FILED
06/28/24
04:59 PM
A2406017

ATTACHMENTS 5.9-D– 5.11-A
TO PROPONENT'S ENVIRONMENTAL ASSESSMENT

ATTACHMENT 5.9-D: FAA NOTICE AND CRITERIA TOOL RESULTS

Structure Name	Latitude (DD-MM-SS.SS)	Longitude (DD-MM-SS.SS)	Site Elevation	Structure Height (AGL)	Determination
MANNING	36-36-00.29	120-36-18.44	678	77	NO HAZARD TO AIR NAVIGATION
1	36-36-00.33	120-36-16.02	675	124	NO HAZARD TO AIR NAVIGATION
2	36-35-53.99	120-36-07.61	671	127	NO HAZARD TO AIR NAVIGATION
3	36-35-47.02	120-35-58.36	674	116	NO HAZARD TO AIR NAVIGATION
4	36-35-46.56	120-35-45.94	661	137	NO HAZARD TO AIR NAVIGATION
5	36-35-46.02	120-35-31.26	650	137	NO HAZARD TO AIR NAVIGATION
6	36-35-45.50	120-35-17.06	641	142	NO HAZARD TO AIR NAVIGATION
7	36-35-44.95	120-35-02.25	636	137	NO HAZARD TO AIR NAVIGATION
8	36-35-44.42	120-34-47.91	623	142	NO HAZARD TO AIR NAVIGATION
9	36-35-43.88	120-34-33.41	612	142	NO HAZARD TO AIR NAVIGATION
10	36-35-44.10	120-34-20.67	597	132	NO HAZARD TO AIR NAVIGATION
11	36-35-44.16	120-34-08.22	581	127	NO HAZARD TO AIR NAVIGATION
12	36-35-44.22	120-33-55.81	569	127	NO HAZARD TO AIR NAVIGATION
13	36-35-44.28	120-33-42.96	553	132	NO HAZARD TO AIR NAVIGATION
14	36-35-44.34	120-33-29.53	545	132	NO HAZARD TO AIR NAVIGATION
15	36-35-44.40	120-33-16.95	530	137	NO HAZARD TO AIR NAVIGATION
16	36-35-44.46	120-33-03.73	518	132	NO HAZARD TO AIR NAVIGATION
17	36-35-44.51	120-32-52.09	508	132	NO HAZARD TO AIR NAVIGATION
18	36-35-44.56	120-32-40.77	499	147	NO HAZARD TO AIR NAVIGATION
19	36-35-44.61	120-32-29.25	487	147	NO HAZARD TO AIR NAVIGATION
20	36-35-44.68	120-32-14.82	471	142	NO HAZARD TO AIR NAVIGATION
21	36-35-44.74	120-32-01.84	459	121	NO HAZARD TO AIR NAVIGATION
22	36-35-38.96	120-31-57.18	455	137	NO HAZARD TO AIR NAVIGATION
23	36-35-32.75	120-31-52.19	456	154	NO HAZARD TO AIR NAVIGATION
24	36-35-32.68	120-31-45.34	453	157	NO HAZARD TO AIR NAVIGATION
25	36-35-32.55	120-31-32.55	441	147	NO HAZARD TO AIR NAVIGATION
26	36-35-32.40	120-31-18.45	428	142	NO HAZARD TO AIR NAVIGATION
27	36-35-32.25	120-31-04.33	422	137	NO HAZARD TO AIR NAVIGATION
28	36-35-32.11	120-30-50.46	402	137	NO HAZARD TO AIR NAVIGATION
29	36-35-31.99	120-30-39.22	392	127	NO HAZARD TO AIR NAVIGATION
30	36-35-31.95	120-30-27.29	382	132	NO HAZARD TO AIR NAVIGATION
31	36-35-31.90	120-30-14.24	372	132	NO HAZARD TO AIR NAVIGATION
32	36-35-31.86	120-30-01.89	360	122	NO HAZARD TO AIR NAVIGATION
33	36-35-31.81	120-29-49.19	350	137	NO HAZARD TO AIR NAVIGATION
34	36-35-31.76	120-29-34.60	339	142	NO HAZARD TO AIR NAVIGATION
35	36-35-31.71	120-29-21.62	329	137	NO HAZARD TO AIR NAVIGATION
36	36-35-31.67	120-29-10.58	320	137	NO HAZARD TO AIR NAVIGATION
37	36-35-31.61	120-28-56.25	309	137	NO HAZARD TO AIR NAVIGATION
38	36-35-31.56	120-28-43.03	300	132	NO HAZARD TO AIR NAVIGATION
39	36-35-31.51	120-28-29.69	292	132	NO HAZARD TO AIR NAVIGATION
40	36-35-31.43	120-28-16.63	282	132	NO HAZARD TO AIR NAVIGATION
41	36-35-31.35	120-28-03.04	273	132	NO HAZARD TO AIR NAVIGATION
42	36-35-31.27	120-27-50.71	266	132	NO HAZARD TO AIR NAVIGATION
43	36-35-31.19	120-27-37.93	257	132	NO HAZARD TO AIR NAVIGATION
44	36-35-31.11	120-27-24.65	251	132	NO HAZARD TO AIR NAVIGATION
45	36-35-31.02	120-27-11.50	246	132	NO HAZARD TO AIR NAVIGATION
46	36-35-30.94	120-26-58.91	240	132	NO HAZARD TO AIR NAVIGATION
47	36-35-30.88	120-26-45.86	235	132	NO HAZARD TO AIR NAVIGATION
48	36-35-30.82	120-26-32.70	230	132	NO HAZARD TO AIR NAVIGATION
49	36-35-30.76	120-26-19.47	227	132	NO HAZARD TO AIR NAVIGATION
50	36-35-30.69	120-26-06.32	224	132	NO HAZARD TO AIR NAVIGATION
51	36-35-30.63	120-25-53.15	222	132	NO HAZARD TO AIR NAVIGATION
52	36-35-30.57	120-25-40.51	220	142	NO HAZARD TO AIR NAVIGATION
53	36-35-30.79	120-25-27.73	218	137	NO HAZARD TO AIR NAVIGATION
54	36-35-31.03	120-25-13.58	217	132	NO HAZARD TO AIR NAVIGATION
55	36-35-31.25	120-25-00.47	214	132	NO HAZARD TO AIR NAVIGATION
56	36-35-31.46	120-24-48.38	213	127	NO HAZARD TO AIR NAVIGATION
57	36-35-31.67	120-24-36.11	212	132	NO HAZARD TO AIR NAVIGATION
58	36-35-31.64	120-24-23.87	210	142	NO HAZARD TO AIR NAVIGATION
PGEStr59	36-35-30.45	120-24-14.76	209	102	NO HAZARD TO AIR NAVIGATION
PGEMM4	36-35-59.76	120-37-15.53	768	92	NO HAZARD TO AIR NAVIGATION

PGEMM3	36-36-00.07	120-36-59.93	745	132	NO HAZARD TO AIR NAVIGATION
PGEMM2	36-36-00.36	120-36-45.14	717	132	NO HAZARD TO AIR NAVIGATION
PGEMM1	36-36-00.58	120-36-33.59	695	92	NO HAZARD TO AIR NAVIGATION
PGEMG5	36-36-01.68	120-37-19.97	774	92	NO HAZARD TO AIR NAVIGATION
PGEMG4	36-36-01.76	120-37-13.84	762	132	NO HAZARD TO AIR NAVIGATION
PGEMG3	36-36-01.94	120-37-00.60	743	132	NO HAZARD TO AIR NAVIGATION
PGEMG2	36-36-02.15	120-36-45.22	717	132	NO HAZARD TO AIR NAVIGATION
PGEMG1	36-36-02.30	120-36-33.71	693	92	NO HAZARD TO AIR NAVIGATION
PGELB2M1	36-36-09.69	120-36-23.29	670	92	NO HAZARD TO AIR NAVIGATION
PGELB2M2	36-36-09.51	120-36-36.93	693	132	NO HAZARD TO AIR NAVIGATION
PGELB2M3	36-36-09.33	120-36-49.47	717	132	NO HAZARD TO AIR NAVIGATION
PGELB2M4	36-36-09.18	120-37-00.42	726	132	NO HAZARD TO AIR NAVIGATION
PGELB2M5	36-36-09.01	120-37-13.25	745	132	NO HAZARD TO AIR NAVIGATION
PGELB2M6	36-36-08.85	120-37-24.25	765	92	NO HAZARD TO AIR NAVIGATION
PGELB1M1	36-36-07.68	120-36-24.23	674	92	NO HAZARD TO AIR NAVIGATION
PGELB1M2	36-36-07.51	120-36-36.45	694	132	NO HAZARD TO AIR NAVIGATION
PGELB1M3	36-36-07.34	120-36-48.63	719	132	NO HAZARD TO AIR NAVIGATION
PGELB1M4	36-36-07.19	120-36-59.84	731	132	NO HAZARD TO AIR NAVIGATION
PGELB1M5	36-36-07.01	120-37-12.95	748	132	NO HAZARD TO AIR NAVIGATION
PGELB1M6	36-36-06.85	120-37-24.73	762	92	NO HAZARD TO AIR NAVIGATION
PGEPM21	36-35-47.90	120-32-04.79	463	182	NO HAZARD TO AIR NAVIGATION
PGEPM20	36-35-47.95	120-32-14.79	472	142	NO HAZARD TO AIR NAVIGATION
PGEPM19	36-35-48.01	120-32-29.22	481	142	NO HAZARD TO AIR NAVIGATION
PGEPM18	36-35-48.06	120-32-40.82	494	142	NO HAZARD TO AIR NAVIGATION
PGEPM17	36-35-48.10	120-32-52.06	507	142	NO HAZARD TO AIR NAVIGATION
PGEPM16	36-35-48.15	120-33-03.45	518	142	NO HAZARD TO AIR NAVIGATION
PGEPM15	36-35-48.35	120-33-16.81	531	142	NO HAZARD TO AIR NAVIGATION
PGEPM14	36-35-48.54	120-33-29.32	544	142	NO HAZARD TO AIR NAVIGATION
PGEPM13	36-35-48.74	120-33-42.88	557	142	NO HAZARD TO AIR NAVIGATION
PGEPM12	36-35-48.93	120-33-55.78	567	142	NO HAZARD TO AIR NAVIGATION
PGEPM11	36-35-49.11	120-34-07.82	577	142	NO HAZARD TO AIR NAVIGATION
PGEPM10	36-35-49.38	120-34-26.65	597	142	NO HAZARD TO AIR NAVIGATION
PGEPM9	36-35-49.55	120-34-37.84	604	142	NO HAZARD TO AIR NAVIGATION
PGEPM8	36-35-49.65	120-34-50.53	622	142	NO HAZARD TO AIR NAVIGATION
PGEPM7	36-35-49.76	120-35-03.95	628	142	NO HAZARD TO AIR NAVIGATION
PGEPM6	36-35-49.87	120-35-17.22	638	142	NO HAZARD TO AIR NAVIGATION
PGEPM5	36-35-49.98	120-35-30.78	644	142	NO HAZARD TO AIR NAVIGATION
PGEPM4	36-35-50.09	120-35-44.45	650	142	NO HAZARD TO AIR NAVIGATION
PGEPM3	36-35-50.20	120-35-57.36	665	132	NO HAZARD TO AIR NAVIGATION
PGEPM2	36-35-56.60	120-36-06.48	666	152	NO HAZARD TO AIR NAVIGATION
PGEPM1	36-36-03.91	120-36-16.89	670	112	NO HAZARD TO AIR NAVIGATION
PGEPM1A	36-36-04.21	120-36-19.96	674	112	NO HAZARD TO AIR NAVIGATION
PGEPM1B	36-36-03.56	120-36-19.41	674	112	NO HAZARD TO AIR NAVIGATION
Existing 230kV	36-35-32.81	120-24-16.35	209	137	NO HAZARD TO AIR NAVIGATION
Existing 230kV Str	36-35-32.71	120-24-23.61	210	132	NO HAZARD TO AIR NAVIGATION
Existing 230kV Str	36-35-32.64	120-24-36.12	212	132	NO HAZARD TO AIR NAVIGATION
Existing 230kV Str	36-35-32.60	120-24-48.43	213	132	NO HAZARD TO AIR NAVIGATION
Existing 230kV Str	36-35-32.52	120-25-00.43	214	132	NO HAZARD TO AIR NAVIGATION
Existing 230kV Str	36-35-32.61	120-25-13.56	216	132	NO HAZARD TO AIR NAVIGATION
Existing 230kV Str	36-35-32.69	120-25-27.64	218	132	NO HAZARD TO AIR NAVIGATION
Existing 230kV Str	36-35-32.73	120-25-40.47	220	132	NO HAZARD TO AIR NAVIGATION
Existing 230kV Str	36-35-32.82	120-25-53.05	221	132	NO HAZARD TO AIR NAVIGATION
Existing 230kV Str	36-35-32.88	120-26-06.23	223	132	NO HAZARD TO AIR NAVIGATION
Existing 230kV Str	36-35-32.98	120-26-19.42	226	132	NO HAZARD TO AIR NAVIGATION
Existing 230kV Str	36-35-33.06	120-26-32.64	230	132	NO HAZARD TO AIR NAVIGATION
Existing 230kV Str	36-35-33.11	120-26-45.81	236	132	NO HAZARD TO AIR NAVIGATION
Existing 230kV Str	36-35-33.12	120-26-58.99	240	132	NO HAZARD TO AIR NAVIGATION
Existing 230kV Str	36-35-33.26	120-27-11.52	245	132	NO HAZARD TO AIR NAVIGATION
Existing 230kV Str	36-35-33.34	120-27-24.76	251	132	NO HAZARD TO AIR NAVIGATION
Existing 230kV Str	36-35-33.41	120-27-37.95	257	132	NO HAZARD TO AIR NAVIGATION
Existing 230kV Str	36-35-33.43	120-27-50.62	266	132	NO HAZARD TO AIR NAVIGATION
Existing 230kV Str	36-35-33.56	120-28-03.39	273	132	NO HAZARD TO AIR NAVIGATION
Existing 230kV Str	36-35-33.63	120-28-16.62	282	132	NO HAZARD TO AIR NAVIGATION

