fish and Wildlife Service 2002). Stock ponds are frequently used by this species if the ponds are managed to provide suitable hydroperiod, pond structure, vegetative cover, and control of nonnative predators (e.g., bullfrogs, fish) (U.S. Fish and Wildlife Service 2002). During summer, California red-legged frogs often vacate their breeding habitat to forage and seek summer habitat if water is not available (U.S. Fish and Wildlife Service 2002).

During the nonbreeding season or when moving between aquatic water bodies, red-legged frogs use a variety of upland habitats (U.S. Fish and Wildlife Service 2002). Suitable refugia includes large cracks in the bottoms of dried ponds, riparian habitat consisting of shrubby riparian growth (arroyo willow), and emergent plants (cattails, bulrushes) (U.S. Fish and Wildlife Service 2010). Small mammal burrows, coarse woody debris, and moist leaf litter can offer important cover for red-legged frogs when they temporarily move out of aquatic habitat or for use during estivation if aquatic habitats dry up (U.S. Fish and Wildlife Service 2002).

Movement

As adults, California red-legged frogs are highly aquatic when active but may take refuge during dry periods in rodent holes or leaf litter in riparian (U.S. Fish and Wildlife Service 2002). Movement distances for the species are listed below in Table B1-4. Red-legged frogs typically remain near water, marked and radio-tagged frogs have been observed to travel more than 2 miles (3 kilometers) through any type of topography, vegetation, or riparian corridors (U.S. Fish and Wildlife Service 2002). These movements are typically made during wet weather and at night (U.S. Fish and Wildlife Service 2002).Red-legged frogs may also disperse in response to receding water, often during the driest time of the year (U.S. Fish and Wildlife Service 2005).

Table B1-4. Documented California Red-Legged Frog Movement

Type	Distance/Area	Location of Study	Citation
Dispersal/migration	0.25–2 mi (0.4–3 km)	Santa Cruz County	U.S. Fish and Wildlife Service 2002
Dispersal/migration	100–4,600 ft. (31–1402 m)	Marin County	Fellers and Kleeman 2007

Note: Disparity in distances between the studies is likely a function of riparian corridor width or habitats adjacent to riparian areas.

Reproduction

California red-legged frogs breed from November through early April. Males often appear at the breeding sites 2–4 weeks before females. Females are attracted to calling males. Females lay a large gelatinous egg mass containing from 2,000 to 5,000 eggs, which hatch in 6–14 days, depending on water temperatures. Those eggs develop into tadpoles in 20–22 days. Larvae metamorphose in approximately 3–7 months, typically between July and September. Males usually attain sexual maturity at 2 years of age and females at 3 years of age. (U.S. Fish and Wildlife Service 2002)

Population Trend and Threats

Population numbers are not precisely known, but the U.S. Fish and Wildlife Service estimates that California red-legged frog populations are declining rapidly. In the early to mid-1990s, a 70% reduction in the geographic range of this subspecies occurred. This decline primarily resulted from habitat loss and the alteration and introduction of exotic predators (U.S. Fish and Wildlife Service 2002).

Populations in the Sierra Nevada and in southern California have greatly declined, possibly due to nonnative predators (bullfrogs and fish), habitat loss from development and agriculture, and pesticide pollution. Windborne pollutants from agriculture in the Central Valley have probably contributed to the extirpation of the species in the nearby Sierra Nevada foothills.] As of 2018, 11 CNDDB occurrences are, “Presumed Extant,” in the Sierra Nevada and associated foothills, with the greatest density of occurrences in El Dorado County (California Department of Fish and Wildlife 2018). In Tuolumne County, the four occurrences in the Sierra Nevadas are, “Potentially Extirpated,” (California Department of Fish and Wildlife 2018). South of Santa Barbara County, Ventura County has seven extant occurrences, Los Angeles has five extant occurrences, Riverside County has 3 extant occurrences, and San Diego has one extirpated occurrence (California Department of Fish and Wildlife 2018). Much of the California red-legged frog’s upland habitat has been developed in the San Francisco Bay Area and in the Sierra Nevada foothills. The Chytrid fungus may have also played a role in population declines. The species persists in northern Baja California. (CaliforniaHerps.com 2012)

Species Management

According to the *Recovery Plan for the California Red-Legged Frog* (U.S. Fish and Wildlife Service 2002), the strategy for recovery of the California red-legged frog involves: 1) protecting existing populations by reducing threats to habitat; 2) restoring and creating habitat that will be protected and managed in perpetuity; 3) surveying and monitoring populations and conducting research on

the biology of these; and 4) reestablishing populations within its historic range. Additional management tools are shown below (U.S. Fish and Wildlife Service 2002).

- Enhance water flow and quality.
- Control/eliminate nonnative species and predators such as plants, vertebrates, and invertebrates.
- Acquire, protect, and enhance habitat.
- Manage grazing.
- Control erosion and sedimentation upstream of breeding habitat.
- Decrease exposure to contaminants.
- Implement watershed management and protection plans.

Habitat Model Development

At elevations below 5,200 feet, California Wildlife Habitat Relationships (CWHR) the California red-legged frog species ranges were utilized to develop the habitat model (California Department of Fish and Wildlife 2014).

Per the range indicated in Shaffer et al. 2004 and the 2010 Revised Determination of Critical Habitat (75 FR 12816-2959), the range for California red-legged frog includes the following hydrographic units in Mendocino County: Point Arena, Garcia, and Gualala, in additional to the original red-legged frog CWHR south and east of Mendocino County. Within the aforementioned California red-legged frog ranges, land cover types used to predict habitat include:

- Fresh emergent wetlands
- Freshwater emergent marsh
- Riverine
- Valley foothill riparian

Potential Upland Habitat

California red-legged frog potential upland dispersal habitat commonly includes the following habitat features: moist leaf litter, dense under story, and small mammal burrows. Within 100 meters of potential breeding habitat (specified below), the following land cover types were used to map potential upland habitat.

- Valley oak woodland
- Valley foothill riparian
- Riverine
- Perennial grassland
- Annual grassland
- Mixed chaparral
- Eucalyptus

- Coastal scrub
- Coastal oak woodland
- Blue oak-foothill pine
- Blue oak woodland

Potential Breeding habitat within the species range, mapping of potential California red-legged frog breeding habitat included pperennial waters, or aquatic features inundated long enough to accommodate the full breeding cycle (11 to 20 weeks in most years) (66 FR 1462–1475). The potential breeding habitat model utilized of the following datasets:

- The 90-foot wide landward edge of all National Hydrography Dataset (NHD) (U.S. Geological Survey 2013) perennial waterbodies: Lake/pond, playa, reservoir, and swamp/marsh
- NHD flowline (U.S. Geological Survey 2013): Perennial streams/rivers and, within critical habitat, intermittent and ephemeral streams buffered 10 feet. (Exclude connector, canal/ditches, underground conduit, pipeline, artificial path, and coastline)
- National Wetland Inventory (NWI) (U.S. Fish and Wildlife Service 2016): permanently flooded ponds

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California Tiger Salamander (*Ambystoma californiense*)

Status

State: Threatened

Federal: Threatened (Central Valley distinct population segment); Endangered (Santa Barbara population and Sonoma County distinct population segments)

Critical Habitat: Yes

Recovery Planning: *Recovery Plan for the Central California Distinct Population Segment of the California Tiger Salamander* (*Ambystoma californiense*) (U.S. Fish and Wildlife Service 2017)

Recovery Plan for the Santa Barbara County Distinct Population Segment of the California Tiger Salamander (U.S. Fish and Wildlife Service 2016a)

Recovery Plan for the Santa Rosa Plain: Blennosperma bakeri (Sonoma sunshine) *Lasthenia burkei* (Burke's goldfields) *Limnanthes vinculans* (Sebastopol meadowfoam) California tiger salamander Sonoma County Distinct Population Segment (*Ambystoma californiense*) (U.S. Fish and Wildlife Service 2016b)

Critical Habitat

Critical habitat for California tiger salamander (CTS) Central Population was established by the U.S. Fish and Wildlife Service (USFWS) in a final rule on August 23, 2005 (70 Federal Register [FR] 49380-49458) where 199,109 acres (805 square kilometers) of critical habitat in 19 counties for the central. In a final decision on critical habitat for the CTS Sonoma County distinct population segment on December 14, 2005 (70 FR 74138-74163), USFWS excluded approximately 17,418 acres (70

square kilometers) of critical. In 2011, the USFWS revised the designation of critical habitat for the Sonoma County population to include approximately 47,383 acres of land (76 FR 54346-54372). Critical habitat for the California tiger salamander in northern Santa Barbara County was designated in 2004 and amounted to 11,180 acres (45 square kilometers) (69 FR 68568 -68609).

Range

CTS is endemic to California. Historically, this species probably occurred in grassland habitats throughout much of the state, but habitat conversion has reduced the species' range and decreased breeding populations (Stebbins and McGinnis 2012). Currently, CTS occurs in the Central Valley and Sierra Nevada foothills from Yolo County south to Kern County, in the coastal valleys and foothills from Sonoma County south to Santa Barbara County, and south to Ventura, Los Angeles, and Riverside Counties (U.S. Fish and Wildlife Service 2009, California Department of Fish and Wildlife 2018).

Within the coastal range, the species currently occurs from southern San Mateo County south to San Luis Obispo County, with isolated populations in Sonoma and northwestern Santa Barbara Counties (California Department of Fish and Game 2012). In the Central Valley and surrounding Sierra Nevada foothills, the species occurs from northern Yolo County southward to northwestern Kern County and northern Tulare and Kings Counties (California Department of Fish and Game 2012).

Habitat Requirements

CTS requires two major habitat components: aquatic breeding sites and terrestrial aestivation or refuge sites. CTS inhabits valley and foothill grasslands and the grassy understory of open woodlands, usually within 1 mile of water (Jennings and Hayes 1994). CTS is terrestrial as an adult and spends most of its time underground in subterranean refuge sites, or *refugia*. Underground retreats are usually California ground squirrel (*Spermophilus beechyii*) burrows and, occasionally, human-made structures. Adults emerge from underground to breed, but only for brief periods during the year. Tiger salamanders breed and lay their eggs primarily in vernal pools and other ephemeral ponds that fill in winter and often dry out by summer (Loredo et al. 1996); they sometimes use permanent human-made ponds (e.g., stock ponds), reservoirs, and small lakes (Stebbins and McGinnis 2012,). Streams are rarely used for reproduction.

Adult salamanders migrate from upland habitats to aquatic breeding sites during the first major rainfall events of fall and early winter and return to upland habitats after breeding. This species requires small-mammal (e.g., California ground squirrel) burrows for cover during the nonbreeding season and during migration to and from aquatic breeding sites (California Department of Fish and Game 2005). Tiger salamanders also use logs, piles of lumber, and shrink-swell cracks in the ground for cover (Holland et al. 1990).

Movement

The proximity of refuge sites to aquatic breeding sites affects the suitability of salamander habitat and the distance an individual must disperse to find suitable breeding and refuge areas. Adult tiger salamanders have been observed up to 1.3 miles (2 kilometers) from breeding ponds (69 FR 47212–47248). A trapping effort in Contra Costa County captured CTS at distances ranging 2,641–3,960 feet (805–1207 meters) from the nearest breeding/aquatic site (69 FR 47212–47248). Trenham (2001) observed CTS moving up to 2,200 feet (671 meters) between breeding ponds in Monterey County. In

a study in winter 2002–2003, Trenham and Schaffer (2005) found that 95% of tiger salamanders resided within 2,040 feet (622 meters) of their breeding pond in Solano County. Alternatively, Loredo and others (1996) found that where the density of California ground squirrel burrows was high, the average dispersal distances between breeding and refuge sites for adults and juveniles was 118 feet (36 meters) and 85 feet (26 meters), respectively. Therefore, although salamanders may disperse over a mile, migration distances are likely to be less in areas supporting refugia closer to breeding sites. Also, habitat complexes that include upland refugia relatively close to breeding sites are considered more suitable because predation risk and physiological stress in CTS probably increases with migration distance.

Dispersal of juveniles from natal ponds to underground refugia occurs during late spring or early summer, when breeding ponds dry out. Juveniles disperse from breeding sites after spending a few hours or days near the pond margin (Jennings and Hayes 1994). Juveniles have been observed to migrate up to 1 mile (1.6 kilometers) from breeding pools to upland areas (69 FR 47212–47248). Dispersal distances also vary depending on the availability of suitable habitat and may increase with an increase in precipitation (65 FR 57242-57264).

Table B1-5. Documented California Tiger Salamander Movement

Type	Distance/Area	Location of Study	Source
Adult dispersal	2,040 feet (620 meters)	Jepson Prairie Preserve, Solano County	Trehnam and Shaffer 2005
Adult dispersal	2,641–3,960 feet (805–1,207 meters)	Contra Costa County	69 FR 47212–47248
Adult dispersal	2,200 feet (670 meters)	Monterey County	Trehnam 2001
Adult dispersal	1.3 miles (2,092 meters)	Not reported	69 FR 47212–47248
Adult dispersal	26–423 feet (8–129 meters)	Contra Costa County	Loredo et al. 1996
Juvenile dispersal	20–187 feet (6–57 meters)	Contra Costa County	Loredo et al. 1996
Juvenile dispersal	2,066 feet (630 meters)	Jepson Prairie Preserve, Solano County	Trenham and Schaffer 2005

Reproduction

Adult CTS migrate to and congregate at aquatic breeding sites during warm rains, primarily between November and February (Barry and Shaffer 1994). Tiger salamanders are rarely observed except during this period (Loredo et al. 1996). During the winter rains, tiger salamanders breed and lay eggs primarily in vernal pools and other shallow, ephemeral ponds that fill in winter and often dry by summer (Loredo et al. 1996). This species also uses permanent human-made ponds (without predatory fish) for reproduction. Spawning usually occurs within a few days after migration, and adults probably leave the breeding sites at night soon after spawning (Barry and Shaffer 1994).

Eggs are laid singly or in clumps on both submerged and emergent vegetation and on submerged debris in shallow water. In ponds without vegetation, females lay eggs on objects on the pond bottom (Barry and Shaffer 1994; Jennings and Hayes 1994). After breeding, adults leave the breeding ponds and return to their refugia.

After approximately 2 weeks, the salamander eggs begin to hatch into larvae. Once larvae reach a minimum body size, they metamorphose into terrestrial juvenile salamanders. Larvae in small ponds develop faster, while larvae inhabiting ponds that retain water for a longer period are larger at time of metamorphosis. In general, salamanders require 10 weeks living in ponded water for complete metamorphosis. If a pond dries prior to metamorphosis, the larvae will desiccate and die (65 FR 57242 -57264). Juveniles disperse from aquatic breeding sites to upland habitats after metamorphosis (Stebbins and McGinnis 2012; Holland et al. 1990).

Population Trend and Threats

Available data suggest that most CTS 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. Because CTS spend most of their life underground and only a fraction of the population emerges during the breeding season, determination of population size range wide is not possible (California Department of Fish and Game 2010). CTS populations have experienced dramatic declines throughout the historical range of the species, particularly in the Central Valley. CTS populations have declined as a result of two primary factors: widespread habitat loss and habitat fragmentation. These factors have both been caused by conversion of valley and foothill grassland and oak woodland habitats to agricultural and urban development (Stebbins and McGinnis 2012). Hybridization with nonnative tiger salamanders (NNTS) has also occurred on a large scale. Other threats to CTS include encroachment of nonnative predators; disease; reduction of ground squirrel populations and the use of poisons as part of rodent control programs; use of pesticides; competition with introduced salamanders; hybridization with introduced salamanders; vehicle kills; and contaminated runoff from roads, highways, and agriculture (U.S. Fish and Wildlife Service 2007).

Species Management

According to the *Status Review of the California Tiger Salamander* (California Department of Fish and Game 2010), two primary management activities should occur for CTS: control non-native tiger salamanders (NNTS) and manage CTS habitat. Echoing recovery objectives in the Recovery Plans for the distinct population segments, management activities outlined in the *Status Review of the California Tiger Salamander* to protect populations of CTS are listed below:

- Eradicate or reduce the impact of known NNTS and CTS x NNTS hybrid populations.
- Identify both aquatic and terrestrial CTS habitats in management and conservation plans. Emphasize managing and protecting groups of ponds (landscape level conservation) rather than single water bodies. Where possible, retain dispersal corridors of suitable habitat among ponds. Assign high priority to ponds or groups of ponds that support large subpopulations of CTS.
- Actively manage CTS habitats, including through maintenance of appropriate vegetation condition, as appropriate, and removal and/or control of nonnative predators.
- Where CTS ponds are adjacent to NNTS or hybrid zones, manage pond hydrology (particularly in stock ponds and other human-made/manipulated water bodies) to favor seasonal rather than perennial wetlands.
- Restore or create ephemeral ponds to enhance existing CTS populations.
- Restore degraded upland habitats adjacent to known or restored breeding sites.

- Retain broad, contiguous sections of undeveloped shoreline (>30% of total perimeter) around CTS breeding sites to minimize straying of migrating individuals into unsuitable habitats (per Trenham and Cook 2008).
- Encourage additional emphasis on CTS habitats in California Rangeland Coalition Conservation Focus Areas.
- Translocate/relocate CTS to establish new populations, remediate for lost or compromised habitat, and/or prevent further loss of individuals, following the guidelines authored by Shaffer and others.
- Discontinue Department private stocking permits for nonnative fishes where they may negatively affect CTS.
- Encourage public and private stock pond management practices consistent with CTS conservation as described in the *Special Rule Exempting Routine Ranching Activities* (69 FR 47212–47248).
- Issue scientific collecting permits as necessary for research essential to the conservation and recovery of CTS.
- Investigate use and effectiveness of wildlife crossing structures and/or tunnels designed for CTS in circumstances where road-kill mortality due to migration to/from breeding ponds is significant.
- Control rodents and mosquitoes on grazing lands in accordance with the *Special Rule Exempting Routine Ranching Activities* (69 FR 47212–47248). On nongrazing lands, avoid introductions of mosquitofish into CTS breeding ponds.
- Within the CTS distinct population segments identified by the USFWS, consider establishment of CTS target population and mitigation goals (California Department of Fish and Game 2010).

Management of the California tiger salamander should also take into account the chytrid fungus and follow the sterilization protocols provided by U.S. Wildlife Service in Appendix D of the *Arroyo Toad* (*Bufo californicus* (=*microscaphus*) *5-Year Review: Summary and Evaluation* (2009b), which is summarized in the *Species Management* section of the Arroyo toad species account above.

Habitat Model Development

The habitat model for the Central Valley distinct population segment was informed by the range depicted in the 2017 recovery plan (U.S. Fish and Wildlife Service 2017). The Central Valley distinct population segment is known to occur in the following counties of the MRHCP planning area: Amador, Calaveras, Monterey, Sacramento, San Benito, San Luis Obispo, Santa Cruz, Stanislaus, Tulare, Tuolumne, and Yolo. CTS is known from sites on the Central Valley floor near sea level, up to a maximum elevation of roughly 3,940 feet (1,200 meters) in the Coast Ranges, and 1,640 feet (500 meters) in the Sierra Nevada foothills (U.S. Fish and Wildlife Service 2017).

The habitat model for the Santa Barbara distinct population segment utilized the range depicted in the 2016 recovery plan (U.S. Fish and Wildlife Service 2016) was utilized. The Santa Barbara County distinct population segment of the California tiger salamander is found in six metapopulations: (1) West Santa Maria/Orcutt, (2) East Santa Maria, (3) West Los Alamos, (4) East Los Alamos, (5) Purisima Hills, and (6) Santa Rita Valley (U.S. Fish and Wildlife Service 2016, Figure 1).

Potential Breeding Habitat

Within the specified range of the distinct population segments, potential breeding habitat meets the criteria outlined below.

- National Hydrography Dataset (NHD) (U.S. Geological Survey 2013) 'lake/pond' types that are below 1.5 acre in size.
- Land cover that contains any vernal pool complexes.
- Changes in the Distribution of Great Valley Vernal Pool Habitats from 2005 to 2012 (Witham et al. 2014) with "converted" polygons removed.
- Connected to (touching) potential upland habitat (as discussed below)

Potential Upland Habitat

Within 1.3 miles of potential breeding habitat (U.S. Fish and Wildlife Service 2003 and California Department of Fish and Wildlife 2003), potential upland/dispersal habitat was mapped in the following land cover types:

- Valley foothill riparian
- Annual grassland and perennial grasslands
- Blue oak, coastal, and valley oak woodlands
- Blue oak-foothill pine
- Mixed and chamise-redshank chaparrals
- Coastal and alkali desert scrubs

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Foothill Yellow-Legged Frog (*Rana boylii*)

Status

State: Species of Special Concern

Federal: "Under Review"

Critical Habitat: None

Recovery Planning: None

Critical Habitat

No critical habitat has been designated for foothill yellow-legged frog.

Range

Historically, foothill yellow-legged frogs occurred in most Pacific drainages from the Santiam River in Oregon to the San Gabriel River in Los Angeles County and in the interior foothills and mountains from the Oregon border into southern California (Jennings and Hayes 1994). The species currently occupies the same general range with an extirpated occurrence in each of the following counties: Butte, Yuba and Napa California Department of Fish and Wildlife 2018). Potential extirpation has been reported for single occurrences in Merced, Sonoma, and Sutter Counties and for two occurrences in Mariposa County.

An isolated population was reported in Sierra San Pedro Martir, Baja Mexico (Feller 2005). The species' known elevation range extends from near sea level to approximately 1,830 meters (6000 feet) above sea level (Stebbins and McGinnis 2012).

Habitat Requirements

Foothill yellow-legged frog inhabits streams and rivers with sunny, sandy, and rocky banks, deep pool, and shallow riffles in a variety of habitats, including woodlands, conifer forests, valley-foothill riparian, coastal scrub, chaparral, and wet meadows (California Department of Fish and Game 2000; Stebbins and McGinnis 2012). Adults bask on exposed rock surfaces near streams and when disturbed seek refuge beneath submerged rocks and sediments (California Department of Fish and Game 2000; Stebbins and McGinnis 2012). Adults feed on a wide range of insects and are a known to eat snails (Stebbins and McGinnis 2012). Tadpoles graze on algae and diatoms attached to rocky

stream bottoms (California Department of Fish and Game 2000). Tadpoles require at least three to four months of water to complete metamorphosis (California Department of Fish and Game 2000). Along intermittent streams large aggregations of adults have been observed at locations of quiet persistent water (i.e., pools) during the dry season (Stebbins and McGinnis 2012). The behavior and resources needs of overwintering frogs is poorly understood (Hayes et al. 2016). Fall and winter habitat includes small perennial tributary streams and adjacent riparian habitat but more research is needed on overwintering sites (Hayes *et al*. 2016, Olson and Davis 2009).

Movement

Foothill yellow-legged frogs are a highly aquatic amphibian, spending most or all of their life in or near streams (California Department of Fish and Game 2000). Adult foothill yellow-legged frogs have high site fidelity and typically occupy small home ranges. Normal home ranges are probably less than 33 feet (10 meters) in the longest dimension, with occasional long distance movements of 165 feet (50 meters) during periods with high water conditions (California Department of Fish and Game 2000). Seasonal movements or migrations from breeding areas have reported to range between 450 – 7,043 m, recently metamorphosed frogs show a strong tendency to migrate upstream, perhaps as an evolutionary mechanism to repatriate individuals washed downstream during the larval stage, and frogs have been found 50 – 80 m from water (Ashton et al., 1997; California Department of Fish and Game 2000, Olson and Davis 2009).

Reproduction

Foothill yellow-legged frogs in California generally breed between March and early June, usually waiting until high spring flows have subsided (Ashton et al. 1997; California Department of Fish and Game 2000). Females typically deposit eggs in clusters of 200 to 300, which are attached to gravel and cobble in moving water near stream margins, though they have also been observed attaching eggs to aquatic vegetation and woody debris (Ashton et al. 1997; California Department of Fish and Game 2000). Eggs can hatch in five to 30 days depending on water temperature (Ashton et al. 1997). Metamorphosis generally occurs approximately 12–16 weeks after oviposition and is also generally temperature dependent (Ashton et al. 1997). Maturity is typically reached when the frog is 40 mm (snout-urostyle length) and breeding typically occurs in the second post-metamorphic year (Ashton et al. 1997).

Population Trend and Threats

The species is still moderately abundant in coast drainages north of Monterey Bay and numerous historic populations appear to have been lost on the western slopes of the Sierra Nevada, especially in the southern part of its range (Stebbins and McGinnis 2012). Many of these population losses are associated with the damming and regulation of stream flow that leads to habitat loss and unnatural flow regimes (Ashton et al. 1997; Stebbins and McGinnis 2012). Periodic water releases (pulse flows) from upstream Sierra reservoirs during the breeding period can scour eggs from their attachments sites and washout and kill tadpoles (Kupferberg et al. 2008; Stebbins and McGinnis 2012). Also, decreased flows can force adult frogs to move into permanent pools, where they may be more susceptible to predation (Ashton et al. 1997).

The introduction of nonnative predatory game fish species, nonnative crayfish, and American bullfrogs have also lead to a decline in populations in California (Ashton et al. 1997; Kupferberg et al. 2008; Stebbins and McGinnis 2012, Hayes et al. 2016).

Species Management

In managed streams, Jennings and Hayes (1994) recommend avoiding water releases that create excess flow and shear conditions when egg masses and the more-fragile younger larval stages are present. Additionally, flow and water level decreases which may cause species isolation and the desiccation and stranding of eggs and larvae should be avoided (see Olson and Davis 2009). Management of the foothill yellow-legged frog should also take into account the chytrid fungus and follow the sterilization protocols provided by U.S. Wildlife Service in Appendix D of the *Arroyo Toad* (Bufo californicus (=microscaphus) *5-Year Review: Summary and Evaluation* (2009), which is summarized in the *Species Management* section of the Arroyo toad species account above.

Habitat Model Development

CWHR species range (California Department of Fish and Wildlife 2014), NHD (National Hydrography Geodatabase)(U.S. Geological Survey 2013), and NED (National Elevation Dataset) (Geish et al. 2002) at elevations below 6,370 feet were used to develop the habitat models for the foothill yellow-legged frog.

Potential Breeding Habitat

Suitable breeding habitat was mapped using the following GIS datasets:

- NHD (U.S. Geological Survey 2013): Perennial streams/rivers buffered 10 feet. (Exclude connector, canal/ditches, underground conduit, pipeline, artificial path, and coastline).
- Exclude areas on developed and agricultural land cover types.

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Santa Cruz Long-Toed Salamander (*Ambystoma macrodactylum croceum*)

Status

State: Endangered (Fully Protected)

Federal: Endangered

Critical Habitat: No

Recovery Planning: *Draft Revised Recovery Plan for the Santa Cruz Long-toed Salamander* (U.S. Fish and Wildlife Service 1999)

Critical Habitat

On June 22, 1978 the U.S. Fish and Wildlife Service proposed to designate Critical Habitat for the Santa Cruz long-toed salamander (43 Federal Register [FR] 26759); however, the proposal was withdrawn in 1979 (44 FR 12382).

Range

The Santa Cruz long-toed salamander is a relic of a species that occurred throughout California during the last glacial period. The species became isolated along the Central Coast due to climatic changes. A majority of the Santa Cruz long-toed salamander's habitat has been lost to agriculture and urban sprawl. (California Department of Fish and Game 2004)

Santa Cruz long-toed salamander is found in southern Santa Cruz County and northern Monterey County and was documented in 24 breeding sites (U.S. Fish and Wildlife Service 2009). Of the sites that have been identified, 17 are located in southern Santa Cruz County and 7 in northern Monterey County. Of the 24 sites, breeding was documented at 19 of the known locations. (U.S. Fish and Wildlife Service 2009a). According to CNDDB, the species is described from 22 occurrences, all of which are listed as extant, with seven occurrences in Monterey County and 15 occurrences in Santa Cruz County (California Department of Fish and Wildlife 2018).

Habitat Requirements

Santa Cruz long-toed salamanders inhabit terrestrial and aquatic habitats during their life cycle. The terrestrial habitats include upland coastal scrub and woodland areas and riparian vegetation. During the rainy season, the Santa Cruz long-toed salamander inhabits shallow ephemeral and perennial freshwater ponds to reproduce. Ideally, freshwater ponds are surrounded by thick vegetation. The breeding ponds utilized vary greatly in size and duration of persistence from year to year, depending on the amount of rainfall. (U.S. Fish and Wildlife Service 1999)

During the non-rainy season, Santa Cruz long-toed salamanders inhabit small mammal burrows, under leaf litter, rotten logs, fallen branches, and along the root system of plants (U.S. Fish and Wildlife Service 2009). Specifically, the Santa Cruz long-toed salamander spends its time in the root system of upland chaparral and woodland areas of coast live oak or Monterey pine, and in strips of riparian vegetation such as arroyo willows, cattails, and bulrush. The Santa Cruz long-toed salamander inhabits these areas to avoid heat and dryness. The soils required by the plants in which Santa Cruz long-toed salamander burrow are usually sandy loams formed on old dune deposits, marine terraces, or alluvium deposits (U.S. Fish and Wildlife Service 1999).

Movement

Santa Cruz long-toed salamanders may use habitat up to 1 mile (.97 kilometers) from their breeding pond. Dispersal from the breeding pond varies from the riparian vegetation surrounding and adjacent to the breeding pond, and oak woodlands and chaparral as far as 1 mile (0.97 kilometers)

or more from the ponds (U.S. Fish and Wildlife Service 1999). A study conducted by Biosearch in 2002 showed that Santa Cruz long-toed salamander move at least 1,100 feet (335 meters) to reach aquatic habitat from upland areas (U.S. Fish and Wildlife Service 2009a).

Table B1-6. Documented Santa Cruz Long-Toed Salamander Movement

Type	Distance/Area	Location of Study	Citation
Dispersal/migration	≥ 1,100 ft. (≥335 m)	Santa Cruz County	U.S. Fish and Wildlife Service 2009
Dispersal/migration	0.6 mi (965 m)	Unknown	U.S. Fish and Wildlife Service 1999

Reproduction

Santa Cruz long-toed salamanders breed in shallow, ephemeral freshwater ponds. Adult Santa Cruz long-toed salamanders migrate from upland chaparral and woodland areas to breeding ponds during rainy nights beginning in mid to late November or December. These species arrive at the breeding ponds from November through March, with most arrivals occurring in January and February. Breeding occurs during January and February. If little or no surface water is present, adult salamanders may not breed for a year or more. If sufficient surface water is present, males migrate to the ponds up to 6 weeks prior to females. Hence, males remain in ponds 1– 5 weeks— twice as long as females—and may breed with more than one female in each season. As female Santa Cruz long-toed salamanders enter the pond, they pair with a male, court, and breed. Females typically lay eggs on submerged vegetation about 1 inch apart; however, unattached and clustered eggs have also been observed. Each female may lay 215–411 eggs per year. After laying the eggs, adult Santa Cruz long-toed salamanders return to the same general upland areas where they spent their previous summer, sometime during the month of March or April. (U.S. Fish and Wildlife Service 1999)

Eggs hatch 15– 30 days into the aquatic larval state, with development time depending on water temperatures. The larvae subsist on aquatic invertebrates such as mosquitoes, worms, and Pacific treefrog (*Pseudacris regilla*) larvae. Santa Cruz long-toed salamander larvae remain in the pond for 90– days until they reach about 1.3 inches (3.3 centimeters). Metamorphosis may extend from early May to mid-August; however, if the pond's environment becomes unsuitable, the larvae will metamorphose in a relatively short period of time. As the pond dries, juvenile Santa Cruz long-toed salamanders may seek refuge underground at the pond site or in adjacent willow stands. Juveniles migrate upland to woodland and chaparral areas on rainy nights. Santa Cruz long-toed salamanders reach sexual maturity at 2– to 3–years of age (U.S. Fish and Wildlife Service 1999). If the breeding pond's water quality remains suitable, Santa Cruz long-toed salamander may remain in the pond for longer periods of time, which may be advantageous to the larvae (U.S. Fish and Wildlife Service 2009a).

Population Trend and Threats

The population of the Santa Cruz long-toed salamander is relatively unknown. According to CNDDB, three occurrences have a trend described as, "Decreasing," with threats attributed to overgrazing, upland trenching, and agricultural encroachment (California Department of Fish and Wildlife 2018). As described in the draft recovery plan (U.S. Fish and Wildlife Service 1999), the Santa Cruz long-toed salamander populations were grouped into three clusters (metapopulations). However, recent genetic evidence (Savage pers. comm 2009) suggests there is little to no interaction within the

clusters of the Santa Cruz metapopulations. Consequently, the 5-year review (U.S. Fish and Wildlife Service 2009a) describes four metapopulations in Santa Cruz County and two in Monterey County, which are outlined below:

In Santa Cruz County,

- In Aptos, the Valencia-Seascape Metapopulation comprises four ponds, of which three (Seascape Ponds 1, 2, and 3) are managed by the Seascape Habitat Conservation Plan (HCP), and one (Valencia Lagoon) is managed by the California Department of Fish and Wildlife. As of 2007, Santa Cruz long-toed populations appeared stable at Seascape Ponds 1 and 3, while budget constraints prevented assessment of Seascape Pond 2 (U.S. Fish and Wildlife Service 2009a). Valencia Lagoon's population estimates dropped from 2,583 adults during mark and recapture efforts in 1977 to 1978 (Reed 1979) to 734 adults in 2007-2008 (Biosearch 2008).
- The Ellicot-Buena Vista Metapopulation, which is immediately south of the Valencia-Seascape Metapopulation, contains five known breeding locations. Ellicot and Buena Vista Pond are managed by the Ellicot Slough National Wildlife Refuge and the California Department of Fish and Wildlife, respectively. While low rainfall in 2009 limited the expectation of Santa Cruz long-toed recruitment (Kodama, pers. comm. 2009), breeding was observed in both protected ponds (U.S. Fish and Wildlife Service 2009a). Breeding was last confirmed in the three private ponds in 1989 (Green's Pond), 1996 (Rancho Road Pond), and the 1960s (Anderson Pond) (U.S. Fish and Wildlife Service 2009a).
- The Freedom Metapopulation, which is east across Highway 1 from the Valencia-Seascape Metapopulation, contains five ponds of which two are afforded protection from development and three are on private land. The two protected are ponds managed by the Tucker HCP and California Department of Fish and Wildlife, respectively. The Tucker Pond had a baseline population of 984 adults in 2002, but no larvae were observed in 2007 and 2008 (Biosearch 2008, U.S. Fish and Wildlife Service 2009a); the presence of non-native goldfish (*Carassius* sp.) and bullfrogs (*Rana catesbeiana*) in Tucker pond likely challenges the persistence of the Santa Cruz long-toed salamander and continued management is needed. The pond managed by the California Department of Fish and Wildlife, Millsap Pond, was estimated to contain 137 ± 21 adults during 2000 to 2001 population studies (Biosearch 2001). During pitfall trap studies in 2004 and 2005 at Millsap Pond, 30 juveniles and 59 adults were captured (Bana Bland and Associates 2005). The remaining three ponds, Palmer Pond, Merk Pond and Racehorse Land Pond, are not managed for Santa Cruz long-toed salamanders and were documented or confirmed to contain Santa Cruz long-toed salamanders in 2004, 2005 and 2008, respectively (Bland pers. comm. 2009, U.S. Fish and Wildlife Service 2009a, California Department of Fish and Wildlife 2018).
- The Larkin Valley Metapopulation is immediately south of the Freedom Metapopulation and contains two privately owned ponds and one owned by the Ellicot Slough National Wildlife Refuge. While the status of the two private ponds is unknown, breeding was confirmed in 2004 (U.S. Fish and Wildlife Service 2009a). The pond owned by Ellicot Slough National Wildlife Refuge (Calabasas Pond) is managed for the Santa Cruz long-toed salamander and successful recruitment and breeding was confirmed in 2008 (Mitcham per. obs 2008, U.S. Fish and Wildlife Service 2009a). Chytrid fungal infections of Santa Cruz long-toed salamanders was confirmed at Calabasas Pond.