Existing 230kV Str	36-35-33.69	120-28-29.78	291	132	NO HAZARD TO AIR NAVIGATION
Existing 230kV Str	36-35-33.78	120-28-42.98	299	132	NO HAZARD TO AIR NAVIGATION
Existing 230kV Str	36-35-33.85	120-28-56.28	309	132	NO HAZARD TO AIR NAVIGATION
Existing 230kV Str	36-35-33.88	120-29-09.52	319	152	NO HAZARD TO AIR NAVIGATION
Existing 230kV Str	36-35-33.95	120-29-21.69	329	152	NO HAZARD TO AIR NAVIGATION
Existing 230kV Str	36-35-34.04	120-29-36.01	340	132	NO HAZARD TO AIR NAVIGATION
Existing 230kV Str	36-35-34.10	120-29-49.18	349	132	NO HAZARD TO AIR NAVIGATION
Existing 230kV Str	36-35-34.16	120-30-01.88	359	132	NO HAZARD TO AIR NAVIGATION
Existing 230kV Str	36-35-34.21	120-30-14.62	373	132	NO HAZARD TO AIR NAVIGATION
Existing 230kV Str	36-35-34.28	120-30-27.50	384	132	NO HAZARD TO AIR NAVIGATION
Existing 230kV Str	36-35-34.17	120-30-39.21	394	132	NO HAZARD TO AIR NAVIGATION
Existing 230kV Str	36-35-34.41	120-30-50.51	403	132	NO HAZARD TO AIR NAVIGATION
Existing 230kV Str	36-35-34.50	120-31-02.46	426	132	NO HAZARD TO AIR NAVIGATION
Existing 230kV Str	36-35-34.57	120-31-18.38	430	152	NO HAZARD TO AIR NAVIGATION
Existing 230kV Str	36-35-34.65	120-31-32.33	439	152	NO HAZARD TO AIR NAVIGATION
PGEMT24	36-35-34.72	120-31-46.88	452	182	NO HAZARD TO AIR NAVIGATION
PGEMT23	36-35-34.82	120-31-50.64	455	182	NO HAZARD TO AIR NAVIGATION
PGEMT22	36-35-41.04	120-31-55.65	456	142	NO HAZARD TO AIR NAVIGATION
PGEMT21	36-35-46.90	120-32-00.36	461	182	NO HAZARD TO AIR NAVIGATION
PGEMT20	36-35-46.96	120-32-14.63	474	142	NO HAZARD TO AIR NAVIGATION
PGEMT19	36-35-47.02	120-32-29.23	483	142	NO HAZARD TO AIR NAVIGATION
PGEMT18	36-35-47.07	120-32-40.79	498	142	NO HAZARD TO AIR NAVIGATION
PGEMT17	36-35-47.12	120-32-52.08	510	142	NO HAZARD TO AIR NAVIGATION
PGEMT16	36-35-47.16	120-33-03.45	517	142	NO HAZARD TO AIR NAVIGATION
PGEMT15	36-35-47.36	120-33-16.83	532	142	NO HAZARD TO AIR NAVIGATION
PGEMT14	36-35-47.55	120-33-29.35	545	142	NO HAZARD TO AIR NAVIGATION
PGEMT13	36-35-47.75	120-33-42.88	557	142	NO HAZARD TO AIR NAVIGATION
PGEMT12	36-35-47.94	120-33-55.80	567	142	NO HAZARD TO AIR NAVIGATION
PGEMT11	36-35-48.12	120-34-07.77	577	142	NO HAZARD TO AIR NAVIGATION
PGEMT10	36-35-48.36	120-34-24.09	594	142	NO HAZARD TO AIR NAVIGATION
PGEMT9	36-35-48.55	120-34-37.34	605	142	NO HAZARD TO AIR NAVIGATION
PGEMT8	36-35-48.66	120-34-50.62	622	142	NO HAZARD TO AIR NAVIGATION
PGEMT7	36-35-48.77	120-35-03.85	631	142	NO HAZARD TO AIR NAVIGATION
PGEMT6	36-35-48.87	120-35-17.20	640	142	NO HAZARD TO AIR NAVIGATION
PGEMT5	36-35-48.98	120-35-30.73	645	142	NO HAZARD TO AIR NAVIGATION
PGEMT4	36-35-49.09	120-35-44.45	652	142	NO HAZARD TO AIR NAVIGATION
PGEMT3	36-35-49.20	120-35-58.18	669	132	NO HAZARD TO AIR NAVIGATION
PGEMT2	36-35-54.80	120-36-06.13	667	142	NO HAZARD TO AIR NAVIGATION
PGEMT1	36-36-01.42	120-36-15.52	672	112	NO HAZARD TO AIR NAVIGATION

ATTACHMENT 5.11-A: SAN JOAQUIN VALLEY O&M HCP

MULTIPLE REGION
OPERATIONS & MAINTENANCE

HABITAT CONSERVATION PLAN

SACRAMENTO VALLEY AND FOOTHILLS
NORTH COAST
CENTRAL COAST

Prepared for:
Pacific Gas & Electric Company

Prepared by:
ICF

FINAL | MAY 2020

FINAL

MULTIPLE REGION OPERATIONS AND MAINTENANCE HABITAT CONSERVATION PLAN

PREPARED FOR:

Pacific Gas and Electric Company
77 Beale St. B28P
San Francisco, CA 94177-1490
Contact: Jon Wilcox
(916) 923-7066

PREPARED BY:

ICF
980 9th Street, Suite 1200
Sacramento, CA 95814
Contact: Brad Norton
(916) 737-3000

May 2020

ICF. 2020. *Multiple Region Operations and Maintenance Habitat Conservation Plan*. Final. May. (ICF 00647.17.) Sacramento, CA. Prepared for Pacific Gas and Electric Company, San Francisco, CA.

Contents

Tables

Figures

Follows Page

Acronyms and Abbreviations

AC	alternating current
AMMs	avoidance and minimization measures
ATVs	all-terrain vehicles
BA	biological assessment
Bay Area O&M HCP	Bay Area Operations and Maintenance Habitat Conservation Plan
BMPs	best management practices
BO	biological opinion
BTU	British Thermal Units
Cal/OSHA	California Occupational Safety and Health Administration
Caltrans	California Department of Transportation
CALVEG	Classification and Assessment with Landsat of Visible Ecological Groupings
CDF	California Department of Forestry and Fire Protection
CDFW	California Department of Fish and Wildlife
CEC	California Energy Commission
CESA	California Endangered Species Act
CFR	Code of Federal Regulations
CNDDB	California Natural Diversity Database
CNPS's	California Native Plant Society's
CPS	cathodic protection system
CPUC	California Public Utilities Commission
CPUs	cathodic protection units
CWA	Clean Water Act
CWHR	California Wildlife Habitat Relationship
CWHR	California Wildlife Habitats Relationship
dbh	diameter breast height
Delta	Sacramento-San Joaquin River Delta
DOT	U.S. Department of Transportation
DPS	Distinct Population Segment
DWR	Department of Water Resources
EA	environmental assessment
EIS	environmental impact statement
EPA	U.S. Environmental Protection Agency
ERTC	Environmental Release to Construction
ESA	federal Endangered Species Act
ETS	Electric Test System

F	Fahrenheit
FAC	Facilities Design, Connections, and Maintenance
FPs	field protocols
FR	Federal Register
FRAP	Fire and Resource Protection Program
G.O.	General Order
GGNRA	Golden Gate National Recreation Area
HCP	Habitat Conservation Plan
ISO	Independent System Operator
kV	kilovolts
kW	kilowatt
kWh	kilowatt-hour
LOB	lines of business
LRAs	Local Responsibility Areas
MARS	mitigation accounting reporting system
MBTA	Migratory Bird Treaty Act
MFL	magnetic flux leakage
MLRAs	major land resource areas
mph	miles per hour
NAIP	National Agricultural Imagery Program
NCCP	natural community conservation plan
NEPA	National Environmental Policy Act
NERC	North American Electric Reliability Corporation
NHD	National Hydraulic Dataset
NMFS	National Marine Fisheries Service
NPDES	National Pollutant Discharge Elimination System
NWI	National Wetland Inventory
O&M	operation and maintenance
PG&E's	Pacific Gas and Electric Company's
Plan Area	covered activities
PLS	pressure limiting stations
psi	per square inch
psig	pounds per square inch gauge
PVC	polyvinyl chloride
Regional Water Board	Regional Water Quality Control Board
ROW	right-of-way
San Joaquin Valley O&M HCP	San Joaquin Valley Operations and Maintenance Habitat Conservation Plan
SCADA	supervisory control and data acquisition

SRAs	State Responsibility Areas
State Water Board	State Water Resources Control Board
SUVs	sport utility vehicles
SWPPP	stormwater pollution prevention plan
TSP	tubular steel poles
TVMP	Transmission Vegetation Management Plan
USACE	U.S. Army Corps of Engineers
USC	U.S. Government Code
USDA	U.S. Department of Agriculture
USFS	U.S. Forest Service
USFWS	U.S. Fish and Wildlife Service
VegCAMP	Vegetation Classification and Mapping Program

ES.1 Purpose and Background

Pacific Gas & Electric Company(PG&E) has prepared this Multiple Region Operation and Maintenance Habitat Conservation Plan (MRHCP), a multiple species Habitat Conservation Plan (HCP) for routine operation and maintenance (O&M) activities in the remainder of its service area not already covered by an HCP. The MRHCP provides a method for PG&E to comply with the federal Endangered Species Act (ESA) by applying for a Section 10(a)(1)(B) permit. The MRHCP is PG&E's third multiple species HCP designed to provide an efficient and consistent approach to both ESA compliance and long-term species conservation. The MRHCP builds on the lessons learned from PG&E's *San Joaquin Valley Operations and Maintenance Habitat Conservation Plan*, which was permitted in 2007, and the *Bay Area Operations and Maintenance Habitat Conservation* Plan, which was permitted in 2017.

The purpose of the MRHCP is to enable PG&E to continue to conduct current and future O&M activities within 34 California counties while avoiding, minimizing, and mitigating temporary and permanent impacts on threatened and endangered species habitat that could result from PG&E's ongoing O&M activities. The HCP provides an analysis of impacts and potential for incidental take over the 30 years of the proposed permit.

ES.2 Study Area, Plan Area, Integrated Plan Area, Covered Species, and Covered Activities

The MRHCP study area consists of territory in 34 California counties: Amador, Butte, Calaveras, Colusa, El Dorado, Fresno, Glenn, Humboldt, Kern, Lake, Lassen, Madera, Mariposa, Mendocino, Modoc, Monterey, Nevada, Placer, Plumas, Sacramento, San Benito, San Luis Obispo, Santa Barbara, Santa Cruz, Shasta, Sierra, Siskiyou, Sutter, Tehama, Trinity, Tulare, Tuolumne, Yolo, and Yuba. Approximately 40% of PG&E's facilities lie within the MRHCP's study area, which represents the portion of PG&E's service area that has not been covered by previous O&M HCPs or the programmatic Biological Opinion (BO) for gas facilities in the Mojave Desert.

The study area is further organized into the Plan Area and regional planning areas. The *Plan Area* consists of the area in which PG&E will conduct its activities. The Plan Area includes PG&E gas and electric transmission and distribution facilities, right-of-way (ROW), a buffer around facilities, the lands owned by PG&E or subject to PG&E easements to maintain facilities, access routes associated with PG&E's routine maintenance, and mitigation areas acquired to mitigate impacts resulting from covered activities. The Plan Area also includes areas for minor new construction. Three regional planning areas, Sacramento Valley and Foothills, North Coast, and Central Coast, were defined to organize the analysis. These regional areas are defined along county lines to some extent and are designed to connect to PG&E's other approved O&M HCP planning areas.

The total Plan Area encompasses approximately 565,781 acres. Approximately 20.8% of the Plan Area is cultivated lands, 18.7% is grassland, 25.5% is urban, and the remaining 35% consists of other natural land-cover types. An *Integrated Plan Area* consisting of the boundaries of all PG&E's

O&M HCPs will allow for the coordination of mitigation across PG&E's Habitat Conservation Plan Areas. In coordination with the U.S. Fish and Wildlife Service, PG&E went through an iterative process of developing predictive habitat models for the covered species based on habitat requirements, species location information, and land-cover data. PG&E also used habitat models from regional conservation plans to validate the range and habitat for covered species.

The MRHCP covers impacts on 24 wildlife and 12 plant species that would result from 30 routine O&M activities for PG&E's electric and gas operations. These "covered species" are those for which PG&E is seeking take authorization. Eighteen covered species have designated critical habitat within the Plan Area. Species in the following taxonomic groups are being proposed for coverage: invertebrates (10), amphibians (7), reptiles (2), birds (2), and mammals (3). Plants consists of perennial trees and shrubs, and herbaceous annuals and perennials.