In Monterey County,

- The McClusky Metapopulation is separated from Ellicot-Buena Vista Metapopulation by Pajaro River. The McClusky Metapopulation contains three known breeding locations: Zmudowski Pond, McClusky Slough, and Bennet Slough/Struve Pond. The California Department of Fish and Wildlife owns Zmudowski pond and the southern portion of the westernmost part of McClusky Slough. In Zmudowski pond, the Santa Cruz long-toed population was estimated at 19 adults in 2002 and 2003 (Biosearch 2003). The estimated adult population in McClusky Slough was 97 (Biosearch 2003). It was reported that the size of the Santa Cruz long-toed salamanders at Zmudowski and McClusky pond were smaller than individuals caught at Seascape Ponds (Laabs 2003) and Tucker Pond (Dana Bland and Associates 2002). According the U.S. Fish and Wildlife Service (2009a), the data from Zmudowski and McClusky Slough suggest the populations are not increasing, lack a stable age distribution and may not be self-sustaining. Bennet Slough/Stuve Pond was observed to contain a single female in 1985 and high salinity levels are hypothesized to contribute to the potential extirpation of Bennet/Stuve Pond.
- The Elkhorn Metapopulation is south of the McClusky Metapopulation and contains four known breeding sites: Lower Cattail Swale, Oxbow Pond, Upper Moro Cojo Slough, and Lower Moro Cojo Slough. Lower Cattail Swale is managed by the Elkhorn Slough National Estuarine Research Reserve, where eight of the ten larvae captured in 2003 contained abnormalities and breeding was last confirmed in 2008 (Savage pers. comm 2009, U.S. Fish and Wildlife Service 2009a). The Santa Cruz long-toed salamander breeding population at Oxbow Pond is protected by the Agriculture and Land Based Training Association and bullfrogs and crayfish were also observed in the pond. The Elkhorn Slough Foundation owns an easement of Upper Moro Cojo Slough and breeding was last confirmed in 2007 (John Gilchrist and Associates 2007). Lower Moro Cojo Slough is privately owned and the southern extent of known breeding populations, where breeding was last confirmed in 1990 (U.S. Fish and Wildlife Service 2009a).

The primary threats to the Santa Cruz long-toed salamander include agriculture, urbanization, and road construction. Additional threats to the species include pollution, siltation, and water quality degradation in breeding ponds from agricultural activities; loss of non-breeding habitat and food resources from the spread of non-native species; predation by fish, bullfrogs, and tiger salamanders; and parasites. (U.S. Fish and Wildlife Service 1999). Chytrid fungus is also a threat to the Santa Cruz long-toed salamander and has been confirmed in the Elkhorn Metapopulation (Oxbow Pond and Lower Cattail Swale) and the Larkin Valley Metapopulation (Calabasas Pond).

Species Management

According to the *Draft Revised Santa Cruz Long-Toed Salamander Recovery Plan* (U.S. Fish and Wildlife Service 1999), the strategy for recovery will involve: 1) perpetuating self-sustaining populations by managing pond and upland habitats, reducing human-related mortality, and monitoring populations; 2) surveying each complex to locate additional breeding sites and suitable upland habitat areas and to identify parcels that would be appropriate for conservation agreements or easements, acquisition, or other management actions; 3) assessing the distribution and population status at known sites and at any other new locations found through the surveys, planning and implementing appropriate management strategies and actions where appropriate; 4) supporting management of habitats and populations with appropriate research; and 5) maximizing public support for conservation through continuing and expanding a program of public education and information. Management of the Santa Cruz long-toed salamander should also take into account

the chytrid fungus and follow the sterilization protocols provided by U.S. Wildlife Service in Appendix D of the *Arroyo Toad* (*Bufo californicus* (=*microscaphus*) *5-Year Review: Summary and Evaluation* (2009b), which is summarized in the *Species Management* section of the Arroyo toad species account above.

Additional management tools are shown below (U.S. Fish and Wildlife Service 1999).

- Improve water quality.
- Restore, enhance, and retain wetland and upland habitat.
- Manage flood waters.
- Provide opportunities for public access and education.
- Prohibit vehicular pass.
- Create habitat management plans and habitat conservation plans.
- Establish watershed management plans.

Habitat Model Development

The following GIS information and datasets were utilized to develop the Santa Cruz long-toed salamander habitat model:

- Santa Cruz long-toed salamander 5-year review (U.S. Fish and Wildlife Service 2009)
- CNDDB records buffered by 1.2 miles (most of the California Natural Diversity Database occurrences will be associated with breeding ponds) (California Department of Fish and Wildlife 2018).
- Breeding pond locations in Monterey and Santa Cruz counties provided by Biosearch (Dave Laabs and Mark Allaback, personal communication 2018).

Breeding Habitat

California Natural Diversity Database occurrences and known pond locations (Laabs, personal communication 2018) were mapped as known or potential breeding sites and habitat.

Upland Habitat

Potentially suitable upland habitat within ½ mile of breeding habitat was mapped within the following land cover types (U.S. Fish and Wildlife Service 2009, U.S. Fish and Wildlife Service and California Department of Fish and Wildlife 2012):

- Coastal oak woodland
- Coastal scrub
- Mixed chaparral
- Valley foothill riparian
- Eucalyptus.
- Rural residential areas, as described in the Santa Cruz General Plan (City of Santa Cruz 2012), were included to capture potential upland dispersal in private properties

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Sierra Nevada Yellow-Legged Frog (*Rana sierrae*)

Status

State: None

Federal: Endangered

Critical Habitat: Yes

Recovery Planning: None.

Critical Habitat

Critical habitat was designated by the U.S. Fish and Wildlife Service (2016) for the Sierra Nevada yellow-legged frog for a total of 1,082,147 acres (437,929 ha) (81 FR 59045-59119). The critical

habitat occurs in Plumas, Lassen, Sierra, Nevada, Placer, El Dorado, Amador, Calaveras, Alpine, Mariposa, Mono, Madera, Tuolumne, Fresno and Inyo Counties.

Range

Sierra Nevada yellow-legged frog occurs in the Sierra Nevada at elevations of 4,500–12,000 feet (1372–3658 meters) (California Department of Fish and Game 2011). The northern extent of the range is north of the Feather River (Butte and Plumas Counties) south through the Sierra Nevada to the Monarch Divide and Cirque Crest (Fresno County) (California Department of Fish and Game 2011).

Habitat Requirements

Sierra Nevada yellow-legged frogs are diurnal and highly aquatic and are found on sunny river banks, creeks, meadow streams, isolated pools, and lake borders in the high Sierra Nevada and stream courses (Stebbins and McGinnis 2012). In areas where lakes are rare, at lower elevations along the west slope of the Sierra Nevada (<6,500 feet) they primarily occupy low to high gradient streams ranging from chaparral to montane zones (California Department of Fish and Game 2011). They spend most of their time directly at the water-land interface and while they are rarely found more than one meter away from water, they are capable of long distance travel in between breeding, foraging, and overwintering habitat within lake complexes (California Department of Fish and Game 2011, U.S. Fish and Wildlife Service 2013).

At high elevations, Sierra Nevada yellow-legged frogs overwinter under ice for 6- 9 months in hibernation (California Department of Fish and Game 2011). Some individuals have been found overwintering in near-shore environments in deep crevices and under ledges (Matthews and Pope 1999).

Movement

Sierra Nevada yellow-legged frogs emerge from overwintering sites in early spring, and breeding soon follows (64 FR 71714). Timing of emergence from winter retreats is dependent on local climate. At high elevations in the Sierra Nevada the period of activity may be as short as only three months (Stebbins and McGinnis 2012).

During the active season, adult Sierra Nevada yellow-legged frogs move only a few hundred meters, but occasionally may move as much as 1 km (0.62 mi) (California Department of Fish and Game 2011). These movements are typically made by adults moving between breeding, feeding, and overwintering habitats (California Department of Fish and Game 2011). Home ranges of Sierra Nevada yellow-legged frogs are probably not more than 33 feet (10 meters) in the longest dimension (California Department of Fish and Game 2008). This species is highly aquatic and rarely found more than 3 feet from water (USFWS 2012, USFS 2014).

Table B1-7. Documented Sierra Nevada Yellow-Legged Frog Movement

Type	Distance/Area	Location of Study	Citation
Movement in aquatic habitat	Typically, a few hundred meters, but up to 1 km (0.62 mi)	Unknown	California Department of Fish and Game 2011
Home range	33 ft. (10 m)	Unknown	California Department of Fish and Game 2008

Reproduction

In the high Sierra Nevada, Sierra Nevada yellow-legged frog breeding occurs in late May, June, and July, and may be before meadows are free of snow, when ice is still present in parts of streams (Stebbins and McGinnis 2012). Egg masses are laid underwater and are typically attached to submerged logs and branches, banks, aquatic vegetation, rocks, or laid on the bottom of the lake or stream (California Department of Fish and Game 2011). In Sierra lakes larvae overwinter and at very high elevation may not transform until their third or fourth larval year (Stebbins and McGinnis 2012). At lower elevations tadpoles may be able to grow sufficient to metamorphose in a single summer (California Department of Fish and Game 2011). Juvenile frogs mature at 3-4 years, typically when they reach a snout-to-vent length of 40mm (California Department of Fish and Game 2011).

Population Trend and Threats

Historically, Sierra Nevada yellow-legged frogs were abundant but during the past century the species has declined throughout its range (California Department of Fish and Game 2011). The California Department of Fish and Wildlife surveyed historic populations between 1995 and 2010 and found that 69% of these populations had been extirpated (California Department of Fish and Game 2011).

The decline of the Sierra Nevada yellow-legged frog population and continuing threats are mostly attributable to predation by introduced trout (California Department of Fish and Game 2011; Stebbins and McGinnis 2012). Prior to the mid-1800s, fish were absent from nearly all high elevation habitats in California but since then fish stocking of high elevation lakes and streams has resulted in nearly all these habitats being occupied by trout (California Department of Fish and Game 2011; Stebbins and McGinnis 2012). Introduced trout are significant predators on yellow-legged frogs and it has been observed that yellow-legged frogs are three more times likely to be detected and six times more abundant in fishless water relative to water bodies inhabited by fish (California Department of Fish and Game 2011).

Another major threat to frog populations is the introduction of chytrid fungus (*Batrachochytrium dendrobatidis*) (California Department of Fish and Game 2011; Stebbins and McGinnis 2012). The chytrid fungus is waterborne and affects amphibians by keratinizing tissues, which disrupts critical skin functions such as osmoregulation and in tadpoles produces mouthpart deformities that can affect feeding (California Department of Fish and Game 2011). The arrival of chytrid fungus into a yellow-legged frog population typically results in rapid increased in disease prevalence and infection intensity, eventually resulting in mass frog die-offs (California Department of Fish and Game 2011). However, recent evidence suggests some resilience to chytrid fungus in Sierra Nevada yellow-legged frog populations had developed in those with a history of exposure (Knapp et al 2016). Research by Knapp et al. 2016 also demonstrated an increase in Sierra Nevada yellow-legged frog populations, which was, in part, attributed to the cessation of fish-stocking in Sierra Nevada lakes and the development of resilience to chytrid fungus.

Species Management

The California Department of Fish and Game's Fisheries Branch has adopted a policy of not stocking waters were Sierra Nevada yellow-legged frogs are present or where their presence is unknown due to a lack of surveys. Starting in 1997, several lakes, ponds, and short stream sections have been

targeted for non-native fish removal to benefit yellow-legged frogs. Initial efforts have shown that following trout removal populations of Sierra Nevada yellow-legged frog expanded rapidly (California Department of Fish and Game 2011). While potential chytrid fungus resilience could develop in Sierra Nevada yellow-legged frog populations, management of the Sierra Nevada yellow-legged frog should also take into account the chytrid fungus and follow the sterilization protocols provided by U.S. Wildlife Service in Appendix D of the *Arroyo Toad* (*Bufo californicus* (=*microscaphus*) *5-Year Review: Summary and Evaluation* (2009), which is summarized in the *Species Management* section of the Arroyo toad species account above.

Habitat Model Development

The following datasets and information were utilized to develop the habitat models for Sierra Nevada yellow-legged frog:

- Designated critical habitat (81 FR 59045-59119))
- Digitized range from listing package (U.S. Fish and Wildlife Service 2014)
- CNDDB occurrences with accuracy class no greater than 1/5 miles and recorded within the past 25 years (U.S. Geological Survey 2017 and California Department of Fish and Wildlife 2018).
- Within 10 feet of streams NHD (U.S. Geological Survey 2013) and elevation between 3,500 and 12,000 feet NED (Gesh et al. 2002)

Land cover types evaluated in the habitat model include:

- Wet meadow
- Riverine
- Montane riparian
- Lacustrine
- Fresh emergent wetland
- Fresh emergent marsh

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Southern Mountain Yellow-Legged Frog (*Rana muscosa*)

Status

State: Endangered

Federal: Endangered

Critical Habitat: Yes

Recovery Planning: None

Critical Habitat

Outside of the plan area, critical habitat is designated for southern mountain yellow-legged frog DPS. In 2006, 8,283 acres (33.5 square kilometers) of stream segments and riparian habitat were designated as critical habitat for the southern California distinct population segment in portions of Los Angeles, Riverside and San Bernardino Counties (71 FR 54344 - 54386). Much of the land designated as critical habitat is managed by the U.S. Forest Service's Angeles National Forest (ANF) and San Bernardino National Forest (SBNF). A small amount of privately owned land (approximately 119 acres [0.48 square kilometers]) is also included as critical habitat (71 FR 54344 - 54386).

Range

Southern mountain yellow-legged frog occurs in the mountains of southern California at elevations of 800–9,100 feet (250–2,780 meters) (California Department of Fish and Game 2011). In southern California, southern mountain yellow-legged frog historically occurred in many drainages in the San Gabriel, San Bernardino, and San Jacinto Mountains and in at least one location on Palomar Mountain. In 2012, the southern mountain yellow-legged frog was known from nine locations in the San Gabriel, San Bernardino, and San Jacinto Mountains (U.S. Fish and Wildlife Service 2012). In the Sierra Nevada, the range of the northern mountain yellow-legged frog distinct population segment (not covered in this HCP) extends from the Monarch Divide and Cirque Crest (Fresno County) in the north to Taylor and Dunlap Meadows (Tulare County) in the south with an isolated population on Breckenridge Mountain in Kern County (California Department of Fish and Game 2011).

Habitat Requirements

Southern mountain yellow-legged frogs are diurnal and highly aquatic. In southern California, southern mountain yellow-legged frogs inhabit perennial mountain streams between 1,214 and 7,546 feet (370–2300 meters) in elevation (i.e., streams that contain plunge pools or backwaters year-round, although not necessarily flowing year-round) with steep gradients—often in the chaparral belt—but may range up into small meadow streams at higher elevations (64 FR 71714-71722). In the Sierra Nevada, the species is found on sunny river banks, creeks, meadow streams, isolated pools, and lake borders in the high Sierra Nevada and stream courses (Stebbins and McGinnis 2012). In areas where lakes are rare, at lower elevations along the west slope of the Sierra Nevada (<6,500 feet) they primarily occupy low to high gradient streams ranging from chaparral to montane zones (California Department of Fish and Game 2011).

Movement

Mountain yellow-legged frogs emerge from overwintering sites in early spring, and breeding soon follows (64 FR 71714). Timing of emergence from winter retreats is dependent on local climate. At lower elevations in southern California, most activity occurs from mid-March to October; however, juveniles have been found in November and early January (U.S. Fish and Wildlife Service 2005). At high elevations in southern California the period of activity is shorter, generally from May or June to mid-October (U.S. Fish and Wildlife Service 2005).

Adult Southern mountain yellow-legged frogs move only a few hundred yards in aquatic habitat, but occasionally may move as much as 0.62 miles (1 kilometer) (U.S. Fish and Wildlife Service 2012). Adults tend to move longer dispersal events just after emergence from hibernation in the spring and just before returning to hibernacula in the winter, with high site fidelity during the middle of the active season (U.S. Fish and Wildlife Service 2012). Home ranges of mountain yellow-legged frogs are probably not more than 33 feet (10 meters) in the longest dimension (California Department of Fish and Game 2008).

Table B1-8. Documented Southern Mountain Yellow-Legged Frog Movement

Type	Distance/Area	Location of Study	Citation
Movement in aquatic habitat	Typically, a few hundred meters (yards), but up to 0.62 mi (1 km)	Unknown	California Department of Fish and Game 2011
Home range	33 ft. (10 m)	Unknown	California Department of Fish and Game 2008

Reproduction

In southern California, southern mountain yellow-legged frog breeding commences when high water streams subside, typically from April to July (Stebbins and McGinnis 2012; U.S. Fish and Wildlife Service 2012). Egg masses are laid underwater and are typically attached to submerged logs and branches, banks, aquatic vegetation, rocks, or laid on the bottom of the lake or stream (California Department of Fish and Game 2011). The time required for full development (adult fertilization to metamorphosis into a subadult frog) is variable and dependent on temperature (U.S. Fish and Wildlife Service 2012). For the southern California DPS, tadpoles are thought to go through metamorphosis at the end of their second summer and reach reproductive maturity at four years of age (U.S. Fish and Wildlife Service 2012). For the colder high Sierra Nevada, metamorphosis typically occurs during the third or fourth years (California Department of Fish and Game 2011).

Population Trend and Threats

The decline in the southern mountain yellow-legged frog was not well documented, but the species was abundant in the Sierra Nevada and many southern California streams prior to the late 1960s (Jennings and Hayes 1994). In southern California, all populations are isolated from one another in the headwater streams or tributaries due to the extensive distribution of predatory nonnative trout downstream in historical habitat (U.S. Fish and Wildlife Service 2012). All extant populations remain very small regardless of individual population trend and thus highly susceptible to stochastic events, especially wildfire (U.S. Fish and Wildlife Service 2012).

The most significant stressors to the southern DPS are attributed to low local abundances that lack sufficient population size to buffer against environmental stochasticity like floods and wildfires, physical isolation stifling genetic diversity, predation by nonnative trout and disease from chytrid fungus constraining recruitment (California Department of Fish and Game 2011, U.S. Fish and Wildlife Service 2012).

Species Management

All populations in southern California are on U.S. Forest Service land except for one population that occurs partially on private land, and two of the nine extant southern populations are within the Western Riverside Multi-Species Habitat Conservation Plan Area (U.S. Fish and Wildlife Service 2012).

The California Department of Fish and Game's Fisheries Branch has adopted a policy of not stocking waters where yellow-legged frogs are present or where their presence is unknown due to a lack of surveys. Starting in 1997, several lakes, ponds, and short stream sections have been targeted for non-native fish removal to benefit yellow-legged frogs. The California Department of Fish and Wildlife has conducted some fish removal projects in southern California and in the Sierra Nevada. Since 2002, ongoing trout removal has been conducted in upper Little Rock Creek in the Angeles National Forest. Survey results from 2010 indicate that all non-native trout have been removed and frogs have extended their pre-project range into these now fish free habitats. Other fish removal projects in southern California include efforts on sections of Fuller Mill Creek and the North Fork San Jacinto River (California Department of Fish and Game 2011). Management of the southern mountain yellow-legged frog should also take into account the chytrid fungus and follow the sterilization protocols provided by U.S. Wildlife Service in Appendix D of the *Arroyo Toad* (*Bufo californicus* (=*microscaphus*) *5-Year Review: Summary and Evaluation* (2009), which is summarized in the *Species Management* section of the Arroyo toad species account above.

The 5-Year Review (U.S. Fish and Wildlife Service 2012) recommends the following actions over the next five years: continue trout removal and barrier construction in areas adjacent to extant southern mountain yellow-legged frog populations and strategize future trout removal locations based on potential connectivity and maintenance for self-sustaining populations of southern mountain yellow-legged frog, continue monitoring of existing populations, conduct surveys for new populations, increase the, "assisted rearing," capacity through maintaining representatives of each distinct population segment at all life stages offsite to safeguard against catastrophic events and experiment with alternative breeding techniques, experiment with release strategies, use modeling to strategize where reestablishment of populations should occur to maintain self-sustaining connectivity, analyze the effects of chytrid fungus, and develop an approved Recovery Outline.

Habitat Model Development

Habitat models for the southern mountain yellow-legged frog were informed by the same GIS datasets, GIS sources and information utilized for the Sierra Nevada yellow-legged frog, with modification from the CWHR range to account for the southern mountain yellow-legged frog (California Department of Fish and Wildlife 2014).

GIS References

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Yosemite Toad (*Anaxyrus canorus*)

Status

State: None

Federal: Threatened

Critical Habitat: Yes

Recovery Planning: None

Critical Habitat

In 2016, the U.S. Fish and Wildlife Service designated 750,926 acres (303,899 ha) of critical habitat (81 FR 59045-59119) for the Yosemite toad in Alpine, Tuolumne, Mono, Mariposa, Madera, Fresno, and Inyo Counties.

Range

The Yosemite toad (*Anaxyrus canorus*) is endemic to the Sierra Nevada mountain range. Populations have been known to occur from near Grass Lake in El Dorado County south to the Tulare County. The elevation range for the Yosemite toad can be from 4,800 to 12,000 feet (1,460 to 3,630 meters).

(Jennings and Hayes 1994; California Department of Fish and Game 2000; California Department of Fish and Game 2012; Stebbins and McGinnis 2012).

Habitat Requirements

Yosemite toads are found primarily in montane wet meadows but also in seasonal ponds associated with lodgepole pine and subalpine forests and high elevation lakes (Stebbins and McGinnis 2012; California Department of Fish and Game 2000). While active they seek cover under rocks in streambeds or other nearby water, and occasionally will seek refuge in burrows during the summer season (Jennings and Hayes 1994; California Department of Fish and Game 2000). Cover during the winter consists of rodent burrows (Jennings and Hayes 1994). Breeding habitats consists of water-filled depressions, slow meandering streams, shallow meadow snowmelt pools, and high elevation lakes (Jennings and Hayes 1994; Stebbins and McGinnis 2012).

Movement

Liang (2010) found that Yosemite toads traveled up to 4,134 feet (1.26 kilometers) away from breeding sites with an average distanced moved of 902 feet (275 meters). Liang (2010) found that on average females moved twice as far males and the average home range for females was 1.5 times as large. Radio-tracked Yosemite toads have been observed staying in the same location for several days or weeks before moving again (Liang 2010). Liang (2010) did not find an obvious path through the environment as toads moved from breeding meadows into upland terrestrial habitats. Long distance movements appear to occur during the night (Liang 2010).

Reproduction

Yosemite toads breed between mid-April through July, generally during snowmelt (Stebbins and McGinnis 2012; California Department of Fish and Game 2000). Eggs are attached to emergent vegetation in shallow still water (Jennings and Hayes 1994). Larvae hatch in three to six days depending on temperature, and typically metamorphose 40 to 50 days after fertilization, though some larvae are thought to overwinter and transform the following summer (Jennings and Hayes 1994; Stebbins and McGinnis 2012). Males typically begin breeding at three to five years of age and females at four to six years of age (Jennings and Hayes 1994).

Population Trends and Threats

Kagarise, Sherman and Morton (1993) observed declines in Yosemite toad populations over a period of 20 years. Yosemite toad populations declined or disappeared from more than 50 percent of the sites where it has been previously recorded (Jennings and Hayes 1994). Brown et al (2015) indicates that Yosemite toad is still well distributed relative to post-1990 records but abundances are low. Estimations of Yosemite toad abundances are difficult to assess as there aren't range-wide estimates for historical abundance (Brown et al. 2015). Given the current understanding of Yosemite toad life history, abundances estimates from one-time surveys can be misleading and low density results could be attributed to timing of the surveys not overlapping with the Yosemite toad seasonality rather than true abundances.

With definitive data generally lacking, threats to the Yosemite toad and reasons for species declines are poorly understood (Stebbins and McGinnis 2012, Brown et al 2015). Some proposed explanations for declines are cattle grazing, drought, ultraviolet radiation, predation from

introduced trout (Jennings and Hayes 1994; U.S. Fish and Wildlife Service 2010; Stebbins and McGinnis 2012); however, recent studies suggest that cattle grazing on U.S. Forest Service lands does not negatively affect Yosemite toad habitat (Roche et al 2012) and that ultraviolet radiation (UV-B) does not appear to affect the hatching success of Yosemite toad eggs (Vredenburg et al 2010). Yosemite toad appears to be persisting in areas where chytrid fungus is common (Fellers et al 2011). However, the *Yosemite Toad Environmental Assessment* ranked chytrid fungus's threat as "high," in the short term and, "unclear," over long term (Brown et al 2015); the species has demonstrated declines in abundance, despite some persistence. The U.S. Fish and Wildlife Service (2010) in their species assessment and listing priority assignment for Yosemite toad note that other possible contributions to declines include effects from roads and timber harvests, vegetation and fire management activities, recreation, and dams and water diversions. In a risk factor analysis of 16 different threats, the *Yosemite Toad Environmental Assessment* suggests risk factors affecting meadow hydrology and long-lived adult upland nonbreeding habitat may be the most significant threats (Brown et al 2015). Other threats of importance discussed by Brown et al 2015 include climate change, livestock grazing of standard levels, recreational activities, and chytrid fungus.

Species Management

Generally, the 2004 Final Supplemental Environmental Impact Statement to the Record of Decision for the Sierra Nevada Forest Plan Amendment would "protect and restore aquatic, riparian, and meadow ecosystems, and provide for the viability of their associated native species via an aquatic management strategy" (U.S. Fish and Wildlife Service 2010). Examples of management standards and guidelines for the Yosemite toad include the exclusion of livestock from inundated wet meadows and associated streams and springs during the breeding and rearing season. Management of the Yosemite toad should also take into account the chytrid fungus and follow the sterilization protocols provided by U.S. Wildlife Service in Appendix D of the *Arroyo Toad* (*Bufo californicus* (=*microscaphus*) *5-Year Review: Summary and Evaluation* (2009), which is summarized in the *Species Management* section of the Arroyo toad species account above. Recent conservation efforts include monitoring and implementation of potential reintroduction efforts for the Yosemite toad. (U.S. Fish and Wildlife Service 2010). The U.S. Fish and Wildlife Service published a Programmatic Biological Opinion (PBO) for nine national forests in the Sierra Nevada for the Sierra Nevada yellow-legged frog, northern distinct population segment of the mountain yellow-legged frog and the Yosemite toad (2014). In the PBO, the U.S. Fish and Wildlife Service determined the following actions in the national forests would not jeopardize the continued persistence of the special-status amphibians through implementation of numerous, adaptive conservation measures: vegetation management, maintenance of roads and trails, maintenance of developed recreation sites and administrative infrastructure, special use permits, rangeland management, biological resource management, invasive species management, mining, and real estate (U.S. Fish and Wildlife Service 2014).

The *Yosemite Toad Environmental Assessment* (Brown et al 2015) discusses management at multiple scales while correlates to identifying and managing priority basins (watersheds), restoring and maintaining meadows, developing protocols for effective management of livestock and recreational activities, and furthering research on Yosemite toad genetics, chytrid fungus and climate change.

Habitat Model Development

The habitat model for Yosemite toad was developed with a 0.5 mile buffer added to occurrences with an accuracy class no greater than 1/5 miles, recorded within the past 25 years, and above 6,500 feet in elevation (California Department of Fish and Wildlife 2018, U.S. Geological Survey

2018, U.S. Forest Service 2015). Potentially suitable habitat was mapped using freshwater emergent marsh and wet meadow land cover types.

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Reptiles

Blunt-Nosed Leopard Lizard (*Gambelia sila*)

Status

State: Endangered and Fully Protected

Federal: Endangered

Critical Habitat: None

Recovery Planning: *Recovery Plan for the Upland Species of the San Joaquin Valley, California* (U.S. Fish and Wildlife Service 1998)

Critical Habitat

No critical habitat has been designated for blunt-nosed leopard lizard.

Range

The historic range of the blunt-nosed leopard lizard is uncertain. The species probably ranged from Stanislaus County in the north to the Tehachapi Mountains of Kern County in the south and from the Coast Range Mountains, Carrizo Plain, and Cuyama Valley in the west to the foothills of the Sierra Nevada in the east (U.S. Fish and Wildlife Service 2007).

Currently, this species is found in the San Joaquin Valley and nearby valleys and foothills. The blunt-nosed leopard lizard's extant occurrences range, from north to south, in the following Counties: southern Merced, Western Madera, eastern San Benito, western Fresno, Kings, western Tulare, western Kern, eastern San Luis Obispo, northeastern Santa Barbara, and northern Ventura. Occupied elevations range from 100 to 2,400 feet (30 to 730 meters) (CaliforniaHerps.com 2012). The occupied range consists of scattered parcels of undeveloped land on the valley floor, most commonly composed of annual grassland and valley sink scrub. In the northern part of the San Joaquin Valley, blunt-nosed lizard populations were documented in Firebaugh and Madera Essential Habitat Areas (Williams 1990), which were described in previous recovery plans as suitable habitat in undeveloped wildlands (U.S. Fish and Wildlife Service 1980). In the southern San Joaquin Valley, extant populations are known to occur in and around the following locations (U.S. Fish and Wildlife Service 2007, California Department of Fish and Wildlife 2018):

- Kern and Pixley National Wildlife Refuges
- Liberty Farms, Allensworth township, and Antelope
- Carrizo and Elkhorn plains
- In and around Buttonwillow, Elk Hills and Tupman Essential Habitat Areas
- North of Bakersfield around Poso Creek
- West of Bakersfield and North of Taft
- Western Kern County around the towns of Maricopa, McKittrick, and Taft

Habitat Requirements

Blunt-nosed leopard lizard inhabits open, sparsely vegetated areas of low relief on the valley floor and the surrounding foothills. It also inhabits alkali playa and valley saltbush scrub. In general, it is absent from areas of steep slope, dense vegetation, or areas subject to seasonal flooding. (U.S. Fish and Wildlife Service 2007). This species prefers, open habitats that are flat and sparsely vegetated in order to stalk and rapidly ambush prey, which is largely insects and occasionally other small lizards.

Blunt-nosed leopard lizards use small mammal burrows to provide shelter from predators, avoid temperature extremes, and lay eggs during the early summer (June and July). Burrows are usually abandoned California ground squirrel tunnels, or occupied or abandoned kangaroo rat tunnels. Each lizard uses several burrows without preference but will avoid those occupied by predators or other leopard lizards. In areas of low mammal burrow density, lizards will construct shallow, simple tunnels in earth berms or under rocks. (U.S. Fish and Wildlife Service 2007).

Movement

Seasonal above ground activity is correlated with weather conditions, primarily temperature. Lizards are most active on the surface when air temperatures are between 74° and 104° F (23°–40° C), with surface soil temperatures between 72° and 97° F (22°–36° C). Smaller lizards and young have a wider activity range than the adults (U.S. Fish and Wildlife Service 2007).

Males are highly combative in establishing and maintaining territories. Male and female home ranges often overlap. The mean home range size varies from 0.25 to 2.7 acres (0.001 to 0.01 square kilometers) for females and 0.52 to 4.2 acres (0.002 to 0.17 square kilometers) for males. Density estimates range from 0.1 to 4.2 lizards per acre. Population densities in marginal habitat generally do not exceed 0.2 blunt-nosed leopard lizards per acre (U.S. Fish and Wildlife Service 2007).

Table B1-9. Documented Blunt-Nosed Leopard Lizard Movement

Type	Distance/Area	Location of Study	Citation
Home range–females	0.25–2.7 acres (0.001–0.01 km^2)	Unknown	U.S. Fish and Wildlife Service 2007
Home range–male	0.52–4.2 acres (0.002–0.17 km^2)	Unknown	U.S. Fish and Wildlife Service 2007

Reproduction

Breeding activity begins within a month of emergence from dormancy and lasts from the end of April to the end of June. Male territories may overlap those of several females, and a given male may mate with several females. Two to six eggs are laid in June and July, and their numbers are correlated with the size of the female. Under adverse conditions, egg-laying may be delayed one or two months, or reproduction may not occur at all (U.S. Fish and Wildlife Service 2007).

Females typically produce only one clutch of eggs per year but may produce a second clutch under favorable environmental conditions (Zeiner et al. 1988). After about two months of incubation, young hatch from late July through early August, rarely to September. (U.S. Fish and Wildlife Service 2007)

Population Trend and Threats

The range-wide abundance of blunt-nosed leopard lizards is unknown. However, population estimates have been made in small portions of the range. In the Valley Floor, Pixley National Wildlife Refuge populations were documented in decline from 1993 to 2006 (Williams *in litt.* 2006) and the Lokern Natural Area's populations were characterized as "variable," (Germano et al. 2005). In the foothills, Elk Hills Conservation Area's populations were described as increasing from 2000-2005 (Quad Knopf 2006) and the Elkhorn Plain's populations documented as variable from 1988 to 2003 (Williams et al. 19993, German and Williams 2005). Williams et al 2006 expressed population fluctuations appear to be negatively correlated with annual precipitation. Germano et al. 2005 noted more individuals in grazed compared to ungrazed plots in all but one year. Habitat disturbance, destruction, and fragmentation continue as the greatest threats to blunt-nosed leopard lizard populations. Stebbins first recognized in 1954 that agricultural conversion of its habitat was causing the extirpation of the blunt-nosed leopard lizard (U.S. Fish and Wildlife Service 2007).

Livestock grazing can result in removal of herbaceous vegetation and shrub cover and destruction of rodent burrows used by lizards for shelter. However, light or moderate grazing may be beneficial, unlike cultivation of row crops, which precludes use by leopard lizards (U.S. Fish and Wildlife Service 2007).

Direct mortality occurs when animals are killed in their burrows during construction, are run over by vehicles, have contact with oil around petroleum facilities, or fall into pits or other excavated areas from which they are unable to escape. Displaced lizards may be unable to survive in adjacent habitat if it is already occupied or unsuitable for colonization (U.S. Fish and Wildlife Service 2007).

The use of pesticides may directly and indirectly affect blunt-nosed leopard lizards. The insecticide Malathion has been used since 1969 to control the beet leafhopper, and its use may reduce insect prey populations. Fumigants, such as methyl bromide, are used to control ground squirrels; because leopard lizards often inhabit ground squirrel burrows, they may be inadvertently poisoned (U.S. Fish and Wildlife Service 2007).

Agricultural actions, petroleum and mineral extraction, pesticide applications, off-road vehicle use, and construction of transportation, communication, and irrigation infrastructures collectively have caused the reduction, fragmentation of populations, and decline of blunt-nosed leopard lizards endemic to California (U.S. Fish and Wildlife Service 2007).

Species Management

According to the Recovery Plan for the upland species of the San Joaquin Valley (USFWS 1998), the strategy for recovery of the blunt-nosed leopard lizard involves: 1) determining appropriate habitat management and compatible land uses for blunt-nosed leopard lizards; 2) protecting additional habitat in key portions of their range; and 3) gathering additional data on population responses to environmental variation at representative sites (U.S. Fish and Wildlife Service 1998).

Habitat Model Development

The habitat model developed for the blunt nosed leopard lizard utilizes three mode discussed in greater detail below, suitable habitat, core habitat and atypical habitat, which are further confined to the following ecoregions (U.S. Forest Service 2007, U.S. Environmental Protection Agency 2013, and Baily 2016):

- Diablo range
- Eastern hills
- Westside alluvial fans and terraces
- San Joaquin basin
- Granitic alluvial fans and terraces

Core Habitat

Core suitable habitat is potentially suitable habitat, outlined below, with a patch size exceeding 1,236 acres (500 hectares). Core suitable habitat excludes habitat fragmented by primary roads, secondary roads, local neighborhood roads, rural roads, and city streets (U.S. Census Bureau 2016), which are assumed barriers to blunt-nosed leopard lizard movement.

Suitable Habitat

Suitable habitat meets all the following criteria on lands outside core suitable habitat in the following land cover types (California Department of Fish and Wildlife 2014; Bailey 2016):

- Alkali desert scrub
- Desert wash
- Desert scrub
- Annual grassland
- Perennial grassland
- Barren

Atypical Habitat

Atypical habitat is within 900 feet of and contiguous with core or potential suitable habitat and meets all the aforementioned criteria. Pasture land satisfies the criteria for atypical habitat.

The habitat model for blunt nosed leopard lizard was developed using the following information and GIS data:

- CWHR range (California Department of Fish and Wildlife 2014)
- Maps contained in the 5- year review (U.S. Fish and Wildlife Service 2010)
- Elevation (Gesch et al. 2002): Below 4,500 feet

GIS Sources

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Giant Garter Snake (*Thamnophis gigas*)

Status

State: Threatened

Federal: Threatened

Critical Habitat: None designated or proposed

Recovery Planning: *Recovery Plan for the Giant Garter Snake (Thamnophis gigas)* (U.S. Fish and Wildlife Service 2017).

Critical Habitat

Critical habitat has not been identified for the giant garter snake.

Range

Historically, the giant garter snake was found throughout the Central Valley from Butte County south to Kern County (U.S. Fish and Wildlife Service 1999). The species has been extirpated from the southern end of its range and currently extends from near Gridley in Butte County to Mendota Wildlife Area in Fresno County (U.S. Fish and Wildlife Service 1999). There are currently 13 recognized giant garter snake populations in the Sacramento Valley and isolated locations in the San Joaquin Valley (U.S. Fish and Wildlife Service 1999). Populations of giant garter snake are limited to ponds, sloughs, marshes, and rice fields of Sacramento, Contra Costa Sutter, Butte, Colusa, and Glenn Counties; remnant populations along the western border of the Yolo Bypass in Yolo and Solano Counties; and along the eastern fringes of the San Joaquin–Sacramento River Delta from the Laguna Creek–Elk Grove region of Sacramento County south to Stockton in San Joaquin County (U.S. Fish and Wildlife Service 1999). In the central San Joaquin Valley, giant garter snakes also occur in rice fields in Merced and Fresno Counties, and at Mendota Wildlife Area in Fresno County (U.S. Fish and Wildlife Service 1999).