The HCP addresses impacts from day-to-day O&M activities as well as large maintenance improvement projects that require extensive planning and coordination and assumes that any activity could be implemented in a given year. The vast majority of O&M activities would affect less than 0.1 acre (approximately 66 feet by 66 feet), would be conducted regularly and routinely, and would take a couple of hours to complete. Small activities typically have short lead times for environmental review, whereas large activities or projects typically require multiple permits and authorizations, extensive coordination, and long lead times for planning and permitting approvals. Typical activities include: gas pipeline protection, recoating, repair and replacement; electric line protection, repair, reconductoring, and replacement; electric pole repair/replacement; vegetation management to maintain clearances around facilities; and minor new gas and electric extensions, as mandated for public safety and reliable energy.

ES.3 Habitat Disturbance and Species Effects

The temporary and permanent habitat disturbance associated with each covered activity and approximate amount of each land-cover type disturbed are identified in the MRHCP. Impacts associated with covered activities were categorized as permanent habitat loss or temporary habitat loss. The time required for habitat functions and values to return is influenced by the type of habitat and disturbance. Physical disturbance to vernal pool, permanent wetland, and seasonal wetland habitats could result in temporary or permanent impacts, depending on the time required to restore hydrological function. Permanent habitat loss would result from disturbances causing permanent conversion from natural land cover suitable for a covered species to a developed land cover (e.g., a new footprint that results from new facilities that previously was not there, as is the case with minor new construction activities). Covered activities that could result in permanent habitat loss include substation expansions, some vegetation management activities (e.g., ROW clearing), and construction of new permanent access roads where existing roads cannot be utilized or restored. Temporary habitat loss would be attributed to covered activities that involve excavation, grading, or stockpiling of soil that alters existing vegetation, soils, topography, and hydrology for a period of days, weeks, or months, but no longer than 12 months. Temporary impacts also could result from equipment staging. While these disturbances may have an impact on the values of habitat for covered species, impacts on habitat would be temporary in nature (less than 1 year). Habitat functions and values would return within that year.

ES.4 Elements of the Conservation Strategy

Five key principles guide PG&E's MRHCP conservation strategy.

1. The avoidance and minimization of impacts is ensured by a thorough review of covered activities via environmental impact review, planning, and screening.
2. Avoiding impacts on habitat (i.e., implementing avoidance and minimization measures [AMMs] and best management practices [BMPs]) is preferable to mitigating or preserving habitat offsite.
3. Preserving lands for covered species with high-quality habitat or of high conservation value helps to build on other local and regional conservation efforts.
4. Preserving large, contiguous areas of habitat is preferable to preserving a larger number of small areas.
5. Habitat mitigation lands will be protected and managed in perpetuity.

PG&E will provide annual HCP training for staff and third-party contractors working under the requirements of the MRHCP. Training will include an overview of the MRHCP, the importance of compliance with the MRHCP and all environmental laws, and a summary of all AMMs and BMPs outlined in the MRHCP.

The primary objective of the strategy is to avoid, minimize, and mitigate impacts on covered species and habitat in the Plan Area. PG&E conducts early planning and review of activities to avoid or minimize impacts on species and the habitats for those species. To avoid and minimize the impacts of its activities, PG&E often redesigns or reconfigures construction plans in consultation with PG&E biologists and land planners by taking the following actions: adjusting or changing access routes, relocating or modifying work areas, minimizing the size of work sites, modifying work practices, and/or adjusting or changing work periods.

PG&E's team of land planners and biologists will conduct site assessments and will employ biologists to determine the need for additional surveys, monitoring, and/or site-specific AMMs. For most small covered activities, affecting less than 0.1 acre, a predictive modeled habitat approach provides an alternative to on-the-ground biological surveys for species occurrence and habitat suitability. Habitat models utilize existing commercial data and biological information to assess the likelihood that a covered species or its habitat is present at a particular location. In some instances, surveys may be conducted to validate these assumptions and determine if habitat is present. For large covered activities, affecting more than 0.1 acre, PG&E land planners and biologists will review and utilize the modeled habitat information, and will use actual, on-the-ground impacts as measured in the field by biologists and land planners to determine the extent of permanent or temporary impacts on habitat.

PG&E will employ a suite of measures to avoid and minimize the impacts on covered species and habitat resulting from covered activities. AMMs are proposed to avoid and minimize effects. PG&E will consistently implement measures when activities are conducted in sensitive areas. There are AMMs specific to hot zones[1], Species-Specific AMMs, and Covered Plant AMMs that will ensure impacts on narrow endemic species are avoided or minimized; each measure focuses on a particular

[1] Hot zones are defined as areas containing a known localized population of covered species with a small and well-defined range, and where species would most likely be affected should covered activities be implemented there.

species or suite of species and will be applied when PG&E undertakes covered activities in a specific area.

Other principles of the strategy include identifying high-value conservation opportunities, providing "jump start" mitigation, acquiring larger mitigation parcels contiguous to protected areas and other nonprotected areas of suitable habitat, and seeking strategic partnerships with local conservation organizations that are actively involved in habitat enhancement and restoration with the goal of species conservation or recovery. PG&E will provide habitat mitigation lands to stay ahead of covered activity impacts over the term of the HCP.

ES.5 Mitigation and Funding

To offset potential effects, PG&E will provide habitat mitigation through the following mechanisms: purchase of high-quality habitat, purchase or placement of conservation easements and endowment, purchase or placement of conservation easements on high-quality habitat, purchase of credits from approved mitigation or conservation banks, partnerships with or contributions to existing conservation planning and recovery efforts, placement of conservation easements on existing PG&E lands, and habitat enhancement and restoration on lands already protected. Approximately 2,139 acres have already been provided to jump start the program.

Over the permit term, PG&E will adjust the amount of habitat mitigation required to reflect the total amount (both estimated and actual) of habitat loss for covered species. The overall intent is to ensure appropriate mitigation is provided in a manner consistent with the stay ahead provision in the MRHCP. Habitat models will be used to drive mitigation accounting for most species, but site-specific habitat assessments will drive mitigation for specific species. Mitigation acreage will be based on temporary and permanent habitat impacts. Temporary effects will be mitigated at a ratio ranging from 0.1:1 to 1:1 (0.1 to 1.0 acre mitigated for every 1 acre temporarily impacted), depending on the species and timing of the mitigation, and permanent effects will be mitigated at a ratio of 3:1. If stay ahead provisions are not adhered to, higher mitigation ratios would be required. In total, PG&E may acquire up to 5,000 acres of covered species' habitat.

The cost of implementing the MRHCP could total approximately $96.6 million over the next 30 years, adjusted for inflation. This amount includes implementation and training costs, mitigation costs, and program development costs.

ES.6 Other Key Components of the HCP

The HCP also includes information on how PG&E will staff, implement, monitor and report on its covered activities and information on program costs, funding, and funding assurances. It describes the regulatory assurances being sought, circumstances that would be considered changed or unforeseen, and conditions for permit renewal and amendments. The HCP also includes the alternatives to the proposed MRHCP that were evaluated and rejected. In addition, a number of implementation tools, including annual and monitoring report checklists, a management plan template, guidance documents, and a Biological Assessment template, have been provided.

Chapter 1
Introduction

***Summary**: This chapter presents the background, purpose, and regulatory framework for Pacific Gas and Electric Company's (PG&E's) Multiple Region Operation and Maintenance Habitat Conservation Plan (MRHCP). It also describes PG&E's overall environmental review and screening process. The MRHCP addresses impacts from day-to-day operation and maintenance (O&M) activities as well as large maintenance projects that require extensive planning and coordination. The MRHCP study area contains territory in 34 California counties. The Plan Area, also known as the Permit Area, is a subset of the study area and consists of PG&E gas and electric transmission and distribution facilities plus rights–of-way (ROWs), the lands owned by PG&E or subject to PG&E easements to maintain these facilities, private access routes associated with PG&E's routine maintenance, a buffer around the ROWs, and mitigation areas acquired to mitigate impacts resulting from covered activities. The Plan Area encompasses approximately 565,781 acres. The Plan Area is further divided into three regional planning areas: Sacramento Valley and Sierra Foothills, North Coast, and Central Coast Regions. Within the Plan Area, approximately 54% is in natural land-cover types, many of which support endangered or threatened species habitat. PG&E is proposing to seek incidental take authorization for O&M and minor new construction activities for its electric and gas transmission and distribution systems affecting 24 covered wildlife and 12 plant species.*

1.1 Background

PG&E is the largest investor-owned electric and gas utility in the United States, serving more than 5.4 million electricity customers and 4.3 million natural gas customers, and employing more than 23,000 people. PG&E's service area stretches from Eureka in the north to Bakersfield in the south and from the Pacific Ocean in the west to the Sierra Nevada in the east, overall encompassing approximately 70,000 square miles in 48 of California's 58 counties. Approximately 40% of PG&E's facilities lie within the following 34 counties that comprise the MRHCP study area: Amador, Butte, Calaveras, Colusa, El Dorado, Fresno, Glenn, Humboldt, Kern, Lake, Lassen, Madera, Mariposa, Mendocino, Modoc, Monterey, Nevada, Placer, Plumas, Sacramento, San Benito, San Luis Obispo, Santa Barbara, Santa Cruz, Shasta, Sierra, Siskiyou, Sutter, Tehama, Trinity, Tulare, Tuolumne, Yolo, and Yuba. PG&E has further organized these areas into regional planning areas, specifically the Sacramento Valley and Foothills, North Coast and Central Coast Regions, which are illustrated in Figure 1-1.

PG&E's electric and gas transmission and distribution infrastructure, the majority of which was installed between 1950 and 1970, requires continued long-term O&M and minor new construction activities to continue to deliver reliable and safe energy to PG&E customers. As the U.S. Fish and Wildlife Service (USFWS) continues to list wildlife and plant species as threatened or endangered under the federal Endangered Species Act (ESA), PG&E developed this comprehensive conservation program to avoid, minimize, and mitigate impacts on listed species while also receiving take authorization for O&M activities and minor new construction. The MRHCP builds on the lessons learned from PG&E's *San Joaquin Valley Operations and Maintenance Habitat Conservation Plan* (San Joaquin Valley O&M HCP) permitted in 2007, and the *Bay Area Operations and Maintenance Habitat Conservation* Plan (Bay Area O&M HCP) permitted in 2017.

1.2 Purpose

PG&E's MRHCP is intended to achieve the following purposes.

- Avoid, minimize, and mitigate temporary and permanent impacts on threatened and endangered species resulting from PG&E's O&M and minor new construction activities in the Plan Area.
- Provide the basis for incidental take authorization pursuant to the ESA for PG&E's current and future O&M activities, and minor new construction in the Plan Area.

The MRHCP is different from most other habitat conservation plans in that it shifts the habitat conservation plan paradigm from one-time use (i.e., standard development projects) and permanent habitat effects, to infrequent and dispersed permanent and temporary effects near existing facilities that result from the performance of infrastructure maintenance. Generally, O&M activities have minor, temporary effects on covered species.

1.3 Overview of Pacific Gas and Electric Company

PG&E provides natural gas and electricity to customers throughout its service area. A summary of PG&E's natural gas and electricity systems follows.

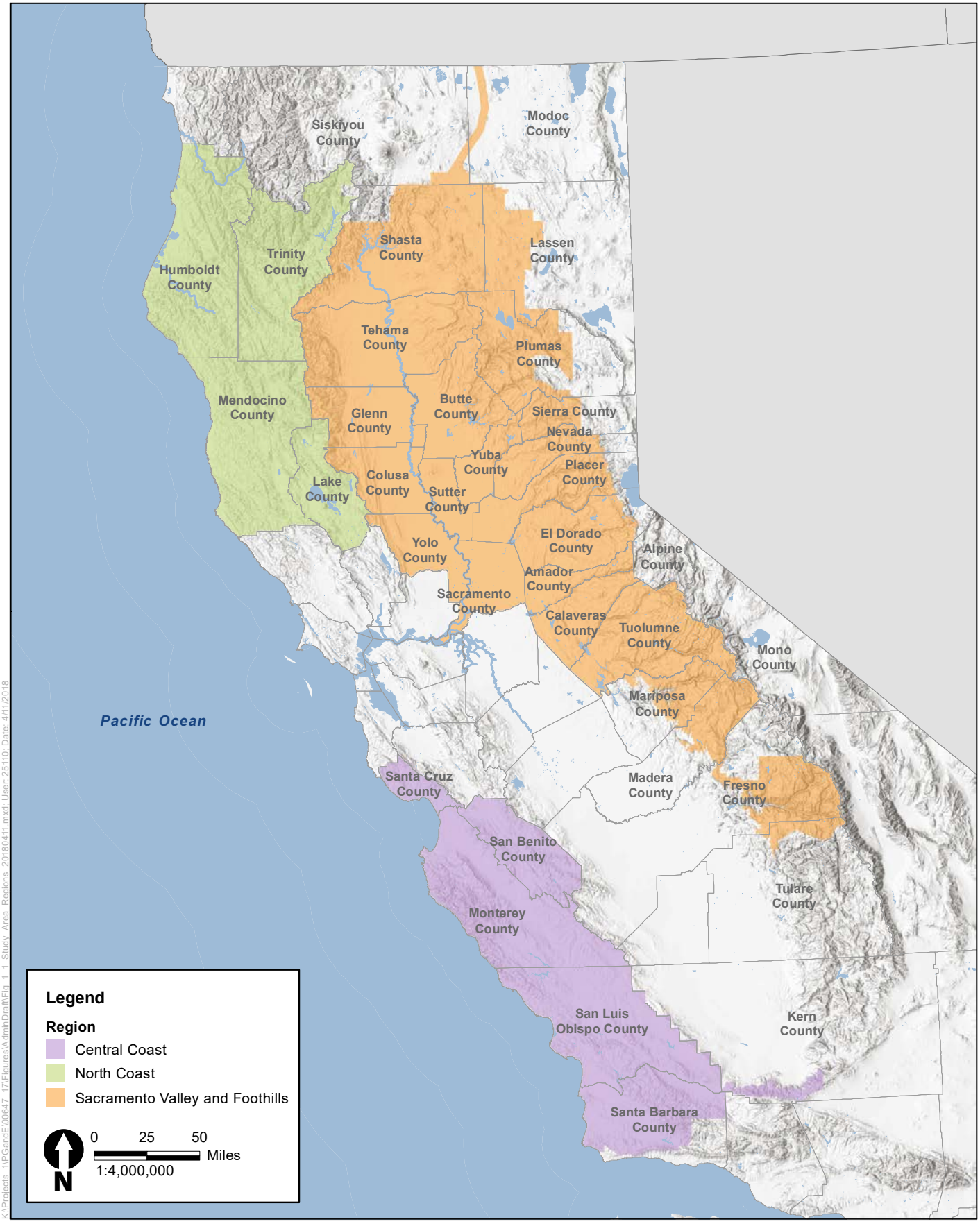
1.3.1 Natural Gas System

Natural gas is initially captured in a well where pressure helps the gas rise to the surface naturally. The gas is then processed at plants, sent through a compressor station to increase pressure, and then moved to an underground storage facility or network of primarily underground transmission lines. Most of the gas in PG&E's system is purchased and imported from Utah, Wyoming, and Canada. Throughout the gas system, regulator stations maintain the pressure of the gas as it travels through the transmission pipelines. Safety valve monitors are also installed along the gas system to ensure the regulator station is accurately maintaining the gas pressure. These monitors are designed to reduce pressure quickly if the gas exceeds specified limits. Before gas enters the distribution system that distributes gas from the regulator stations to customers, the pressure is reduced from transmission levels to distribution levels. PG&E monitors and adjusts pressure and flow rate as needed at gas pressure limiting stations.

Statewide, PG&E maintains more than 6,400 miles of high-pressure gas transmission pipelines, 59 compressors at 17 stations, and more than 42,000 miles of gas distribution pipelines. In the MRHCP Plan Area, PG&E owns 19,000 miles of gas distribution lines, and 1,600 miles of gas transmission pipelines.

1.3.2 Electric System

PG&E acquires a diverse mix of electric power generation from hydroelectric, nuclear, natural gas, solar, wind, and geothermal sources from more than 400 plants owned by independent power producers or qualified facilities for resale to its customers. PG&E's role in, and responsibilities related to, the transmission and distribution of electric energy are not anticipated to change. Electric energy is carried over the bulk electric grid, a network of high-voltage transmission lines that



K:\Projects_1\PGandE\00647_17\Figures\AdminDraft\Fig_1-1_Study_Area_Regions_20180411.mxd User: 26110 Date: 4/11/2018

Figure 1-1
Study Area and Regions

transport power from power plants to switching stations or substations, where power is redirected and transformed to lower voltages. PG&E substations are critical junctions and switching points in the electric system, connecting the transmission system to the distribution system. Substations use transformers to lower the voltage of electric energy before it is sent to the distribution lines and on to customers. The distribution system includes main or "primary" lines and lower voltage or "secondary" lines, which deliver electric energy either overhead or underground; distribution transformers, which lower voltage to usage levels; and switching equipment to permit the lines to be connected together in various combinations and patterns. Individual services then connect the distribution system to the customer. The transmission lines operate at 500, 230, 115, 70, or 60 kilovolts (kV) and may be constructed on steel towers, steel poles, or wooden poles. The switching stations and substations transform the electric energy down to 21 or 12 kV for the distribution system. The distribution lines are installed either underground or on the overhead poles typically found along highways and streets. Pole-mounted transformers further reduce the voltage to 110/220 volts for normal household use.

Statewide, the PG&E system comprises about 18,600 miles of interconnected transmission lines, about 141,215 miles of distribution lines, and 1,014 substations. In the MRHCP Plan Area, PG&E owns, operates, and maintains approximately 4,500 miles of transmission lines, and 28,000 miles of distribution lines.

1.4 Regulatory Context

1.4.1 Utility Specific Regulatory Agencies

As an investor-owned utility, PG&E is regulated by the state and federal agencies listed below.

- **California Public Utilities Commission (CPUC)**: As the primary regulating agency, CPUC establishes gas and retail electric rates, approves major construction projects, and provides general oversight of utility facility O&M programs and financial/accounting practices.
- **California Independent System Operator (CAISO)**: CAISO is responsible for ensuring a safe and reliable electric system in California.
- **California Energy Commission (CEC)**: CEC is responsible for long-term energy forecasting, energy-planning programs, and certification of thermal powered electric generation plants.
- **North American Electric Reliability Corporation (NERC)**: NERC is certified by the Federal Energy Regulatory Commission to establish, monitor, and enforce compliance with reliability standards for the bulk-power system.
- **U.S. Department of Transportation (DOT)**: The DOT Office of Pipeline Safety issues regulations addressing the construction, operation, and maintenance of natural gas pipelines and compressor stations.

In addition to the utility-specific regulatory structure listed above, PG&E's activities are subject to state and federal wildlife laws and regulations, as described below.

1.4.2 Endangered Species Laws

The MRHCP is designed primarily to comply with Section 10(a)(1)(B) of the ESA. The MRHCP is also consistent with other federal and state wildlife laws and regulations. Relevant laws and regulations are described below.

1.4.2.1 Federal Endangered Species Act

In 1973, the federal government passed the ESA. Congress intended to improve upon previous protective regulations by creating a more comprehensive approach that would protect not only individual species but also their habitats. The federal ESA is intended to conserve the ecosystems on which endangered and threatened species depend, and to help restore and recover listed species.

USFWS and the National Marine Fisheries Service (NMFS) administer the ESA. The ESA requires USFWS and NMFS to maintain lists of threatened and endangered species and provides substantial protections for listed species. NMFS's jurisdiction under the ESA is limited to the protection of marine mammals, marine fish, anadromous fish, corals, and some marine plants; all other species, including freshwater fish, are subject to USFWS jurisdiction.

Section 9 of the ESA prohibits the take of any fish or wildlife species listed under the ESA as endangered and most species listed as threatened. *Take*, as defined by the ESA, means "to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct." *Harass* is defined as the intentional or negligent actions that create the likelihood of injury to a listed species by annoying it to such an extent as to significantly disrupt normal behavioral patterns, which include breeding, feeding, and sheltering. *Harm* is defined by regulation as "any act that kills or injures the species, including significant habitat modification." All or some forms of take of threatened species are prohibited by regulation at the time of listing.

Exceptions to these prohibitions on take are addressed in Section 7 (for federal actions) and Section 10 (for nonfederal actions) of the ESA, as described below.

Section 7

Section 7 of the ESA requires federal agencies to ensure that any action they authorize, fund, or carry out is not likely to jeopardize the continued existence of any listed species or result in the destruction or adverse modification of habitat critical to such species' survival. To ensure that its actions do not result in jeopardy to listed species or adverse modification of critical habitat, each federal agency must consult with USFWS and/or NMFS regarding federal agency actions. The consultation is initiated when the federal agency submits to USFWS and/or NMFS a written request for initiation of consultation, along with the agency's biological assessment (BA) of its proposed action. If USFWS and/or NMFS conclude that the action is not likely to adversely affect a listed species or its designated critical habitat, the action may be carried forward without further review under the ESA. Otherwise, USFWS and/or NMFS must prepare a written biological opinion (BO) describing how the agency's action would affect the listed species and its critical habitat.

If the BO concludes that the proposed action would jeopardize the continued existence of a listed species or cause the destruction or adverse modification of its critical habitat, the opinion must suggest "reasonable and prudent alternatives" that would avoid that result. If the BO concludes that the action as proposed would involve the take of a listed species, but not to an extent that would jeopardize the species' continued existence, the BO must include an *incidental take statement*. The

incidental take statement must specify an amount of take that may result from the action and suggest reasonable and prudent measures to minimize the impact of the take. If the action complies with the BO and incidental take statement, it may be implemented without violation of the ESA, even if incidental take results.

Although the MRHCP constitutes a nonfederal project and, accordingly, must use the exemption provided by Section 10 (described below), the permitting of the plan itself is considered a federal action. This permitting process triggers an internal Section 7 consultation whereby USFWS must prepare a BO that addresses those actions permitted by the MRHCP and their impacts on listed species and critical habitat.

Section 10

Until 1982, nonfederal entities had no means to acquire incidental take authorization. Private landowners and state agencies risked being in direct violation of the ESA no matter how carefully their projects were implemented. This statutory dilemma led Congress to amend Section 10 of the ESA in 1982 to authorize the issuance of an incidental take permit to a nonfederal project proponent upon completion of an approved conservation plan (now called a habitat conservation plan or HCP).

In cases where federal land, funding, or authorization is not required for an action by a nonfederal entity, the take of listed species must be permitted by USFWS and/or NMFS through the Section 10 process. Private landowners, corporations, state agencies, local agencies, and other nonfederal entities must obtain a Section 10(a)(1)(B) incidental take permit for take of federally listed fish and wildlife species that is "incidental to, and not the purpose of, the carrying out of an otherwise lawful activity." Because Section 9 of the ESA does not prohibit incidental take of listed plants, Section 10 incidental take permits are necessary only for take of wildlife and fish species. Nonetheless, plants often are included in habitat conservation plans such that USFWS can make findings of no-jeopardy when the Section 7 process is triggered.

To receive an incidental take permit, the nonfederal entity is required under Section 10(a)(2)(A) to prepare an HCP that must contain information about the following effects and components of the plan:

- Impacts likely to result from the proposed taking of the species for which permit coverage is requested.
- Measures that will be implemented to monitor, minimize, and mitigate impacts.
- Funding that will be made available to undertake such measures.
- Procedures to address unforeseen circumstances.
- Alternative actions considered that would not result in take.
- Additional measures USFWS/NMFS may require as necessary or appropriate for purposes of the plan.

To issue an incidental take permit, USFWS or NMFS must make the following findings:

- The taking will be incidental.
- The applicant will, to the maximum extent practicable, minimize and mitigate the impacts of such taking.
- The applicant will ensure that adequate funding for the HCP will be provided.

- The taking will not appreciably reduce the likelihood of the survival and recovery of the species in the wild.
- Other measures that USFWS or NMFS requires as necessary or appropriate for purposes of the HCP will be met.

As mentioned above, issuance of an incidental take permit is a federal action and, as such, is subject to Section 7 consultation. Accordingly, prior to the approval of an HCP, USFWS and/or NMFS is required to undertake an internal Section 7 consultation. The agencies examine the HCP to ensure that the activities to be covered by the incidental take permit are not likely to jeopardize the continued existence of listed species or result in the destruction or adverse modification of designated critical habitat.

To meet the requirements of Section 7, elements specific to the Section 7 process (e.g., analysis of impacts on designated critical habitat, analysis of impacts on listed plant species, and analysis of indirect and cumulative impacts on listed species) are included in the MRHCP.

1.4.2.2 California Endangered Species Act

The California Endangered Species Act (CESA) protects wildlife and plants listed as threatened and endangered by the California Fish and Game Commission. CESA prohibits the take of state-listed wildlife and plants and requires a permit for authorization of incidental take. Section 86 of the California Fish and Game Code defines *take* as any action or attempt to "hunt, pursue, catch, capture, or kill."

The California Department of Fish and Wildlife (CDFW) may authorize, by permit, the take of endangered, threatened, and candidate species if all of the following conditions are met: (1) The take is incidental to an otherwise lawful activity; (2) the impacts of the authorized take are minimized and fully mitigated, the measures required to meet this obligation are roughly proportional in extent to the impact, and all required measures could be feasibly implemented; (3) the permit is consistent with regulations adopted pursuant to California Fish and Game Code Sections 2112 and 2114; (4) the applicant ensures adequate funding to implement the measures and for monitoring compliance with, and effectiveness of, those measures; and (5) issuance of the permit would not jeopardize the continued existence of the species. The requirements of an application for an incidental take permit under CESA are described in Section 2081 of the California Fish and Game Code and in final adopted regulations for implementing Sections 2080 and 2081 (California Code of Regulations, Title 14, Section 783).

PG&E may apply for a Section 2081 permit for those state-listed species that may be taken according to CESA and for which CDFW is able to authorize incidental take. Although PG&E is committed to the protection of endangered and rare plants and will continue to work to avoid and minimize its impacts on them, PG&E is also exempt from the provisions of CESA and the Native Plant Protection Act prohibiting incidental take of plants. The Native Plant Protection Act of 1973 (Fish and Game Code Sections 1900–1913) includes provisions that prohibit the taking of endangered or rare native plants. Section 2080 of CESA similarly prohibits the taking of state-listed plants. Section 1913(b) includes a specific provision to allow for the incidental removal of listed plant species, if not otherwise salvaged by CDFW, to allow a public utility to fulfill its obligation to provide service to the public.