Habitat Requirements

The giant garter snake is endemic to emergent wetlands in the Central Valley (U.S. Fish and Wildlife Service 1999). The species occurs in marshes; sloughs; ponds; small lakes; and low-gradient

waterways such as small streams, irrigation and drainage canals, and rice fields (U.S. Fish and Wildlife Service 1999). Giant garter snakes require permanent water during the active season (early spring through mid-fall) for foraging; herbaceous emergent vegetation for protective cover and foraging habitat; open areas and grassy banks for basking; and higher elevation upland areas for cover and refuge from flooding (U.S. Fish and Wildlife Service 1999). All four habitat components (e.g., year-round water source, cover and foraging habitat, basking areas, and protected hibernation sites) are needed for the species to persist in an area (U.S. Fish and Wildlife Service 1999). Small mammal burrows and other small crevices in upland habitat are required for winter hibernation sites and refuge from floodwaters (U.S. Fish and Wildlife Service 1999). Because of their lack of basking areas, excessive shade, and lack of prey, riparian woodlands usually do not support giant garter snake (U.S. Fish and Wildlife Service 1999). Large rivers and wetlands with sand, gravel, or rock substrates do not support giant garter snake (U.S. Fish and Wildlife Service 1999). Giant garter snakes may concentrate foraging activities at pooled areas that trap and concentrate prey, mainly fish and amphibians (U.S. Fish and Wildlife Service 1999).

Movement

Giant garter snakes are most active from early spring through mid-fall, but activity may vary depending on weather conditions. By November 1st, most snakes have moved into winter retreats, where they generally remain inactive during the winter months (U.S. Fish and Wildlife Service 1999). On warmer days, giant garter snakes may occasionally bask or move short distances away from hibernation sites (U.S. Fish and Wildlife Service 1999).

Radiotelemetry studies have shown that giant garter snakes move very little from day to day; however, activity varies substantially among individuals. Movements of giant garter snakes have ranged from 820 feet (250 meters) to 0.5 mile (0.8 kilometer) in a day (Wylie et al. 1997). Snakes moved up to 5 miles (8 kilometers) at the Colusa Wildlife Refuge following de-watering of habitat during refuge maintenance (Wylie et al. 1997). Territory size studies reported a variety of size ranges including 10.3–203 acres (0.04–0.82 square kilometers) at Badger Creek Marsh, 47–260 acres (0.2–1.05 square kilometers) at Gilsizer Slough, and 3.2– 2,792 acres (0.01–11 square kilometers) at the Colusa National Wildlife Refuge (Wylie et al. 1997) (Table 1).

Table B1-10. Movement Distances for Giant Garter Snake (Wylie et al. 1997 as cited in U.S. Fish and Wildlife Service 1999

Home Range	Area or Distance	Location of Study (Surface Area)
Territory	2-641 acres (0.01-2.6 km^2) (median 47 acres [0.2 km^2])	Gilsizer Slough (3,500 acres)
	3.2–2,792 acres (0.01–11 km^2) at (median 131 acres [0.5 km^2])	Colusa National Wildlife Refuge (11,120 acres)
	10.3–203 acres (0.04–0.82 $km^{2)}$ (median 23 acres [0.1 km^2])	Badger Creek Marsh (580 acres)
Movement	820 feet–0.5 mi (250 m–0.8 km) in a day	Colusa National Wildlife Refuge

Reproduction

Giant garter snakes begin to court and mate soon after emergence from overwintering sites. The breeding season lasts from March through May and resumes briefly in September (U.S. Fish and

Wildlife Service 1999). Females give birth to live young from late July through early September. Brood size averages 23 young but can range from 10 to 46 (U.S. Fish and Wildlife Service 1999). Sexual maturity is attained at approximately three years in males and five years in females (U.S. Fish and Wildlife Service 1999).

Population Trend and Threats

The current distribution and abundance of giant garter snakes has been reduced significantly from historic levels Population size estimates for giant garter snakes are limited. Although the population abundance of giant garter snakes has declined in the Sacramento Valley, the distribution of the giant garter snake potentially still reflects its historic range (Wylie et al. 2010, U.S. Fish and Wildlife Service 2012). Comparatively, the giant garter snake abundance and distribution in the San Joaquin Valley has significantly declined (R. Hansen 1980; Wylie and Amarello 2007).

Agriculture and flood control measures have extirpated the species from the southern one-third of its range, which comprised the historic Buena Vista, Tulare, and Kern lakebeds (U.S. Fish and Wildlife Service 1999, U.S. Fish and Wildlife Service 2017). Almost no suitable freshwater habitat remains south of Fresno (U.S. Fish and Wildlife Service 1999). The largest extant population inhabits the water channels and ditches of agricultural lands in the American River basin at the confluence of the American and Sacramento Rivers (U.S. Fish and Wildlife Service 1993). Some of the 13 populations of giant garter snake may not be viable because they are small, highly fragmented, and restricted to small patches of habitat of limited quality (U.S. Fish and Wildlife Service 1999).

Surveys on the Natomas Basin found that the mean size of male and female giant garter snakes has decreased over time, and they are smaller than other populations to the north. This decrease in size could be due to changes in sampling methodology, or could be due to high mortality rates and decreased fitness in the Natomas Basin because of nematode infestations or vehicle collisions (U.S. Fish and Wildlife Service 2006).

Habitat loss due to agricultural development and flood control activities has been the primary factor in the decline of giant garter snake populations (U.S. Fish and Wildlife Service 1999). Upstream watershed modifications, water storage and diversion projects, and urban and agricultural development cumulatively affect wetland habitat for giant garter snakes on the valley floor (U.S. Fish and Wildlife Service 1999). The population numbers in the central San Joaquin Valley have declined more rapidly than the associated loss of suitable habitat acreages, indicating that other factors are contributing to their decline (U.S. Fish and Wildlife Service 1999). Other factors may include interrupted water supply, poor water quality, and environmental contaminants (U.S. Fish and Wildlife Service 1999). Small remaining populations are susceptible to predation by mammals, birds, and introduced game fish (e.g., largemouth bass (*Micropterus salmoides*) and catfish (*Ictalurus* spp.) (U.S. Fish and Wildlife Service 1999). Additional causes of mortality include vehicular traffic, agricultural practices, and maintenance of water channels (e.g., scraping canal banks, mowing, applying herbicides) (U.S. Fish and Wildlife Service 1999). Weed abatement, pest control, and overgrazing by cattle, particularly along the water's edge, may decrease availability of cover and underground burrows (U.S. Fish and Wildlife Service 1999).

Giant garter snakes may be subject to predation by feral cats, crayfish, and bullfrogs. Studies on other snake species have found that bullfrogs feed on snakes up to 31.5 inches (80 cm) in length (U.S. Fish and Wildlife Service 1999).

Species Management

The goals of the *Recovery Plan for the Giant Garter Snake* (U.S. Fish and Wildlife Service 2017) are outlined below:

- Establish and protect self-sustaining populations of the giant garter snake throughout its range
- Restore and conserve the Central Valley wetland ecosystem function to support the giant garter snake and associated communities and species of conservation concern including Central Valley waterfowl and shorebirds.
- Lessen or extinguish to the extent possible, the threats that resulted in the giant garter snake listing and any foreseeable future threats.

Strategies to reach the aforementioned goals are as follows:

- Protect existing occupied habitat and identify areas for habitat restoration, enhancement, or creation, including areas to provide connectivity between populations
- Appropriate management that ensures suitable habitat helps facilitate maintenance of stable populations and encourages colonization in restored and enhanced habitat. Management must also ensure sufficient clean water for suitable habitat during the summer. Management plans must also consider a monitoring program that is designed to determine success or failure of different management actions and provide feedback to inform modification of actions.
- Research on the ecology, behavior and life history will help assess threats and the most effective means of ameliorating the threats.
- The reintroduction and augmentation of giant garter snakes into historically occupied areas, known as repatriation, is needed in the San Joaquin Valley where recent surveys report decreasing population numbers. This will require captive propagation and a genetics management plan.
- Recovery measure implementation should incorporate multiple species management through applying conservation measures that protect and maintain health ecosystems. Recovery measures could also benefit the western pond turtle, Pacific flyway waterfowl and shore birds.
- It is necessary to development and implement incentive programs for private landowners and local agencies to conserve giant garter snake habitat. In addition, distribution of informational material can help encourage participation and cooperation with private citizens and land managers.

To aid in recovery planning, nine recovery units were developed to correspond with the geographically and genetically distinct populations (Paquin et al. 2006; Engstrom 2010, U.S. Fish and Wildlife Service 2017). Development of the recovery units is appropriate due to the limited dispersal of giant garter snakes between watersheds (U.S. Fish and Wildlife Service 2017). Discussed in greater detail below, the nine recovery units include the Butte Basin, Colusa Basin, Sutter Basin, Yolo Basin, Consumes-Mokelumne Basin, Delta Basin, San Joaquin Basin, and Tulare Basin.

Butte Basin reaches from Red Bluff in the north to the Sutter Buttes in the south. Dominated by the Sacramento River and containing 479,118 acres, the Butte Basin includes Tehama, Butte, Sutter and Colusa Counties. The Butte Basin includes the following state and federal conservation areas: Gray Lodge Wildlife Area, Upper Butte Basin Wildlife Area, Butte Sink Wildlife Management Area, and several units of the Sacramento River National Wildlife Refuge (NWR). In addition, approximately

10,000 acres of privately owned lands are enrolled in the U.S. Fish and Wildlife Service wetland easement program in the Butte Sink Wildlife Management Area. As of the 2017 Recovery Plan, there haven't been any conservation banks in the Butte Basin designed for the Giant Garter Snake. In 2006 and 2009 to 2011, the giant garter snake has been observed in new locations within the species range and in previously documented occurrences (Gallaway in litt. 2008, Joe Silveira, pers. comm. 2009, Halstead in litt. 2011, Western Ecological Resource Center, Dixon Field Station 2011, R. Martin in litt. 2012).

Colusa Basin extends from Red Bluff in the north to Cache Creek in the South. The Sacramento River dominates the Colusa Basin, which consists of 686,096 acres. The Colusa Basin includes Tehama, Glenn, Colusa, and Yolo Counties. Federal conservation areas include the Sacramento, Delevan, and Colusa National NWRs. In the U.S. Fish and Wildlife wetland easement program, 5,500 acres of privately owned land occurs in the Colusa Basin. Dolan Ranch Conservation Bank (252 acres) and Ridge Cut Conservation Bank (186) acres are within the Colusa Basin. With a 95% confidence interval, giant garter snake populations estimates for the Colusa NWR ranged from 29 (22-53) in 1997 to 163 (42-196) in 2002, with 12,198 and an unreported number of trapping days, respectively (Wylie et al. 2002, Wylie et al. 2010).

Sutter Basin extends from the Sutter Buttes in the North to the confluence of the Feather and Sacramento Rivers in the south. Containing 239,810 acres, the Colusa Basin includes portions of Butte and Sutter Counties. Federal and state conservation within the Sutter Basin include: Sutter NWR, Sutter Bypass Wildlife Area, and Feather River Wildlife Area. The Sutter Basin also includes the Sutter Basin Conservation Bank (429 acres), the Gilsizer South Slough Conservation Bank (379 acres), and the Tule Giant Garter Snake Preserve (150 acres). In 1996, Gilsizer Slough's giant garter snake population estimates, with a 95% confidence interval, reported 177 (124-280) snakes calculated from 17,136 trap-days (Wylie et al. 2010).

American Basin extends from Oroville southward to the confluence of the Sacramento and American Rivers. Consisting of 376,104 acres, the American Basin includes portions of Butte, Yuba, Sutter, Placer and Sacramento Counties. The public conservation lands in the American Basin include several units of the state Feather River Wildlife Area along the Feather and Bear Rivers. However, these conservation lands may not support suitable giant garter snake habitat. The Natomas Basin HCP established several preserves amounting to 4,145 acres. In one mark-recapture study in the rice fields of the Natomas Basin in Sacramento County (1995), population size was estimated at 1,000 garter snakes in one square mile (U.S. Fish and Wildlife Service 1999).

Yolo Basin is contained by Cache Creek to the North and Sacramento-San Joaquin River Delta in the south. Comprising 410,914 acres, the Yolo Basin includes portions of Yolo and Solano Counties. The Yolo Basin includes the state Yolo Bypass Wildlife Area, wetland easements within the Yolo Bypass, and the Jepson Prairie Preserve in Solano County. In addition, Yolo Basin contains the Pope Ranch Conservation Bank (390 acres). In 2005, the Yolo Wildlife Area's estimated giant garter snake abundance, with a 95% confidence interval, was reported as 57 (45-84) calculated from 13,700 trap days (Hansen 2008).

Cosumnes-Mokelumne Basin is bordered by the Cosumnes River and the City of Sacramento to the North, Sierra Nevada foothills to the east, I-5 to the west and Mokelumne River to the South. Consisting of 234,960 acres, the Cosumnes-Mokelumne Basin is found within Sacramento and San Joaquin County. The Cosumnes-Mokelumne Basin is primarily contained within the Consumes River Preserve, which is managed by the California Department of Fish and Wildlife, The Nature

Conservancy, the Bureau of Land Management, and Ducks Unlimited. As of 2017, there are not any conservation banks set up in this giant garter snake recovery unit. Within the Cosumnes-Mokelumne Basin, giant garter snake abundance in Badger Creek was reported, with a 95% confidence interval, as 118 (111-132) in 1997 to 216 (137-383) in 2002 (Hansen 2003, Wylie et al. 2010).

Delta Basin is just south of the confluence between the Sacramento and American Rivers and south to the Stanislaus River. Containing 699,502 acres, the Delta Basin is comprised of portions of Sacramento, Yolo, Solano, San Joaquin and Contra Costa Counties. Federal and state conservation areas in the Delta Basin include the Federal Stone Lakes NWR and the state's Sherman Island Wildlife Area and White Slough Wildlife Area. The Delta Basin doesn't have any conservation banks set up for the giant garter snake. Much of the Delta Basin has not been comprehensively surveyed because a majority of the land is privately-owned (U.S. Fish and Wildlife Service 2012). The Department of Water Resources conducted trapping surveys are various sites in the Delta that supported suitable habitat and no snakes were detected (California Department of Water Resources 2010). However, the presence of the giant garter snake was confirmed in White Slough Wildlife Area with three snake captures in 2009 (Hansen 2011). San Joaquin Basin is contained by the Stanislaus River in the north, the San Joaquin River in the south, the Coast Ranges in the west and the Sierra Nevada to the east. Consisting of 800,327 acres, the San Joaquin Basin includes portions of Stanislaus, Fresno, Merced, and Madera Counties. The San Joaquin Basin's federal conservation areas include the San Joaquin River NWR, the San Luis NWR Complex, and Merced NWR. The State conservation areas in the San Joaquin Basin include the North Grassland Wildlife Area, Los Banos Wildlife Area, and Volta Wildlife Area. Within the San Joaquin Basin, the Grassland Ecological Area consists of wetlands on private land protected by conservation easements, Volta and Los Banos Wildlife Areas, and San Luis and Merced NWRs. In addition, the Grassland Mitigation Bank (281 acres) is also contained in the San Joaquin Basin. Giant garter snake trapping surveys performed in 2006 and 2007 within the Grasslands Ecological Study area, both south and east of the San Joaquin River and in the Medota Wildlife Area (in Tulare Basin), yielded only 10 trappings (Hansen 2008). As a wetland supply channel for the private wetlands in the northern extent of Grassland Ecological Study area, the Los Banos Creek corridor contained the greatest number of trappings in the 2006 and 2007 survey.

Tulare Basin is the southern-most of the Central Valley and reaches from the southern San Joaquin River south to the Buena Vista and Kern lakebeds. Comprising 1,701,841 acres, the Tulare Basin includes portions of Fresno, Kings, Tulare, and Kern Counties. The federal and state conservation areas in the Tulare Basin are the Kern and Pixley NWRs and the Mendota Wildlife Area, respectively. While the Kern Water Bank and Coles Levee Ecosystem Preserve are properties preserved in perpetuity, the properties would require significant restoration and reconfiguration to provide suitable giant garter snake habitat. The Coles Levee Ecosystem Preserve (6,059-acre) was created by Aera Energy LLC and is managed by the California Department of Fish and Wildlife. The Kern Water Bank HCP provided the 3,267-acre conservation bank. Agriculture and flood control measures have extirpated the species from the southern one-third of its range, which comprised the historic Buena Vista, Tulare, and Kern lakebeds (U.S. Fish and Wildlife Service 1999, U.S. Fish and Wildlife Service 2017). Within the Mendota Wildlife Area, giant garter snake detected presence has oscillated from no snakes in 1998, 2000 and 2007 to 14 in 2001 (Dickert 2002), and one in 2008 (Hansen 2008).

Habitat Model Development

Three habitat models were developed for this species to encompass the areas most likely to contain suitable habitat for giant garter snake (rice fields, wetlands and marsh and upland habitat).

Recovery Units (U.S. Fish and Wildlife Service 2017) and CNDDB occurrences with accuracy class no greater than 1/5 miles (California Department of Fish and Wildlife 2018 and U.S. Geological Survey 2018) were included in the development of these habitat models.

Potential Aquatic Habitat – Rice fields

In the range of the giant garter snake, rice fields as a single, predominant land cover type were mapped as areas that could potentially support suitable habitat and giant garter snakes.

Potential Aquatic Habitat – Wetlands and Marshes

The following land cover data, information and GIS datasets were included in the development of the wetlands and marshes habitat model for giant garter snake: Includes the following land cove types

- Fresh emergent wetland
- Freshwater emergent marsh
- Wet meadow
- Marsh
- Lacustrine (20-foot landward edge)
- National Hydrography Dataset (NHD) Waterbodies (U.S. Geological Survey 2013)classified as one of the following types:
    - swamp/marsh (20-foot landward edge)
    - lake/pond (20-foot landward edge)
    - canal ditch (20-foot landward edge)

Patches of suitable habitat smaller than 50 acres and greater than a mile from suitable habitat were not used in the habitat model because such patches are isolated and not likely to support giant garter snakes.

Potential Upland Habitat

To map potential upland habitat (non-agricultural) for GGS, the following land covers within 1,000 feet of potentially suitable aquatic habitat were utilized to develop this model:

- Valley oak woodland
- Pasture
- Perennial grassland
- Annual grassland
- Valley foothill riparian
- Rice

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Birds

Marbled Murrelet (*Brachyramphus marmoratus*)

Status

State: Endangered

F**ederal**: Threatened

Critical Habitat: Yes

Recovery Planning: Recovery Plan for the Threatened Marbled Murrelet (*Brachyramphus marmoratus*) in Washington, Oregon, and California (U. S. Fish and Wildlife Service 1997)

Critical Habitat

Critical habitat for marbled murrelet was established by the U.S. Fish and Wildlife Service (USFWS) in a final rule on May 24, 1996 (61 FR 26255-26320). In 2016, revised critical habitat was designated with 3,698,100 acres (1,497,000 ha) in the States of California, Oregon and Washington (81 FR 51348-51370).

Range

Marbled murrelets breed on the western Aleutian Islands and Alaska along the coast to central California. Marbled murrelets are widely distributed in coastal waters of western North America, usually within 3 miles (5 kilometers) of shore (Nelson 1997). The densest populations are centered on Prince William Sound, with subpopulations becoming smaller and disjunct southward (Ralph et al. 1995). The breeding distribution of marbled murrelet is determined by the distribution of accessible old-growth conifer forest. Accordingly, gaps in the species' breeding distribution in Washington, Oregon, and California may be the result of timber harvest practices (Ralph et al. 1995).

In California, the Monterey coast represents the extreme southern limit of the taxon's known breeding range (Ralph et al. 1995). Reported sightings of marbled murrelets along the central California coast have been concentrated within a 6-mile (10-kilometer) radius of Point Año Nuevo in Santa Cruz County (Ainley et al. 1995).

There are approximately 2.2– 3.95 million acres (890,000–1.6 million hectares) of suitable marbled murrelet nesting habitat remaining in the contiguous United States (U.S. Fish and Wildlife Service 2009).

Habitat Requirements

Marbled murrelets spend most of their lives at sea but come onshore to nest; in California they nest only in large, old trees. They are highly secretive on land and their nest sites are difficult to locate (Ralph et al. 1995). Marbled murrelet breeding habitat consists of mature and old-growth coniferous forests, or forests with old-growth components (Nelson 1997). Old growth components include large trees with large limbs or large platforms created by factors such as damage, disease, or mistletoe; nesting substrates, such as moss, needles, lichen; and layered canopies (Nelson 1997).

Characteristics of nest sites are: tall trees which facilitate entry and exit for birds with low maneuverability in flight; broad limbs or deformities, which provide platforms for nests (usually with epiphyte cover); and forest canopy gaps, which provide access (Burger and Waterhouse 2009). In California, the most important predictors of marbled murrelet occupancy were percent old-growth canopy cover and tree species composition (>50% coast redwood [*Sequoia sempervirens*]) (Nelson 1997). Re-use of nesting sites is infrequent: 18% (26 of 143) of nest trees surveyed showed evidence of multiple nesting in separate seasons (Burger et al. 2009).

Nesting can occur at elevations up to 5,020 feet (1,530 meters), but typically occurs below 3,610 feet (1,100 meters) and within approximately 8 miles (13 kilometers) of the coastline (Nelson 1997; U.S. Fish and Wildlife Service 2009). In summer, marbled murrelets forage close to shore, in shallow water (California Department of Fish and Game 2008).

Movement

Little information is available on natal dispersal. Two radio-tagged fledglings in Alaska and Washington were observed to remain in shallow waters directly offshore from their nest sites (Nelson 1997). Fidelity to nesting areas appears to be high. Some forest stands, and even individual nest trees, have been occupied for decades, although the lack of marked individuals precludes conclusions about site fidelity of individuals (Nelson 1997).

The few data available to assess migratory behavior come from at-sea surveys that indicate seasonal shifts in distribution due to small-scale migratory behavior (Nelson 1997) (Table 1). These data indicate that birds move either into protected areas from near coastal waters (e.g., into Puget Sound), move south, or move to other unknown areas. Most movements occur after the breeding season, usually in late July or early August (Nelson 1997). However, recent work using genetic sampling found 83% (10 out of 12) of those sampled in winter in central California (San Francisco Bay Area southward) had originated from populations north of there; during the breeding season the proportion was 6% (Hall et al. 2009).

Marbled murrelets have been detected flying over inland sites throughout the year. Flight and vocalization activity is variable throughout the year at inland sites but increases during the breeding season, peaking in July (O'Donnell et al. 1995). Peaks in activity typically occur within one hour of dawn (O'Donnell et al. 1995).

There is no information available on territorial behavior or home range size. However, it is known that more than one nesting pair will occupy a single forest stand, and simultaneously active nests as close as 98 feet (30 meters) apart have been recorded (Nelson 1997). In summer, individuals or pairs may forage 0.6–1.2 miles (1–2 kilometers) off the coast (California Department of Fish and Game 2008).

Home range size and use varies across the marbled murrelet's range, possibly due to habitat use and prey availability (U.S. Fish and Wildlife Service 2009). The distance murrelets can travel away from nesting habitat is limited by the need to incubate an egg and feed a chick (U.S. Fish and Wildlife Service 2009). In California, in recent radio telemetry studies, breeders foraged more closely to nesting habitat once nesting was initiated than non-breeders (Hébert and Golightly 2008; U.S. Fish and Wildlife Service 2009). In northern California mean home range size was 252.9 square miles (655 square kilometers) for non-nesters and 92.7 square miles (240 square kilometers) for nesters (Hébert and Golightly 2008; U.S. Fish and Wildlife Service 2009). Mean along shore movement was 42.9 miles (69 kilometers) for nesting females and 48.5 miles (78 kilometers) for nesting males

(Hébert and Golightly 2008; U.S. Fish and Wildlife Service 2009). Mean movement offshore was 0.87 miles (1.4 kilometers) regardless of sex or nesting status (Hébert and Golightly 2008; U.S. Fish and Wildlife Service 2009).

In Washington, home range size during the breeding season (for both nesting and non-nesting birds) was more variable: home range size was 810 square miles (2,098 square kilometers) in 2005 compared to 181 square miles (469 square kilometers) in 2004 (U.S. Fish and Wildlife Service 2009). In 2005, marbled murrelets used multiple core feeding areas, likely due to poor oceanographic conditions (U.S. Fish and Wildlife Service 2009).

In central California, nesting birds used night time at-sea resting areas located an average of 3.2 miles (5.1 kilometers) from the mouths of drainages used to reach nesting habitat, and traveled from these resting areas to daytime foraging locations (U.S. Fish and Wildlife Service 2009). Non-breeders often spent the night near daytime foraging areas (U.S. Fish and Wildlife Service 2009).

Table B1-11. Movement Distances for Marbled Murrelet

Type	Distance/Area	Location of Study	Sources
Home range	Active nests 98 ft. (30 m) apart	California	Nelson 1997
	Non-nesting birds: 253 sq. mi (655 sq. km); Nesting birds: 92.7 sq. mi (240 sq. km)	Northern California	Hébert and Golightly 2008; U.S. Fish and Wildlife Service 2009
Dispersal	Little information		
Migration	Seasonal shifts in distribution	California	Nelson 1997

Reproduction

Unlike other species in the family Alcidae, marbled murrelets nest primarily in trees in California. Nesting begins in April and continues into early July. A single egg is laid and incubated for about 30 days. Fledging occurs at approximately 27–40 days. Incubation duties are shared equally between the male and female, who switch every 24 hours at dawn, allowing one to forage at sea while the other incubates the egg (Nelson 1997).

Population Trend and Threats

The marbled murrelet population estimate for Washington to California is about 18,000 birds (95% confidence interval: 14,700–21,200), based on at-sea surveys conducted during the 2008 breeding season (U.S. Fish and Wildlife Service 2009). Average annual change in population size from 2001 to 2008 was -4.3% (U.S. Fish and Wildlife Service 2009).

The historic decline of murrelet reproduction is likely caused by a shift to a reduced trophic level of available prey (U.S. Fish and Wildlife Service 2009). Low reproductive success in central California is due to low food availability in some years and predation in others (U.S. Fish and Wildlife Service 2009). Lower quotas for fisheries targeting murrelet prey species may be needed to increase murrelet productivity (U.S. Fish and Wildlife Service 2009).

Studies in British Columbia and central California have documented long-term declines in quality of murrelet prey (U.S. Fish and Wildlife Service 2009). These studies indicate that murrelet recovery may be affected as long-term trends in ocean climate affect prey resources and reproductive rate. Thus, nestlings fed primarily sand lance (*Ammodytes hexapterus*) during the last few decades probably experienced much lower energy-provisioning rates than nestlings historically fed higher trophic level prey (Gutowsky 2009). Energy-provisioning rate is often positively related with chick-rearing success and overall reproductive success (Gutowsky 2009). Diet composition during development may have important consequences for juvenile survival (Janssen 2009).

Research assessing disturbance and marbled murrelet productivity have provided some slightly contrasting data. While traffic noise had little to no impact on nesting success (Herbert and Golightly 2006), Golightly et al (2009) demonstrated that murrelets were more likely to nest further from road compared to random sites**.** In a study of disturbance at nests, the sound from an operating chainsaw did not reduce reproductive success, and did not cause chicks or incubating adults to flush from the nest (Hébert and Golightly 2006). However, the proportion of resting behavior was significantly less when the saw was operating than before or after (Hébert and Golightly 2006). Perhaps more importantly, indirect effects of longer-term noise (greater than 15 minutes) include the potential attraction of corvids (four species of birds in the family Corvidae) (Hébert and Golightly 2006). Nest predation by corvids has been implicated as a major source of nest failure (Hébert and Golightly 2006).

Important threats to marbled murrelets are both long term (loss of nesting habitat, effects of climate change) and short term (poor reproductive success due to lower quality prey and high levels of nest predation). Low reproductive success may be indirectly due to habitat modification, habitat fragmentation and edge effects, leading to higher numbers of nest predators, (e.g., ravens, crows, jays) (U. S. Fish and Wildlife Service 1997, 2009). Threats such as habitat loss and death from gill-netting fisheries have been reduced since the species was listed (U.S. Fish and Wildlife Service 2009). Entanglement in fishing nets still occurs (U.S. Fish and Wildlife Service 2009). However, habitat loss has not been sufficiently offset by creation of habitat (U. S. Fish and Wildlife Service 2004). Threats from oil spills continue, as well as predation (U. S. Fish and Wildlife Service 2004). There is some potential threat from large-scale wildfires that ignite the canopy and ultimately reduce nesting habitat (Testky 1994). In addition, marbled murrelets are rated as one of the most vulnerable species to oiling, and could therefore be threatened by offshore oil spills (Nelson 1997).

Species Management

According to the 1997 recovery plan, the strategy for recovery of the marbled murrelet will involve (1) protecting habitat, (2) managing habitat to reduce threats (e.g., maintaining large blocks of suitable habitat, maintaining buffer habitat, decreasing risks of fire and windthrow, reducing predation), and (3) research to determine current population size and trends (U.S. Fish and Wildlife Service 1997). Recovery actions should include those listed below.

- Developing landscape-level management strategies.
- Identifying and protecting habitat areas, including marine habitat.
- Monitoring populations and habitats, and surveying potential breeding habitat to identify occupied nesting sites.
- Implementing short-term actions to stabilize and increase the population (e.g., maintaining suitable habitat in large contiguous blocks and buffer areas; decreasing risk of fire and

windthrow; decreasing adult and juvenile mortality; reducing nest predation, research to determine impacts of disturbance in terrestrial and marine habitats).

- Implementing long-term actions to increase population growth, by increasing nesting habitat distribution, decreasing fragmentation, improving marine habitat quality.
- Research to develop survey and monitoring protocols, to develop better population estimates, determine limiting factors, and evaluate impacts of disturbance.

In addition, since re-use of nest sites is infrequent, management should focus on providing multiple potential nest sites by maintaining large tracts of old growth forest with many large trees with potential nest platforms (Burger et al. 2009). Management of nesting habitat should provide greater protection of habitat in regions where habitat is sparse, and minimize predation risk where murrelets more frequently re-use nest sites (Burger et al. 2009).

Habitat Model Development

To develop the habitat model for marbled murrelet, a 5-mile buffer was included on all CNDDB occurrences with an accuracy class no greater than 1/5 miles were mapped against the following land cover types (California Department of Fish and Wildlife 2018 and U.S. Geological Survey 2018):

- Douglas Fir
- Sierran mixed conifer
- Ponderosa pine
- Klamath mixed conifer
- Jeffrey pine
- Redwood

USFWS indicated that there are some records on the central coast thought they are not in CNDDB. Therefore, the model was also applied to the central coast south of Garrapata State Park.

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Northern Spotted Owl (*Strix occidentalis caurina*)

Status

State: Threatened

Federal: Threatened

Critical Habitat: Yes

Recovery Planning: Revised Recovery Plan for the Northern Spotted Owl (U.S. Fish and Wildlife Service 2011)

Critical Habitat

Critical habitat for the northern spotted owl was initially established by the U.S. Fish and Wildlife Service in a final rule on January 15, 1992 (57 FR 1796 1838). There were 1,188,700 acres (481,050 hectares) of critical habitat designated for northern spotted owl in California. Revised critical habitat was designated in 2012 (77 FR 71875-72068) to provide approximately 2,102,050 acres (850,669 hectares) of critical habitat in California.

Range

There are currently three recognized subspecies of the spotted owl: the California spotted owl (*Strix occidentalis* ssp. *occidentalis*) occurs in the Sierra Nevada, central Coast Ranges, and mountains of Southern California and Baja California; Mexican spotted owl (*S. occidentalis* ssp. *lucida*), occurs in the mountains and canyons of the southwestern United States, from Utah and Colorado south to central Mexico; and the threatened northern spotted owl (*S. occidentalis* ssp. *caurina*) (Gutiérrez et al. 1995). Northern spotted owls occur in most of the major types of coniferous forest from southwestern British Columbia through western Washington, western Oregon, and northern California south to the San Francisco Bay Area, wherever suitable habitat still exists (Gutiérrez et al. 1995). Historically, habitat for the northern spotted owl was continuous, particularly in the wetter

parts of its range in northern California and most of western Oregon and Washington (U.S. Fish and Wildlife Service 2008; U.S. Fish and Wildlife Service 2011).

Habitat Requirements

The northern spotted owl uses a wide variety of habitat types, including mixed evergreen and mixed conifer forests dominated by western hemlock (*Tsuga heterophylla*), Douglas-fir (*Pseudotsuga menziesii*), redwood (*Sequoia sempervirens*), Douglas-fir/hardwood, ponderosa pine (*Pinus ponderosa*), western red cedar (*Thuja plicata*), and steep, rocky canyons and riparian areas (Gutierrez et al. 1995). Winter habitat is similar to breeding habitat (Gutiérrez et al. 1995).

Northern spotted owls generally rely on older forested habitats because these habitats contain the characteristics required for nesting, roosting, and foraging (U.S. Fish and Wildlife Service 2008). Nesting habitat provides nesting structures, weather protection, and cover from predators (U.S. Fish and Wildlife Service 2008). Characteristics of nesting habitat include: high canopy closure (60–80%); a multi-layered, multi-species canopy with large [>30 inches diameter at breast height (dbh] overstory trees; many large trees with deformities (e.g., large cavities, broken tops, mistletoe infections, and other evidence of decadence); large snags; many logs and other woody debris on the ground; and open space below the canopy for northern spotted owls to fly (Thomas et al. 1990, U.S. Fish and Wildlife Service 2008). Northern spotted owls may nest in younger forest stands if they contain the structural characteristics of mature forests. In mature forests, nests are often in broken-top trees and cavities, and on platforms formed by debris, mistletoe, squirrel nests or abandoned raptor nests. In younger forests (<150 years old), nests occur more often on platforms. Mature and old-growth forests provide available nest sites, cover to decrease the likelihood of predation (particularly from great horned owls), thermoregulation (canopy and vertical structure decreases heat), and prey availability (Franklin et al. 2000).

Roosting habitat provides shelter from precipitation, cover from predators, and thermoregulation (U.S. Fish and Wildlife Service 2008). Roosting habitat is similar to nesting habitat but does not contain structural characteristics required for nesting (U.S. Fish and Wildlife Service 2008). During the summer, roost sites are usually near streams or on the lower third of slopes (Gutiérrez et al. 1995). Spotted owls seek cooler microclimates when temperatures are high, to avoid heat stress (Gutiérrez et al. 1995).

Foraging habitat is essential to northern spotted owl survival and reproductive success (U.S. Fish and Wildlife Service 2008) and may include habitat similar to nesting and roosting habitat described above as well as areas with more open, edge, and decreased canopy cover (U.S. Fish and Wildlife Service 2011). Foraging habitat is correlated with high levels of mixed tree height, canopy closure, >31 inch dbh trees, and snag densities (U.S. Fish and Wildlife Service 2008). Northern spotted owls select old forests for foraging in greater proportion than their availability at the landscape scale, but will forage in younger stands with high prey densities and prey access (U.S. Fish and Wildlife Service 2008). In the northern portion of their range, northern spotted owls select forests that support northern flying squirrels (U.S. Fish and Wildlife Service 2008). In the southern range where woodrats are the primary prey species, northern spotted owls are more likely to use a variety of stands, including younger stands, brushy openings in older stands, and edges among forest types, apparently in response to higher prey density. In northern California, foraging owls selected late seral forest edge sites where dusky-footed woodrats (*Neotoma fuscipes*) were more abundant (Ward 1998).

In a banded northern spotted owl population in northwestern California studied from 1985 through 1994, a mosaic of older forest interspersed with other vegetation types resulted in higher survival and reproductive output (Franklin et al. 2000). Annual survival was positively correlated both with amounts of interior old-growth forest and length of edge between forests and other vegetation types. Reproductive output was negatively correlated with interior forest but positively associated with the amount of edge between mature and old-growth conifer forest and other vegetation types (Franklin et al. 2000).