1.4.3 Other Federal and State Wildlife Regulations

PG&E activities are regulated by other federal and state wildlife regulations in addition to the ESA and CESA, specifically, the federal Migratory Bird Treaty Act (MBTA), California Fish and Game Code provisions for fully protected species, and California Fish and Game Code provisions for the protection of birds and their nests.

1.4.3.1 Migratory Bird Treaty Act

The MBTA of 1918, as amended, implements various treaties and conventions between the United States and Canada, Japan, Mexico, and the former Soviet Union for the protection of migratory birds. Under the MBTA, taking, killing, or possessing migratory birds is unlawful, as is taking of any parts, nests, or eggs of such birds (16 U.S. Government Code [USC] 703).Bald and Golden Eagle Protection Act

The Eagle Act (16 USC 668), signed into law in 1940 and expanded in 1962 to include golden eagle, prohibits take and disturbance of individuals and nests. *Take* under the Eagle Act includes any actions to pursue, shoot, shoot at, poison, wound, kill, capture, trap, collect, destroy, molest, or disturb eagles. *Disturb* is further defined in 50 CFR 22.3 as:

> to agitate or bother a bald or golden eagle to a degree that causes, or is likely to cause, based on the best scientific information available (1) injury to an eagle, (2) a decrease in its productivity, by substantially interfering with normal breeding, feeding, or sheltering behavior, or (3) nest abandonment, by substantially interfering with normal breeding, feeding, or sheltering behavior.

Prior to 2009, permits for purposeful take of birds or body parts were limited to scientific (50 CFR 22.21), religious (50 CFR 22.22), or falconry (50 CFR 22.24) pursuits; eagles causing serious injury to livestock or other wildlife (50 CFR 22.23); and golden eagle nests that interfere with resource development or recovery operations (50 CFR 22.21–25). In 2009, USFWS issued the 2009 Final Rule on new permit regulations that allows take "for the protection of…other interests in any particular locality" and where the take is "associated with and not the purpose of an otherwise lawful activity…" (74 Federal Register [FR] 46836–46879). The 2009 Final Rule authorized programmatic take (take that is recurring and not in a specific, identifiable timeframe or location) of eagles only if avoidance measures have been implemented to the maximum extent achievable such that take was no longer avoidable.

In 2016, USFWS issued revisions to the Final Rule pertaining to incidental take and take of eagle nests. The Final Rule changed the programmatic take standard to a new standard authorizing "incidental take" if all "practicable" measures to reduce impacts on eagles are implemented. An eagle incidental take permit under the 2016 Revisions to the Final Rule (50 CFR 22) is available for activities that may disturb or otherwise take eagles on an ongoing basis, such as operational activities. The eagle incidental take permit under the 2009 Final Rule was valid up to 5 years. In 2012, USFWS proposed to extend the maximum term for eagle incidental take permits from 5 to 30 years (77 FR 22267–22278). In 2013, USFWS issued a Final Rule to extend the maximum term for eagle incidental take permits to 30 years, subject to a recurring 5-year review process throughout the life of the permit. The final regulations under the 2016 Revisions to the Final Rule also include a maximum permit term of 30 years, subject to a recurring 5-year review process throughout the life of the permit (81 FR 91494–91554).

1.4.3.2 California Fish and Game Code for Fully Protected Species

State fully protected species are those species for which take under state law is not permitted except in cases where collection of these species is needed for scientific research, when bird species relocation is necessary for the protection of livestock, in the context of recovery actions, or where the activities are covered under an approved natural community conservation plan (NCCP), if a fully protected species is a covered species under the NCCP. Fully protected species for which CDFW may not authorize take, except under the scenarios mentioned above, are described in Section 3511 (fully protected birds), Section 4700 (fully protected mammals), Section 5050 (fully protected reptiles and amphibians), and Section 5515 (fully protected fish) of the California Fish and Game Code. These protections state that "[n]o provision of this code or any other law shall be construed to authorize the issuance of permits or licenses to take any fully protected" bird, mammal, reptile, amphibian, or fish species.

1.4.3.3 California Fish and Game Code for Protection of Birds and Their Nests

Section 3503.5 of the Fish and Game Code prohibits the take, possession, or destruction of any birds of prey or their nests or eggs. Likewise, Section 3503 provides, "It is unlawful to take, possess, or needlessly destroy the nest or eggs of any bird, except as otherwise provided by this code or any other regulation made pursuant thereto."

1.4.4 Federal and State Water and Wetland Laws and Regulations

In addition to the species-specific laws and regulations discussed in Sections 1.4.2 and 1.4.3, PG&E's covered activities are subject to federal and state laws and regulations concerning potential impacts on water bodies, as described below.

1.4.4.1 Clean Water Act and Porter-Cologne Water Quality Control Act

Clean Water Act Section 404

The U.S. Environmental Protection Agency (EPA) has delegated the authority to issue permits under the federal Clean Water Act (CWA) to the U.S. Army Corps of Engineers (USACE). The CWA is the primary federal law that protects the quality of the nation's surface waters, including lakes, rivers, and coastal areas. The CWA regulates discharges into the nation's waters, making unlawful any discharge not specifically authorized by a permit; issuance of such permits constitutes the CWA's principal regulatory tool.

Section 404 of the CWA regulates the discharge of dredged or fill material into waters of the United States, including wetlands. USACE issues two types of permits under Section 404: general permits (either nationwide permits or regional permits) and standard permits (either letters of permission or individual permits). General permits are issued by USACE to streamline the Section 404 process for nationwide, statewide, or regional activities that have minimal direct or cumulative environmental impacts on the aquatic environment. Standard permits are issued for activities that do not qualify for a general permit (i.e., that may have more than a minimal adverse environmental impact). Applicants in California that obtain a permit from USACE under Section 404 also must

obtain certification of that permit by the appropriate Regional Water Quality Control Board (Regional Water Board).

Clean Water Act Section 401

Under CWA Section 401, states have the authority to certify federal permits for discharges to waters under state jurisdiction. States may review proposed federal permits (e.g., Section 404 permits) for compliance with state water quality standards. The permit cannot be issued if the state denies certification. In California, the State Water Resources Control Board (State Water Board) and the Regional Water Boards are responsible for the issuance of Section 401 certifications.

Clean Water Act Section 402

Under CWA Section 402, the National Pollutant Discharge Elimination System (NPDES) controls water pollution by regulating point sources of pollution to waters of the United States. Projects that disturb 1 or more acres of soil are required to obtain coverage under the state NPDES General Permit for Discharges of Storm Water Associated with Construction Activities. A Storm Water Pollution Prevention Plan (SWPPP) must be developed and implemented for each project covered by the general permit. The SWPPP must include best management practices (BMPs) that are designed to reduce potential impacts on surface water quality during project construction and operation.

Porter-Cologne Water Quality Control Act

The Porter-Cologne Water Quality Control Act (Porter-Cologne Act, codified in California Water Code Section 13000 et seq.) is the primary state law concerning water quality. It authorizes the State Water Board and Regional Water Boards to prepare management plans such as regional water quality plans to address the quality of groundwater and surface water. The Porter-Cologne Act also authorizes the Regional Water Boards to issue waste discharge requirements defining limitations on allowable discharge to waters of the state.[1] Because the authority for waste discharge requirements is derived from the Porter-Cologne Act and not the CWA, waste discharge requirements may apply to a somewhat different range of aquatic resources than do Section 404 permits and Section 401 water quality certifications.

1.4.4.2 California Department of Fish and Wildlife Lake and Streambed Alteration Program

Pursuant to Fish and Game Code Sections 1600–1616, CDFW regulates work that could substantially affect existing fish and wildlife resources associated with rivers, streams, and lakes in California. An entity, defined as any person, state, or local governmental agency or public utility, must notify CDFW of any work that will substantially divert or obstruct the natural flow of—or substantially change or use any material from the bed, channel, or bank of—any river, stream, or lake, or deposit or dispose of debris, waste, or other material containing crumbled, flaked, or ground pavement where it may pass into any river, stream, or lake.

After reviewing the notification, if CDFW determines the work may substantially adversely affect fish and wildlife resources, a Lake or Streambed Alteration Agreement is required. The agreement

[1] *Waters of the state* are defined in the Porter-Cologne Act as "any surface water or groundwater, including saline waters, within the boundaries of the state" (California Water Code Section 13050[e]).

will, include measures necessary to protect the fish and wildlife resources, and the entity must conduct the activity in accordance with the agreement. Because CDFW includes under its jurisdiction streamside habitats that may not qualify as wetlands under the CWA definition, CDFW jurisdiction may be broader than USACE jurisdiction.

1.4.5 National Environmental Policy Act

Issuance of an incidental take permit by USFWS under ESA Section 10 constitutes a federal action that requires compliance with the National Environmental Policy Act (NEPA). NEPA requires federal agencies to include in their decision-making process appropriate and careful consideration of environmental impacts of a proposed action and of possible alternatives. Documentation of the environmental impact analysis and efforts to avoid or minimize the adverse impacts of proposed actions are often made available for public notice and review. This analysis is typically documented in an environmental assessment (EA) or an environmental impact statement (EIS).

1.4.6 Relationship to Other Planning Efforts

The MRHCP incorporates relevant data and information from other conservation planning efforts, such as regional HCPs and NCCPs, recovery plans, other regional planning efforts, and mitigation and conservation banking opportunities. PG&E used data from the following plans and planning efforts.

- *Natomas Basin Habitat Conservation Plan*.
- *Draft Western Placer County Habitat Conservation Plan/Natural Community Conservation Plan*.
- *Yolo Habitat Conservation Plan/Natural Community Conservation Plan*.

Where data gaps existed, PG&E modeled habitat and utilized a similar analysis and approach as used in the above conservation planning efforts.

USFWS has prepared recovery plans for several of the listed species covered by the MRHCP. These recovery plans were utilized in the conservation planning process and were integrated into the species accounts presented in Appendix B, *Species Accounts*.

1.5 Overview of the Habitat Conservation Plan Process

1.5.1 Plan Area, Regions, and Integrated Plan Area

The MRHCP addresses PG&E's routine O&M and minor new construction activities in 34 counties. These 34 counties compose the study area and represent the portion of PG&E's service area that has not been covered by previous O&M HCPs or the programmatic BO for gas facilities in the Mojave Desert. The study area is further organized into the Plan Area and regional planning areas. The *Plan Area* consists of the area in which PG&E will conduct its activities. The Plan Area includes PG&E gas and electric transmission and distribution facilities, ROWs, a buffer around facilities, the lands owned by PG&E or subject to PG&E easements to maintain facilities, access routes associated with PG&E's routine maintenance, and mitigation areas acquired to mitigate impacts resulting from

covered activities. The Plan Area also includes areas for minor new construction. Three regional planning areas, the Sacramento Valley and Foothills, North Coast, and Central Coast, were defined to further organize the analysis. These regional areas are defined along county lines and are designed to connect to PG&E's other approved O&M HCP planning areas. The study area and regional planning areas are illustrated in Figure 1-1, and the acres within the Plan Area, associated with each region, are summarized in Table 1-1.

Table 1-1. MRHCP Plan Area Overview (by region, in acres)

Facility Type	Sacramento Valley and Foothills	North Coast	Central Coast	Plan Area Total
Electric Transmission (160–400 feet)[a]	93,063	19,464	35,503	148,029
Electric Distribution (50 feet)	155,005	32,049	68,524	255,578
Gas Transmission (300 feet)	54,232	7,609	17,955	79,796
Gas Distribution (50 feet)	50,626	3,630	12,619	66,874
Subtotal	352,926	62,752	134,601	550,278
Minor New Construction[b]	3,529	628	1,346	5,503
Mitigation Areas	5,000	2,500	2,500	10,000
Subtotal	8,529	3,128	3,846	15,503
Total	361,455	65,880	138,447	565,781

[a] Electric transmission buffer corridor varies depending on the facility size (500 kilovolts (kV)—200 feet per side, 230 kV—120 feet per side, and 60/70/115 kV—80 feet per side). Overlapping facility areas are included.

[b] Minor new construction is estimated at 1% of the total rights-of-way. Based on PG&E's assessment of the land-cover types likely to be affected by new construction, the analysis assumes that 80% of minor new construction would be implemented within natural vegetation, 10% within urban areas, and 10% within agricultural lands.

The Sacramento Valley and Foothills Region consists of the Sacramento Valley counties from Sacramento County in the south to Shasta County in the north, specifically Sacramento, Yolo, Yuba, Sutter, Colusa, Glenn, Butte, and Tehama Counties. The region also includes the foothill counties that rise into the Cascade and Sierra Nevada mountain ranges, specifically Lassen, Plumas, Sierra, Nevada, Placer, El Dorado, Amador, Calaveras, Tuolumne, Mariposa, Madera, Fresno, and Tulare Counties. The southern counties were included in this planning area because they abut PG&E's San Joaquin Valley O&M HCP area. In the north, portions of Siskiyou and Modoc Counties that contain gas and electric transmission lines are also included in this region.

The North Coast Region consists of Humboldt, Trinity, Mendocino and Lake Counties. It abuts PG&E's Bay Area O&M HCP area to the south and the Sacramento Valley and Foothills Region to the east.

The Central Coast region consists of Santa Cruz, Monterey, San Benito, San Luis Obispo, Santa Barbara and southern Kern Counties. It abuts PG&E's San Joaquin Valley O&M HCP area to the east.

Finally, PG&E also proposes an Integrated Plan Area, whereby mitigation for impacts of MRHCP covered activities can be implemented across approved O&M HCP planning areas with USFWS approval. The Integrated Plan Area consists of the three MRHCP regional planning areas plus the areas covered by the Bay Area O&M HCP and the San Joaquin Valley O&M HCP. Figure 1-2 depicts the Integrated Plan Area and all PG&E O&M HCP regions. The Integrated Plan Area is designed to

ensure mitigation could be acquired outside the MRHCP Plan Area (i.e., in areas covered by the Bay Area O&M HCP or San Joaquin Valley O&M HCP) when such mitigation is regionally and ecologically appropriate (e.g., within service area of a conservation bank or when a conservation opportunity provides appropriate ecological benefits as determined by USFWS). The Integrated Plan Area does not extend take authorization to covered activities outside the HRCHP Plan Area, nor does it allow PG&E to mitigate within the MRHCP Plan Area impacts of Bay Area O&M HCP or San Joaquin Valley O&M HCP covered activities areas unless authorized by those plans.

1.5.2 Covered Species

Covered species, as defined for the MRHCP, are federally listed species that PG&E intends to conserve and protect through this HCP in support of the federal incidental take permit issued under ESA Section 10(a)(1)(B) (the permit). Tables 1-2 and 1-3 address wildlife and plant species proposed for coverage in the MRHCP. The covered species would be protected through avoidance and minimization measures (AMMs) and vegetation management BMPs; mitigation would compensate for impacts on these species resulting from PG&E's covered activities.

In determining which species to cover in the MRHCP, PG&E initially evaluated approximately 200 wildlife and 400 plant species (Appendix A, *Species Considered*). These lists were compiled using information from the following sources.

- California Natural Diversity Database (CNDDB) (California Department of Fish and Wildlife 2018) for the 34 counties in the study area.
- California Native Plant Society's (CNPS's) (2012) Inventory of Rare and Endangered Vascular Plants of California.
- Discussions with Dr. Richard Arnold (Ph.D., President and Principal of Entomological Consulting and author of USFWS recovery plans for eight endangered or threatened California insects), an independent biological consultant specializing in entomology.
- ICF and PG&E biological resource specialists.
- Discussions with USFWS's Arcata, Klamath, Sacramento, Yreka, and Ventura Field Offices.

PG&E gathered information on the status, population trends, and distribution of each species with potential to occur in the Plan Area. The following criteria were applied to each wildlife species to determine whether it would be covered in the MRHCP.

Range: The species is known to occur or likely to occur within the Plan Area, based on credible evidence from the sources listed above.

Status: The species is currently listed as threatened, endangered, or as a candidate species under the ESA, or was judged to have a high probability of listing by USFWS during the permit term.

Impact: The species may be adversely affected by PG&E's covered activities. This criterion assumes that AMMs would be implemented for activities that could affect listed species in the Plan Area, and that only those species for which impacts would not be avoided through use of the AMMs would be covered under the MRHCP.

Data: Sufficient data exist on the species' life history requirements, habitat requirements, and occurrence in the Plan Area to estimate impacts on the species and to develop conservation

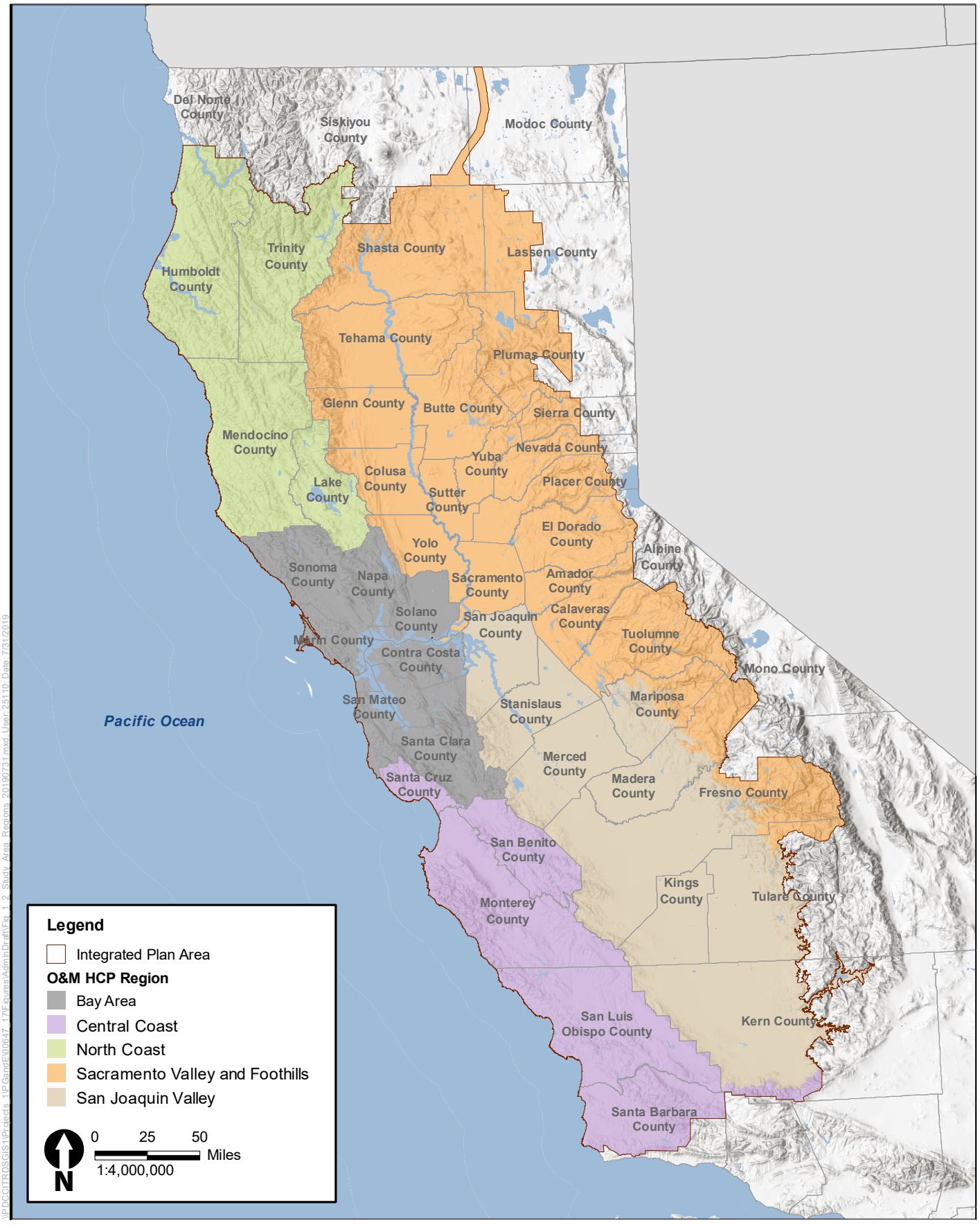


Figure 1-2
Integrated Plan Area and O&M HCP Regions

measures to compensate for these impacts and meet regulatory standards; or available data are limited, but important habitat for the species occurs in the Plan Area.

These factors were considered and incorporated in the following analytical steps:

Step 1. Primary emphasis was placed on the species listing status. Only federally listed threatened or endangered species, or candidate species, within the PG&E study area were considered. A total of 57 wildlife species and 72 plant species met this criteria. Species listed as threatened or endangered only by the state were not considered further because the MRHCP was prepared for a federal permit. Other species of conservation concern may benefit from conservation actions but were not considered because no federal permits are needed for activities that may affect these species.

Step 2. Available information on life history and geographic range of species identified in Step 1 was used to determine where PG&E facilities were likely to coincide with species range or habitat, leading to potential impacts of covered activities. Species were generally considered to fall within three categories:

a) Species that could be reasonably certain to occur at or near PG&E facilities and be impacted by covered activities.

b) Species for which further consideration was warranted because of lack of life history or distribution information or unknown potential for interaction with covered activities, or because the species are so difficult to detect and avoid that coverage may be beneficial.

c) Species unlikely to occur near utility facilities or be impacted by covered activities, or species that, although they could occur at or near PG&E facilities, would be reasonably unlikely to be impacted by covered activities.

Step 3. In this step of the analysis, the Step 2 categories of species were further evaluated. Species were evaluated against qualitative criteria (e.g., frequency PG&E has consulted on the species or expects to need to consult on the species in the future) to confirm which species warranted coverage in this HCP and whether species were likely avoidable or whether activities affecting the species could reasonably be permitted separately, if necessary.

Some of the analysis led to decisions not to cover most species within specific taxonomic groups. For example, fish were excluded categorically because limited in-water work is conducted by PG&E and permits are needed for this work. Birds were generally not covered because habitat is typically not in conflict with utility facilities; birds have a propensity to move away from human activity; and potential conflicts with birds during covered activities are addressed by adhering to nest setback distances and stopping work if nests are present. Similarly, several mammals were not covered because vehicle and equipment noise and human presence typically cause these species to stay clear of human activity. Some burrow-dwelling mammals were retained in the event their burrows are impacted by PG&E's work. A screening table of the factors contributing to a decision to cover a species is included in Appendix A, *Species Considered*.

Tables 1-2 lists the wildlife species proposed for coverage in the MRHCP.

Table 1-2. Wildlife Species Proposed for Coverage

Species	Federal Status [a]	Sacramento Valley and Foothills Region	North Coast Region	Central Coast Region
Invertebrates				
Conservancy fairy shrimp (*Branchinecta conservatio*)	E	X	–	–
Longhorn fairy shrimp (*Branchinecta longiantenna*)	E	–	–	X
Vernal pool fairy shrimp (*Branchinecta lynchi*)	T	X	–	X
Vernal pool tadpole shrimp (*Lepidurus packardi*)	E	X	–	–
Morro shoulderband snail (*Helminthoglypta walkeriana*)	E	–	–	X
Mount Hermon June beetle (*Polyphylla barbata*)	E	–	–	X
Ohlone tiger beetle (*Cicindela ohlone*)	E	–	–	X
Valley elderberry longhorn beetle (*Desmocerus californicus dimorphus*)	T	X		
Smith's blue butterfly (*Euphilotes enoptes smithi*)	E	–	–	X
Zayante band-winged grasshopper (*Trimerotropis infantilis*)	E	–	–	X
Invertebrate Totals		4	0	7
Amphibians				
California red-legged frog (*Rana draytonii*)	T[b]	X	X	X
California tiger salamander (Central California and Santa Barbara DPS) (*Ambystoma californiense*)	T/E[c]	X	–	X
Foothill yellow-legged frog (*Rana boylii*)	–	X	X	X
Mountain yellow-legged frog (northern DPS) (*Rana muscosa*)	E	X	–	–
Santa Cruz long-toed salamander (*Ambystoma macrodactylum croceum*)	E	–	–	X
Sierra Nevada yellow-legged frog (*Rana sierrae)*	E	X	–	–
Yosemite toad (*Anaxyrus canorus*)	T	X	–	–
Amphibian Total		5	2	5

Species	Federal Status [a]	Sacramento Valley and Foothills Region	North Coast Region	Central Coast Region
Reptiles				
Blunt-nosed leopard lizard (*Gambelia sila*)	E	–	–	X
Giant garter snake (*Thamnophis gigas*)	T	X	–	–
Reptile Total		1	0	1
Birds				
Marbled murrelet (*Brachyramphus marmoratus*)	T	–	X	–
Northern spotted owl (*Strix occidentalis caurina*)	T	X	X	–
Bird Total		1	2	0
Mammals				
Giant kangaroo rat (*Dipodomys ingens*)	E	–	–	X
Point Arena mountain beaver (*Aplodontia rufa nigra*)	E	–	X	–
San Joaquin kit fox (*Vulpes macrotis mutica*)	E	X	–	X
Mammal Total		**1**	**1**	**3**
Grand Total[d]		**12**	**5**	**15**

[a] Federal status abbreviations:
E = listed as endangered.
T = listed as threatened.
D = delisted.
P = federally proposed for listing.
CT = federal candidate for listing as threatened.

b Federal listing does not include Humboldt or Trinity Counties and Russian Gulch, Parlin Creek, Lower Greenwood Creek, Mallo Pass Creek, and Stewart Creek watersheds in Mendocino County; Glenn, Lake and Sonoma Counties west of the Central Valley Hydrologic Basin; Sonoma and Marin Counties north and west of the Napa River, Sonoma Creek and Petaluma River drainages which flow into the San Francisco Bay and north of the Walker Creek drainage which flows to the Pacific Ocean.

c Federal listing includes both the Central California Distinct Population Segment (DPS) and the Santa Barbara County DPS. The Santa Barbara County DPS's federal status is endangered.

d Some species are covered in multiple regions; therefore, the total cannot be summed across regions.

Appendix B, *Species Accounts*, provides species accounts for wildlife and plant species proposed for coverage.

The screening process for plants was similar in that PG&E considered range, status, impact, and data. Because of the large number of rare endemic plants in the 34 counties, PG&E focused primarily on screening plants lists as threatened or endangered under the ESA. Further, PG&E conducted additional detailed analysis of known populations to determine the likelihood of an impact, and evaluated critical habitat and occurrences on federal lands before making a final decision on coverage. Plant species proposed for coverage are listed in Table 1-3.