Forsman et al. (2002) demonstrated that northern spotted owls are capable of dispersing through fragmented habitat. However, large, non-forested valleys are apparent barriers to natal and breeding dispersal (Forsman et al. 2002). While the degree to which bodies of water provide barriers to northern spotted owl dispersal is unknown, radio telemetry data indicates spotted owls move around bodies of water instead of crossing them (Forsman et al. 2002). Habitat characteristics can determine the success of natal dispersal and influence northern spotted owl population viability (Miller 1997). In a study in Oregon from 1982 to 1985, spotted owls selected closed canopy over open canopy during natal dispersal (Miller 1997). Old-growth and mature forest was used most frequently during dispersal (35.3%) and colonization (61.2%) (Miller 1997). The use of clear-cuts may decrease probability of successful natal dispersal. During transience dispersal, use of sapling stands decreased probability of mortality, while use of clear-cuts during colonization dispersal increased probability of mortality (Miller 1997).

Movement

Northern spotted owls remain within their home range throughout the year. The typical home range of a northern spotted owl is relatively large compared with that of other avian predators of similar size (1,035–10,189 acres [419-4,123 hectares]) and varies greatly in size, generally increasing to the north (Thomas et al. 1990; U.S. Fish and Wildlife Service 2008). Northern spotted owl home ranges are generally larger where northern flying squirrels are the predominant prey and smaller where wood rats are the primary prey (U.S. Fish and Wildlife Service 2008). Home range size also increases with increasing forest fragmentation (U.S. Fish and Wildlife Service 2008). Northern spotted owl home ranges contain two distinct use areas: the core area, which includes the nest site and the area of concentrated use; and the remainder of the home range, which is used for foraging and roosting (U.S. Fish and Wildlife Service 2008). As with home ranges, the size of core areas varies considerably across the northern spotted owl's range, varying from over 4,057 acres (1642 hectares) in the northernmost sites to less than 500 acres (202 hectares) in the southernmost sites (Thomas et al. 1990; U.S. Fish and Wildlife Service 2008).

Juvenile dispersal occurs in stages, with dispersing juveniles moving into temporary home ranges for several months. Juveniles show a preference for mature and old growth forest in transit and in temporary home ranges (U.S. Fish and Wildlife Service 2008). Natal dispersal distances, measured from natal areas to eventual home ranges, tend to be larger for females (about 15 miles [24 kilometers]) than males (about 8.5 miles [13.7 kilometers]) (Thomas et al. 1990; U.S. Fish and Wildlife Service 2008). Corridors of forest in fragmented landscapes are used for movement but not colonization (U.S. Fish and Wildlife Service 2008).

Table B1-12. Movement Distances for Northern Spotted Owl

Age-Class	Area or Distance	Location of Study	Sources
Juvenile dispersal	8.5–15 mi (13.7–24 km)	California, Oregon and Washington	U.S. Fish and Wildlife Service 2008
Adult breeding pair (home range)	1,035–10,189 acres (419-4,123 ha)	California, Oregon and Washington	U.S. Fish and Wildlife Service 2008

Reproduction

Pair bond establishment in early February and March is followed by nest-site selection in March and April (Gutiérrez et al. 1995). Northern spotted owls typically have only one brood per year and rarely re-nest if the first nest fails (Gutiérrez et al. 1995). Northern spotted owls rarely nest every year (Gutiérrez et al. 1995): one study found an average nesting rate of once every two to three years in northern California (Thome et al. 2000). Spotted owls are sexually mature at one year of age, but rarely breed until they are two to five years of age (Miller et al. 1985; Forsman et al. 2002). Eggs are usually laid in April and clutch size varies from one to four (Gutiérrez et al. 1995). The female incubates the eggs for approximately 30 days (Gutiérrez et al. 1995). The male generally feeds the female during incubation and early brooding (Gutiérrez et al. 1995). The female broods young continuously for 8–10 days, then leaves the nest to forage for progressively longer periods (Gutiérrez et al. 1995). The male and female feed the owlets until they leave the nest at approximately 34– 36 days old, from mid-May through June (Gutiérrez et al. 1995). Average fledging rate per pair varies from 0.25 to 0.93 young, and is positively correlated with habitat quality (Gutiérrez et al. 1995). Both parents usually roost near the young through August. The siblings often roost together but may move farther apart as they mature (Gutiérrez et al. 1995). Young disperse from early September through October (Gutiérrez et al. 1995).

Population Trend and Threats

The actual number of currently occupied northern spotted owl sites across its range is unknown because many areas remain unsurveyed, resurveyed or can be surveyed on an annual basis (U.S. Fish and Wildlife Service 2011). As of 1994, there were 5,431 known northern spotted owl pairs or resident singles: 851 sites (16%) in Washington, 2,893 sites (53%) in Oregon, and 1,687 sites (31%) in California (U.S. Fish and Wildlife Service 2008). These totals represent the cumulative number of locations recorded in the three states, not population estimates. Northern spotted owls no longer occupy many historical sites because of displacement by barred owls, timber harvest, or severe fires. Also, new sites may have been established through recruitment into areas where suitable habitat developed (U.S. Fish and Wildlife Service 2008).

Demographic data are used to identify trends in northern spotted owl populations, since survey coverage is not sufficient to produce accurate range-wide estimates of population size (U.S. Fish and Wildlife Service 2008). Demographic data indicate that populations in 13 long-term study areas have decreased by approximately 3.7% from 1985 to 2003 (U.S. Fish and Wildlife Service 2008). Spotted owl numbers in most areas of California have been declining from 1985 to 2003 (U.S. Fish and Wildlife Service 2008). A meta-analyses assessed the population trends using data from 11 long-term study areas (Forsman et al 2011). The results demonstrated strong evidence that populations declined in seven of the 11 areas (including northwestern California) and populations declined by 20 to 30%. Forsman et al. (2011) indicated declines in Washington and Oregon were noteworthy

and cause for concern. Decreasing population trends are caused by the decline in apparent adult survival (based on model average), as notably demonstrated by less than 80% apparent adult survival in Washington (Forsman et al 2011).

The U.S. Fish and Wildlife Service Revised Recovery Plan (2011) outlines the most important range-wide threats to the northern spotted owl as competition with the barred owl and loss of habitat attributed to timber harvest, stand replacing wildfires, and other disturbances.

Barred owls have reportedly reduced spotted owl site occupancy, reproduction, and survival. The issue of whether barred owl range expansion is a response to manmade changes in the landscape, global warming, or other factors, has not been formally evaluated (Gutiérrez 2007; U.S. Fish and Wildlife Service 2008). Barred owls compete with spotted owls for prey and habitat, and may attack and kill spotted owls (U.S. Fish and Wildlife Service 2008). Barred owl range has expanded to as far south as Marin County, California, and now completely overlaps with that of the northern spotted owl (Gutiérrez 2007, U.S. Fish and Wildlife Service 2008).

Loss of suitable habitat and the resulting isolation of populations can hinder the genetic diversity that helps buffer populations against stochastic events (U.S. Fish and Wildlife Service 2011). West Nile Virus may become a threat to spotted owls as it eventually spreads throughout its range (U.S. Fish and Wildlife Service 2008). Although it is unknown how the virus will affect spotted owl populations, most species of owls are susceptible to the virus (U.S. Fish and Wildlife Service 2008). Toxicants were not identified as a threat when the NSO was listed, but a growing body of information suggests exposure to contaminants, such as anti-coagulant rodenticides and fertilizers associated with marijuana cultivation, represent a growing concern for NSO (Thompson et al. 2013; Gabriel et al. 2013; Wengert et al. 2015; CDFW 2016; Gabriel et al. 2017a and 2017b; Higley et al. 2017).

Species Management

The proposed "Recovery Strategy" in the 2011 Revised Recovery Plan recommends the following actions and strategies to address the threats described above:

- Develop a range-wide habitat modeling framework that uses the best available information, including modeling information to evaluate and refine the habitat conservation network to support the recovery of the northern spotted owl. The U.S. Fish and Wildlife Service recommends future revisions of Federal land management plans to consider the northern spotted owl's need for large, contiguous conservation areas.
- Barred owl management should progress scientific evaluation of management options to reduce the impact of barred owls on spotted owls. Specifically, recovery actions address research focusing on the competition between the two owl species, experimental control of barred owls, and if recommended by research, control of barred owls.
- Monitoring and research of the northern spotted owl should continue to track the progress towards recovery, inform recovery actions through informed adaptive management, and determine when delisting is appropriate. Monitoring should also track the status and trends of spotted owl habitat.
- Adaptive management should be employed at each step to consider the key gaps in knowledge; improve understanding of ecosystem responses, thresholds and dynamics; assess the

effectiveness of alternative management policies; and document and disseminate knowledge gained for future management.

- Habitat conservation and active forest restoration will provide a more resilient forested habitat for the northern spotted owl. Land management actions should not just consider the needs of the northern spotted owl, but the ecosystem as a whole to improve system function and provide an umbrella of benefit for all of the species present.

Habitat Model Development

To develop the habitat model for the northern spotted owl, the California Department of Fish and Wildlife Spotted Owl Observation database's northern spotted owl activity centers were digitized, and potential suitable habitat was mapped as the following land cover types within the range of the activity cemters (California Department of Fish and Wildlife 2018):

- Coastal oak woodland
- Douglas fir
- Montane hardwood
- Montane hardwood-conifer
- Montane riparian
- Ponderosa pine
- Redwood
- Sierran mixed conifer
- Red fir
- Lodgepole pine
- Klamath mixed conifer
- Jeffery pine

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Mammals

Giant Kangaroo Rat (*Dipodomys ingens*)

Status

State: Endangered

Federal: Endangered

Critical Habitat: None

Recovery Planning: *Recovery Plan for Upland Species of the San Joaquin Valley, California* (U.S. Fish and Wildlife Service 1998)

Critical Habitat

No critical habitat has been designated for giant kangaroo rat.

Range

Historically, the range of giant kangaroo rat extended from western edge of the San Joaquin Valley, California, from the base of the Tehachapi Mountains to the south, to a point about 16 kilometers (10 miles) south of Los Banos, Merced County to the north; the Carrizo and Elkhorn Plains and San Juan Creek watershed west of the Temblor Mountains which form the western boundary of the southern San Joaquin Valley; the upper Cuyama Valley along the Carrizo Plain; and scattered colonies on steeper slopes and ridge tops in Ciervo, Kettleman, Panoche, and Tumey Hills, and in the Panoche Valley (U.S. Fish and Wildlife Service 1998).

Currently, giant kangaroo rats occupy only 5% of their former range. The current distribution of giant kangaroo rat is fragmented into six major geographic regions: (1) the Ciervo-Panoche region in western Fresno and eastern San Benito Counties; (2) Kettleman Hills in southwestern Kings County; (3) San Juan Creek Valley in eastern San Luis Obispo County; (4) the Lokern area, Elk Hills previously known as the National Petroleum Reserve Number One (NPR-1), which includes Buena Vista and McKittrick Valleys; National Petroleum Reserve Number Two (NPR-2); and Taft and Maricopa in western Kern County; (5) the Carrizo Plain in eastern San Luis Obispo County; and (6) Cuyama Valley along the eastern Santa Barbara County-San Luis Obispo county line (U.S. Fish and Wildlife Service 2010).

Habitat Requirements

Giant kangaroo rat inhabits annual grassland and shrub community habitats with various soil types and slopes up to 22%. This current use of habitats suggests that current populations are found in suboptimal grassland habitats on which historical populations were found (i.e., gentle slopes of approximately 10% or less). Inhabited areas receive an average of 6–7 inches of rain and are free from flooding (U.S. Fish and Wildlife Service 2010).

Changes in rainfall have been linked to expansions and declines in giant kangaroo rat populations. Changes in rainfall also can affect the availability of forage plant species, the development of toxic

pathogenic molds, and fire fuel loads—affecting habitats inhabited by giant kangaroo rats (U.S. Fish and Wildlife Service 2010).

Movement

Described in Table B1-13 below, the home range of the giant kangaroo rat extends from approximately 646 to 3767 square feet (U.S. Fish and Wildlife Service 1998).

Table B1-13. Documented Giant Kangaroo Rat Movement

Type	Distance/Area	Location of Study	Source
Home range	646–3767 sq. ft. (60–350 sq. m)	Elkhorn and Carrizo Plain	U.S. Fish and Wildlife Service 1998

Reproduction

Reproduction patterns for Giant kangaroo rat are dependent on population densities and availability of food. Females can breed in the same year they are born and will usually produce two to three litters per year when conditions are optimal. The gestation period is between 30 and 35 days and litter size varies from one to three young (U.S. Fish and Wildlife Service 1998).

Population Trends and Threats

Historically, the greatest threat to giant kangaroo rat was the conversion of natural habitat to agricultural lands. The amount of suitable lands that are currently being converted to agricultural use has slowed because the remaining suitable habitats are too rugged for agricultural uses. Currently, there are numerous threats to suitable habitat. These include development of large-scale renewable solar energy projects and construction of large transmission lines; potential increases in oil and gas developments in the southern portion of the species range and Kettleman Hills; increased off-road vehicle use throughout the species range, but particularly in the southern portion of the range; and urban and residential development in western Kern County. Road widening projects continue to threaten giant kangaroo rats, although these road projects currently affect less habitat area than the threats listed previously (U.S. Fish and Wildlife Service 2010).

Species Management

The U.S. Fish and Wildlife Service has listed locations for protection, completion of Habitat Conservation Plans (HCPs), approval and implementation of habitat management plans, and future research and population monitoring as future actions needed to preserve giant kangaroo rat habitat. Habitat that needs protection include: dispersal corridors within the northern range along Panoche Creek and Silver Creek in western Fresno County, Panoche Valley in eastern San Benito County (Loew et al. 2005), and Buena Vista Valley in western Kern County. The Kern County Valley Floor HCP's public draft was distributed in 2006 and is still in the planning phase (California Department of Fish and Wildlife 2017), but aims to conserve listed plant and animals species (including the giant kangaroo rat) and habitat through a general compensation strategy of preserving 90% of the high quality habitat areas and 75% of slightly disturbed areas that provide suitable dispersal habitat, take-minimization measures including pre-activity surveys and BMPS, conservation goals for each species, monitoring programs to track the conservation goals, targeted acquisition by the Management Committee from willing sellers, and voluntary efforts like conservation agreements

with private land owners. The following HCPs cover the giant kangaroo rat: Kern County Water Bank (20,000 acres in portions of Kern, Tulare and Kings Counties), Seneca and Enron Oil and Gas (650 acres in Bakersfield, Kern County), PG&E San Joaquin Valley Operation and Maintenance HCP (portions of San Joaquin, Stanislaus, Merced, Fresno, Kings, Kern, Mariposa, Madera and Tulare Counties), Nuevo-Torch HCP (21,800 acres in Bakersfield, Kern County), Metropolitan Bakersfield HCP (262,000 acres in Bakersfield, Kern County), Kern County Waste Facilities HCP (1,500 acres in Bakersfield, Kern County), EnviroCycle, Inc HCP (20 acres in Bakersfield, Kern County), Chevron Pipeline (25.5 acres in Kern County), ARCO Coles Levee (ARCO Western Energy) HCP (120,320 acres in Kern County) (U.S. Fish and Wildlife Service 2018). Additional ways that would facilitate the preservation of habitat include: the implementation of habitat management plans, such as the 44,000 acre (17,806 hectare) Lokern Natural Area in western Kern County; and the flexibility to alter dates and stocking rates of livestock to respond to annual plant production to prevent the dominance of exotic grasses in giant kangaroo habitat as part of those management plans (Germano et al. 2001). Future research and monitoring would include continuing long term monitoring in western Kern County and Carrizo Plain, begin long term monitoring within the Ciervo-Panoche area in western Fresno and eastern San Benito Counties, and census and monitor populations in satellite populations in the Cuyama Valley, San Juan Creek Valley, and Kettleman Hills (U.S. Fish and Wildlife Service 2010).

Habitat Model Development

To develop the habitat model for giant kangaroo rat, CNDDB occurrence polygons for giant

kangaroo rat were clipped to the CWHR range and then mapped against the following land cover types limited to topographically flat areas (California Department of Fish and Wildlife 2014 and 2018):

- Alkali desert scrub
- Annual grassland
- Perennial grassland
- Desert riparian
- Desert wash
- Sagebrush
- Desert scrub.

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Point Arena Mountain Beaver (*Aplodontia rufa nigra*)

Status

State: None

Federal: Endangered

Critical Habitat: None

Recovery Planning: Point Arena Mountain Beaver Aplodontia rufa nigra (Rafinesque) Recovery Plan (U.S. Fish and Wildlife Service 1998).

Critical Habitat

No critical habitat has been designated for Point Arena Mountain Beaver.

Range

Historically, mountain beavers have been known to occur in many areas of the Pacific Northwest. As of the 5 Year Review (2009), the Point Arena subspecies, was only found in an approximate 33 square mile [85 square kilometer] area in western Mendocino County, California. The U.S. Fish and Wildlife Service considered the range of Point Arena mountain beaver to include areas 5 miles inland from the Pacific Ocean extending from a point 2 miles north of Bridgeport Landing to a point 5 miles south of the town of Point Arena. Point Arena mountain beavers have also been documented along Elk Creek, an unnamed drainage near Bridgeport Landing, Mills Creek, Mallow Pass Creek, Irish Gulch, a bluff between Irish Gulch and Mallo Pass Creek, Alder Creek and tributaries, a bluff between Irish Gulch and Alder Creek, Manchester Stark Park, Brush Creek and Tributaries, Lagoon Lake and Creek, Garcia River and Hathaway Creek (U.S. Fish and Wildlife Service 2009, California Department of Fish and Wildlife 2018).

Habitat Requirements

Point Arena mountain beavers occupy a variety of vegetation communities including coastal scrub, coastal bluff-scrub, northern riparian scrub, northern dune scrub, freshwater seep, north coast riparian and closed-cone conifer forests (U.S. Fish and Wildlife Service 1998, Fitts et al. 2002). On a finer scale, Point Arena mountain beaver occupied sites are characterized by moderate slopes, friable soils, in plant communities prevalent with herbaceous vegetation and a cool, moist micro-climate. The mountain beaver subspecies lives in underground burrows with openings in moderately tall, lush vegetation on north-facing slopes of gullies (Johnson 1971, Kinney 1971), but also occur on relatively flat coastal dune areas with abundant vegetation and coastal fog. Point Arena mountain beavers have primitive kidneys and poorly concentrate urine and as a result, the subspecies must drink water daily or consume succulent vegetation (Nungesser and Pfeiffer 1965; Schmidt-Nelson and Pfeiffer 1970).

Movement

Other subspecies of mountain beaver have been recorded dispersing up to 1,850 feet (564 meters) from natal dens. Among the other subspecies of mountain beaver, wide variation in home range size has been reported, ranging from 0.2–0.4 acres (0.08–0.16 hectares) per animal (Neal and Barrecco 1981). Studies are currently underway on various aspects of the life history of the Point Arena subspecies (U.S. Fish and Wildlife Service 2009) (Table 1).

Table B1-14. Documented Point Arena Mountain Beaver Movement

Type	Distance/Area	Location of Study	Source
Dispersal	Up to 1,850 feet (564 m)		USFWS 2009
Home range*	0.2–0.4 ac (0.08–0.16 ha	Washington*	Neal and Borrecco 1981

*Data for mountain beaver *Aplodontia rufa not Aplodontia rufa nigra*

Reproduction

Mountain beaver have a very low reproductive output for a rodent, with females starting to breed in their second year and then producing a single litter each year consisting of two to three offspring (Pfeiffer 1958). The breeding season of the Point Arena mountain beaver is December 1 through June 30, with dispersal occurring from April 15 through September 30 (U.S. Fish and Wildlife Service 2009).

Population Trend and Threats

The total number of individual Point Arena mountain beavers throughout their range is unknown. It is also unclear exactly how many separate Point Arena mountain beaver subpopulations currently exist, but estimations suggest there are 26 separate subpopulations (U.S. Fish and Wildlife Service 1998). The amount of occupied and suitable unoccupied Point Arena mountain beaver habitat throughout the range is unknown. Within Manchester State Park, there are an estimated 481 acres (195 hectares) of suitable habitat, of which 57 acres (23 hectares) are considered occupied (U.S. Fish and Wildlife Service 2009). On BLM land, 70 acres (28.3 hectares) of suitable habitat was mapped with only 15.6 acres (6.3 hectares) of occupied habitat (BioConsultants LLC 2006). In1998, the Recovery Plan estimated population abundance ranging from 200 to 500 individuals with 262 total individual records mapped range-wide (U.S. Fish and Wildlife Service 1998 and 2009). The

individual records are of limited inference because many of the records occur on private land have haven't been visited in recent years and as a result, the records have little to no information on current status, population size or occupied area. The Point Arena mountain beaver is primarily threatened by loss and modification of habitat from development, agriculture, recreation, water diversion and invasive species (U.S. Fish and Wildlife Service 2006). Population expansion is limited by the adjacent land conversion to livestock grazing (U.S. Fish and Wildlife Service 1998). The Point Arena mountain beaver is also threatened by the few number of populations and the presumed low number of individuals in the populations (U.S. Fish and Wildlife Service 1998). Populations near residential areas could be extirpated by predation from dogs and cats.

Species Management

The 5 Year Review (2009) outlines the following actions to aid in Point Arena mountain beaver persistence and recovery:

- Research and characterize the genetic diversity between and among populations
- Monitor established survey grids for estimation of abundance, survival rates, and recruitment
- Find suitable habitat, potential dispersal corridors, dispersal barriers and restoration areas.
- Demarcate appropriate conservation units informed by gene flow, dispersal barriers and potential dispersal distances
- Create and implement a non-invasive sampling program to monitor range-wide trends in distribution and abundance, and develop a monitoring plan to assess habitat quality, quantity and threats.
- With sufficient data, revise the current Recovery Plan for updated recovery criteria and tasks.
- Identify key areas for protection for conservation easements and acquisition
- Identify areas for management of exotic plants and livestock exclusion.

Habitat Model Development

The range indicated in the Point Arena mountain beaver recovery plan (U.S. Fish and Wildlife Service 1998) was buffered by 0.5 mile and slightly revised to include some CNDDB occurrences (California Department of Fish and Wildlife 2018) on the upper reaches of drainages. Within the species range and below 300 meters in elevation, potentially suitable habitat occurs in the following land cover types (California Department of Fish and Wildlife 2014):

- Montane hardwood
- Montane riparian
- Valley foothill riparian
- Redwood
- Douglas fir
- Coastal scrub
- Coastal oak woodland
- Wet meadow

The habitat model also included other land cover types within 200 meters of streams or creeks that flowed within montane hardwood-conifer, redwood and douglas fir land cover types.

GIS Sources

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San Joaquin Kit Fox (*Vulpes macrotis mutica*)

Status

State: Threatened

Federal: Endangered

Critical Habitat: None

Recovery Planning: *Recovery Plan for Upland Species of the San Joaquin Valley, California* (U.S. Fish and Wildlife Service 1998)

Critical Habitat

No critical habitat has been designated for San Joaquin kit fox.

Range

Although the precise historical range of San Joaquin kit fox is unknown, it is believed to have extended in the north from Contra Costa and San Joaquin Counties to Kern County in the south. By the 1930s, the range had been reduced to the southern and western portions of the Central Valley (Grinnell et al. 1937). Surveys conducted between 1969 and 1975 extended the known range of San Joaquin kit fox back into portions of its historical range in the northern San Joaquin Valley, including Contra Costa, Alameda, and San Joaquin Counties. Additionally, kit foxes were found in three counties outside the originally defined historical range: Monterey, Santa Clara, and Santa Barbara (Orloff et al. 1986).

Currently, the known range of San Joaquin kit fox extends through the valley floor in Kern, Tulare, Kings, Fresno, San Joaquin, Madera, Merced and Stanislaus Counties. From the valleys of the Coast Ranges, the San Joaquin kit fox is known to occupy Monterey, San Benito, and Santa Clara Counties of the Pajaro River watershed, Monterey and San Luis Obispo Counties in the Salinas River watershed, and in the upper Cuyama River watershed of northern Ventura, northern Santa Barbara, and southeastern San Luis Obispo Counties (U.S. Fish and Wildlife Service 2010, California Department of Fish and Wildlife 2018)No records for San Joaquin kit fox are known for Mariposa County.

Habitat Requirements

Historically, San Joaquin kit foxes occurred in a variety of native plant communities throughout the San Joaquin Valley, including valley sink scrub, valley saltbush scrub, upper Sonoran subshrub scrub, interior Coast Range saltbush scrub, and annual grassland. Before the rapid expansion of irrigated agriculture in the San Joaquin Valley, valley saltbush scrub was probably the species' prime habitat (Grinnell et al. 1937).

Because agriculture has replaced much of the native Central Valley habitat, San Joaquin kit foxes appear to have adapted to living in marginal areas such as grazed, non-irrigated grasslands; peripheral lands adjacent to tilled and fallow fields; irrigated row crops, orchards, and vineyards;

and petroleum fields and urban areas (Morrell 1971; Jensen 1972; O'Farrell 1980; Ralls and White 1991).

San Joaquin kit fox usually prefers areas with loose-textured soils suitable for den excavation (U.S. Fish and Wildlife Service 1983) but is found on virtually every soil type (U.S. Fish and Wildlife Service 1998). However, dens are usually scarce in areas with shallow soils, due to the proximity to bedrock (O'Farrell and Gilbertson 1979; O'Farrell et al. 1980), impenetrable hardpan layers (Morrell 1972), and high water tables (McCue et al. 1981). Where soils make digging difficult, kit foxes frequently use and modify burrows built by other animals, particularly those of California ground squirrels (Orloff et al. 1986). Structures such as culverts, abandoned pipelines, and well casings may also be used as den sites (U.S. Fish and Wildlife Service 1983).

Although kit foxes may construct their own dens, it is commonly believed that they more often enlarge the burrows of California ground squirrels into suitable dens (Orloff et al. 1986; U.S. Fish and Wildlife Service 1998). Den structure varies across the species' range, depending on local topography and soil type. In the southern portion of the range, dens generally have two entrances with ramp-shaped mounds of dirt 3–6 feet (1–2 meters) long in front and are located on slopes of less than 40° (Morrell 1972; Reese et al. 1992). Natal and pupping dens tend to be larger, have more entrances (2 to 18), and occur on flatter terrain (slopes of about 6°). In the central portion of the range, the dirt apron in front of the den is usually replaced with a long trailing ramp with a runway down the middle. Farther north, dens are generally placed higher than the surrounding terrain on the lower portions of slopes (Orloff et al. 1986).

Kit fox home ranges vary from less than 1 square mile (2.6 square kilometers) up to approximately 12 square miles (31 square kilometers) (Morrell 1972; Knapp 1978; Zoellick et al. 1987; Spiegel and Bradbury 1992; White and Ralls 1993). Kit foxes may use up to 70 different dens in a year within their home range. They may move between dens four or five times during the summer months and once or twice during the pup-rearing season (Morrell 1972; Hall 1983) (Table 1).

Movement

Foraging kit foxes can range up to 10 miles (16 kilometers) in a single night during the breeding season and 6 miles (10 kilometers) during the pup-rearing and dispersal season (Zoellick et al. 1987) (Table B1-15).

Table B1-15. Documented San Joaquin Kit Fox Movement

Type	Distance/Area	Location of Study	Source
Home range	1–12 square miles (2.6–31 square kilometers)	Kern County	Morrell 1972; Knapp 1978; Zoellick et al. 1987; Spiegel and Bradbury 1992; White and Ralls 1993
Foraging	6–10 square miles (10–16 square kilometers)	Kern County	Zoellick et al. 1987

Reproduction

Kit fox is believed to be monogamous and can, but generally does not, breed during the first year of adulthood (Morrell 1972). The breeding season begins during September and October when adult

females begin to clean and enlarge natal or pupping dens (U.S. Fish and Wildlife Service 1998). Mating and conception occur between late December and March (Egoscue 1956; Morrell 1972; Zoellick et al. 1987). Gestation is 48–52 days, and litters of two to six pups are born between late February and late March (Egoscue 1962; Morrell 1972; Zoellick et al. 1987).

Egoscue (1975) estimated the average age of kit foxes in a Utah population to be about 2 years. Individual foxes may live more than 8 years (U.S. Fish and Wildlife Service 1998), but such longevity is rare. In a population of kit foxes on the Naval Petroleum Reserve #1 in California, animals less than 1 year old outnumbered older foxes 2.8:1 (Berry et al. 1987). In captivity, foxes may live up to 10 years (McGrew 1979; U.S. Fish and Wildlife Service 1998).

The annual adult mortality of kit foxes has been estimated to be approximately 50% (Morrell 1972; Egoscue 1975; Berry et al. 1987; Ralls and White 1995; Standley et al. 1992). Juvenile mortality rates are usually higher, approaching 70% (Berry et al. 1987).

Population Trend and Threats

The 1983 recovery plan (U.S. Fish and Wildlife Service 1983) estimated the pre-1930 population of adult San Joaquin kit foxes between 8,667 and 12,134 animals. By 1975, the estimated population had fallen to only 6,961 adults, a 20%–43% decline. Currently, the entire range of the kit fox appears to be similar to what it was at the time of the 1998 Recovery Plan; however, population structure has become more fragmented, at least some of the resident satellite subpopulations, such as those at Camp Roberts, Fort Hunter Liggett, Pixley National Wildlife Refuge (NWR), and the San Luis NWR, have apparently been locally extirpated and portions of the range now appear to be frequented by dispersers rather than resident animals (U.S. Fish and Wildlife Service 2010).

Habitat loss and fragmentation as a result of agricultural, industrial, and urban development, in addition to continued predation and competition from coyotes and other predators, continue to present major threats to the survival of kit fox in California. Catastrophic events such as extended drought or rain, with a corresponding decline in prey availability, likely have a more significant effect on small isolated populations of kit fox than on larger, contiguous populations. The role of accidents and disease in kit fox mortality is not well documented, but these factors may become increasingly important as kit foxes are subjected to more contact with humans, their pets, and livestock. Rabies caused several deaths of radio-collared kit foxes at Camp Roberts and may have contributed to the recent decline of kit foxes there (U.S. Fish and Wildlife Service 1998). Increasing noise in the environment from highway traffic, wind generators, and other human-related activities may interfere with foxes' ability to communicate, detect prey, and avoid predators. The reduction and elimination of prey species by pesticide use is an additional threat to kit fox (U.S. Fish and Wildlife Service 2010). Many of these factors are likely to act synergistically to further reduce San Joaquin kit fox numbers across their range.

Species Management

The *Recovery Plan for Upland Species of the San Joaquin Valley, California* provides a summary of significant conservation efforts and a recovery strategy for San Joaquin kit fox (U.S. Fish and Wildlife Service 1998). Principal conservation efforts include important kit fox habitat acquisition by the U.S. Bureau of Land Management, the California Department of Fish and Game, the California Energy Commission, the U.S. Bureau of Reclamation, the U.S. Fish and Wildlife Service, and The Nature Conservancy. Key acquisitions include lands in the Carrizo Plain, the Ciervo-Panoche Natural Area,

and the Lokern Natural Area. Negotiations for additional acquisition of 60,000 acres (24,281 hectares) of suitable kit fox habitat in western Merced, Stanislaus, and eastern Santa Clara Counties are under way through a multiagency cooperative effort. The *Five-Year Review* for this species (U.S. Fish and Wildlife Service 2010) identifies the acquisition of large blocks of land (at least 10,000 acres [4,047 hectares]) as critical to supporting sustainable populations of kit fox for long-term conservation, and goes on to note that these large land areas should be linked with protected broad dispersal corridors.

Ongoing research on kit fox ecology, behavior, habitat requirements, and management of kit fox habitat is being implemented as mitigation by the California Energy Commission, U.S. Department of Energy (Naval Petroleum Reserves in California), Army National Guard (Camp Roberts) and the Department of Defense (Fort Hunter Liggett). Research on kit fox biology has also been conducted through the research program on the Carrizo Plain Natural Area cosponsored by the Smithsonian Institution and The Nature Conservancy (White and Ralls 1993; White et al. 1994; Ralls and White 1995; White et al. 1996); these research efforts have focused on such topics as dispersal (Scrivner et al. 1987), mortality (Berry et al. 1987), fox movements, and home range dynamics (Zoellick et al. 1987). California State University, Stanislaus students conducted research in western Merced County to identify habitat use of San Joaquin kit fox in Merced (Constable et al. 2009). Management research efforts have been directed toward understanding the benefits and constraints of habitat enhancement, kit fox relocation, supplemental feeding, and coyote control as means of enhancing recovery. In a continuing effort to monitor suitable kit fox habitat changes across the range of the subspecies, large-scale habitat surveys have been conducted on the Carrizo Plain (Kato and O'Farrell 1986; Kakiba-Russell et al. 1991) and the southern San Joaquin Valley (Anderson et al. 1991). Numerous smaller-scale surveys have been conducted range wide across all areas of potential kit fox habitat in compliance with the federal Endangered Species Act, the National Environmental Policy Act, and the California Environmental Quality Act.

Habitat Model Development

The San Joaquin kit fox model was developed and refined using extensive information and habitat models that have were previously developed for the Endangered Species Recovery Plan (ESRP) by the wildlife agencies. The perimeter of moderate quality habitat and CNDDB records were hand digitized to reflect the range of the species. Low quality habitat in Santa Cruz county and isolated patch size areas without CNDDB records in western San Luis Obispo and western Santa Barbara counties were not included. Perennial water body areas were excluded from the habitat model (U.S. Geological Survey 2013). Potentially suitable habitat within the kit fox model is characterized by the attributes described below:

- **Land Cover—**High suitability habitat includes saltbrush (*Atriplex polycarpa* and *A. spinifera*) scrublands and grasslands dominated by red brome (*Bromus madritensis*). Medium suitability habitats include alkali sink scrublands and grasslands dominated by wild oats (*Avena* spp.) Other habitat types and anthropogenically altered lands (e.g., agricultural lands, urban areas) are considered low suitability.
- **Slope—**High suitability areas are generally characterized by flat or gently rolling terrain (average slopes < 5%); suitability declines as the average slope increases, due largely to an associated increase the risk of predation.

- **Vegetation Density—**Kit foxes are optimally adapted to arid environments with sparse vegetation and a high proportion of bare ground. Consequently, habitat suitability decreases as vegetation density increases.

Habitat suitability throughout the species' range was assessed using a GIS-based map-algebra model. The model was initialized with suitability values of the land use/land cover layer with values of 0–100, with 100 being most suitable. The output was then categorized into three suitability classes (refer to Cypher et al. 2013 for details on the map algebra used).

- **High Value Suitable Habitat—**Scores greater than 90. These are areas within the historic range where SJKF populations are known to be robust and persistent.
- **Moderate Value Suitable Habitat—**Scores between 90 and 75. These are areas where SJKF populations are known to be less dense or intermittently present.
- **Low Value Suitable Habitat—**Scores less than 75. These are areas where SJKF populations appear to be absent with no or only infrequent observations.
- **Urban Suitable Habitat—**Areas mapped as urban within the Metropolitan Bakersfield Urban Area.

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Appendix B2

Species Accounts—Plants

Information for the following species accounts was derived from the California Natural Diversity Database (2018), the Inventory of Rare and Endangered Plants of California (California Native Plant Society 2018), and The Jepson Manual (Baldwin et al. 2012), and 5-Year Status Reviews and Recovery Plans, where available.

Sacramento Valley/Foothills Region

Ione Manzanita (*Arctostaphylos myrtifolia Parry*)

Status

Federal: Threatened

State: None

Critical Habitat: None

Recovery Planning: None

Range

Ione manzanita is found in the Central Sierra Nevada foothills in Amador and Calaveras County (California Department of Fish and Wildlife 2018). The fifteen documented occurrences of this species all fall within the Sacramento Valley region. The species is known from 15 extant (California Department of Fish and Wildlife 2018).

Table B2-1. Occurrences of Ione Manzanita Documented in the Multi-Region HCP Study Area

County	Total Existing Occurrences	Extant Occurrences	Public	Private	Unknown
Amador	11	11	4	8	2
Calaveras	4	4	0	4	0

Source: California Department of Fish and Wildlife 2018.
Notes: Three occurrences occur on public and private land in Amador County.

Habitat Requirements

Ione manzanita is restricted to the Ione soil formation in Amador and Calaveras Counties (U.S. Fish and Wildlife Service 2010). While the Ione Formation extends in discontinuous patches from near Fresno, to north near Lincoln, California, Ione manzanita occurs along approximately 19.5 miles (31.4 kilometers) of the formation centralized near Ione, California. The Ione formation is composed

of fluvial, estuarine and shallow marine deposits developed in a subtropical or tropical climate during the Eocene (35 to 57 million years ago) (U.S. Fish and Wildlife Service 2010). These soils contain high quantities of commercially valuable minerals including quartz sands, kaolinitic (containing a hydrous silicate of aluminum) clays, lignite (low-grade coal), and heavy-mineral-bearing gravels (Force and Creely 2000; Creely and Force 2007). Known from an approximate elevation range of 230 to 2,525 feet (70 – 770 meters) commonly observed associate species include: whiteleaf manzanita (*Arctostaphylos viscida*), chamise (*Adenostoma fasciculatum*), interior live oak (*Quercus wislizeni*), Irish Hill buckwheat (*Eriogonum apricum* var. *prostratum*) and Amador rushrose (*Helianthemum suffrutescens*).