Table 1-3. Potential Covered Plants for the Multi-Region O&M HCP

Region/Type/Scientific Name	Common Name	Federal Status[a]
Sacramento Valley and Foothills Region		
Perennial Trees and Shrubs		
Arctostaphylos myrtifolia	Ione manzanita	T
Ceanothus roderickii	Pine Hill ceanothus	E
Fremontodendron decumbens	Pine Hill flannelbush	E
Herbaceous Annuals and Perennials		
Calystegia stebbinsii	Stebbins' morning-glory	E
Packera layneae	Layne's ragwort	T
North Coast Region		
Herbaceous Annuals and Perennials		
Layia carnosa	beach layia	E
Central Coast Region		
Herbaceous Annuals and Perennials		
Camissonia benitensis	San Benito evening-primrose	T
Chorizanthe pungens var. pungens	Monterey spineflower	T
Chorizanthe robusta var. robusta	robust spineflower	E
Eremalche parryi subsp. kernensis	Kern mallow	E
Gilia tenuiflora ssp. arenaria	Monterey gilia	E
Piperia yadonii	Yadon's rein orchid	E

[a] Federal status abbreviations:
E = listed as endangered.
T = listed as threatened.

1.5.3 Covered Activities

The MRHCP covers PG&E O&M and minor new construction activities that are related to PG&E's natural gas and electric transmission and distribution systems located in natural areas in the Plan Area, and that may result in take of covered species.

O&M activities are implemented throughout the existing network of facilities, and their potential impacts are described in detail in Chapter 3, *Covered Activities*, and Chapter 4, *Covered Species Impact Analysis*. PG&E commits to the mitigation approach that is outlined in the MRHCP, which is based primarily on estimates of future impacts but which, in certain situations, permits mitigation after covered activities have resulted in impacts.

Covered activities would be implemented at or near the existing facilities and within the ROW, easement areas, or other authorized access points. PG&E conducts tens of thousands to hundreds of thousands of maintenance activities each year. The majority of these activities are very small in size and typically last several hours. Some activities are large and take several days or months. Both small and large activities are covered under the MRHCP.

The MRHCP does not cover the following activities.

- Major new construction on undisturbed land.

- Hydropower or nuclear operations and maintenance.
- Activities undertaken by companies or individuals performing work that is not on PG&E's behalf.
- Application of herbicides, rodenticides, or fungicides.

1.5.4 Requested Duration of the Permits

The *permit term* is the time period during which all covered activities receive take authorization under an HCP, consistent with the requirements of the HCP. The permit term is also the time during which all conservation actions must be successfully completed to offset covered activity impacts. Prior to permit expiration, PG&E may apply to renew or amend the MRHCP and its associated permit to extend the permit term. PG&E is requesting a 30-year permit for the MRHCP for the reasons discussed below.

PG&E has generated and delivered energy for more than 100 years, and PG&E expects it will continue to do so into the future. Electric and gas infrastructure typically has a long life span. The existing electric and natural gas facilities will need to remain operable and be periodically maintained, upgraded, and modified to ensure safe and efficient operation. PG&E must maintain these facilities at consistent intervals, and incidental take authorization is necessary to conduct such activities over the life of these facilities. Ongoing O&M activities are expected to continue into the future; consequently, incidental take authorization for these activities is needed for as long a period as feasible.

As described in Chapter 3, *Covered Activities*, PG&E's activities primarily involve O&M of existing facilities (as opposed to new construction), and these O&M activities typically result in localized, small impacts on habitat over a large geographical area that are expected to affect the covered species throughout the permit term. Electric transmission and distribution lines are located above ground and are subject to equipment failure due to emergencies, storms, and outages. In most cases, electric transmission infrastructure is anticipated to remain above ground, and no major changes are anticipated for either the construction or installation methodology. By contrast, gas transmission and distribution lines are primarily underground, and repairs are not anticipated to be as frequent; however, as the infrastructure ages and because of new federal regulations (e.g., Pipeline Integrity Act), the lines are inspected more regularly and repairs are made as necessary, often with short planning timelines. Accordingly, for both gas and electric transmission lines, many decades of continued maintenance work is expected, and the associated habitat and species effects can be estimated for this duration.

PG&E will need to continue to maintain its facilities in perpetuity, and its facility corridors will continue to harbor endangered species. PG&E's maintenance practices have not changed substantially and are not likely to change substantially; therefore, a 30-year permit term is appropriate.

1.6 Environmental Screening Processes

PG&E implements a variety of environmental screening processes based on the size of the work, type of facility, and urgency of the activity. In general, the CPUC requires that PG&E provide reliable energy to the public in a way that avoids or substantially lessens the related environmental impacts.

To achieve this, PG&E's overall environmental screening processes can be categorized into four phases: project assessment, environmental screening and review, project refinement, and release to construction (Figure 1-3).

1.6.1 Phase 1 – Project Assessment

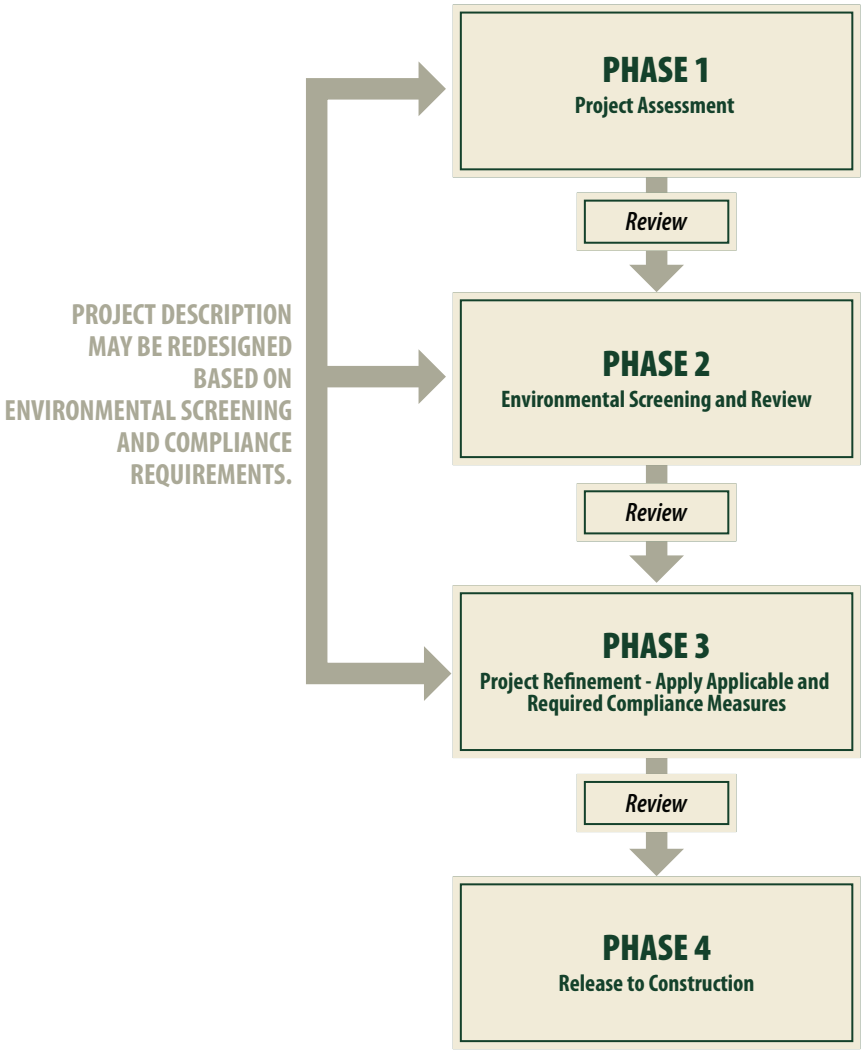
Covered activities arise out of an extensive multi-year planning process that factors in the age of the facilities, life of the equipment, equipment conditions, wear, outage history, and other considerations. During the first phase, PG&E staff (land planners and engineers) evaluates a given project and begins developing the project scope and description. The level of detail in the project description varies based on the activity size (i.e., less detailed for small projects and more detailed for large projects) and an initial assessment of the site conditions and constraints. Typically, a project description for a large maintenance project, such as electric reconductoring or a gas pipeline replacement project, includes an evaluation of site access, temporary construction areas, construction footprint, construction schedule, and outage schedule, with the ultimate goal of assessing the environmental impacts and potential discretionary permits and environmental review requirements. The time required to develop the project scope and description varies from 1 day to greater than 1 year, with some projects taking 2 years or more for assessment and design because of required field surveys.

1.6.2 Phase 2 – Environmental Screening and Review

During the second phase, PG&E's staff of land planners, biologists, cultural resource specialists, vegetation management staff, and environmental field specialists conducts initial environmental screening and review of the proposed project and associated work activities. Multiple environmental screening processes are used by the various staff members supporting the project, depending on the line of business and type of work. Land planners review ministerial and discretionary permits as well as land rights. The HCP team provides HCP compliance screening. Analysts and planners for distribution projects use GIS to conduct an automated environmental assessment (i.e., environmental screening) of work sites. Land planners, vegetation management inspectors, and biologists conduct riparian screening for vegetation management activities. During the screening process, projects and activities are evaluated for potential impacts on wetlands, state and federal waters, and listed or special-status species and their respective habitats. PG&E staff verifies that the necessary land rights are obtained for both temporary and permanent easements. The environmental permitting process may also begin in this phase. PG&E maintains a comprehensive geographic information system to evaluate projects, and routinely uses this system to evaluate all aspects of a project's scope or description.

PG&E's Environmental Team routinely evaluates the impacts of proposed projects and recommends the appropriate avoidance, minimization, or mitigation measures, based on best practices and permit requirements, as follows.

- Land use and planning practices to minimize impacts when designating work sites.
- Visual resource practices to lessen the visual impacts on a sensitive receptor.
- Biological resources evaluation and screening to minimize environmental impacts.
- Geology and soils practices to engineer facilities correctly and minimize erosion.
- Water quality practices to protect water quality.



03442.03_PGE-BayAreaHCP (01-08-15) SS

Figure 1-3
PG&E's Generalized Environmental Screening Process

- Cultural resources practices to protect cultural resources.
- Transportation and circulation practices to minimize traffic impacts.
- Noise and vibration practices to minimize noise and vibration impacts on sensitive receptors.
- Air quality practices to minimize air quality impacts and vehicle emissions.
- Hazardous materials practices to ensure the proper management, use, disposal, and storage of hazardous materials.
- Environmental justice practices to ensure minority communities are not adversely affected.
- Cleanup and restoration practices to ensure work sites are restored.

1.6.3 Phase 3 – Project Refinement

During the third phase, based on the results of the environmental screening and review, PG&E staff (land planners, biologists, field crews, and other specialists) submits or refines permit applications, and identifies other appropriate AMMs and BMPs to avoid and minimize impacts from the activity. These measures are added to the project work as required conditions. These measures include Environmental Protection Measures, Applicant Proposed Measures, BMPs, and Field Protocols, and required compliance measures, such as permit conditions and mitigation measures. Based on this information and information from the second phase, the project may be refined or modified to minimize its impacts.

1.6.4 Phase 4 – Release to Construction

The fourth phase is a release to construction review. PG&E staff implements an Environmental Release to Construction (ERTC) process, or an equivalent procedure, to ensure projects and activities are reviewed for environmental constraints or restrictions. The ERTC process is primarily for large activities, and many small activities are constrained by PG&E's automated environmental assessment process, or other line of business procedures.

This screening process in conjunction with PG&E's annual environmental awareness training and project-specific tailboard trainings help ensure that PG&E avoids and minimizes its impacts and complies with applicable environmental laws and regulations.

1.7 Document Organization

This document is organized in the following chapters and appendices.

- Chapter 1, *Introduction*.
- Chapter 2, *Environmental Setting*.
- Chapter 3, *Covered Activities*.
- Chapter 4, *Covered Species Impact Analysis*.
- Chapter 5, *Conservation Strategy*.
- Chapter 6, *Plan Implementation and Funding*.

- Chapter 7, *Alternatives Analysis*.
- Chapter 8, *References Cited*.
- Chapter 9, *Preparers*.
- Appendix A, *Species Considered*.
- Appendix B, *Species Accounts*.
- Appendix C, *Implementation Tools*.

Chapter 2
Environmental Setting

***Summary**: This chapter presents the physical and biological setting associated with the 34-county study area. It also presents detailed information on land cover within PG&E's facility corridors (i.e., the Plan Area) that is used to evaluate the direct and indirect impacts of covered activities on covered species.*

2.1 Geographic Overview

The geographic scope of PG&E's MRHCP study area includes all or part of 34 California counties (Chapter 1, Figure 1-1). Within the study area, there are 15.3 million acres of public lands and 16.8 million acres of private lands (Table 2-1). The Plan Area itself comprises PG&E's ROW along the gas and electric transmission and distribution infrastructure, access routes to PG&E's infrastructure, plus potential ROW (new gas pipeline or electric line extensions), PG&E's fee-owned lands or lands subject to PG&E easements for the new infrastructure, and offsite areas where mitigation parcels would be acquired to offset permanent and temporary impacts. The width of the ROW varies depending on the facility type.

Table 2-1. Land Ownership within the Study Area

Region	Publicly Owned (million acres)	Privately Owned (million acres)	Total (million acres)	Publicly Owned (%)	Privately Owned (%)
Sacramento Valley and Foothills	10	8.0	18	56%	44%
North Coast	3.3	4	7.3	45%	55%
Central Coast	2	4.8	6.8	30%	70%
Total	15.3	16.8	32.1		

The Plan Area encompasses approximately 565,700 acres, and the majority of activities would be implemented in the ROW of existing electric and gas transmission and distribution facilities. Most of the land in the Plan Area is privately owned, with conserved lands accounting for 1.6% of the total Plan Area (GreenInfo Network 2018). PG&E owns less than 1% of the ROWs in fee; the remaining ROWs are held as easements. The following sections describe the Plan Area's physical environment, biological diversity, and land ownership within each planning area.