Population Ecology

Ione manzanita is an evergreen, perennial shrub of the Heath Family (Ericaceae). Compared to more ancestral Arctostaphylos species that respond to fire by sprouting from underground storage organs (Wells 1969), Ione manzanita is an obligate-seeder (U.S. Fish and Wildlife Service 2010). As an obligate-seeder, Ione manzanita plants are generally killed by fire and the population is replaced by germination from a long-lived seed whose germination cues are triggered by fire. Initial seed dispersal is facilitated by gravity. However, seed-caching rodents secondarily disperse the seeds by burying them at a depth safe from the fire's extreme heat on the soil's surface (Vander Wall 2010).

Population Trend and Threats

For Ione manzanita, two occurrences are decreasing, 13 occurrences have an unknown population trend, and all of the occurrences are extant (California Department of Fish and Wildlife 2018). Given most of the occurrences inhabit private land, threats to Ione manzanita include development, agricultural clearing, fire control and fuel reduction (U.S. Fish and Wildlife Service 2010). However, Ione manzanita's greatest threat is from the spread of fungal infection from *Fusicoccum* sp. and *Phytophora cinnamomi* (U.S. Fish and Wildlife Service 2010).

Species Management

As there is not currently a *Recovery Plan* for Ione manzanita, the *Ione Manzanita and Ione Buckwheat 5-Year Review: Summary and Evaluation* places a high priority of finalizing a recovery plan for both species (U.S. Fish and Wildlife Service 2010). Given the significant threat from fungal infection, the *5-Year Review* expresses measures should be implemented to restrict the movement of soils and plant material contaminated with fungal infection and conduct research on how to eliminate the disease (U.S Fish and Wildlife Service 2010).

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Pine Hill Ceanothus (*Ceanothus roderickii* W. Knight)

Status

Federal: Endangered

State: Rare

Critical Habitat: None

Recovery Planning: *Recovery Plan for Gabbro Soil Plants of the Central Sierra Nevada Foothills* (U.S. Fish and Wildlife Service 2002)

Range

Pine Hill ceanothus is endemic to the northern Sierra Nevada foothills in the north, central and south areas of the Pine Hill formation in El Dorado County. The species is restricted to gabbro soil openings in chaparral (Wilson 1986).

Table B2-2. Occurrences of Pine Hill ceanothus Documented in the Multi-Region HCP Study Area

County	Total Existing Occurrences	Extant Occurrences	Public	Private	Unknown
Eldorado	8	8	3	3	4

Source: California Department of Fish and Wildlife 2018.
Notes: Two occurrences occur on public and private land in Eldorado County.

Habitat Requirements

Pine Hill ceanothus is found in chaparral and cismontane woodland, often on serpentinite and gabbroic soils (U.S. Fish and Wildlife Service 2002). It is found at elevations between 850 and 2,070 feet. Commonly associated species include whiteleaf manzanita (*Arctostaphylos viscida*), Lemon's ceanothus (*Ceanothus lemmonii*), chamise (*Adenostoma fasciculatum*), El Dorado County mule ears (*Wyethia reticulata*), redberry buckthorn (*Rhamnus crocea*), creeping sage (*Salvia sonomensis*) and Stebbins' morning glory (*Calystegia stebbinsii*), which is also covered in this HCP (California Department of Fish and Wildlife 2018).

Population Ecology

Pine Hill ceanothus is an evergreen shrub of the Buckthorn Family (Rhamnaceae). The species blooms from April to June. Although the Rhamnaceae ancestral response to fire is to resprout from the crown, Pine Hill ceanothus plants are killed by fire. In that species, the populations regenerate from seed, after the dormant seeds are stimulated to germinate by the fire's heat pulse (James 1996, U.S. Fish and Wildlife Service 2002, Vasey and Parker 2014). Capitalizing on the absence of competition, the species will proliferate until overtaken by other shrub species, often by whiteleaf manzanita. Pine Hill ceanothus is dependent for local persistence on accumulation of a long-lived seed bank in between fire intervals (Wells 1969).

Population Trend and Threats

All eight occurrences are extant with one occurrence's trend described as, "Decreasing," and the remaining occurrences' trend is described as "Unknown," (California Department of Fish and Wildlife 2018). Primarily attributed to urbanization, the most pressing threats to Pine Hill ceanothus include habitat loss, habitat fragmentation, alteration of the natural fire regime, and suppression of disturbance (U.S. Fish and Wildlife Service 2002).

Species Management

The Recovery Plan for Gabbro Soil Plants of the Central Sierra Nevada Foothills (U.S. Fish and Wildlife 2010) outlines the following objectives in a multi-species strategy habitat protection and management: surveying and monitoring, research, public participation, outreach, and education. With respect to Pine Hill Ceanothus, species-specific management pertains to fire management that facilitates the natural fire regime to allow sufficient seed bank accumulation, demographic studies determining limiting life stages, and development of propagation techniques.

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Pine Hill Flannelbush (*Fremontodendron decumbens* R. M. Lloyd)

Status

Federal: Endangered

State: Rare

Critical Habitat: None

Recovery Planning: *Recovery Plan for Gabbro Soil Plants of the Central Sierra Nevada Foothills* (U.S. Fish and Wildlife Service 2002)

Range

Pine Hill flannelbush is restricted to gabbro soils along the Sierra Nevada foothills (U.S. Fish and Wildlife Service 2002). Specifically, the species' primary range is within and in the proximity of Pine Hill. Pine Hill flannelbush grows an elevation range of 1,394 to 2,493 feet (425-760 meters) (Baldwin et al. 2012).

Table B2-3. Occurrences of Pine Hill Flannelbush Documented in the Multi-Region HCP Study Area

County	Total Existing Occurrences	Extant Occurrences	Public	Private	Unknown
Eldorado	7	7	2	5	2
Nevada	3	3	2	1	0
Yuba	2	0	1	0	1

Source: California Department of Fish and Wildlife 2018.
Notes: Two occurrences occur on public and private land in Eldorado County. The Owner/Manager for the public occurrence in Yuba County was listed as "BLM?" and was logged as public.

Habitat Requirements

Primarily found in Gabbro Chaparral, a shrub community, the species has also been observed growing on scattered rock outcrops in chaparral and black oak woodland (U.S. Fish and Wildlife Service 2002). Commonly associated species include Ponderosa pine *(Pinus ponderosa*), foothill pine (*P. sabiniana),* chamise (*Adenostoma fasciculatum*), toyon (*Heteromeles arbutifolia)* and bigberry manzanita (*Arctostaphylos glauca*) (Kelman 1991, Boyd 1996).

Population Ecology

Pine Hill flannelbush is an evergreen shrub in the Mallow Family (Malvaceae). The blooming period is from April to July (U.S. Fish and Wildlife Service 2002). Pine Hill flannelbush begins producing flower buds in late winter, but by the time the flowers open, 98% of the flower buds have already been destroyed by insects (Boyd and Serafini 1992). Seventy percent of developing fruit is

destroyed by insects. The remaining fruit dehisce during summer, where seeds are dispersed by ants and eaten by rodents (Boyd 1996). Alluding to fire adaptation, Pine Hill flannelbush seed germination rates were the highest with the addition of heat and ash (Boyd and Serafini 1992). The species is capable of sprouting from established roots (Boyd 1987). Seeds have been demonstrated to remain viable for at least seven years.

Population Trend and Threats

The 12 CNDDB occurrences are presumed extant (California Department of Fish and Wildlife 2018). Primarily attributed to urbanization, the most pressing threats to Pine Hill flannelbush include habitat loss, habitat fragmentation, alteration of the natural fire regime, and suppression of disturbance (U.S. Fish and Wildlife Service 2002).

Species Management

The Recovery Plan for Gabbro Soil Plants of the Central Sierra Nevada Foothills (U.S. Fish and Wildlife 2010) outlines the following objectives in a multi-species strategy habitat protection and management, surveying and monitoring, research, public participation, outreach, and education. With respect to Pine Hill flannelbush, specie-specific management pertains to collecting and banking of seed in Center for Plant Conservation certified botanic gardens.

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Stebbins' Morning-Glory (Calystegia stebbinsii)

Status

Federal: Endangered

State: Endangered

Critical Habitat: None

Recovery Planning: *Recovery Plan for Gabbro Soil Plants of the Central Sierra Nevada Foothills* (U.S. Fish and Wildlife Service 2002)

Range

Stebbins' morning glory is patchily distributed within two populations in the northern and southern range of the Pine Hill soil formation of Eldorado and Nevada Counties (U.S. Fish and Wildlife Service 2002). Stebbins' morning glory grows within the habitat type regarded as gabbroic northern mixed chaparral, which is restricted to Rescue stony loam soils (Holland 1986).

In these counties, the species is known to grow along the elevation range of 607 to 3,583 feet (185 - 1092 meters). The species is known from 15 occurrences, of which one 14 are presumed extant (California Department of Fish and Wildlife 2018).

Table B2-4. Occurrences of Stebbins' Morning Glory Documented in the Multi-Region HCP Study Area

County	Total Existing Occurrences	Extant Occurrences	Public	Private	Unknown
Eldorado	8	7	3	8	0
Nevada	7	7	2	4	3

Source: California Department of Fish and Wildlife 2018.

Notes: Three occurrences occur on public and private land in Eldorado County and two occurrences occur on public and private land in Nevada County. One occurrence in El Dorado County has land ownership listed as private with a question mark and this occurrence was logged as private in the table.

Habitat Requirements

Associated with chaparral on gabbro soils, Stebbins' morning glory grows in chaparral openings. Stebbins' morning glory is commonly associated with whiteleaf manzanita (*Arctostaphylos viscida), chamise (Adenostoma fasciculatum),* manzanita species (*Arctostaphylos* sp.) and foothill pine (*Pinus sabiniana*) (California Department of Fish and Wildlife 2018).

Population Ecology

Proliferating from rootstock after disturbance or germination from a dormant seed bank, the species grows and flowers the year after emergence (U.S. Fish and Wildlife 2002). Stebbins' morning glory is capable of developing extensive root growth while above ground vegetation may not undergo significant change (Eng *in litt.* 1999). The species is shade intolerant and fire-adaptation could be inferred from high germination rates with stimuli from scarification and heat treatments (Nosal

1997). Stebbins' morning glory is most frequently pollinated by Hymenoptera (bees, wasps and ants), Halictidae (solitary bees) and Apidae (honey bees) (Nosal 1997).

Population Trend and Threats

One occurrence has been extirpated and three are considered possibly extirpated (California Department of Fish and Wildlife 2018). Stebbins' morning glory is threatened by habitat fragmentation and suppression of disturbance associated with development (U.S. Fish and Wildlife Service 2002). Specifically, Stebbins' morning glory is threatened by fire suppression as the species grows in a fire-adapted community and is shade intolerant.

Species Management

The Recovery Plan for Gabbro Soil Plants of the Central Sierra Nevada Foothills (U.S. Fish and Wildlife 2010) outlines the following objectives for down-listing Stebbins' morning glory: preserving extant populations, detecting new occurrences for eventual land acquisition, research into the limiting life stages, and seed collection for germination in fragmented populations.

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Layne's Ragwort (*Senecio layneae* Greene; *Packera layneae* [Greene] W. A. Weber & Á. Löve)

Status

Federal: Threatened

State: Rare

Critical Habitat: None

Recovery Planning: *Recovery Plan for Gabbro Soil Plants of the Central Sierra Nevada Foothills* (U.S. Fish and Wildlife Service 2002)

Range

Layne's ragwort's highest occurrence density is within a 40,000-acre area of western El Dorado County that includes the Pine Hill formation and adjacent serpentine outcrops (U.S. Fish and Wildlife Service 2002). A few other populations occur in the Eldorado National Forest in El Dorado County and on Bureau of Land Management managed lands in Yuba County and in the Red Hills Management Area in Tuolumne County (BioSystems Analysis, Inc. 1984, A. Franklin pers. comm. 1997).

Table B2-5. Occurrences of Layne's ragwort Documented in the Multi-Region HCP Study Area

County	Total Existing Occurrences	Extant Occurrences	Public	Private	Unknown
Eldorado	36	36	11	29	3
Placer	1	1	1	0	0
Tuolumne	6	6	6	0	0
Yuba	2	2	2	2	0

Source: California Department of Fish and Wildlife 2018.

Notes: Seven occurrences occur on public and private land in Eldorado County. Two occurrences in Yuba County occur on both public and private land.

Habitat Requirements

Layne's ragwort has been observed to occupy communities dominated by conifers, shrubs and herbaceous species (Williams 2014). The species preferentially inhabits temporary openings on rocky gabbro or serpentine soil and is extirpated from its local inhabitance by neighboring vegetation (Baad and Hanna 1987). Plant density was observed to be the highest on moderate (10-15%) slopes (Williams 2014).

Population Ecology

Layne's ragwort is a perennial and herbaceous dicot that displays an early successional life history (U.S. Fish and Wildlife Service 2002). Germination requirements were observed to vary with elevation. Southern populations germinate easily with high rates (Marsh 2000), but the northern population in Yuba County residing at 1000 feet higher elevation has lower rates of germination. It was postulated that the northern population has a stricter germination syndrome to survive in the cooler, darker conditions (Williams 2014).

Population Trend and Threats

Layne's ragwort has been documented for 45 extant occurrences. Of these occurrences, two are considered "Possibly Extirpated and three have a trend described as "Decreasing," (California Department of Fish and Wildlife 2018). However, the two potential extirpated occurrences are in areas that were graded or where the population was heavily impacted by bridge and road widening work. Primarily attributed to urbanization, the most pressing threats to Layne's ragwort include

habitat loss, habitat fragmentation, alteration of natural fire regime, and suppression of disturbance (U.S. Fish and Wildlife Service 2002).

Species Management

The Recovery Plan for Gabbro Soil Plants of the Central Sierra Nevada Foothills (U.S. Fish and Wildlife 2002) outlines the following objectives in a multi-species strategy habitat protection and management plan: surveying and monitoring, research, public participation, outreach, and education. With respect to Layne's ragwort, management recommendations describe: securing and protecting habitat and maintenance of metapopulation dynamics, studying the germination syndrome, determining the effects of grazing, researching the effects of disturbance and fire on seedling establishment, pollination studies, genetic studies, collection of seeds seed in Center for Plant Conservation certified botanic gardens for the disjunct populations Layne's ragwort, and demographic studies identifying limiting life stages.

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North Coast Region

Beach Layia (*Layia carnosa* [Nutt.] Torr. & A. Gray)

Status

Federal: Endangered

State: Endangered

Critical Habitat: None

Recovery Planning: Seven Coastal Plants and the Myrtle's Silverspot Butterfly Recovery Plan (U.S. Fish and Wildlife Service 1998).

Range

Beach layia occurs along coastal California from Santa Barbara north to Humboldt County (U.S. Fish and Wildlife Service 1998). There are 23 documented occurrences, of which two are considered, "Extirpated," in Humboldt County, one occurrence listed in both San Francisco and San Mateo County is considered "Extirpated," and both Marin and Monterey County have an occurrence considered, "Possibly Extirpated," (California Department of Fish and Wildlife 2018).

Table B2-6. Occurrences of Beach layia Documented in the Multi-Region HCP Study Area

County	Total Existing Occurrences	Extant Occurrences	Public	Private	Unknown
Humboldt	9	7	6	2	0
Marin	6	6	5	1	1
Monterey	4	4	3	1	1
San Francisco	1	0	0	0	0
San Mateo	1	0	0	0	0
Santa Barbara	3	3	3	0	0

Source: California Department of Fish and Wildlife 2018.

Note: Humboldt County has one extant occurrence on private and public land. Marin County has one occurrence that is on both public and private land. Monterey County has one occurrence on public and private land.

Habitat Requirements

Beach layia is restricted to the sparse openings in beach sand dunes, where the species occupies an elevation ranging from 0 to 100 feet (U.S. Fish and Wildlife Service 1998). The species colonizes scarcely vegetated, stabilized dunes or bare blowouts in secondary succession. Commonly associated species include coast buckwheat (*Eriogonum latifolium*), beach pea (*Lathyrus littoralis*), beach sagewort (*Artemisia pycnocephala*), dune bluegrass (*Poa douglasii*), dune goldenrod (*Solidago spathulata*), sand verbenas (*Abronia* sp.), and beach-bur (*Ambrosia chamissonis*).

Population Biology

Beach layia is a succulent, annual herb in the Sunflower family (Asteraceae). Beach layia is a winter annual that germinates between fall and mid-winter and blooms from March to July (U.S. Fish and Wildlife Service 1998). Seeds disperse during late spring and early summer months. Colonies often occur where sparse vegetation traps the wind-dispersed seeds. While little is known of beach layia pollinators (U.S. Fish and Wildlife Service 1998), a box elder bug was observed on the plant and could be a potential pollinator (Johns 2009).

Population Trends and Threats

As a coastal species, beach layia is threatened by invasive species, recreational ORV activities, pedestrians, and urban development. Beach layia populations also demonstrate high inter-annual variation (Botanica Northwest Associates 1992).

Species Management

According to the Seven Coastal Plants and the Myrtle's Silverspot Butterfly Recovery *Plan* (1998), strategies for down-listing beach layia include: restoring and protecting dune habitat and existing populations, carrying out existing land-use plans, adaptive management, and systematic research on the efficacy of reintroduction protocols.

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Central Coast Region

San Benito Evening-Primrose (Camissonia benitensis P. H. Raven)

Status

Federal: Threatened

State:

Critical Habitat: None

Recovery Planning: Recovery Plan for Camissonia benitensis (San Benito evening-primrose) (U.S. Fish and Wildlife Service 2006).

Range

San Benito evening-primrose is restricted to serpentine outcrops within the Central Coast Range of southeastern San Benito County, extreme western Fresno County, and one occurrence is on the border of San Benito County and northeastern Monterey County (U.S. Fish and Wildlife Service 2009, California Department of Fish and Wildlife 2018). The species is known from 60 extant occurrences that primarily reside in and around the Clear Creek Management Area of San Benito and western Fresno Counties (California Department of Fish and Wildlife 2018).

Table B2-7. Occurrences of San Benito Evening-Primrose Documented in the Multi-Region HCP Study Area

County	Total Existing Occurrences	Extant Occurrences	Public	Private	Unknown
Fresno	10	10	9	2	0
Monterey	1	1	0	1	0
San Benito	50	50	30	29	0

Source: California Department of Fish and Wildlife 2018.

Note: One occurrence in Fresno County occurs on both private and public property. One occurrences occurs in both Monterey and San Benito County. Nine occurrences in San Benito County occur on both public and private land.

Habitat Requirements

The species grows in relatively stable alluvial terraces or alluvial outwashes below 4,500 feet (1,372 meters) in elevation (Taylor 1990). San Benito evening-primrose is restricted to residual serpentine or serpentine alluvium substrate, subject to frost-heaving and with a minimal cover of surface gravel. The species grows amongst other annuals in areas with less than 25 percent shrub cover, commonly provided by manzanitas (*Arctostaphylos viscida* and *A. pungens*) and oaks (*Quercus berberidifolia* and. Q*. durata*) (Taylor 1990, Dick et al. 2014).

Population Biology

San Benito evening-primrose self-pollinates, producing seed without assistance from outside abiotic or biotic mechanisms (U.S. Fish and Wildlife Service 2009). The species germinates February to March, blooms from April to June, and seed pods mature in early summer (U.S. Fish and Wildlife Service 2009, California Native Plant Society 2018). A seed bank assessment of San Benito evening-primrose in Clear Creek and San Carlos demonstrated seed bank density ranging from 100 to 4,700 seeds per square meter, which exceeded the number of living plants present. The seed bank data suggests San Benito evening-primrose populations are a function of rainfall instead of the prior year's fecundity (Taylor and Davilla 1989, Taylor 1990). Seed dispersal is facilitated by gravity and evidence of long distance dispersal is evident through the distribution of occurrences separated by streams within a watershed (U.S. Fish and Wildlife Service 2006).

Population Trends and Threats

While all of the known occurrences of San Benito evening-primrose are considered extant, the species is threatened by habitat destruction via erosion and other impacts from off-road vehicles, hiking, camping and gravel removal (U.S. Fish and Wildlife Service 2006).

Species Management

According to the *Recovery Plan for Camissonia benitensis (San Benito evening primrose)* (U.S. Fish and Wildlife Service 2006), the objectives to provide a framework for recovery include: protecting extant occurrences and suitable habitat, decreasing soil erosion and stream sedimentation of the watersheds supporting suitable habitat, developing a species management plan including needed research, developing an *ex situ* seed collection, and conducting a public outreach program. The amendment to the Clear Creek Management Plan in 2006 resulted in a reduction of the open routes and barrens (U.S. Bureau of Land Management 2006). Clear Creek Management Area has experience

past closures due to risks of exposure to air born asbestos, which benefited the San Benito evening-primrose (U.S. Bureau of Land Management 2008).

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Monterey Spineflower (*Chorizanthe pungens* Benth. subsp. *pungens*)

Status

Federal: Threatened

State: None.

Critical Habitat: Critical habitat for Monterey spineflower was designated in 2008 (73 FR 1525, January 9, 2008). Approximately 18,829 acres of critical habitat were designated in Santa Cruz and Monterey Counties, all of which is within the Central Coast Region.

Recovery Planning: *Seven Coastal Plants and the Myrtle's Silverspot Butterfly Recovery Plan* (U.S. Fish and Wildlife Service 1998).

Range

Monterey spineflower is endemic to central coastal California near Monterey Bay, in Monterey, Santa Cruz, and San Luis Obispo Counties (California Department of Fish and Wildlife 2018). There are 50 known occurrences, one of which is considered, "Possibly Extirpated," (California Department of Fish and Wildlife 2018). All the occurrences are within the Central Coast region.

Table B2-9. Occurrences of Monterey spineflower Documented in the Multi-Region HCP Study Area

County	Total Existing Occurrences	Extant Occurrences	Public	Private	Unknown
Monterey	39	39	12	15	13
San Luis Obispo	1	1	0	0	1
Santa Cruz	11	11	2	4	5

Source: California Department of Fish and Wildlife 2018.

Note: Monterey County has one occurrence on both public and private land. One occurrence lies in both Monterey and Santa Cruz County with an unknown land owner.

Habitat Requirements

Monterey spineflower colonizes open sandy sites and tends to invade roadsides and firebreaks (U.S. Fish and Wildlife Service 1998). It is found in maritime chaparral, coastal live oak woodlands, coastal scrub, grasslands, and recent coastal dune habitats (U.S. Fish and Wildlife Service 1998). Monterey spineflower occupies sandy soils derived from ancient stabilized dunes from the ice age (Pleistocene) (Zoger and Pavlik 1987). The subspecies is associated with beach-bur (*Ambrosia chamissonis*), coastal sagewort (*Artemisia pycnocephala*), and mock heather (*Ericameria ericoides*) (California Department of Fish and Wildlife 2018).

Population Biology

Monterey spineflower is an annual herb in the Polygonaceae Family (Buckwheat). The blooming period is from April to June. Seed dispersal is facilitated by the spiny bracts attaching to passing animals (U.S. Fish and Wildlife Service 1998). Thriving in open or sparsely vegetation areas lends to the species' recruitment in areas without competition and of recent disturbance (U.S. Fish and Wildlife 1998).

Population Trends and Threats

Urban development in coastal cities have resulted in the loss of large portions of the Monterey spineflower range (U.S. Fish and Wildlife Service 1998). Introduction of nonnative African iceplant (*Carpobrotus edulis*) and European beach grass (*Ammophila arenaria*) for dune stabilization has altered typical Monterey spineflower habitat and made conditions unsuitable for the species. Historic occurrences in the Salinas Valley have been extirpated, primarily because of agricultural land conversion.

Species Management

According to the *Seven Coastal Plants and the Myrtle's Silverspot Butterfly Recovery Plan* (1998), conservation measures for Monterey spineflower largely follow the removal of nonnative iceplant,

restoring natural dune function, and enforcement of local guidelines protecting and mitigating impacts to native habitat.

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Robust Spineflower (*Chorizanthe robusta* Parry subsp. *robusta*)

Status

Federal: Endangered

State: None

Critical Habitat: Critical habitat for robust spineflower was designated in 2002 (67 FR 36822–36845, May 28, 2002). Approximately 469 acres of critical habitat were designated in Santa Cruz County, all of which is within the Central Coast Region.

Recovery: Recovery Plan for Robust Spineflower (Chorizanthe robusta robusta) (U.S. Fish and Wildlife Service 2004).

Range

Robust spineflower once ranged for 65 miles from Alameda County on the eastern side of the San Francisco Bay, south to Monterey County (U.S. Fish and Wildlife Service 2004). The 2004 recovery plan describes the species' presence in the Point Reyes National Seashore in Marin County, but this occurrence was eliminated (U.S. Fish and Wildlife Service 2010) because a genetics study demonstrated this occurrence is not robust spineflower, but is instead a morphologically similar inland species, woolly-headed spineflower (*Chorizanthe cuspidata* var. *villosa*) (Brinegar and Baron 2008). The 2004 recovery plan also describes the identity of the Alameda occurrence as "unresolved," but the occurrence is from 1948 and is no longer present (Reveal and Hardam 1989, U.S. Fish and Wildlife Service 2004). In fact, the occurrences in Alameda, San Francisco, San Mateo and Santa Clara are regarded as, "Possibly Extirpated," through the California Native Diversity Database (California Department of Fish and Wildlife 2018).

Table B2-10. Occurrences of Robust Spineflower Documented in the Multi-Region HCP Study Area

County	Total Existing Occurrences	Extant Occurrences	Public	Private	Unknown
Alameda	1	1	0	0	1
Santa Clara	2	2	0	0	2
Santa Cruz	15	15	8	6	2
San Francisco	1	1	0	0	1
San Mateo	2	2	0	0	2

Source: California Department of Fish and Wildlife 2018.

Note: One occurrence is in both San Francisco and San Mateo Counties. Land ownership of one occurrence in Santa Cruz County is listed as, "City of Aptos? PVT," and was logged as both public and private land

Habitat Requirements

Robust spineflower grows in sandy soils associated with active coastal dunes and inland sites with sandy soils (U.S. Fish and Wildlife Service 2004). The species is associated with the following habitat types: coastal dune, coastal scrub grassland, grassland, maritime chaparral, and oak woodlands. Also covered in this HCP, Monterey spineflower and sand gilia are known to co-occur with robust spineflower (U.S. Fish and Wildlife Service 2004). Robust spineflower is known to thrive in communities with little to no cover by nonnative species. Robust spineflower doesn't compete well with other species and as a result, performs well in areas of disturbance as seen in natural dune dynamics (U.S. Fish and Wildlife Service 2004).

Population Biology

Robust spineflower is an annual, dicot of the Buckwheat Family (Polygonaceae). The species germinates during the winter and flowers April to June, while some individuals may continue blooming during the summer (U.S. Fish and Wildlife Service 2004). Frequently observed pollinators include insects from the following orders: Diptera, Hymenoptera, Lepidoptera, and Coleoptera (Murphy 2003). While the species is capable of self-pollination, this capability only produces 19 percent of the seed (Murphy 2003). As is common is other annual spineflower (*Chorizanthe*) species, robust spineflower is protandrous, a reproductive strategy where the stamen-bearing anthers shed pollen prior to the maturation of the style (female reproductive structure). If pollination doesn't occur within 1 to 2 days, self-pollination may occur as the flower closes at the end of the day (Reveal 2001). Out of 100 seedlings, 42 survived to flowering at a parcel in Buena Vista (Baron 1998). Maturing by August, seed dispersal is facilitated by the spiny involucral spines on the flowers (U.S. Fish and Wildlife Service 2004).

Population Trends and Threats

As is common with annual species, robust spineflower demonstrates sizable inter-annual variations in population size. At the time of its listing, robust spineflower is threatened by recreation, residential development, and introduction of nonnative species (U.S. Fish and Wildlife Service 1994). Historically, many populations of robust spineflower were extirpated by urbanization and conversion of suitable habitat for agriculture (U.S. Fish and Wildlife Service 2010). Where occupied habitat remains, successional processes could result in suitable robust spineflower habitat being

shaded out (U.S. Fish and Wildlife Service 2010). Occurrences on private land are threatened by development.

Species Management

According to the *Recovery Plan for Chorizanthe robusta var. robusta (Robust Spineflower)* (U.S. Fish and Wildlife Service 2004), the special management considerations to maintain the primary constituents of the robust spineflower include:

- Maintaining the supply and movement of sand in the coastal occurrences.
- In more interior locations, the sandy soils occupied by robust spineflower should be maintained through limiting or restricting the use of herbicides, fertilizers or other soil amendments.
- In order to maintain the habitat needs of pollinators and seed dispersal agents, the associated plant communities of robust spineflower should be maintained.
- Fragmentation of suitable habitat should be limited to enable seed dispersal agents plentiful options.
- In coastal scrub and maritime chaparral, it may be beneficial to maintain a mosaic of different-aged stands, which could provide canopy openings for robust spineflower.
- Invasion of nonnative species should be actively managed to maintain open habitat for robust-spineflower.
- In areas subject to high foot traffic by humans or livestock, fencing could protect the species from trampling.

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Kern Mallow (*Eremalche parryi* [Greene] *Greene subsp. kernensis* [C. B. Wolf] D. M. Bates; *Eremalche kernensis* [C. B. Wolf])

Status

Federal: Endangered

State: None

Critical Habitat: None

Recovery: *Recovery plan for upland species of the San Joaquin Valley, California* (U.S. Fish and Wildlife Service 1998)

Range

Kern mallow was originally described with an incredibly limited contained within Temblor Valley, Belridge Oil Field, and two sites west of Buttonwillow in western Kern County (Wolf 1938). At the time of the Kern mallow's listing, the species was known from only 6 locations in an approximate 40 square mile area (U.S. Fish and Wildlife Service 1990 and 1998). However, many of the previous records were found to be misidentified (Andreason et al. 2002) and the range was reduced to a narrow strip along Lokern Road in western Kern County (Cypher 2002). Presently, Kern mallow is known from Kings, San Luis Obispo, Santa Barbara, Ventura, Tulare and Kern County. The majority of the known occurrences are east of the Sierra Madre Mountains and centered around the Carrizo Plain National Monument (California Department of Fish and Wildlife 2018). Kern mallow is known from 163 occurrences, of which two are considered, "Extirpated," (California Department of Fish and Wildlife 2018). Most of the extant occurrences are on public land.

Table B2-11. Kern Mallow Occurrences Documented in the Multi-Region HCP Study Area

County	Total Existing Occurrences	Extant Occurrences	Public	Private	Unknown
Kern	81	79	25	37	27
Kings	1	1	0	0	1
San Luis Obispo	76	76	52	16	11
Santa Barbara	1	1	0	0	1
Tulare	3	3	1	0	2
Ventura	4	4	3	0	1

Source: California Department of Fish and Wildlife 2018.

Note: Ten occurrences in Kern County occur in both public and private land. With the landowner described as unknown, one occurrence lies both in Kern and San Luis Obispo County and one occurrence lies both in Kern and Santa Barbara County. In San Luis Obispo County, three occurrences lie on public and private land.

Habitat Requirements

At elevations below 2,000 feet, Kern mallow occupies arid grassland and saltbush scrub habitats (U.S. Fish and Wildlife Service 1998). Instead of growing in alkaline scalds, the Kern mallow grows in and around spiny saltbush (Atriplex spinifera), common saltbush (A. polycarpa), and patches of herbaceous species (U.S. Fish and Wildlife Service 1998). Kern mallow typically grows in areas of less than 25 percent shrub cover (Taylor and Davilla 1986). Commonly associated herbs include: red brome (Bromus madritensis ssp. rubens), red stemmed filaree (Erodium cicutarium), woolly goldfields (Lasthenia minor), and white Sierran layia (Layia pentachaeta ssp. albida). At mid-elevations ranging from 2,000 to 3,000 feet, Kern mallow is commonly associated with desert tea (Ephedra californica) (U.S. Fish and Wildlife Service 2013, California Department of Fish and Wildlife 2018). At elevations exceeding 3,000 feet, Kern mallow typically grows in juniper woodlands amongst California juniper (Juniperus californicus) (De Vries 2011).

Population Biology

Kern mallow is an annual dicot of the Mallow Family (Malvaceae). The species germinates in January and blooms from March to May (U.S. Fish and Wildlife Service 1998). As commonly observed with arid annuals, Kern mallow's populations vary tremendous between years associated with annual precipitation (U.S. Fish and Wildlife Service 1998). Methods of seed dispersal are unknown, but likely facilitated by small animals and wind (Taylor and Davilla 1986, Mazer et al. 1993, Cypher 1994, U.S. Fish and Wildlife Service 1998 and 2013). Preliminary studies demonstrated Kern mallow is capable of self-fertilization, but produces far greater seed with insect pollination (U.S. Fish and Wildlife Service 1998).

Population Trends and Threats

Annual population numbers vary drastically following the trend of rainfall. While 81 occurrences reside on public land and will likely be protected from development, 52 occurrences inhabit private land risk extirpation due to development (California Department of Fish and Wildlife Service 2018). The species is threatened by commercial and residential development, pipeline operation and maintenance activities, invasion of nonnative species, and over grazing (U.S. Fish and Wildlife Service 1998).

Species Management

According to the *Recovery plan for upland species of the San Joaquin Valley, California* (U.S. Fish and Wildlife Service 1998), conservation strategies for the Kern mallow include: research on the demography and reproductive biology of the Kern mallow, salvage of plant specimens and seeds in occupied areas intended for development, and population monitoring and research on the species' response to grazing.

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Monterey Gilia (*Gilia tenuiflora* Benth. subsp. a*renaria* [Benth.] A. D. Grant & V. Grant)

Status

Federal: Endangered

State: Threatened

Critical Habitat: None

Recovery Planning: Seven Coastal Plants and the Myrtle's Silverspot Butterfly Recovery Plan (U.S. Fish and Wildlife Service 1998).

Range

Sand gilia is distributed in discontinuous populations and its range extends from Spanish Bay on the Monterey Peninsula north to Sunset Beach State Park in Santa Cruz County (California Department of Fish and Wildlife 2018). It is known from 31 occurrences, four of which are extirpated. All of the occurrences are within the Central Coast region.

Table B2-12. Occurrences of Sand Gilia Documented in the Multi-Region HCP Study Area

County	Total Existing Occurrences	Extant Occurrences	Public	Private	Unknown
Monterey	30	26	17	8	3
Santa Cruz	1	1	1	0	0

Source: California Department of Fish and Wildlife 2018.
Note: Two occurrences in Monterey County occur in both private and public property.

Habitat Requirements

Sand gilia is generally found in the fog belt area, but extends to inland areas as well. Along the coast, sand gilia is found on rear dunes, near the dune summit in level areas, and on depressions or slopes in wind-sheltered openings in low-growing dune scrub vegetation (California Department of Fish and Wildlife 2018). It does not occur in areas exposed to strong winds and salt spray (U.S. Fish and Wildlife Service 2005). On ancient dune soils, which extend inland, it occurs in openings among maritime chaparral, coastal sage scrub, oak woodlands, grasslands, and where other vegetative cover is low. It is found at elevations up to 800 feet. Sand gilia is commonly associated with the following species: silver beach lupine (*Lupinus chamissonis*), common phacelia (*Phacelia distans*), seaside fiddleneck (*Amsinckia spectabilis*), coast buckwheat (*Eriogonum latifolium*), sun cup species (*Camissonia contorta, C. micrantha, C cheiranthifolia*), Canada toadflax (*Linaria canadensis*), sand

pygmy weed (*Crassula connata*), dune knotweed (*Polygonum paronychia*), slender fescue (*Vulpia octoflora*) and Monterey spineflower (*Chorizanthe pungens* var. *pungens*), which is also covered under this HCP.

Population Biology

Sand gilia is an annual herb in the Polemoniaceae Family (Phlox). Sand gilia typically germinates from December to February (Dorrell-Canepa 1994). It is able to self-pollinate as well as outcross, and fruit is set from the end of April to the end of May (Grant and Graft 1965, U.S. Fish and Wildlife Service 2005). It produces small seeds that are dropped or shaken from their capsules and are then dispersed by likely gravity or wind (U.S. Fish and Wildlife Service 1998). The plant occurs along trails and roadsides, on the cut banks of sandy ephemeral drainages, in recently burned chaparral, and in other disturbed patches. Most populations are small and localized.

Population Trends and Threats

Sand gilia is threatened by encroachment of invasive plants, trampling by equestrians and pedestrians, and development (U.S. Fish and Wildlife Service 1998). Extirpation of three of the four occurrences can be attributed to development.

Species Management

According to the Recovery Plan (1998), strategies for down-listing Sand Gilia include: restoring and protecting dune habitat and existing populations, carrying out existing land-use plans, adaptive management, and systematic research on the efficacy of reintroduction protocols.

References

California Native Plant Society, Rare Plant Program. 2018. Inventory of Rare and Endangered Plants of California (online edition, v8-03 0.39). Website http://www.rareplants.cnps.org [accessed 13 February 2018].

California Natural Diversity Database. 2018. RareFind 5 [Internet]. California Department of Fish and Wildlife. Available at: https://www.wildlife.ca.gov/Data/CNDDB/Maps-and-Data. Accessed February 13, 2018.

Dorrell-Canepa,Joey. 1994. An Autoecological Study of Gilia tenuflora ssp. arenaria. Prepared for Calif. Dept. of Fish and Game. Sacramento, CA.

Grant, V. K.A. Grant 1965. *Flower pollination in the Phlox family*. Columbia University Press, New York, New York. 177pp.

U.S. Fish and Wildlife Service. 1998. Seven Coastal Plants and the Myrtle's Silverspot Butterfly Recovery Plan. Portland, Oregon. 141 pp.

———. 2005. Biological opinion for Bureau of Land Management ongoing activities on Fort Ord public lands, Monterey County, California ((1-8-04-F/C-22). Fish and Wildlife Service. Ventura, California. December 30, 2005.

Yadon's Rein Orchid (*Piperia yadonii* Rand. Morgan & J. Ackerman)

Status

Federal: Endangered

State: None

Critical Habitat: Designated, (72 FR 60410 60450, October 24, 2007). Approximately 2,117 acres of critical habitat were designated in Monterey County between the Monterey Peninsula and Big Sur. All the critical habitat is within the Central Coast Region.

Recovery Planning: *Recovery Plan for Five Plants from Monterey County, California* (U.S. Fish and Wildlife Service 2004).

Range

Yadon's rein orchid is restricted to the central California coast in Monterey County, from the vicinity of Monterey Bay south to Big Sur. It is known from 23 occurrences, one of which is considered, "Potentially Extirpated," (California Department of Fish and Wildlife 2018). All of these occurrences are within the Central Coast region.

Table B2-13. Occurrences of Yadon's rein orchid Documented in the Multi-Region HCP Study Area

County	Total Existing Occurrences	Extant Occurrences	Public	Private	Unknown
Monterey	23	23	9	14	2

Source: California Department of Fish and Wildlife 2018.
Note: Two occurrences in Monterey County occur in both private and public property.

Habitat Requirements

Yadon's rein orchid generally grows on sandy loam soils in coastal coniferous forests with a relatively open canopy of Monterey pines (*Pinus radiata*) (U.S. Fish and Wildlife Service 2009). The species can also be found on ridges in maritime chaparral growing within dwarfed Hooker's manzanita (*Arctostaphylos hookeri*). Yadon's rein orchid occurs at elevations between 30 and 1,360 feet. Commonly associated species include Pajaro manzanita (Arctostaphylos pajaroensis), chaise (*Adenostoma fasciculatum*), Monterey ceanothus (*Ceanothus cuneatus* var. *rigidus*), golden-yarrow (*Eriophyllum confertiflorum*), and bush monkeyflower (*Mimulus aurantiacus*) (Doak and Graff 2001)

Population Biology

Yadon's rein orchid is a perennial, herbaceous monocot of the Orchid Family (Orchidaceae), which blooms from May to August. As with other orchids, it is likely Yadon's rein orchid requires a symbiosis with a fungus for germination (U.S. Fish and Wildlife Service 2009). Also commonly observed in orchids, only a small proportion of Yadon's rein orchid were observed to bloom each year (Allen 1996). Primarily facilitated by nocturnal, short-tongued moths, pollination of Yadon's rein orchid produces a greater quantity of seeds compared to selfing (Doak and Graff 2001).

Population Trends and Threats

With a single occurrence considered "Possibly Extirpated," the extant occurrences appears to be relatively stable. The species is threatened by urbanization, recreational development, non-native plants, road maintenance, and herbivory (California Native Plant Society 2018)

Species Management

According to *the Recovery Plan for Five Plants from Monterey County* (U.S. Fish and Wildlife Service 2004), downlisting of Yadon's rein orchid can be achieved by permanent protection of presently occupied habitat, control of invasive weeds the protected habitat, development of life-history informed management strategies, conduct monitoring that demonstrates long-term viability of existing populations, and establish seed banks at a recognized institutions.

References

Allen, D. 1996. Results of two consecutive years of surveys for Yadon's piperia (Piperia yadonii). 1 p. + appendices.

California Native Plant Society, Rare Plant Program. 2018. Inventory of Rare and Endangered Plants of California (online edition, v8-03 0.39). Website http://www.rareplants.cnps.org [accessed 13 February 2018].

California Natural Diversity Database. 2018. RareFind 5 [Internet]. California Department of Fish and Wildlife. Available at: https://www.wildlife.ca.gov/Data/CNDDB/Maps-and-Data. Accessed February 13, 2018.

Doak, D.F., and A. Graff. 2001. Reproductive biology and pollination ecology of the federally endangered Yadon's piperia (Piperia yadonii, Orchidaceae) in Monterey County, California. Unpublished report prepared for U.S. Fish and Wildlife Service, Ventura Field Office, Ventura, California. 45 pp.

U.S. Fish and Wildlife Service. 2004. Recovery Plan for Five Plants from Monterey County, California. Portland, Oregon. xii +159 pp.

———. 2009. Piperia yadonii (Yadon's piperia) 5-Year Review: Summary and Evaluation. August. Ventura, California.

Appendix C

Implementation Tools

Appendix C

Implementation Tools—Contents

C1. Land Acquisition Proposal Template

C2. Conservation Easement Template

C3. Management Plan Outline

C4. Mitigation Monitoring Report Summary

C5. Morro Shoulderband Snail Guidance

C6. VELB Conservation Program Implementation

Attachment C6-1. VELB Conservation Program Compliance Brochure English

Attachment C6-2. VELB Conservation Program Compliance Brochure Spanish

C7. Impact Accounting Methodology for Annual Plants

C8. Endangered Species Act Section 7 Compliance Tools

Figure C8-1. Federal Lands and HCP Areas

Figure C8-2. Section 7 Compliance Routes

Attachment C8-1. Biological Assessment Template Outline

Attachment C8-2. Draft Section 7 Compliance Letters

Appendix C1

Land Acquisition Form Proposal Template

Summary Cover Sheet for Land Acquisition Form

Executive Summary

Locational and Legal Summary

APN(s):	Ownership:
	Proponent(s):
County:	Sectional cords (MDBM):
Nearest City:	
Total Acres of Credit:	

Summary of Proposed Mitigation, by Species

Species Name	Total Acres of Property	Acres Approved for MRHCP Credit	USFWS Obligation	CDFW Obligation

Signatures Verifying That Parcels Are Acceptable for Use in Mitigation

Entity	Signature/Email/eSign	*Or* Name, Title, and Date of Signature
USFWS:		
CDFW:		
PG&E:		

Supporting Attachments

Conservation Easement Template

PLEASE NOTE:
The following Conservation Easement Deed is provided by the Sacramento Fish and Wildlife Office. Any modifications to this template shall be identified using tracked changes or other editable electronic comparison and explained in a memorandum.
(Template Version Date: July 10, 2012)

RECORDING REQUESTED BY AND
WHEN RECORDED MAIL TO:

[***Fill in Grantee Name/Address***]
Grantee Name
Grantee Address
City, State ZIP
Attn:_____

_____
Space Above Line for Recorder's Use Only

CONSERVATION EASEMENT DEED
[*Insert Conservation Site Name*]

THIS CONSERVATION EASEMENT DEED ("Conservation Easement") is made as of the _____ day of _____, 20____, by [***insert full legal name(s) of Grantor:*** _____] ("Grantor"), in favor of [***insert Grantee's full legal name:*** _____] ("Grantee"), with reference to the following facts:

RECITALS

A. Grantor is the sole owner in fee simple of certain real property containing approximately _____ acres, located in the City of [***insert City name***], County of [***insert County name***], State of California, and designated Assessor's Parcel Number(s) [***insert Assessor's Parcel Number(s)***] (the "Conservation Site Property"). The Conservation Site Property is legally described and depicted in **Exhibit A** attached to this Conservation Easement and incorporated in it by this reference.

B. The Conservation Site Property possesses wildlife and habitat values of great importance to Grantee, the people of the State of California and the people of the United States. The Conservation Site Property will provide high quality natural, restored and/or enhanced habitat for [***specify listed and sensitive plant and/or animal species***] and contain [***list habitats; native and/or non-native***]. Individually and collectively, these wildlife and habitat values comprise the "Conservation Values" of the Conservation Site Property.

C. The United States Fish and Wildlife Service (the "USFWS"), an agency within the United States Department of the Interior, has jurisdiction over the conservation, protection, restoration and management of fish, wildlife, native plants, and the habitat necessary for biologically sustainable populations of these species within the United States pursuant to the federal Endangered Species Act (ESA), 16 U.S.C. Section 1531, *et seq.*, the Fish and Wildlife Coordination Act, 16 U.S.C. Sections 661-666c, the Fish and Wildlife Act of 1956, 16 U.S.C. Section 742(f), *et seq.*, and other provisions of federal law.

D. [***Use this version of Recital E when qualified nonprofit organization is Grantee***]. Grantee is authorized to hold this conservation easement pursuant to California Civil Code Section 815.3 and Government Code Section 65965. Specifically, Grantee is (i) a tax-exempt nonprofit organization qualified under section 501(c) (3) of the Internal Revenue Code of 1986, as amended, and qualified to do business in California; (ii) a "qualified organization" as defined in section 170(h) (3) of the Internal Revenue Code; and (iii) an organization which has as its primary and principal purpose and activity the protection and preservation of natural lands or resources in its natural, scenic, agricultural, forested, or open space condition or use.

[***Use this version of Recital E when governmental entity is Grantee***]. Grantee is authorized to hold this conservation easement pursuant to California Civil Code Section 815.3. Specifically, Grantee is a governmental entity identified in Civil Code Section 815.3 (b) and otherwise authorized to acquire and hold title to real property.

E. This Conservation Easement is being established by Grantor and Grantee knowingly and voluntarily as a means to implement certain agreed upon conservation measures as described in the Biological Opinion, USFWS File No. **[*insert number*]**, issued by the **[*insert USFWS Field Office name*]**. These conservation measures were proposed by **[*insert Project Proponent Name*]** as a means of minimizing the effect(s) of the [***Insert Project Name***] Project on the **[*insert species*]**, federally listed as **[*choose one:*** threatened ***or*** endangered**]** under the ESA. To fully implement these conservation measures, a Conservation Site Development Plan, Interim Management Plan (if applicable), and a Long-term Management Plan have been developed, and are incorporated by this reference into this Conservation Easement as if fully set forth herein.

A final, approved copy of the Development Plan and the Management Plan, and any amendments thereto approved by the USFWS, shall be kept on file at the **[*insert Field Office name*]** of the USFWS. If Grantor, or any successor or assign, requires an official copy of the Development Plan or the Management Plan, it should request a copy from the USFWS at its address for notices listed in Section 12 of this Conservation Easement.

F. All section numbers referred to in this Conservation Easement are references to sections within this Conservation Easement, unless otherwise indicated.

COVENANTS, TERMS, CONDITIONS AND RESTRICTIONS

For good and valuable consideration, the receipt and sufficiency of which is hereby acknowledged, and pursuant to the laws of the United States and the State of California, including California Civil Code Section 815, *et seq.*, Grantor hereby voluntarily grants and conveys to Grantee a conservation easement in perpetuity over the Conservation Site Property.

1. Purposes.

The purposes of this Conservation Easement are to ensure that the Conservation Site Property will be retained forever in its natural, restored, or enhanced condition as contemplated by the Development Plan and the Management Plan, and to prevent any use of the Conservation Site Property that will impair or interfere with the Conservation Values of the Conservation Site Property. Grantor intends that this Conservation Easement will confine the use of the Conservation Site Property to activities that are consistent with such purposes, including, without limitation, those involving the preservation, restoration and enhancement of native species and their habitats implemented in accordance with the Development Plan and the Management Plan.

2. Grantee's Rights.

To accomplish the purposes of this Conservation Easement, Grantor hereby grants and conveys the following rights to Grantee:

(a) To preserve and protect the Conservation Values of the Conservation Site Property.

(b) To enter the Conservation Site Property at reasonable times, in order to monitor compliance with and otherwise enforce the terms of this Conservation Easement, the Development Plan, and the Management Plan and to implement at Grantee's sole discretion Development Plan and Management Plan activities that have not been implemented, provided that Grantee shall not unreasonably interfere with Grantor's authorized use and quiet enjoyment of the Conservation Site Property.

(c) To prevent any activity on or use of the Conservation Site Property that is inconsistent with the purposes of this Conservation Easement and to require the restoration of such areas or features of the Conservation Site Property that may be damaged by any act, failure to act, or any use or activity that is inconsistent with the purposes of this Conservation Easement.

(d) To require that all mineral, air and water rights as Grantee deems necessary to preserve and protect the biological resources and Conservation Values of the Conservation Site Property shall remain a part of and be put to beneficial use upon the Conservation Site Property, consistent with the purposes of this Conservation Easement.

(e) All present and future development rights appurtenant to, allocated, implied, reserved or inherent in the Conservation Site Property; such rights are hereby terminated and extinguished, and may not be used on or transferred to any portion of the Conservation Site Property, nor any other property adjacent or otherwise.

3. Prohibited Uses.

Any activity on or use of the Conservation Site Property that is inconsistent with the purposes of this Conservation Easement is prohibited. Without limiting the generality of the foregoing, the following uses and activities by Grantor, Grantor's agents, and third parties are expressly prohibited:

(a) Unseasonable watering; use of fertilizers, pesticides, biocides, herbicides or other agricultural chemicals; weed abatement activities; incompatible fire protection activities; and any and all other activities and uses which may impair or interfere with the purposes of this Conservation Easement [***include the following language only if the Development Plan or Management Plan, including any adaptive management measures, specifies such an exception:***], except for [***insert specific exception(s)***] as specifically provided in the [***specify:*** Development Plan ***or*** Management Plan].

(b) Use of off-road vehicles and use of any other motorized vehicles except on existing roadways [***include the following language only if the Development Plan or Management Plan, including any adaptive management measures, specifies such an exception:***], except for [***insert specific exception(s)***] as specifically provided in the [***specify:*** Development Plan ***or*** Management Plan].

(c) Agricultural activity of any kind [***include the following language only if the Development Plan or Management Plan, including any adaptive management measures, specifies such an exception:***] except grazing for vegetation management as specifically provided in the [***specify:*** Development Plan ***or*** Management Plan].

(d) Recreational activities, including, but not limited to, horseback riding, biking, hunting or fishing except for personal, non-commercial, recreational activities of the Grantor, so long as such activities are consistent with the purposes of this Conservation Easement and specifically provided for in the Management Plan.

(e) Commercial, industrial, residential, or institutional uses.

(f) Any legal or de facto division, subdivision or partitioning of the Conservation Site Property.

(g) Construction, reconstruction, erecting or placement of any building, billboard or sign, or any other structure or improvement of any kind [***include the following language only if the Development Plan or Management Plan specifies such an exception:***], except for [***insert specific exception(s)***] as specifically provided in the [***specify:*** Development Plan ***or*** Management Plan].

(h) Depositing or accumulation of soil, trash, ashes, refuse, waste, bio-solids or any other materials.

(i) Planting, introduction or dispersal of non-native or exotic plant or animal species.

(j) Filling, dumping, excavating, draining, dredging, mining, drilling, removing or exploring for or extracting minerals, loam, soil, sand, gravel, rock or other material on or below the surface of the Conservation Site Property, or granting or authorizing surface entry for any of these purposes.

(k) Altering the surface or general topography of the Conservation Site Property, including but not limited to any alterations to habitat, building roads or trails, paving or otherwise covering the Conservation Site Property with concrete, asphalt or any other impervious material except for those habitat management activities specified in the Development Plan or Management Plan.

(l) Removing, destroying, or cutting of trees, shrubs or other vegetation, except as required by law for (i) fire breaks, (ii) maintenance of existing foot trails or roads, or (iii) prevention or treatment of disease [***include the following language only if the Development Plan or Management Plan specifies such an exception:***]; and except for [***insert specific exception(s)***] as specifically provided in the [***specify:*** Development Plan ***or*** Management Plan].

(m) Manipulating, impounding or altering any natural water course, body of water or water circulation on the Conservation Site Property, and any activities or uses detrimental to water quality, including but not limited to degradation or pollution of any surface or sub-surface waters [***include the following language only if the Development Plan or Management Plan specifies such an exception:***], except for [***insert specific exception(s)***] as specifically provided in the [***specify:*** Development Plan ***or*** Management Plan].

(n) Without the prior written consent of Grantee, which Grantee may withhold, transferring, encumbering, selling, leasing, or otherwise separating the mineral, air or water rights for the Conservation Site Property; changing the place or purpose of use of the water rights; abandoning or allowing the abandonment of, by action or inaction, any water or water rights, ditch or ditch rights, spring rights, reservoir or storage rights, wells, ground water rights, or other rights in and to the use of water historically used on or otherwise appurtenant to the Conservation Site Property, including but not limited to: (i) riparian water rights; (ii) appropriative water rights; (iii) rights to waters which are secured under contract with any irrigation or water district, to the extent such waters are customarily applied to the Conservation Site Property; and (iv) any water from wells that are in existence or may be constructed in the future on the Conservation Site Property.

(o) Engaging in any use or activity that may violate, or may fail to comply with, relevant federal, state, or local laws, regulations, or policies applicable to Grantor, the Conservation Site Property, or the use or activity in question.

4. Grantee's Duties.

(a) To ensure that the purposes of this Conservation Easement as described in Section 1 are being accomplished, Grantee and its successors and assigns shall:

(1) Perform, at a minimum on an annual basis, compliance monitoring inspections of the Conservation Site Property; and

(2) Prepare reports on the results of the compliance monitoring inspections, and provide these reports to the USFWS on an annual basis.

5. Grantor's Duties.

Grantor shall undertake all reasonable actions to prevent the unlawful entry and trespass by persons whose activities may degrade or harm the Conservation Values of the Conservation Site Property or that are otherwise inconsistent with this Conservation Easement. In addition, Grantor shall undertake all necessary actions to perfect and defend Grantee's rights under Section 2 of this Conservation Easement, and to observe and carry out the obligations of Grantor under the Development Plan and the Management Plan.

6. Reserved Rights.

Grantor reserves to itself, and to its personal representatives, heirs, successors, and assigns, all rights accruing from Grantor's ownership of the Conservation Site Property, including the right to engage in or permit or invite others to engage in all uses of the Conservation Site Property that are not prohibited or limited by, and are consistent with the purposes of, this Conservation Easement.

7. Grantee's Remedies.

If Grantee determines that a violation of this Conservation Easement has occurred or is threatened, Grantee shall give written notice to Grantor of such violation and demand in writing the cure of such violation ("Notice of Violation"). If Grantor fails to cure the violation within thirty (30) days after receipt of a Notice of Violation, or if the cure reasonably requires more than thirty (30) days to complete and Grantor fails to begin the cure within the thirty (30)-day period or fails to continue diligently to complete the cure, Grantee may bring an action at law or in equity in a court of competent jurisdiction for any or all of the following: to recover any damages to which Grantee may be entitled for violation of the terms of this Conservation Easement or for any injury to the Conservation Values of the Conservation Site Property; to enjoin the violation, *ex parte* as necessary, by temporary or permanent injunction without the necessity of proving either actual damages or the inadequacy of otherwise available legal remedies; to pursue any other legal or equitable relief, including but not limited to, the restoration of the Conservation Site Property to the condition in which it existed prior to any violation or injury; or to otherwise enforce this Conservation Easement. Without limiting the liability of Grantor, Grantee may apply any damages recovered to the cost of undertaking any corrective action on the Conservation Site Property.

If Grantee, in its sole discretion, determines that circumstances require immediate action to prevent or mitigate injury to the Conservation Values of the Conservation Site Property, Grantee may pursue its remedies under this Conservation Easement without prior notice to Grantor or without waiting for the period provided for cure to expire. Grantee's rights under this section apply equally to actual or threatened violations of this Conservation Easement.

Grantor agrees that Grantee's remedies at law for any violation of this Conservation Easement are inadequate and that Grantee shall be entitled to the injunctive relief described in this section, both prohibitive and mandatory, in addition to such other relief to which Grantee may be entitled, including specific performance of this Conservation Easement, without the necessity of proving either actual damages or the inadequacy of otherwise available

legal remedies. Grantee's remedies described in this section shall be cumulative and shall be in addition to all remedies now or hereafter existing at law or in equity, including but not limited to the remedies set forth in California Civil Code Section 815, *et seq.* The failure of Grantee to discover a violation or to take immediate legal action shall not bar Grantee from taking such action at a later time.

(a) Costs of Enforcement.

All costs incurred by Grantee, where Grantee is the prevailing party, in enforcing the terms of this Conservation Easement against Grantor, including, but not limited to, costs of suit and attorneys' and experts' fees, and any costs of restoration necessitated by negligence or breach of this Conservation Easement, shall be borne by Grantor.

(b) Grantee's Discretion.

Enforcement of the terms of this Conservation Easement by Grantee shall be at the discretion of Grantee, and any forbearance by Grantee to exercise its rights under this Conservation Easement in the event of any breach of any term of this Conservation Easement shall not be deemed or construed to be a waiver of such term or of any subsequent breach of the same or any other term of this Conservation Easement or of any rights of Grantee under this Conservation Easement. No delay or omission by Grantee in the exercise of any right or remedy shall impair such right or remedy or be construed as a waiver.

(c) Acts Beyond Grantor's Control.

Nothing contained in this Conservation Easement shall be construed to entitle Grantee to bring any action against Grantor for any injury to or change in the Conservation Site Property resulting from (i) any natural cause beyond Grantor's control, including, without limitation, fire not caused by Grantor, flood, storm, and earth movement, or any prudent action taken by Grantor under emergency conditions to prevent, abate, or mitigate significant injury to the Conservation Site Property resulting from such causes; or (ii) acts by Grantee or its employees.

(d) Enforcement; Standing.

All rights and remedies conveyed to Grantee under this Conservation Easement shall extend to and are enforceable by the Third-Party Beneficiaries (as defined in Section 14(m)). These enforcement rights are in addition to, and do not limit, the rights of enforcement under the Development Plan or the Management Plan. If at any time in the future Grantor uses, allows the use, or threatens to use or allow use of, the Conservation Site Property for any purpose that is inconsistent with or in violation of this Conservation Easement then, despite the provisions of California Civil Code Section 815.7, the California Attorney General and the Third-Party Beneficiaries each has standing as an interested party in any proceeding affecting this Conservation Easement.

(e) Notice of Conflict.

If Grantor receives a Notice of Violation from Grantee or a Third-Party Beneficiary with which it is impossible for Grantor to comply consistent with any prior uncured Notice(s) of Violation, Grantor shall give written notice of the conflict (hereinafter "Notice of Conflict") to the Grantee and Third-Party Beneficiaries. In order to be valid, a Notice of Conflict shall be given within fifteen (15) days of the date Grantor receives a conflicting Notice of

Violation, shall include copies of the conflicting Notices of Violation, and shall describe the conflict with specificity, including how the conflict makes compliance with the uncured Notice(s) of Violation impossible. Upon issuing a valid Notice of Conflict, Grantor shall not be required to comply with the conflicting Notices of Violation until such time as the entity or entities issuing said conflicting Notices of Violation issue(s) revised Notice(s) of Violation that resolve the conflict. Upon receipt of a revised Notice of Violation, Grantor shall comply with such notice within the time period(s) described in the first grammatical paragraph of this Section. The failure of Grantor to issue a valid Notice of Conflict within fifteen (15) days of receipt of a conflicting Notice of Violation shall constitute a waiver of Grantor's ability to claim a conflict.

(f) Reversion.

If the USFWS determines that Grantee is not holding, monitoring or managing this Conservation Easement for conservation purposes in the manner specified in this Conservation Easement or in the Development Plan or the Management Plan then, pursuant to California Government Code Section 65965(d), this Conservation Easement shall revert to the State of California, or to another public agency or nonprofit organization qualified pursuant to Civil Code Section 815.3 and Government Code Section 65965 (and any successor or other provision(s) then applicable) and approved by the USFWS.

8. Access.

This Conservation Easement does not convey a general right of access to the public.

9. Costs and Liabilities.

Grantor retains all responsibilities and shall bear all costs and liabilities of any kind related to the ownership, operation, upkeep, and maintenance of the Conservation Site Property. Grantor agrees that neither Grantee nor any Third-Party Beneficiaries shall have any duty or responsibility for the operation, upkeep or maintenance of the Conservation Site Property, the monitoring of hazardous conditions on it, or the protection of Grantor, the public or any third parties from risks relating to conditions on the Conservation Site Property. Grantor remains solely responsible for obtaining any applicable governmental permits and approvals required for any activity or use permitted by this Conservation Easement and any activity or use shall be undertaken in accordance with all applicable federal, state, local and administrative agency laws, statutes, ordinances, rules, regulations, orders and requirements.

(a) Taxes; No Liens.

Grantor shall pay before delinquency all taxes, assessments (general and special), fees, and charges of whatever description levied on or assessed against the Conservation Site Property by competent authority (collectively "Taxes"), including any Taxes imposed upon, or incurred as a result of, this Conservation Easement, and shall furnish Grantee with satisfactory evidence of payment upon request. Grantor shall keep the Conservation Site Property free from any liens (other than a security interest that is expressly subordinated to this Conservation Easement, as provided in Section 14(k)), including those arising out of any obligations incurred by Grantor for any labor or materials furnished or alleged to have been furnished to or for Grantor at or for use on the Conservation Site Property.

(b) Hold Harmless.

(1) Grantor shall hold harmless, protect and indemnify Grantee and its directors, officers, employees, agents, contractors, and representatives and the heirs, personal representatives, successors and assigns of each of them (each a "Grantee Indemnified Party" and collectively, "Grantee's Indemnified Parties") from and against any and all liabilities, penalties, costs, losses, damages, expenses (including, without limitation reasonable attorneys' fees and experts' fees), causes of action, claims, demands, orders, liens or judgments (each a "Claim" and, collectively, "Claims"), arising from or in any way connected with: (i) injury to or the death of any person, or physical damage to any property, resulting from any act, omission, condition, or other matter related to or occurring on or about the Conservation Site Property, regardless of cause, except that this indemnification shall be inapplicable to any Claim due solely to the negligence of Grantee or any of its employees; (ii) the obligations specified in Sections 5, 9 and 9(a); and (iii) the existence or administration of this Conservation Easement. If any action or proceeding is brought against any of the Grantee's Indemnified Parties by reason of any such Claim, Grantor shall, at the election of and upon written notice from Grantee, defend such action or proceeding by counsel reasonably acceptable to the Grantee's Indemnified Party.

(2) Grantor shall hold harmless, protect and indemnify Third-Party Beneficiaries and their respective directors, officers, employees, agents, contractors, and representatives and the heirs, personal representatives, successors and assigns of each of them (each a "Third-Party Beneficiary Indemnified Party" and collectively, "Third-Party Beneficiary Indemnified Parties") from and against any and all Claims arising from or in any way connected with: (i) injury to or the death of any person, or physical damage to any property, resulting from any act, omission, condition, or other matter related to or occurring on or about the Conservation Site Property, regardless of cause and (ii) the existence or administration of this Conservation Easement. *Provided, however,* that the indemnification in this Section 9 (b) (2) shall be inapplicable to a Third-Party Beneficiary Indemnified Party with respect to any Claim due solely to the negligence of that Third-Party Beneficiary Indemnified Party or any of its employees. If any action or proceeding is brought against any of the Third-Party Beneficiary Indemnified Parties by reason of any Claim to which the indemnification in this Section 9 (b) (2) applies, then at the election of and upon written notice from the Third-Party Beneficiary Indemnified Party, Grantor shall defend such action or proceeding by counsel reasonably acceptable to the applicable Third-Party Beneficiary Indemnified Party or reimburse the Third-Party Beneficiary Indemnified Party for all charges incurred for services of the California Attorney General or the U.S. Department of Justice in defending the action or proceeding.

(c) Extinguishment.

If circumstances arise in the future that render the preservation of Conservation Values, or other purposes of this Conservation Easement impossible to accomplish, this Conservation Easement can only be terminated or extinguished, in whole or in part, by judicial proceedings in a court of competent jurisdiction.

(d) Condemnation.

The purposes of this Conservation Easement are presumed to be the best and most necessary public use as defined at California Code of Civil Procedure Section 1240.680 notwithstanding Code of Civil Procedure Sections 1240.690 and 1240.700.

10. Transfer of Conservation Easement or Conservation Site Property.

(a) Conservation Easement.

This Conservation Easement may be assigned or transferred by Grantee upon written approval of the USFWS, which approval shall not be unreasonably withheld or delayed, but Grantee shall give Grantor and the USFWS at least sixty (60) days prior written notice of the proposed assignment or transfer. Grantee may assign or transfer its rights under this Conservation Easement only to an entity or organization: (i) authorized to acquire and hold conservation easements pursuant to California Civil Code Section 815.3 and Government Code Section 65965 (and any successor or other provision(s) then applicable), or the laws of the United States; and (ii) otherwise reasonably acceptable to the USFWS. Grantee shall require the assignee to record the assignment in the county where the Conservation Site Property is located. The failure of Grantee to perform any act provided in this section shall not impair the validity of this Conservation Easement or limit its enforcement in any way. Any transfer under this section is subject to the requirements of Section 11.

(b) Conservation Site Property.

Grantor agrees to incorporate the terms of this Conservation Easement by reference in any deed or other legal instrument by which Grantor divests itself of any interest in all or any portion of the Conservation Site Property, including, without limitation, a leasehold interest. Grantor agrees that the deed or other legal instrument shall also incorporate by reference the Development Plan, the Management Plan, and any amendment(s) to those documents. Grantor further agrees to give written notice to Grantee and the USFWS of the intent to transfer any interest at least sixty (60) days prior to the date of such transfer. Grantee or the USFWS shall have the right to prevent any transfers in which prospective subsequent claimants or transferees are not given notice of the terms, covenants, conditions and restrictions of this Conservation Easement (including the exhibits and documents incorporated by reference in it). The failure of Grantor to perform any act provided in this section shall not impair the validity of this Conservation Easement or limit its enforceability in any way. Any transfer under this section is subject to the requirements of Section 11.

11. Merger.

The doctrine of merger shall not operate to extinguish this Conservation Easement if the Conservation Easement and the Conservation Site Property become vested in the same party. If, despite this intent, the doctrine of merger applies to extinguish the Conservation Easement then, unless Grantor, Grantee, and the USFWS otherwise agree in writing, a replacement conservation easement or restrictive covenant containing the same protections embodied in this Conservation Easement shall be recorded against the Conservation Site Property.

12. Notices.

Any notice, demand, request, consent, approval, or other communication that Grantor or Grantee desires or is required to give to the other shall be in writing, with a copy to the USFWS, and served personally or sent by recognized overnight courier that guarantees next-day delivery or by first class United States mail, postage fully prepaid, addressed as follows:

To Grantor: [Grantor name]
[Grantor address]
Attn:_____

To Grantee: [Grantee name]

[Grantee address]
Attn: _____

To USFWS: United States Fish and Wildlife Service
[Field Office name] Office
[FIELD OFFICE ADDRESS]
Attn: Field Supervisor

or to such other address a party or the USFWS shall designate by written notice to Grantor, Grantee and the USFWS. Notice shall be deemed effective upon delivery in the case of personal delivery or delivery by overnight courier or, in the case of delivery by first class mail, three (3) days after deposit into the United States mail.

13. Amendment.

This Conservation Easement may be amended only by mutual written agreement of Grantor and Grantee and written approval of the USFWS, which approval shall not be unreasonably withheld or delayed. Any such amendment shall be consistent with the purposes of this Conservation Easement and California law governing conservation easements, and shall not affect its perpetual duration. Any such amendment shall be recorded in the official records of the county in which the Conservation Site Property is located, and Grantee shall promptly provide a conformed copy of the recorded amendment to the Grantor and the USFWS.

14. Additional Provisions.

(a) Controlling Law.

The interpretation and performance of this Conservation Easement shall be governed by the laws of the United States and the State of California, disregarding the conflicts of law principles of such state.

(b) Liberal Construction.

Despite any general rule of construction to the contrary, this Conservation Easement shall be liberally construed to effect the purposes of this Conservation Easement and the policy and purpose of California Civil Code Section 815, *et seq.* [***add if Grantee is nonprofit organization:*** and Government Code Section 65965]. If any provision in this instrument is found to be ambiguous, an interpretation consistent with the purposes of this Conservation Easement that would render the provision valid shall be favored over any interpretation that would render it invalid.

(c) Severability.

If a court of competent jurisdiction voids or invalidates on its face any provision of this Conservation Easement, such action shall not affect the remainder of this Conservation Easement. If a court of competent jurisdiction voids or invalidates the application of any provision of this Conservation Easement to a person or circumstance, such action shall not affect the application of the provision to any other persons or circumstances.

(d) Entire Agreement.

This document (including its exhibits and the Development Plan and the Management Plan incorporated by reference in this document) sets forth the entire agreement of the parties and the USFWS with respect to the Conservation Easement and supersedes all prior discussions, negotiations, understandings, or agreements of the parties relating to the Conservation Easement. No alteration or variation of this Conservation Easement shall be valid or binding unless contained in an amendment in accordance with Section 13.

(e) No Forfeiture.

Nothing contained in this Conservation Easement will result in a forfeiture or reversion of Grantor's title in any respect.

(f) Successors.

The covenants, terms, conditions, and restrictions of this Conservation Easement shall be binding upon, and inure to the benefit of, the parties and their respective personal representatives, heirs, successors, and assigns, and shall constitute a servitude running in perpetuity with the Conservation Site Property.

(g) Termination of Rights and Obligations.

A party's rights and obligations under this Conservation Easement terminate upon transfer of the party's interest in the Conservation Easement or Conservation Site Property, except that liability for acts, omissions or breaches occurring prior to transfer shall survive transfer.

(h) Captions.

The captions in this instrument have been inserted solely for convenience of reference and are not a part of this instrument and shall have no effect upon its construction or interpretation.

(i) No Hazardous Materials Liability.

(1) Grantor represents and warrants that it has no knowledge or notice of any Hazardous Materials (defined below) or underground storage tanks existing, generated, treated, stored, used, released, disposed of, deposited or abandoned in, on, under, or from the Conservation Site Property, or transported to or from or affecting the Conservation Site Property.

(2) Without limiting the obligations of Grantor under Section 9 (b), Grantor hereby releases and agrees to indemnify, protect and hold harmless the Grantee’s Indemnified Parties (defined in Section 9 (b) (1)) from and against any and all Claims (defined in Section 9 (b)(1)) arising from or connected with any Hazardous Materials or underground storage tanks present, alleged to be present, released in, from or about, or otherwise associated

with the Conservation Site Property at any time, except any Hazardous Materials placed, disposed or released by Grantee or any of its employees. This release and indemnification includes, without limitation, Claims for (A) injury to or death of any person or physical damage to any property; and (B) the violation or alleged violation of, or other failure to comply with, any Environmental Laws (defined below). If any action or proceeding is brought against any of the Grantee's Indemnified Parties by reason of any such Claim, Grantor shall, at the election of and upon written notice from the applicable Grantee Indemnified Party, defend such action or proceeding by counsel reasonably acceptable to the Grantee Indemnified Party

(3) Without limiting the obligations of Grantor under Section 9 (b), Grantor hereby releases and agrees to indemnify, protect and hold harmless the Third-Party Beneficiary Indemnified Parties (defined in Section 9 (b)(2)) from and against any and all Claims arising from or connected with any Hazardous Materials or underground storage tanks present, alleged to be present, released in, from or about, or otherwise associated with the Conservation Site Property at any time, except that this release and indemnification shall be inapplicable to a Third-Party Beneficiary Indemnified Party with respect to any Hazardous Materials placed, disposed or released by that Third-Party Beneficiary Indemnified Party or any of its employees. This release and indemnification includes, without limitation, Claims for (A) injury to or death of any person or physical damage to any property; and (B) the violation of alleged violation of, or other failure to comply with, any Environmental Laws. If any action or proceeding is brought against any of the Third-Party Beneficiary Indemnified Parties by reason of any such Claim, Grantor shall, at the election or and upon written notice from the applicable Third-Party Beneficiary Indemnified Party, defend such action or proceeding by counsel reasonably acceptable to the Third-Party Beneficiary Indemnified Party for all charges incurred for services of the California Attorney General or the U.S. Department of Justice in defending the action or proceeding.

(4) Despite any contrary provision of this Conservation Easement, the parties do not intend this Conservation Easement to be, and this Conservation Easement shall not be, construed such that it creates in or gives to Grantee or any Third-Party Beneficiaries any of the following:

(A) The obligations or liability of an "owner" or "operator," as those terms are defined and used in Environmental Laws (defined below), including, without limitation, the Comprehensive Environmental Response, Compensation and Liability Act of 1980, as amended (42 U.S.C. § 9601, *et seq.*; hereinafter, "CERCLA"); or

(B) The obligations or liabilities of a person described in 42 U.S.C. § 9607(a)(3) or (4); or

(C) The obligations of a responsible person under any applicable Environmental Laws; or

(D) The right to investigate and remediate any Hazardous Materials associated with the Conservation Site Property; or

(E) Any control over Grantor's ability to investigate, remove, remediate or otherwise clean up any Hazardous Materials associated with the Conservation Site Property.

(5) The term "Hazardous Materials" includes, without limitation, (a) material that is flammable, explosive or radioactive; (b) petroleum products, including by-products and fractions thereof; and (c) hazardous materials, hazardous wastes, hazardous or toxic substances, or related materials defined in CERCLA, the Resource Conservation and Recovery Act of 1976 (42 U.S.C. § 6901, et seq.; hereinafter, "RCRA"); the Hazardous Materials Transportation Act (49 U.S.C. §5101, et seq.; hereinafter, "HTA"); the Hazardous Waste Control Law (California Health & Safety Code § 25100, et seq.; hereinafter, "HCL"); the Carpenter-Presley-Tanner Hazardous Substance Account Act (California Health & Safety Code § 25300, et seq.; hereinafter "HSA"), and in the regulations adopted and publications promulgated pursuant to them, or any other applicable Environmental Laws now in effect or enacted after the date of this Conservation Easement.

(6) The term "Environmental Laws" includes, without limitation, CERCLA, RCRA, HTA, HCL, HSA, and any other federal, state, local or administrative agency statute, ordinance, rule, regulation, order or requirement relating to pollution, protection of human health or safety, the environment or Hazardous Materials. Grantor represents, warrants and covenants to Grantee and Third-Party Beneficiaries that, activities upon and use of the Bank Property by Grantor, its agents, employees, invitees and contractors will comply with all Environmental Laws.

(j) Warranty.

Grantor represents and warrants that Grantor is the sole owner of the Conservation Site Property. Grantor also represents and warrants that, except as specifically disclosed to and approved by the USFWS pursuant to the Conservation Site Property Assessment and Warranty signed by Grantor, [***choose applicable statement:*** there are no outstanding mortgages, liens, encumbrances or other interests in the Conservation Site Property (including, without limitation, mineral interests) which may conflict or are inconsistent with this Conservation Easement ***or*** the holder of any outstanding mortgage, lien, encumbrance or other interest in the Conservation Site Property (including, without limitation, mineral interest) which conflicts or is inconsistent with this Conservation Easement has expressly subordinated such interest to this Conservation Easement by a recorded Subordination Agreement approved by Grantee and the USFWS].

(k) Additional Interests.

Grantor shall not grant any additional easements, rights of way or other interests in the Conservation Site Property (other than a security interest that is expressly subordinated to this Conservation Easement), nor shall Grantor grant, transfer, abandon or relinquish (each a “Transfer”) any mineral, air, or water right or any water associated with the Conservation Site Property, without first obtaining the written consent of Grantee and the USFWS. Such consent may be withheld if Grantee or the USFWS determines that the proposed interest or Transfer is inconsistent with the purposes of this Conservation Easement or will impair or interfere with the Conservation Values of the Conservation Site Property. This Section 14(k) shall not limit the provisions of Section 2(d) or 3(n), nor prohibit transfer of a fee or

leasehold interest in the Conservation Site Property that is subject to this Conservation Easement and complies with Section 10. Grantor shall provide a copy of any recorded or unrecorded grant or Transfer document to the Grantee and USFWS.

(l) Recording.

Grantee shall record this Conservation Easement in the Official Records of the County in which the Conservation Site Property is located, and may re-record it at any time as Grantee deems necessary to preserve its rights in this Conservation Easement.

(m) Third-Party Beneficiary.

Grantor and Grantee acknowledge that the USFWS is a third party beneficiary of this Conservation Easement with the right of access to the Conservation Site Property and the right to enforce all of the obligations of Grantor including, but not limited to, Grantor's obligations under Section 14, and all other rights and remedies of the Grantee under this Conservation Easement.

(n) Funding.

Endowment funding for the perpetual management, maintenance and monitoring of the Conservation Site Property is specified in and governed by the Management Plan.

IN WITNESS WHEREOF Grantor has executed this Conservation Easement Deed the day and year first above written.

GRANTOR: [***Notarization Required***]

BY:_____

NAME:_____

TITLE:_____

DATE: _____

Approved as to form:

GRANTEE:	**USFWS:**
BY: _____	BY: _____
NAME: _____	NAME: _____
TITLE: _____	TITLE: _____
DATE: _____	DATE: _____

Appendix C3

Management Plan Outline

Note: The California multi-agency Project Delivery Team developed this general outline to assist in the development of the Long-term Management Plan. Objectives and tasks are provided for illustrative purposes only and may not represent management requirements for a specific parcel.

(Template Version Date: May 2008_October 2019 updates for PG&E's O&M HCP)

Long-term Management Plan
For
_____ for PG&E's Multiple Region O&M HCP

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Long-Term Management Plan

I. Introduction

A. Purpose of Establishment

The _____ ("Parcel") was established to compensate for unavoidable impacts to, and to conserve and to protect covered species and covered habitat. The Parcel property includes _____acres of covered species for [*specify threatened/endangered species*], and _____acres of covered habitat for [*specify threatened/endangered species habitat*]. The Parcel Signatory Agencies are the _____ Office of the U.S. Fish and Wildlife Service, and the California Department of Fish and Wildlife ("CDFW")_____ Region. These agencies comprise and are referred to jointly as the Wildlife Agencies (WA).

B. Purpose of this Long-term Management Plan

The purpose of this long-term management plan is to ensure the Parcel is managed, monitored, and maintained in perpetuity. This management plan establishes objectives, priorities and tasks to monitor, manage, maintain and report on the waters of the U.S., covered species and covered habitat on the Parcel. This management plan is a binding and enforceable instrument, implemented by the conservation easement covering the Parcel property.

C. Land Manager and Responsibilities

The land manager is _____. The land manager, and subsequent land managers upon transfer, shall implement this long-term management plan, managing and monitoring the Parcel property in perpetuity to preserve its habitat and conservation values in accordance with PG&E's O&M HCP, the conservation easement, and the long-term management plan. Long-term management tasks shall be funded through the Endowment Fund. The land manager shall be responsible for providing an annual report to the WA detailing the time period covered, an itemized account of the management tasks and total amount expended. Any subsequent grading, or alteration of the site's hydrology and/or topography by the land manager or its representatives must be approved by the WA and the necessary permits, such as a Section 404 permit, must be obtained if required.

II. Property Description

A. Setting and Location

The Parcel is located at _____ [*include address and county*], State of California, designated Assessor's Parcel No. _____. The Property is shown on the general vicinity map (Figure 1) and the Parcel property map (Figure 2). The general vicinity map shows the Parcel location in relation to cities, towns, or major roads, and other distinguishable landmarks. The Parcel property map shows the Parcel property boundaries on a topographic map.

B. History and Land Use

[*Describe past and present land use including grazing practices*]. The land in the general area of the Parcel site is currently _____ [*Describe adjacent land and local area land uses.*]

C. Cultural Resources –

[*Describe all existing structures including roads, levees, fencing, and buildings, and their intended future use on the area. If such structures are likely to be considered "historical resources" of the state pursuant to Executive Order W-26-92 and historic resources preservation laws.*]

[*Describe any known archeological sites without providing their specific locations on the property, and include a summary of the results of any site surveys/inventories, including who conducted them. An assessment of the impacts of management should be given for such sites*.]

D. Hydrology and Topography

[*Describe hydrology and topography of Parcel site. Indicate whether wetlands are driven by surface flows (i.e., fluvial systems) or groundwater flows from offsite sources. Describe precipitation onto and off of the site.]*

E. Soils

[*Describe soils on the Parcel site*.]

F. Existing Easements

[*Include descriptions/locations of existing easements, their nature (buried pipeline, overhead power, ingress/egress, etc), authorized users (if known), access procedures, etc. Depict easements, rights of way, ingress, and egress routes on an attached map.*]

G. Adjacent Land Uses

[*Detail the baseline adjacent land uses. These land uses may change over time; however, the description of the baseline conditions will give the manager some idea of the conditions present when the management plan was first developed. Also detailing adjacent land uses will bring to light areas that may be of management concern or items that may compromise biological integrity over time.*]

III. Habitat and Species Descriptions

A. Biological Resources Survey of Parcel

[*The Biological Resources Survey, Exhibit H, shall include a general description of geographic location and features, topography, soils, vegetation (assessment of native vs. exotic species), species present and potentially present, habitat requirements of each species and a quality assessment of all habitat types (i.e., life history requirements of covered species met, habitat diversity, connectivity to other habitats and protected areas), and species presence based on the results of protocol surveys. In addition, provide an inventory list, if available, of plant and animal species which are know or likely to occur on the property. An overview of native plant species present, if applicable, their habitat and management requirement should be presented here.]*

A. **S**ummary of Parcel Development Plan (if applicabl***e)***

[*Describe all covered species and covered habitat. Include acreages and describe plant and animal species. Provide final map showing the location of waters of the U.S., covered species, and covered habitat.]*

B. Endangered and Threatened Species

[*Describe all endangered and threatened species that occur or may occur on the Parcel site. If applicable, provide map showing their location.]*

C. Rare Species and Species of Special Concern

[*Description of rare species and species of special concern that occur or may occur on the Parcel site. If applicable, provide map showing their location.]*

IV. Management and Monitoring

The overall goal of long-term management is to foster the long term viability of the Parcel site's waters of the U.S., covered species and covered habitat. Routine monitoring and minor maintenance tasks are intended to assure the viability of the Parcel site in perpetuity.

A. Biological Resources

The approach to the long-term management of the Parcel site's biological resources is to conduct annual site examinations and monitoring of selected characteristics to determine stability and ongoing trends of the [*list covered species and covered habitats*]. Annual monitoring will assess the Parcel's condition, degree of erosion, invasion of exotic or deleterious (e.g., thatch producing) species, water quality, fire hazard, and/or other aspects that may warrant management actions. While it is not anticipated that major management actions will be needed, an objective of this long-term management plan is to conduct monitoring to identify any issues that arise, and using adaptive management to determine what actions might be appropriate. Those chosen to accomplish monitoring responsibilities will have the knowledge, training, and experience to accomplish monitoring responsibilities.

Adaptive management means an approach to natural resource management which incorporates changes to management practices, including corrective actions as determined to be appropriate by the WA in discussion with the land manager. Adaptive management includes those activities necessary to address the affects of climate change, fire, flood, or other natural events, force majeure, etc. Before considering any adaptive management changes to the long-term management plan, the WA will consider whether such actions will help ensure the continued viability of Parcel's biological resources.

[*The list that follows is not meant to be exhaustive and some sites may have more elements to consider and some may have fewer*.]

The land manager for the Parcel site shall implement the following:

Element A.1 Waters of the U.S., including wetlands

Objective: Monitor, conserve and maintain the Parcel site's waters of the U.S., including wetlands, if present and applicable. Limit any impacts to waters of the U.S. from vehicular travel or other adverse impacts.

Task: At least one annual walk-through survey will be conducted to qualitatively monitor the general condition of these habitats. General topographic conditions, hydrology, general vegetation cover and composition, invasive species, erosion, will be noted, evaluated and mapped during a site examination in the spring. Notes to be made will include observations of species encountered, water quality, general extent of wetlands, and any occurrences of erosion, and weed invasion.

Task: Establish reference sites for photographs and prepare a site map showing the reference sites for the Parcel file. Alternatively, utilize photographic reference sites, if any, developed during interim Parcel management period. Reference photographs will be taken of the overall wetland mosaic at least every five years from the beginning of the long-term management, with selected reference photos taken on the ground more frequently, _____ times per year ***(****if applicable****)***.

Element A.2 Covered Species (if applicable)

Objective: Monitor, conserve and maintain the Parcel site's covered species.

Task: As part of the annual site walk-through, the status and any changes to the covered species will be noted. Any necessary tasks will be identified, prioritized and implemented as funding is available.

Element A.3. Covered Habitat *(if applicable)*

Objective: Monitor, conserve and maintain the Parcel site's covered habitat.

Task: As part of the annual site walk-through, the Parcel site's covered habitat will be examined for any changes, current condition or pending needs. Any necessary tasks will be identified, prioritized and implemented as funding is available.

Element A.4 Threatened/Endangered Plant Species Monitoring *(if applicable)*

[Note: This methodology is an example specific to Limnanthes vinculans and may vary for other plant species as determined in consultation with the appropriate agencies]

Objective: Monitor population status and trends.

Objective: Manage to maintain habitat for _____.

Task: Monitor status every year by conducting population assessment surveys. The annual survey dates will be selected during the appropriate blooming period and will generally occur from late March through April depending on the timing of the blooming period each year. Occupied habitat will be mapped and numbered to allow repeatable data collection over subsequent survey years. Abundance will be assessed semi-quantitatively using broad abundance categories, i.e., 0, 1 - 100, 101 - 500, 501 - 1,000, and >1,000 plants.

Task: Visually observe for changes to occupied habitat, such as changed hydrology or vegetation composition. Record any observed changes.

Task: Implement other tasks that enhance or monitor habitat characteristics for _____.

Element A.5 Threatened/Endangered Animal Species Monitoring *(if applicable)*

[Note: Species-specific objectives and tasks will need to be developed in consultation with the appropriate WA agencies]

Objective: Monitor population status and trends.

Objective: Manage to maintain habitat for _____.

Task: Monitor status every year by conducting population assessment surveys. [*The annual survey dates will be selected during the appropriate period each year*.]

Task: Implement other tasks that enhance or monitor habitat characteristics for _____.

Element A.6 Non-native Invasive Species

[Note: Species-specific objectives and tasks will need to be developed in consultation with the appropriate WA agencies] Invasive species threaten the diversity or abundance of native species through competition for resources, predation, parasitism, interbreeding with native populations, transmitting diseases, or causing physical or chemical changes to the invaded habitat.

Objective: Monitor and maintain control over non-native invasive species, including but not limited to noxious weeds, that diminish site quality for which the Parcel was established. The land manager shall consult the following sources for guidance on what species may threaten the site and on management of those species: The California Department of Food and Agriculture (CDFA) list of "noxious weeds" that are subject to regulation or quarantine by county agricultural departments, the California Department of Food and Agriculture's Integrated Pest Control Branch, and the University of California State Integrated Pest Management Program list of "Exotic and invasive pests and diseases that threaten California's agricultural, urban, or natural areas".

Task: Mapping of non-native invasive species cover or presence shall occur during the first five years of Parcel management, to establish a baseline. Mapping shall be accomplished through use of available technologies, such as GIS and aerial photography.

Task: Each year's annual walk-through survey (or a supplemental survey) will include a qualitative assessment (e.g. visual estimate of cover) of potential or observed noxious weeds or other non-native species invasions, primarily in or around the wetlands. Additional actions to control invasive species will be evaluated and prioritized.

Element A.7 Vegetation Management

Objective: Analyze effects of mowing and grazing on habitat quality. If determined appropriate, develop and implement specific mowing and/or grazing actions in coordination with management at other local conservation sites to maintain habitat quality. [Site specific targets for vegetation may be specified here and task revised or added to achieve those targets].

Objective: Adaptively manage vegetation based on site conditions and data acquired through monitoring to maintain biological values.

Task: Review and explore potential vegetation management regimes as proposals and/or opportunities and funding arise. If determined to potentially maintain site quality, develop specific grazing practices, amend this long-term management plan with the WA's approval to reflect those practices, and implement grazing actions as funding allows.

Task: Implement vegetation management techniques, if determined beneficial and as funding allows, to maintain vegetation height and composition similar to baseline conditions or as determined likely to maintain seasonal wetland function [or *threatened/endangered plant species habitat*]. Implementation of vegetation management techniques must be approved by the WA.

B. Security, Safety, and Public Access

The Parcel will be fenced and shall have no general public access, nor any regular public or private use. Research and/or other educational programs or efforts may be allowed on the Parcel site as deemed appropriate by the WA, but are not specifically funded or a part of this long-term management plan.

Potential mosquito abatement issues will be addressed through the development of a plan by the land manager and the mosquito and vector control district in coordination with and approved by the WA.

Potential wildfire fuels will be reduced as needed by mowing in areas where approved by the WA.

Element B.1 Trash and trespass

Element B.2 Fire Hazard Reduction

Objective: Maintain the site as required for fire control while limiting impacts to biological values.

Task: Mow or graze to reduce vegetation in areas required by authority agency(ies), and as approved by the WA, for fire control.

C. Infrastructure and Facilities

[*Fence and gate maintenance and repair frequency will be dependent on trespass and access control issues, as well as whether grazing is utilized as a vegetation management technique and to what extent.]*

Element C.1 Fences and Gates

Objective: Monitor condition of fences and gates.

Objective: Maintain fences and gates to prevent casual trespass, allow necessary access, and [*if applicable:* facilitate grazing regime and management.]

Task: During each site visit, record condition of fences and gates. Record location, type, and recommendations to implement fence and/or gate repair or replacement, if applicable.

Task: Maintain fences and gates as necessary by replacing posts, wire, and/or gates. Replace fences and/or gates, as necessary, and as funding allows.

D. Reporting and Administration

Element D.1 Annual Report

Objective: Provide annual report on all management tasks conducted and general site conditions to the WA and any other appropriate parties.

Task: Prepare annual report and any other additional documentation. Include a summary. Complete and circulate to the WA and other parties by August 15 of each year.

Task: Make recommendations with regard to (1) any habitat enhancement measures deemed to be warranted, (2) any problems that need near short and long-term attention (e.g., weed removal, fence repair, erosion control), and (3) any changes in the monitoring or management program that appear to be warranted based on monitoring results to date.

V. Transfer, Replacement, Amendments, and Notices

A. Transfer

Any subsequent transfer of responsibilities under this long-term management plan to a different land manager shall be requested by the land manager in writing to the WA, shall require written approval by the WA, and shall be incorporated into this long-term management plan by amendment. Any subsequent Property Owner assumes land manager responsibilities described in this long-term management plan and as required in the Conservation Easement, unless otherwise amended in writing by the WA.

B. Replacement

If the land manager fails to implement the tasks described in this long-term management plan and is notified of such failure in writing by any of the WA, land manager shall have 90 days to cure such failure. If failure is not cured within 90 days, land manager may request a meeting with the WA to resolve the failure. Such meeting shall occur within 30 days or a longer period if approved by the WA. Based on the outcome of the meeting, or if no meeting is requested, the WA may designate a replacement land manager in writing by amendment of this long-term management plan. If land manager fails to designate a replacement land manager, then such public or private land or resource management organization acceptable to and as directed by the WA may enter onto the Parcel property in order to fulfill the purposes of this long-term management plan.

C. Amendments

The land manager**,** property owner**,** and the WA may meet and confer from time to time, upon the request of any one of them, to revise the long-term management plan to better meet management

objectives and preserve the habitat and conservation values of the Parcel property. Any proposed changes to the long-term management plan shall be discussed with the WA and the land manager. Any proposed changes will be designed with input from all parties. Amendments to the long-term management plan shall be approved by the WA in writing shall be required management components and shall be implemented by the land manager.

If the WA determine, in writing, that continued implementation of the long-term management plan would jeopardize the continued existence of a state or federally listed species, any written amendment to this long-term management plan, determined by either the CDFG or USFWS as necessary to avoid jeopardy, shall be a required management component and shall be implemented by the land manager.

D. Notices

Any notices regarding this long-term management plan shall be directed as follows:

Land Manager (name, address, telephone and FAX)

_____

_____

_____

_____

Property Owner (name, address, telephone and FAX)

_____

_____

_____

_____

Wildlife Agencies:

U.S. Fish and Wildlife Service

_____ Office

[FIELD OFFICE ADDRESS]

Attn: Field Supervisor

Telephone:

Fax:

California Department of Fish and Wildlife

_____Region

[REGION ADDRESS]

Attn: Regional Manager

Telephone:

Fax:

VI. Funding and Task Prioritization

A. Funding

[*The list of tasks in Table 1 is not meant to be exhaustive and some sites may have more elements to consider and some may have fewer depending on the attributes of the Parcel.*] Table 1 summarizes the anticipated costs of long- term management for the Parcel. These costs include estimates of time and funding needed to conduct the basic monitoring site visits and reporting, weed mowing, trash removal, fence repair, and a prorated calculation of funding needed to fully replace the fences every _____ years. The total annual funding anticipated is approximately $_____, therefore, with the current annual estimated capitalization rate of,____ the total endowment amount required will be $_____.

PG&E will identify the endowment holder and the endowment holder shall hold the endowment principal and interest monies as required by law in the Special Deposit Fund, or a subsequent authorized trustee fund, which consists of monies that are paid into it in trust pursuant to law, and is appropriated to fulfill the purposes for which payments into it are made. These interest monies will fund the long-term management, enhancement, and monitoring activities on habitat lands in a manner consistent with this long-term management plan.

Land manager shall consult with endowment holder on a year to year basis to determine the amount of funding available for management and monitoring activities. Following annual management activities, land manager may invoice endowment holder for management activities following the invoicing instructions provided by the endowment holder.

B. Task Prioritization

Due to unforeseen circumstances, prioritization of tasks, including tasks resulting from new requirements, may be necessary if insufficient funding is available to accomplish all tasks. The land manager and the WA shall discuss task priorities and funding availability to determine which tasks will be implemented. In general, tasks are prioritized in this order: 1) required by a local, state, or federal agency; 2) tasks necessary to maintain or remediate habitat quality; and 3) tasks that monitor resources, particularly if past monitoring has not shown downward trends. Equipment and materials necessary to implement priority tasks will also be considered priorities. Final determination of task priorities in any given year of insufficient funding will be determined in consultation with the WA and as authorized by the WA in writing.

Table 1. Parcel Management and Monitoring Activities, Level of Effort, Frequency and Cost.

General Parcel Management & Monitoring Activities	Description	Level of Effort	Cost per Unit	Cost	Frequency	Schedule	Annual Cost
Element A.1 Waters of the U.S. , including wetlands (if applicable)							
Monitor waters if the U.S.	Walking survey; notes, photos	No. of hours	$/hour	$	2-3 surveys per year	winter, spring	$
Reference photography	Compile and present	No. of hours	$/hour	$+ 100 exps.	annual	winter, spring	$
Element A.2 Covered Species, *if applicable*							
Monitor Covered Species	Walking survey; notes, photos	No. of hours	$/hour	$	once per year	any time	$
Element A.3 Covered Habitat, *if applicable*							
Monitor **Covered Habitat**	Map; assess abundance/health	No. of hours	$/hour	$	every year	April (May)	$
Element A.4 Threatened/Endangered plant species monitoring, *if applicable*							
	Map; assess abundance/health	No. of hours	$/hour	$	every year	As appropriate	$
Element A.5 Threatened/Endangered animal species monitoring, *if applicable*							
Monitor species	Map; assess abundance/health	No. of hours	$/hour	$	every year	As appropriate	$
Element A.6 Invasive Species							
Assess weed growth, extent	Walking survey, map; research	No. of hours	$/hour	$	1-2 times per year	spring, summer	$
Weed removal	Hand labor	No. of hours	$/hour	$	as needed	late spring, summer	$
Element A.7 Vegetation Management							
Mowing	Contract mowing	No. of hours	$/hour	$	once per year	early summer	$

General Parcel Management & Monitoring Activities	Description	Level of Effort	Cost per Unit	Cost	Frequency	Schedule	Annual Cost
Grazing research and management	Research and coordination	No. of hours	$/hour	$	as appropriate	as needed	$
Element B.1 Trash and Trespass							
Trash and trespass monitoring	Walking surveys	No. of hours	$/hour	$	3 times per year	as appropriate	$
Trash removal and cleanup	Hand labor	No. of hours	$/hour	$	as needed	as needed	$
Element B.2 Fire Hazard Reduction							
Fire hazard assess and contracting	Survey, contract, supervise	No. of hours	$ /hour	$	as needed; once per year	late spring	$
Element C.1 Fences and Gates							
Survey & assess fences	Walk; document conditions	No. of hours	$/hour	$	1-2 times per year	as needed	$
Repair fencing	Hand labor	No. of hours	$ /hour	$	as needed	as needed	$
Replace fencing	Materials and labor	number of feet	$/ foot	$	replace all every __ yr	ongoing	$
Gate replacement	Materials and labor	1 gate	$	$	replace every __ yr	as needed	$
Element D.1 Annual Report							
Annual report	Analyze & report; maps, photos	No. of hours	$/hour	$	once per year	due in summer	$
Account administration		No. of hours	$ /hour	$	as needed	annually	$
Vehicles and supplies				$			$
Totals							$
Current annual capitalization rate							x.x%
TOTAL ENDOWMENT							$

Attachment

Sample Cost and Endowment Worksheet for PG&E's Mitigation Parcels

Task	Description	Level of Effort	Unit	Cost Per Unit	Cost	Frequency	Annual Cost
Endangered Species Monitoring							
Invasive Species Monitoring and Control							
Vegetation Management							
Trash, & Trespass							
Facilities							
Annual Reporting							
						Subtotal	
Miscellaneous Expenses							
Subtotal Labor and Expenses							
Contingency (5%)							
Adapative Management (4.5% of contingency)							
Change Circumstances (0.5% of contigency)							
						TOTAL ANNUALIZED COST	
Net Annual Cost							
Annual Capitalization Rate							
						MANAGEMENT ENDOWMENT REQUIRED TO YIELD AN ANNUALIZED COST	

A contingency of 5% is required for the HCP to include adaptive management and changed circumstance expenses.
This assumes all other expenses are reasonably estimated and a large contingency is not needed.

Appendix C4

Mitigation Monitoring Report Summary

Property 1. Annual Summary

Property 2. Annual Summary

Property 3. Annual Summary

Property 4. Annual Summary

Appendix C5

Morro Shoulderband Snail Guidance for PG&E Activities in Urban Settings of the Los Osos-Baywood Areas in San Luis Obispo County

This appendix is intended to provide guidance on the implementation of measures to avoid and minimize impacts on Morro shoulderband snail, an endangered species covered in PG&E's Multi-Region HCP and which inhabits urban areas in PG&E's service area. PG&E has identified areas where additional environmental review and screening is needed for operations and maintenance (O&M) activities. The measure for this species reads:

> Hot Zone-12. Avoid impacts on natural and urban habitat by working from paved roads or areas without vegetation to the extent practicable. If the Morro shoulderband snail habitat cannot be avoided, then a qualified individual shall survey, collect, and relocate individual snails to the nearest appropriate location that provides a safe shelter for the snails that will not be impacted by the work activity.

The following measures are to be followed during the performance of O&M activities in vegetated areas within the urban settings in Los Osos-Baywood areas. When work in vegetated areas within in the urban Morro shoulderband snail habitat (within Hot Zone-12) cannot practicably be performed from paved roads or areas without vegetation, the following measures are intended to minimize take in the form of injury and mortality of Morro shoulderband snail individuals:

Inspection: A qualified individual will inspect the work area for individual snails, as well as any material or debris that will be affected by or moved as part of the O&M activity.

- Examples of material or debris in which Morro shoulderband snails can be found include:
  - vegetation
  - leaf litter
  - downed wood
  - flat surfaces such as cardboard or plywood
  - concrete blocks
  - underside of culverts
- Morro shoulderband snails can also be found at the base of fence posts, or on or in other structures that retain moisture or that provide cover or shade.

Movement: Live snails observed that could be affected by the activity should be carefully moved out of the work area, either on the material to which they are attached or individually collected from the material and carefully set aside such that the individuals remain shaded and are not crushed or injured during or after the relocation.

Ongoing Activities: In instances where an O&M activity will be conducted at the same location over multiple days and when weather conditions are foggy or wet, the work area will be inspected prior to commencement of work activities each day.

Recordkeeping: PG&E staff will keep records of snails found at work locations and how many snails they moved at a given location.

Appendix C6

Valley Elderberry Longhorn Beetle Transition from Current Process to the MRHCP

The following outline details how PG&E will implement various aspects of the MRHCP that pertain to valley elderberry longhorn beetle (VELB). The program will build on PG&E's efforts implemented over the past 16 years for conservation of VELB during vegetation maintenance and other utility operation and maintenance activities. These efforts have included training staff in shrub identification, avoiding and minimizing impacts, tracking impacts on shrubs, and mitigating impacts on shrubs.

Training

An environmental awareness training and education program was implemented in 2003 and will continue for all personnel who are likely to encounter elderberry shrubs or VELB during execution of their job responsibilities. Training to become a VELB qualified individual is mandatory for PG&E employees and contractors who perform routine maintenance activities, supervisors overseeing such activity, and those assigned to perform pre-inspections for vegetation management purposes or lead maintenance crews within the right-of-way for determining the physical condition of gas, electric, or related infrastructure. Company supervisors will continue to be responsible for employee and contractor conduct when performing work within potential VELB habitat. PG&E will provide this training to ensure that covered activities comply with the standards and requirements contained in the MRHCP and in any VELB supplemental materials included in the MRHCP. The environmental awareness training will continue to include information about the life history requirements of VELB, the identification of suitable VELB habitat, the legal requirements and penalties under the Endangered Species Act, and the measures necessary to avoid and minimize impacts on VELB and elderberry shrubs. VELB environmental awareness training may be conducted as part of larger MRHCP training program. Additionally, PG&E conducts environmental tailboards and distributes educational brochures. The brochures are provided as Attachment C7-1.

Surveys and Avoidance

Surveys for elderberry shrubs will be performed by a qualified individual. A qualified individual is either a biologist or field crew member who attends VELB-specific training (discussed above) to become a qualified individual. Visual search for elderberry shrubs will be performed by a qualified individual within the immediate area of a covered activity and in a 20-foot buffer beyond the boundary of a covered activity. Although stem classification and exit hole searches will not be performed, elderberry shrubs will be flagged in the field by a qualified individual. A no-work buffer of 20 feet will be established around the shrub with pin flagging or other means of demarcation, as practicable, depending on the activity. Except for cut stump treatment of removed trees during vegetation maintenance activities, herbicides will not be used within the 20-foot zone. MRHCP avoidance and minimization measure VELB-1 establishes methods for avoidance of impacts on VELB (see Table 5-1). When avoidance of elderberry is not possible (i.e., one or more shrubs must be pruned or removed), impacts are defined and tracked on PG&E's reporting forms, as discussed below.

Impacts, Tracking, and Reporting

Impact accounting, tracking and reporting has occurred since 2003. PG&E's existing systems and procedures will be used to the extent possible and folded into the MRHCP to continue to track and report on impacts in the MRHCP. Impact and tracking will occur as described in the MRHCP in Section 4.2.8, *Sacramento Valley and Foothills Region, Valley Elderberry Longhorn Beetle*. Reporting will occur as part of the requirements of the MRHCP as described in Section 6.4, *Reporting*.

Mitigation

PG&E has provided 1,241.8 acres of mitigation to date for its impacts on VELB habitat throughout its range. PG&E has provided 257 acres of the mitigation in the MRHCP area (Glenn County), 229 acres of which remain for use in the MRHCP. Mitigation will occur as part of the requirements of the MRHCP as described in Section 5.6.1, *Approach to Mitigation*.

Our Responsibilities

To comply with the terms and conditions of the permit, Pacific Gas and Electric Company must implement (1) an identification and avoidance program and (2) record and track any work-related impacts to elderberry shrubs within the range of the beetle.

Identification and Avoidance means that for all routine work in the range of the VELB, a qualified (trained) individual will survey for elderberry shrubs. If they are present within 20 feet of the work site, shrubs will be identified (flagged) for avoidance. Workers at a job site near elderberry will be briefed on the location of the shrubs and the measures necessary to avoid impacts to the shrub.

If ground disturbance is planned within 20 feet of an elderberry shrub or if the shrub must be pruned or otherwise disturbed, then the impact must be documented and submitted on a VELB Habitat Impact Report form (right).

In some cases, an elderberry shrub must be removed in order to complete the work necessary. Trimming is preferable to removal; however, authorization for shrub removal can be requested from the PG&E VELB Program Manager on a case-by-case basis. The request must be approved before removal takes place.

What To Do

1) Survey work site for elderberry
2) Identify plants with flagging
3) Avoid and impact to plant
4) If impact is unavoidable, complete and submit *VELB Habitat Impact Report* to:

VELB Program Manager

See Website for contact and additional reporting information.

Valley Elderberry Longhorn Beetle Habitat Impact Report Field Form

Instructions: Detailed reporting instructions can be found at http://pgeweb/sharedservices/environmental/ep/velb/Pages/default.aspx.
This form is to be used to gather information from the field regarding impacts to VELB habitat (elderberry bushes). Once accurate information is gathered, enter this information into the VELB Habitat Impact Report Database found at http://www/elderberry/HabitatImpactForm.aspx.

For assistance in filling out this form, contact Jordan McKay (j7mc@pge.com, VELB Program Manager (916-296-6684). This form is available online at the VELB website (see link above).

Are stems greater than (>) 1" in diameter at ground level? ☐ Yes ☐No
If Yes, this form is required for reporting **one** of the following activities:

☐ **Impacts** to elderberry shrubs during routine operations and maintenance or emergency restoration activities, as defined PG&E's VELB Conservation Plan. Examples include trimming of shrubs to maintain electric conductor clearance or to maintain access to company facilities on roads or to towers.
Impact Type (identify one):
☐ Trimming/pruning
☐ Damaged by vehicle/equipment
☐ Ground disturbance within 20 feet, distance to stem(s) = ___ (ft)
Impact Date: ___ **Quantity** ___

OR

☐ **Removal request**, requiring authorization for complete removal of an elderberry shrub. Such removal may be necessary to maintain safety and reliability of PG&E facilities or equipment.

Must request and receive approval from VELB Program Manager in advance of removal.
Please allow 2 weeks.

Quantity ___
Date of Anticipated Removal ___

Contact Information (reporting individual)
Name:_____
Department: ___
Job Title: ___
Telephone Number: ___
Email Address: ___
Date Form Completed: _____

Plant Information (provide as much detail as possible)
Evidence of previous cutting/impact? ☐Yes ☐No
Estimated Height _____ (ft) (pre-impact)
Estimated Height _____ (ft) (post-impact)
Estimated Max. Canopy Width ___ (ft) (pre-impact)
Estimated Max. Canopy Length ___ (ft) (pre-impact)

Work Activities (Indicate one work category, plus a subcategory, if applicable):
Work Category: ☐**Electric** ☐**Gas** ☐ **Other** (describe): (e.g., Hydro)
Subcategory: ☐Transmission ☐Distribution ☐ Other (describe):
Department responsible for initiating work: ___

Nature of Work Activity (check one) and, if available, record SAP (PM) order #
☐ Wood Pole Replacement ☐ Right-of-Way Maintenance ☐ Pipeline Maintenance
☐ Canal Maintenance ☐ Road Maintenance ☐ Accidental/Other
☐ Vegetation Management, GO95, PRC 4292, 4293 (Work Request #____) ☐ Emergency
☐ Pole Test and Treat (Pole Reference #) Type of follow-up construction required: ☐ None ☐ Stubbing ☐ Replace

Location of Plant:
PG&E Area (1-7): ___ **PG&E Division:** ___ **City:** _____**County:** ___

- **GPS (lat-long in decimal degrees) Coordinates,** ___
- **Nearest address, road, or cross street:** ___
- **Name of circuit, pipeline (+ milepoint), road, canal, tower, or station:** ___
- **Distance and Direction of plant from company facility (road, tower, pipeline, etc) named above:** ___
- **Other helpful landmarks, directions, or comments:** ___

http://pgeweb/sharedservices/environmental/SS/NCRP/velb/Documents

For assistance in filing the form, please contact the PG&E VELB Program Manager.

VALLEY ELDERBERRY LONGHORN BEETLE ENVIRONMENTAL COMPLIANCE

Environmental Guide to Protect Valley Elderberry Longhorn Beetle Habitat

Pacific Gas and Electric Company

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Rev 5-18,j7mc

The Beetle

The valley elderberry longhorn beetle was listed as a threatened species by the US Fish and Wildlife Service, under the Endangered Species Act, in 1980.

The valley elderberry longhorn beetle is approximately 3/4" to 1" in length. Female (left) and male (right). These specimens were collected prior to Endangered Species Act protection that was given to the species in 1980.

Females lay eggs on the bark of living elderberry plants where stems measure approximately one-inch or greater. Larvae bore into the pith of stems where they feed for a year or more. After pupation, adults emerge through a 7-10mm exit hole they bore in the bark of elderberry stems.

The range in which the beetle may be found consists of California's Central Valley and associated foothills below the 500-foot elevation on the east and the watershed of the Central Valley on the west.

The Shrub

Elderberry (*Sambucus* spp.) is the sole host of the valley elderberry longhorn beetle larvae up to 500' elevation. The elderberry often grows by riverbanks in the valley foothills but can also be found in a variety of other habitats, including urban areas.

Because of the rarity of the beetle, its legal status, and the decrease in abundance of its limited habitat, the US Fish and Wildlife Service has chosen to protect elderberry shrubs throughout the range of the VELB in order to protect the beetle and manage the effects on its limited habitat.

Elderberry stems and a beetle exit hole.

The Law

The range of the beetle covers most of the Pacific Gas and Electric Company service area. Because of the extensive geographic nature of company facilities, frequent encounters with its elderberry host plant can occur. Necessary maintenance and operations activity associated with those facilities has, in the past, conflicted with federal laws that protect the beetle and its habitat.

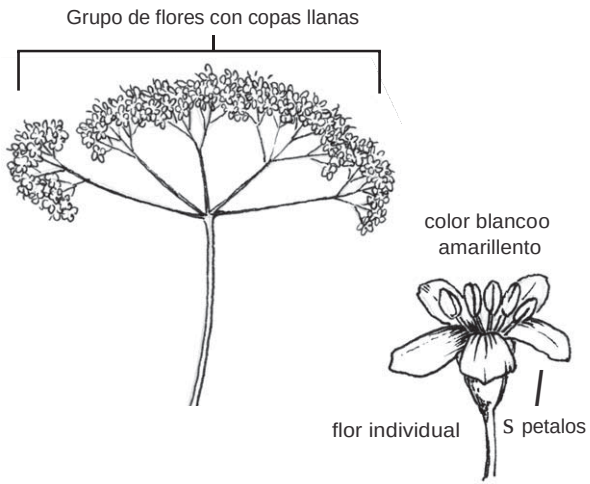
To achieve compliance with federal law, Pacific Gas and Electric Company has obtained a permit that allows the company to conduct necessary routine maintenance and operations activities that may impact VELB habitat.

The VELB's presumed historic range overlaps portions of 19 counties (as of 2014).

This permit allows Pacific Gas and Electric Company to prune (and under certain circumstances, remove) elderberry shrubs when they conflict with safe and effective operation of company facilities.

Such activities do not include construction of new electric or gas facilities but do include the following routine work activities that could affect VELB habitat:

- Gas pipeline repair or maintenance
- Gas pipeline right-of-way maintenance (vegetation management, GO112-E)
- Gas and Electric system facility inspections
- Wooden pole and tower replacement or repair
- Vegetation management for electric facilities (e.g., CPUC GO 95, PRC 4293, etc.)
- Hydroelectric system maintenance on canals, dams, penstocks, etc.



Consejos para identificar al sauce se un la estaci6n

Primavera-
Las hojas com1enzan a brotar; los racimos de tlores pueden comenzar a brotar.

Verano-
Aparecen los racimos de tlores, las hojas estan en su plenitud, los frutos siguen a las tlores.

Otofio-
Las hojas comienzan a caer, permanecen los racimos de bayas (berries).

Invierno-
El arbusto queda pelado en invierno. Presenta muy pocas o ninguna hoja. Observe las caracteristicas de la corteza, la forma en general del arbusto y su ubicaci6n; pueden permanecer aun algunos racimos de bayas secas. Busque hojas u hojillas caidas que le ayuden a la identificaci6n, observe tambien los tallos terminales , que presentan una tonalidad tipicamente rojiza.

Arbusto de sauco en invierno (sin hojas)

Que hacer

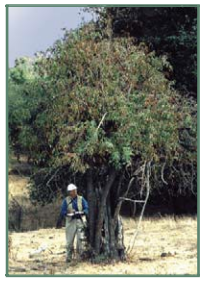
1) Examine el sitio de trabajo en busqueda de arbustos de sauco.
2) Identifiquelos con banderillas.
3) Evite cualquier impacto sobre la planta.
4) Si el impacto es inevitable, complete y envie un Informe de impacto sobre el habitat del VELB (VELB Habitat Impact Report) al:
Gerente de! Programa de protecci6n del VELB (VELB Program Manager)

Visite el sitio Web referido al VELB, para obtener la informaci6n de contacto del Gerente de Programa y ayuda adicional.
Sitio en Intranet:
http://uo/SSOS/ENV/Habitat/Reference/VELB.htm

Leyes ambientales y multas

Toda persona que viole deliberadamente alguna disposici6n de la Ley sobre las especies en peligro, o cualquier permiso emitido al amparo de dicha ley, podra ser multada con hasta $50,000 o con hasta **1** afio de prisi6n, tras ser condenado. Las violaciones de esta ley podran abarcar multas corporativas e individu ales.

GUiA PARA LA IDENTIFICACION DEL SAUCO(ELDERBERRY)



Gui"a ambiental
para proteger el habitat del
escarabajo *Desmocerus californicus dimorphus*
(Valley Elderberry Longhron Beetle, VELB)

Pacific Gas and Electric Company

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Rev7/2018

Valores corporativos y polftica ambiental

PG&E esta comprometida a mantener un liderazgo medioambien tal mediante el suministro de productos y servicios seguros, econ6micos y confiables, de un modo responsable y sensible para con el ambiente. Los valores fundamentales de PG&E incluyen la protecci6n del media ambiente. La politica de PG&E consiste en lograr el total cumplimiento con la tetra y el espiritu de las leyes y normas ambientales, y en buscar medidas innovadoras que sobrepasen los estandares actuales de protecci6n ambiental a la vez que se alcanza el exito en los mercados competitivos . Este folleto forma parte de una serie que brinda informaci6n con el prop6sito de permitir que los empleados que trabajan en el campo reconozcan algunos de los recursos ambientales sensibles en diversas regiones.

Cuestiones a cumplir

El presente folleto es una guia que le ayudara a identificar el habitat del escarabajo *Desmocerus californicus dimorphus* (Valley Elderberry Longhorn Beetle, VELB), una especie en peligro listada en el ambito federal y protegida por la Ley sabre las especies en peligro (Endangered Species Act).

El VELB habitat exclusivamente en los arbustos de sauco (elderberry) que se encuentran en el Valle Central y en las colinas al pie de las montafias (por debajo de los 152.4 m) de California. Estos arbustos estan adaptados a suelos secos y humedos; pueden crecer perfectamente tanto a pleno sol coma en lugares sombreados y pueden encontrarse jun to a las zanjas (acequias), los arroyos y los vallados (fencerows), yen los bordes de los campos, las areas donde se filtra el agua y los terrenos bajos. El sauco es muy importante para el VELB, ya que constituye el unico habitat adecuado para este pequefio y amenazado escarabajo.

Los arbustos de sauco, con tallos de 2.5 cm (1 pulgada) o mas de diametro, que se encuentren dentro del rango (o distribucion) geografica del escarabajo, estan protegidos por la Ley sobre las especies en peligro.

A efectos de cumplir con la Ley sabre las especies en peli gro, PG&E tramit6 y obtuvo un permiso que habilita a la compafiia a realizar operaciones relacionadas a rutinas de mantenimiento que podrian impactar sabre los arbustos de sauco y, por lo tanto, impactar al habitat del VELB.

El mencionado permiso autoriza a PG&E a cortar (y bajo determinadas circunstancias, a retirar) arbustos de sauco alli donde exista un conflicto con la operativa segura y efectiva de los servicios de la compafiia. Los terminos y condiciones del penniso requieren que PG&E (1) implemente un programa de identificaci6n y evitaci6n, y (2) registre y haga un seguimiento de todos los impactos relacionados con los arbustos de sauco, dentro del rango geografico del escarabajo.

El personal que trabaje dentro del rango geografico potencial del VELB, debe en todo momento llevar el folleto de Cumplimiento ambiental del VELB (62-1424) (Environmental Compliance Brochure) en sus vehiculos.

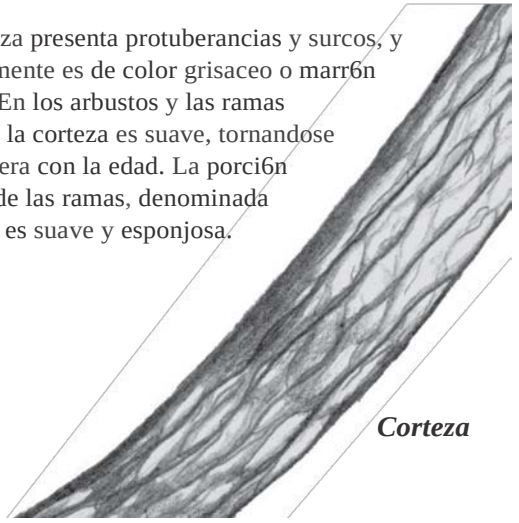
Descripci6n del sauce

El arbusto, o arbol, de sauco puede alcanzar hasta 10 metros de altura y tiene una copa irregular de ramas extendidas, pudiendo carecer de un tronco principal. A menudo crece en grandes grupos, lo que hace dificil distinguir la cantidad de plantas individuates.

Arbusto de sauco solitario

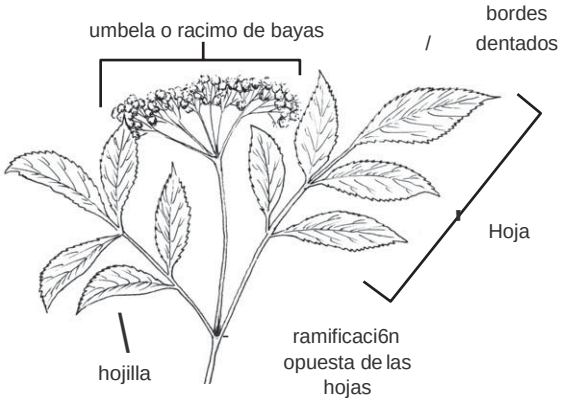
Grupo de arbustos de sauco

La corteza presenta protuberancias y surcos, y generalmente es de color grisaceo o marr6n oscuro. En los arbustos y las ramas j6venes, la corteza es suave, tornandose mas aspera con la edad. La porci6n interna de las ramas, denominada medula, es suave y esponjosa.



Corteza

Las hojas son opuestas, fonnadas por multiples hojillas (alargados y pinadas). Tienen entre I 3 y 26 cm de largo, con entre 3 a 9 hojillas cada una. Tanto las hojas coma las hojillas se encuentran formando parejas a lo largo de los tallos, por mas que las parejas de hojas opuestas sean la clave para la identificaci6n. Las hojillas son ovaladas y largas , terminadas en punta y con bordes dentados. Su color es verde brillante en la parte superior y verde mate en la inferior.



Las flares son pequefias, de color amarillo a blanco, y se presentan en forma de racimo chato (piano). Cada flor tiene 5 petalos y los racimos estan compuestos por muchas flares individuales. Los frutos que siguen a las flores son redondos, parecidos a las bayas (berries), generalmente de un color entre morado y azul oscuro o negro, con un diametro aproximado de 0.5 cm.

Appendix C7
Impact Accounting Methodology for Annual Plants

When annual plants cannot be surveyed during their respective flowering period for appropriate identification, PG&E will measure on-the-ground habitat disturbance, using square footage or acreage, as a surrogate to estimate the loss of individual covered annual plant species. For activities that are less than 0.1 acre, PG&E will either use the disturbance estimates provided in the MRHCP or will measure the post-activity ground disturbances. If larger activity work is planned in the Map Book zone during the non-flowering period, a biologist will estimate the loss of individual plants using the following methodology:

1. Identify the work area boundary within a Map Book zone. Permanent impacts on plants are defined as a loss of covered plants subsequent to and as a result of a covered activity. Temporary impacts on plants are defined as pruning or temporarily removing topsoil and seedbank, where the plants recover.
2. Conduct a field survey of the work area to document the site-specific microhabitat conditions and confirm that the microhabitat could support the covered plant species. Map all vegetation communities in the work area and identify areas that are potentially suitable for covered plant species based on soil type, vegetation community, plant species composition, slope, aspect, and other habitat constituents.
3. Following construction, use a measuring tape or similar tool to verify the work area footprint within a Map Book zone that identifies the extent of the temporary and permanent impact areas. Measure and document the actual extent of the temporary and permanent ground disturbance.
4. Review California Natural Diversity Database (CNDDB) records and other documentation (as available) that contains information on local covered plant species distribution and density, including density at nearby populations.
5. Estimate the distribution and density of the covered plant species in the work area based on covered species life history within the MRHCP, CNDDB Element Occurrences, literature reviews, and field surveys (optional). If data on local plant distribution and density is not available, assume the following:
    a. All suitable microhabitat areas within a Map Book zone at the time of a field survey are occupied.
    b. Plants are uniformly distributed throughout suitable habitat.
6. Develop a restoration plan as described in Chapter 5, Section 5.6.2.5, *Mitigation Summary for Plants*.

Appendix C8
Endangered Species Act Section 7 Compliance Tools

Based on experience with implementation of existing Habitat Conservation Plans (HCPs), PG&E has identified a need for an established, uniform approach to future Endangered Species Act (ESA) Section 7 consultations that involve HCP covered activities such that the benefits of an approved HCP can be realized. Therefore, a group of administrative tools has been developed to assist PG&E staff, consultants, and federal agency staff in completing Section 7 consultation, including preparation of a Biological Assessment (BA), for HCP covered activities that require approval or authorization from other federal agencies such as U.S. Army Corps of Engineers, U.S. Forest Service, National Park Service or other federal land management agencies. Federal lands overlapping with PG&E's HCP planning areas are illustrated on Figure C9-1. The specific approach to consultation will vary based on the federal agency involved, the federal agency concerns about the resources being affected, and extent to which the species covered in the HCP are similar to those being affected on the federal lands. To assist in preparation and review of BAs, PG&E has created several tools to ensure that effects determinations and project activities described are accurately reflected. These tools consist of the following:

1. An annotated BA template (Attachment C8-1); and
2. A set of cover letter templates to address species effects determinations under five anticipated scenarios (Attachment C8-2):
    a. Covered species only are present and likely to be adversely affected.
    b. Both covered and non-covered species are present but not likely to be adversely affected.
    c. Both covered and non-covered species are present and likely to be adversely affected.
    d. Only non-covered species are likely to be adversely affected.
    e. Covered species are likely to be adversely affected and non-covered species are not likely to be adversely affected.

A flowchart illustrating which template letter should be followed in which instance is provided in Figure C8-2

A high-level summary of the approach is presented, in Table C8-1.

Table C8-1. Roles and Responsibilities for Preparation and Evaluation of Biological Assessments for ESA Section 7 Consultation Regarding Project Activities

Biological Assessment (Section Description)	PG&E (and Consultant)	USFWS (Federal Agency)
Action Area	Explain how Action Area is within existing approved HCP (e.g., MRHCP)	Ensure that Action Area is within existing approved HCP
Project Activity	Explain how proposed activities are consistent with activities covered by the HCP	Ensure that covered activities are consistent with those of an approved PG&E HCP
Impacts on Species (Covered and Non-Covered, addressed in relevant USFWS intra-agency Section 7 Biological Opinion HCP Biological Opinion)	• For species covered by an HCP, effects determination recommendations must be THE SAME as that for the species in the intra-agency Section 7 Biological Opinion (BO) • For non-covered species addressed in the intra- agency Section 7 BO, the effects determination may not need to be the same for any future, project-specific BO (also known as an interagency Section 7 BO) • For covered species, relevant HCP avoidance and minimization measures (AMMs) must be listed in order to support any recommendations of effects determinations. As stated above, recommendations for effects determinations for covered species should be THE SAME as those made in the relevant intra-Service BO.	Ensure that effects determinations recommendations for species addressed in the Biological Assessment are THE SAME as those recorded in the relevant BO (for covered and non-covered species).
Impacts on species not addressed by the BO prepared on the HCP	Identify and use AMMs and other measures to minimize or avoid incidental take. AMMs are often not sufficient to avoid take, and in such circumstances effects are merely minimized, meaning there are still adverse effects despite the inclusion of AMMs.	Ensure that effect determinations and AMMs are appropriate to the project
Compensatory Mitigation	• Explain amount and type of compensatory mitigation required by the project, consistent with relevant HCP • Describe deduction amounts	Ensure that mitigation totals are correct, pursuant to approved HCP

Attachment C8-1
Biological Assessment Template Outline

An annotated BA template outline is presented below. The outline will further be developed into a template, which will direct authors to relevant sections in the HCP. Sample text will also be provided where appropriate. **Boldface text indicates guidance relevant to HCPs and related Biological Opinions**.

I. Introduction

a) State the purpose of the document ("to assess the effects of the proposed action on federally protected resources"). This section should include language to show which species under consideration have already been addressed by an approved PG&E regional HCP, as well as which species have not been addressed.

b) Briefly describe the proposed action. Include the federal action (e.g., issuance of a 404 permit), as well as the PG&E project action. **Describe the activity in the context of covered activities identified in the applicable HCP**.

c) List all species being addressed in the BA (up front or in Introduction). **Distinguish species that are covered in the HCP from those which are not**.

d) For HCP-covered species, recommendations for effects determinations must be the same as those made under the previous HCP Section 7 consultation. **Determinations must be the same, so as not to make new or separate determinations**.

e) Include summary of anticipated temporary and permanent effects. **Summarize the amount and type of compensatory mitigation required by the project, consistent with relevant HCP, and describe the amount of the resulting deduction(s)**.

II. Project Description

a) Explain how proposed activities are consistent with activities covered by the applicable HCP (e.g., MRHCP).

i. Describe the action, subdivided into relevant project elements—construction, operation, maintenance.

ii. Describe equipment to be used when/where/how for each project element.

b) Include a map that delineates all project elements.

c) Pursuant to U.S. Fish and Wildlife Service (USFWS) guidance, identify any conservation measures that will be incorporated into project design. **Include HCP AMMs in the project description section**. **Indicate which measures apply to HCP-covered species and any measures that would apply to non-covered species**.

III. Action Area

a) Identify and explain how many acres are in the defined action area. The action area should include a buffer around the area where proposed activities would be conducted (provide a map figure). The action area is the area where direct and indirect impacts could result from proposed activities. Note that the action area is typically larger than the area directly affected by the action. **Explain how Action Area is within existing approved HCP area (e.g., MRHCP)**.

b) Delineate the geographic area that will be affected, i.e., the area encompassing project-related physical, chemical, and biotic effect. Describe the physical and biological attributes.

c) Delineate specific area that will be affected by each project element.

d) Identify ongoing activities that may be currently affecting species or habitat.

IV. Species and Critical Habitat Considered

a) Identify species or critical habitat that "may be present" (candidates, as well as proposed and designated critical habitat). **Describe how species are either:**

i. **Covered by the relevant HCP;**

ii. **Not covered by the relevant HCP.**

b) If there are species that may be present in the general area, but not in the action area, explain why. Show the sources of this information.

c) Describe the current population and habitat conditions (status and trend, if known) in the action area for each protected resource that "may be present." It is not necessary to include life history detail.

V. Effects Analysis

a) Describe how the action may affect each protected resource—document conclusion and supporting rationale. Include any indirect effects.

b) For each species or critical habitat parcel, explain how it will or will not be affected by the project (consider effects to all life stages).

c) Describe the anticipated response to any likely effects (e.g., none, injury, death, abandonment of the area, decrease in foraging success, reduced fecundity).

d) Include explanation of species habitat (and applicable subcategories) that will be temporarily and permanently affected (acreage).

e) If activities will occur in critical habitat, explain any impacts that will result.

f) Explain how much mitigation will be owed as a result of the project, and from where the mitigation will come (i.e., which parcels PG&E has acquired easements on or purchased for mitigation). See tables in the HCP and the T&E permit. The BA should describe any instances in which a covered species has a category of mitigation (e.g., upland habitat versus wetland habitat).

g) Avoid words such as "typical" in effects discussions because they allow for discussion of exceptions that are usually not addressed. Avoid the use of other vague, subjective language.

h) Provide a cumulative effects analysis for actions likely to adversely affect listed resources. Identify any future state, local (i.e. county or city), or private activities (not involving federal activities) that are reasonably certain to occur within the action area and describe how such activities will affect listed resources within the action area.

VI. Conclusion and Determination of Effects

a) For each protected resource, make a Section 7 determination and include rationale. For species covered by an HCP, the Effects Determination must be THE SAME as that for the species in the HCP Biological Opinion. Appropriate measures from the relevant HCP must be used to ensure that effects to a given species do not exceed that described in the BO. Otherwise:

i. "No effect." There will be no positive or negative impacts on resources. Concurrence from USFWS is not required.

ii. "May affect, but not likely to adversely affect." Means that all effects are beneficial, insignificant, or discountable. Beneficial effects are contemporaneous positive effects without any adverse effects to the species or habitat. Insignificant effects relate to the size of the impact and include those effects that are undetectable, not measurable, or cannot be evaluated. Discountable effects are those extremely unlikely to occur. These determinations require written concurrence from USFWS.

iii. "May affect, and is likely to adversely affect." Listed resources are likely to be exposed to the action or its environmental consequences and will respond in a negative manner to the exposure. Take, including mortality of or injury to individuals, is an adverse effect, even if the amount of ground disturbance or environmental damage will be very small.

b) For a finding of "may affect, but not likely to adversely affect," recommend that the action agency (e.g., Corps) seek concurrence from USFWS. For a finding of "may affect, likely to adversely affect", (**not already made in an approved HCP Biological Opinion)** recommend that the action agency request initiation of Formal Consultation.

c) Describe the amount and type of compensatory mitigation required by the project, consistent with relevant HCP. Explain which mitigation lands will be used or conservation lands purchased.

VII. Literature Cited

VIII. List of Contacts Made and Preparers

IX. Attachments

a) Relevant Reports

b) Survey Results

c) Supporting Documents

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Attachment C8-2

Draft Template Letters

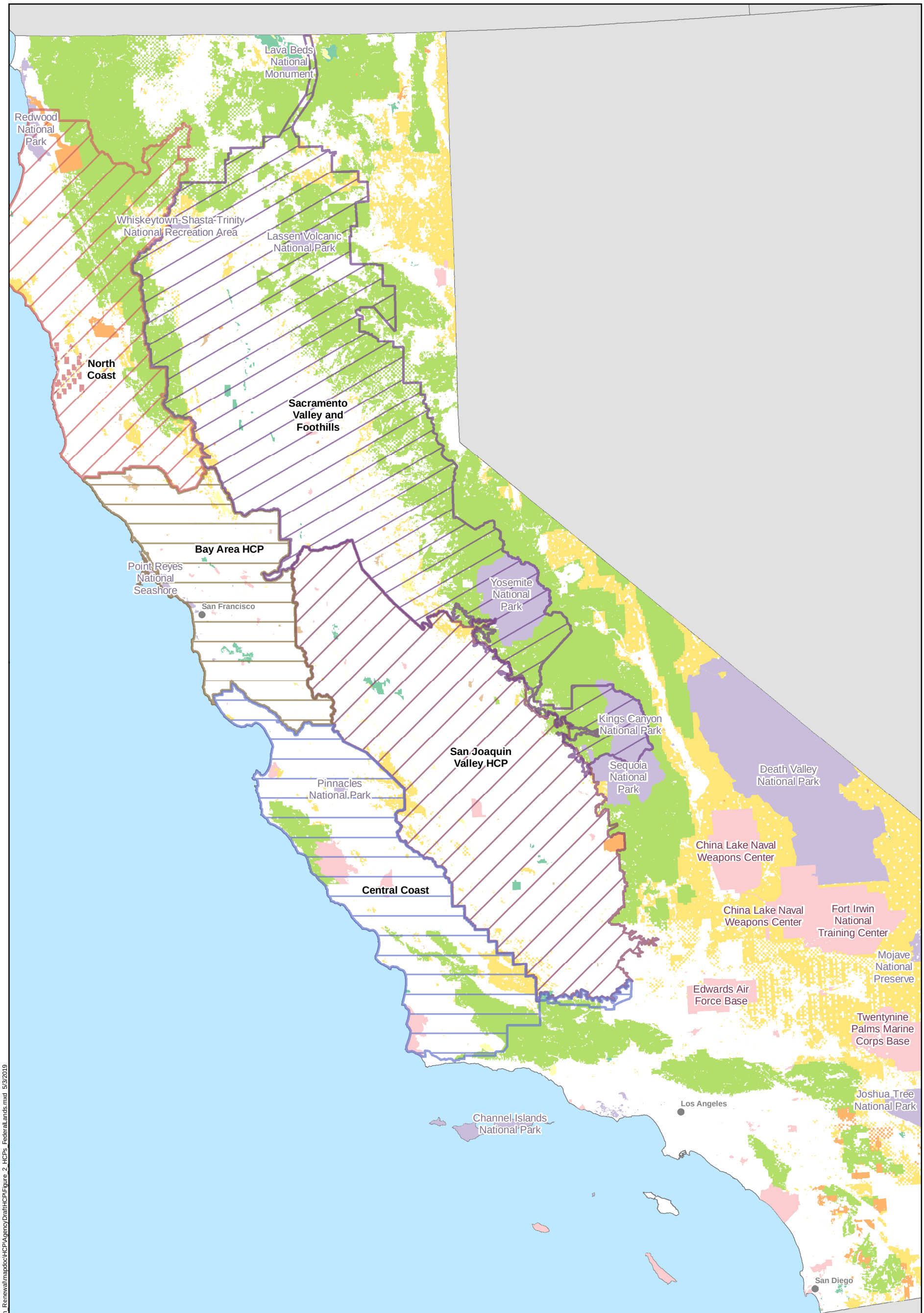

Figure C9-1. PG&E Operation and Maintenance Habitat Conservation Plans and Overlapping Federal Lands

HCP Regions
- Central Coast
- North Coast
- Sacramento Valley and Foothills
- Bay Area
- San Joaquin Valley

Federal Lands
- Bureau of Indian Affairs
- Bureau of Land Management
- Bureau of Reclamation
- Department of Defense
- Fish and Wildlife Service
- Forest Service
- National Park Service
- Other Federal

1:3,000,000
0 45 90 Miles

Pacific Gas and Electric Company®

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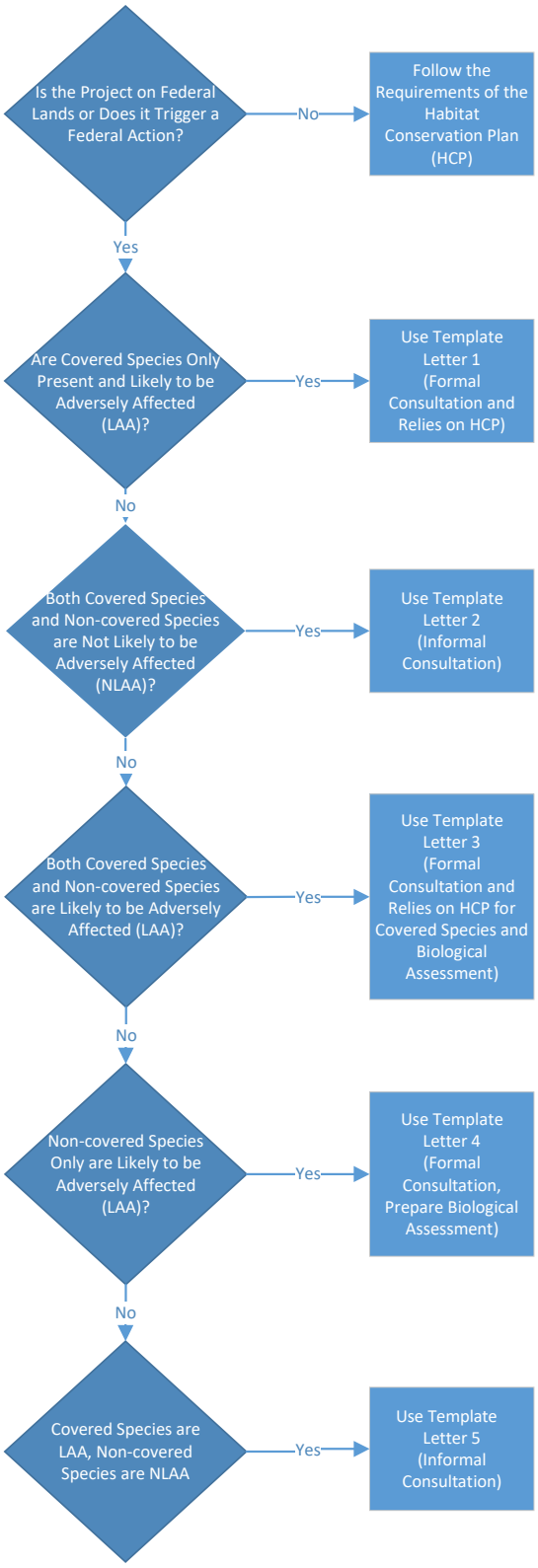

Figure C8-2

Flowchart Illustrating When Template Letters Should be Used

Covered Species and Covered Activities

Re: Informal Section 7 Consultation for [project name] in [project location]

Dear _____:

This letter serves as a request for initiation of informal Section 7 consultation for [project name]. The [federal agency] is processing a request from the Pacific Gas and Electric Company (PG&E) to [access land/discharge dredge or fill material into waters of the U.S. etc.] so that it may [describe O&M or minor new construction activity]. The activity is a "Covered Activity" under the [Name of PG&E HCP – e.g. Bay Area, Multi-Region, San Joaquin Valley] and Section 10 incidental take permit issued to PG&E on [date of permit issuance], and the manner in which the activity is proposed to be carried out is consistent with the HCP.

The proposed action of [granting access/issuing a permit etc.] may affect the [species name]. The [species] is a "Covered Species" under the HCP and Section 10 permit, and PG&E is authorized to incidentally take [species] as it undertakes Covered Activities. The proposed action may affect and is likely to adversely affect [species]. The HCP requires implementation of conservation measures so that the effects of Covered Activities on Covered Species are minimized and mitigated to the maximum extent practicable. The U.S. Fish and Wildlife Service (Service) evaluated the effects of the Covered Activities in the biological opinion [file number] prepared for the decision to issue the incidental take permit and concluded that the Covered Activities were not likely to jeopardize the continued existence of the Covered Species. Based on the applicability of the HCP to the proposed action, we are requesting confirmation from the Service that the Section 7 obligations of [federal agency] are complete [*for federally listed Covered Species]* respect to the proposed action.

Both Covered and Non-Covered Species (Not Likely to be Adversely Affected)

Re: Informal Section 7 Consultation for [project name] in [project location]

Dear _____:

This letter serves as a request for initiation of informal Section 7 consultation for [project name]. The [federal agency] is processing a request from the Pacific Gas and Electric Company (PG&E) to [access land/discharge dredge or fill material into waters of the U.S. etc.] so that it may [describe O&M or minor new construction activity]. The activity is a "Covered Activity" under the [Name of PG&E HCP – e.g. Bay Area, Multi-Region, San Joaquin Valley] and Section 10 incidental take permit issued to PG&E on [date of permit issuance], and the manner in which the activity is proposed to be carried out is consistent with the HCP.

The proposed action of [granting access/issuing a permit etc.] may affect the [species name]. The [species] is a "Covered Species" under the HCP and Section 10 permit, and PG&E is authorized to incidentally take [species] as it undertakes Covered Activities. The proposed action may affect and is likely to adversely affect [species]. The HCP requires implementation of conservation measures so that the effects of Covered Activities on Covered Species are minimized and mitigated to the maximum extent practicable. The U.S. Fish and Wildlife Service (Service) evaluated the effects of the Covered Activities in the biological opinion [file number] prepared for the decision to issue the incidental take permit and concluded that the Covered Activities were not likely to jeopardize the continued existence of the Covered Species. Based on the applicability of the HCP to the proposed action, we are requesting confirmation from the Service that the Section 7 obligations of [federal agency] are complete for federally listed Covered Species with respect to the proposed action.

The proposed action also may affect [species name]. The [species] is not a Covered Species under the MRHCP. Implementation of the Covered Activity will include the conservation measures identified in the MRHCP, which will minimize and mitigate effects to [species]. We request concurrence from the Service that the proposed action is not likely to adversely affect [species].

Both Covered and Non-Covered Species (Likely to be Adversely Affected)

Re: Formal Section 7 Consultation for [project name] in [project location]

Dear _____:

This letter serves as a request for initiation of formal Section 7 consultation for [project name]. The [federal agency] is processing a request from the Pacific Gas and Electric Company (PG&E) to [access land/discharge dredge or fill material into waters of the U.S. etc.] so that it may [describe O&M or minor new construction activity]. The activity is a "Covered Activity" under the [Name of PG&E HCP – e.g. Bay Area, Multi-Region, San Joaquin Valley] and Section 10 incidental take permit issued to PG&E on [date of permit issuance], and the manner in which the activity is proposed to be carried out is consistent with the HCP.

The proposed action of [granting access/issuing a permit etc.] may affect the [species name]. The [species] is a "Covered Species" under the HCP and Section 10 permit, and PG&E is authorized to incidentally take [species] as it undertakes Covered Activities. The proposed action may affect and is likely to adversely affect [species]. The HCP requires implementation of conservation measures so that the effects of Covered Activities on Covered Species are minimized and mitigated to the maximum extent practicable. The U.S. Fish and Wildlife Service (Service) evaluated the effects of the Covered Activities in the biological opinion [file number] prepared for the decision to issue the incidental take permit and concluded that the Covered Activities were not likely to jeopardize the continued existence of the Covered Species. Based on the applicability of the HCP to the proposed action, we are requesting confirmation from the Service that the Section 7 obligations of [federal agency] are complete for federally listed Covered Species with respect to the proposed action.

The proposed action also may affect and is likely to adversely affect [species name]. The [species] is not a Covered Species under the HCP. Implementation of the Covered Activity will include the conservation measures identified in the HCP, which will minimize and mitigate effects to [species]. Enclosed is an assessment of effects likely to result to [species] as a result of implementation of the Covered Activity.

Non-Covered Species (Likely to be Adversely Affected)

Re: Formal Section 7 Consultation for [project name] in [project location]

Dear _____:

This letter serves as a request for initiation of formal Section 7 consultation for [project name]. The [federal agency] is processing a request from the Pacific Gas and Electric Company (PG&E) to [access land/discharge dredge or fill material into waters of the U.S. etc.] so that it may [describe O&M or minor new construction activity]. The activity is a "Covered Activity" under the [Name of PG&E HCP – e.g. Bay Area, Multi-Region, San Joaquin Valley] and Section 10 incidental take permit issued to PG&E on [date of permit issuance], and the manner in which the activity is proposed to be carried out is consistent with the HCP.

The proposed action of [granting access/issuing a permit etc.] may affect and is likely to adversely affect the [species name]. The [species] is not a "Covered Species" under the HCP or Section 10 permit. Implementation of the Covered Activity will include the conservation measures identified in the HCP, which will minimize and mitigate effects to [species]. Enclosed is an assessment of effects likely to result to [species] as a result of implementation of the Covered Activity.

Non-Covered Species (Not Likely to be Adversely Affected)

Re: Informal Section 7 Consultation for [project name] in [project location]

Dear _____:

This letter serves as a request for initiation of formal Section 7 consultation for [project name]. The [federal agency] is processing a request from the Pacific Gas and Electric Company (PG&E) to [access land/discharge dredge or fill material into waters of the U.S. etc.] so that it may [describe O&M or minor new construction activity]. The activity is a "Covered Activity" under the [Name of PG&E HCP – e.g. Bay Area, Multi-Region, San Joaquin Valley] and Section 10 incidental take permit issued to PG&E on [date of permit issuance], and the manner in which the activity is proposed to be carried out is consistent with the HCP.

The proposed action of [granting access/issuing a permit etc.] may affect the [species name]. The [species] is not a Covered Species under the HCP. Implementation of the Covered Activity will include the conservation measures identified in the HCP, which will minimize and mitigate effects to [species]; a crosswalk of how these conservation measures protect non-covered species is also included. We request concurrence from the Service that the proposed action is not likely to adversely affect the [species].