2.1.1 Sacramento Valley and Foothills

2.1.1.1 Physical Environment

The Sacramento Valley and Foothills Region covers territory from Shasta County in the north to Tulare County in the south. A corridor also extends north through southeastern Siskiyou County and western Modoc County to the Oregon border. The Sacramento Valley portion of the region is mostly

flat, and is situated between the northern Coast Ranges to the west, the Klamath Mountains to the north and the southern Cascade and Sierra Nevada Mountains to the east. The region also includes a northeastern piece of the Sacramento-San Joaquin River Delta (Delta). Climate in the Sacramento Valley is characterized by hot, dry summers with the high temperatures above 100° Fahrenheit (F) and cool, sometimes foggy winters. Precipitation falls as rain primarily from late fall through early spring.

In the more mountainous portions of the region, the climate varies with elevation. High elevations have cold snowy winters and cool summers; foothill areas have rainy winters and mild to hot summers. With the exception of occasional thunderstorms, summers are dry throughout the mountain and foothill portions of the region. Temperatures decrease with increasing latitude and elevation, declining by approximately 3.3°F for each 1,000 feet. At Blue Canyon, an important weather station located in the northern Sierra between Auburn and Truckee at about 4,700 feet elevation, relative humidity is highest in January at 60% and lowest in July at 30%. Extremely low relative humidity is common throughout the Sacramento Valley and Foothills Region during the summer.

Topography

The Sacramento Valley is a mostly flat alluvial plain that lies between the Cascades and Sierra Nevada Mountains on the east and the Coast Ranges on the west. The east and west margins of the valley are dominated by undulating foothills topography, where slopes as steep as 15–30% are common. The Sacramento Valley is drained by the south-flowing Sacramento River and joins with the San Joaquin River at the Delta, which empties into San Francisco Bay (Norris and Webb 1990; Harden 1998). The elevation of the Sacramento Valley floor ranges from near sea level to about 1,000 feet above mean sea level (Hackel 1966).

The foothills portion of the region joins the Sacramento Valley to the Sierra Nevada in the east and Cascade Range in the north, and extends south through the central and southern Sierra Nevada. This block of the Earth's crust broke free along a bounding fault line and has been uplifted and tilted (Huber 1987). Elevations range from 492 feet on the American River near Sacramento to 9,100 feet at Castle Peak. The relatively moderate western slope of the Sierra Nevada is incised with a series of steep river canyons from the Feather River in the north to the Kern River in the south. As the mountain block was uplifted, the rivers cut deeper and deeper into underlying rock (Huber 1987). The foothills are gently rolling with both broad and narrow valleys. At the mid elevations, landforms include canyons and broad ridges that run primarily from east-northeast to west-southwest. Rugged mountainous terrain dominates the landscape at the higher elevations (Wagtendonk and Fites-Kaufman 2006).

Geology and Soils

The valley floor is a thick sequence of sedimentary deposits that range in age from Jurassic through Quaternary. Under the eastern and central portions of the valley, the base of the sequence likely rests on Mesozoic crystalline rock; to the west, basement rocks are believed to be Franciscan meta-sediments or mélange. Mesozoic sedimentary rocks are overlain by Tertiary strata reflecting marine, estuarine, and terrestrial conditions, which are in turn overlain by Quaternary fluvial and alluvial strata recording uplift and erosion of the Sierra Nevada and Coast Ranges to approximately their present shape (Norris and Webb 1990).

The region falls in three major land resource areas (MLRAs) identified by the U.S. Department of Agriculture (USDA). Most of the region is located within MLRA 17, the Sacramento and San Joaquin Valleys. The west and east margins of the region are located in MLRA 15 (Central California Coast Range) and MLRA 18 (Sierra Nevada foothills), respectively. Within these MLRAs, soils are nearly level, and are alluvial, occurring on low terraces, fans, and floodplains, and in basins. Soil textures range from clay to loamy sand (Earth System Science Center 1998).

The oldest rocks of the foothills portion of the region were metamorphosed from sediments deposited on the sea floor that collided with the continent during the early Paleozoic Era (Huber 1987). These rocks grade into early Mesozoic Era metasediments and metavolcanics west of the crest of the Sierra Nevada. Granites formed 225 million years ago, and pulses of liquid rocks continued for more than 125 million years, forming the granite core of the range (Schweickert 1981). Violent volcanic eruptions during the second half of the Tertiary Period blanketed much of the subdued landscape of the foothills in the northern part of the region and portions of the more mountainous central part of the region with ash that dammed streams, filled narrow valleys, and covered passes (Hill 1975). Today, volcanic rocks occur primarily in the mountains of the northern and central parts of the region, although small outcrops can be seen throughout the range (Wagtendonk and Fites-Kaufman 2006).

Hydrology

The Sacramento Valley experiences Mediterranean- and steppe-type climate conditions characterized by hot, dry summers and mild winters (Planert and Williams 1995). In the spring, summer, and early fall, northerly winds are commonly associated with humidity of less than 10%, except in the Delta, where strong marine inflow locally increases atmospheric moisture. During the winter, relative humidity is typically higher, and a shallow layer of dense fog may form overnight, lasting as long as 2 to 3 weeks (Western Regional Climate Center 2009). Precipitation, almost all of which falls as rain in the Sacramento Valley, is highly variable from year to year. In the northern part of the Sacramento Valley, the average precipitation is about 23 inches per year (Planert and Williams 1995).

The Sacramento River Basin and San Joaquin River Basin comprise about 25% of the state's total area and 30% of the state's irrigable land; the two rivers provide slightly more than half of the state's water supply. The Sacramento River Basin has an area of about 27,200 square miles and consists of all watersheds north of the Cosumnes River watershed and tributaries to the Sacramento River, as well as the interior-drainage Goose Lake region, which lies outside of the MRHCP's Sacramento Valley and Foothills Region. Principal tributaries draining the Sierran uplift include the Pit, Feather, Yuba, Bear, and American Rivers. Principal tributaries draining the Coast Ranges include Cottonwood, Stony, Cache, and Putah Creeks. Other important water bodies in the Sacramento Basin include Lake Shasta, Lake Oroville, and Folsom Lake, as well as Clear Lake (which is in the North Coast Region), and Lake Berryessa (which is in the Bay Area O&M HCP area) (Central Valley Regional Water Quality Control Board 2018).

The pattern of weather in the foothill and mountainous portion of the region is influenced by topography and geographic position relative to the Central Valley, the Coast Ranges, and the Pacific Ocean. Winters are dominated by low pressure in the northern Pacific Ocean while summer weather is influenced by high pressure in the same area (Wagtendonk and Fites-Kaufman 2006). The primary sources of precipitation are winter storms that move from the north Pacific and cross the Coast Ranges and Central Valley before reaching the foothills and mountains. As the air masses

move up the gentle western slope, precipitation increases and, at the higher elevations, falls as snow. Precipitation decreases from north to south, with nearly twice as much falling in the northern foothills and mountains as does in the south. Mean annual precipitation ranges from a low of 10 inches at the western edge of the foothills to more than 79 inches north of Lake Tahoe (Wagtendonk and Fites-Kaufman 2006).

2.1.1.2 Land Ownership

Most of the land in the Sacramento Valley is privately owned. Of the 18 million acres in the Sacramento Valley and Foothills Region, 9.5 million acres is in the Sacramento Valley portion of the region. Approximately 7.1 million acres, or 75%, of the land in the Sacramento Valley is privately owned; the remaining 2.4 million acres, or 25%, is publicly owned. This public ownership is a combination of federal, state, and county holdings, and lands in private ownership with a dedicated conservation easement.

Most of the land in the foothills portion of the region is publicly owned. Of the 8.5 million acres in the foothills, 11%, or fewer than 1 million acres, is privately owned, while 89%, or 7.6 million acres, is publicly owned. This public ownership is a combination of federal, state, and county holdings, and lands in private ownership with a dedicated conservation easement.

2.1.2 North Coast

2.1.2.1 Physical Environment

The North Coast Region encompasses coastal redwood forests, inland mountain valleys, and the North Coast Ranges in Humboldt, Mendocino, Lake, and Trinity Counties. The coastal climate is cool, moist, and often foggy, with rainy winters at lower elevations and snow in the high mountains. Inland the climate is drier with low rainfall in winter and hot, dry summers. Much of the North Coast Region is forested.

Topography

The North Coast Region includes the coastline from the Sonoma/Mendocino county line north to the Humboldt/Del Norte county line and extends east across the Coastal Ranges into Trinity County in the north, Lake County in the south, and interior Mendocino County in between. This region includes the southern-most Klamath Mountains and the Trinity Alps. The topography in this region varies from sea level on the coast, to 9,002 feet at Mt. Thompson Peak in the Trinity Alps (Norris and Webb 1990). The Klamath Mountains average between 5,000 and 7,000 feet.

Geology and Soils

The Coast Ranges geomorphic province is characterized by northwest-trending mountain ranges formed, over the past 10 million years or less, by active uplift related to complex tectonics of the San Andreas fault/plate boundary system (Norris and Webb 1990; Buising and Walker 1995; Atwater and Stock 1998). The majority of formations in the North Coast Region are made up of Mesozoic marine sedimentary rocks and continental deposits. There are some Cenozoic continental deposits in the Coast Ranges and Cenozoic marine sedimentary deposits along the coast around Point Arena. Unique ultramafic, metamorphic, and granitic bedrock types in the region often support rare plant and animal species (California Department of Fish and Game 2003).

Hydrology

The North Coast Region has the state's wettest climate, with average annual rainfall varying from more than 80 inches in some coastal areas to less than 20 inches further inland. The average annual rainfall for the region is 51 inches (California Department of Water Resources 2005). This amount of rainfall results in nearly 41% of the state's total natural runoff (California Department of Water Resources 2005). Major rivers include the Eel, Trinity, Klamath, and Mad.

2.1.2.2 Land Ownership

Of the 7.3 million acres in the North Coast Region, approximately 55%, or 4.0 million acres, is privately owned, while approximately 45%, or 3.3 million acres, is publicly owned. This public ownership is a combination of federal, state, and county holdings, and lands in private ownership with a dedicated conservation easement.

2.1.3 Central Coast

Most of the facilities in the Central Coast Region are located around coastal cities such as Monterey and Morro Bay and, thus, are located mostly in the Watsonville Plain-Salinas Valley, North Coastal Santa Lucia Range, and South Coastal Santa Lucia Range ecoregions.

2.1.3.1 Physical Environment

The Central Coast Region has a wide variety of habitats and vegetation, including coastal prairie scrub, mixed hardwoods, and valley oaks on the rolling hills and mountains that descend to the ocean. This region includes Santa Cruz County and stretches south through San Benito, Monterey, and San Luis Obispo Counties, and into northern Santa Barbara County. The region also includes a portion of southern Kern County along a gas transmission corridor. Like much of coastal California, the climate is characterized as Mediterranean. In general, the Central Coast Region has foggy summers, mild falls, and chilly, rainy winters. Farther inland, hot, dry summers and warm autumns are followed by mild, wet winters. Snowfall is rare.

Topography

The topography of the region is varied. The region consists of rugged, northwest-to-southeast trending ranges, notably the Santa Cruz Mountains, Santa Lucia Ranges, Gabilan Range, and Temblor Range. Coupled with these ranges are expansive valleys including the Santa Clara, Salinas, and Santa Maria River valleys. Near the ocean lie sand dunes and gently rolling hills. Elevations range from sea level to 6,828 fee at Big Pine Mountain in Santa Barbara County (Norris and Webb 1990).

Geology and Soils

The Coast Ranges geomorphic province is characterized by northwest-trending, elongate ranges and narrow valleys that are approximately parallel to the coast formed over the past 10 million years (Norris and Webb 1990; Buising and Walker 1995; Atwater and Stock 1998). The most unique soil types are on Serpentinite outcrops of the Mesozoic Franciscan Complex, a mélange of metamorphosed sedimentary and volcanic rocks. These outcrops are especially widespread in the South Coastal Santa Lucia Range (Griffin 1975). Stabilized Pleistocene sand dunes support distinctive maritime chaparral vegetation in the Santa Maria and Salinas River valleys, east of Pismo and Morro Bays (Van Dyke and Holl 2001).

Hydrology

The regional climate is Mediterranean with cool wet winters and warm dry summers. More than 80% of seasonal rain falls from November through March, primarily due to occluded fronts and occasional cold fronts from the west-northwest (Null 1995). Precipitation decreases from north to south, but topography exerts an equally strong influence on climate with the highest rainfall in the coastal mountains and lowest rainfall in rain shadows along the eastern edge of the region. To illustrate these patterns, at the northern end of the region, long-term mean annual precipitation decreases from 49.2 inches in Big Basin Redwoods State Park to 30.2 inches in Santa Cruz to 16.8 inches at Pinnacles National Monument. At the southern end of the region, mean annual rainfall ranges from 22.7 inches at San Luis Obispo to 5.5 inches at the interior location of Cuyama (Davis and Borchert 2006).

2.1.3.2 Land Ownership

Most of the land in the Central Coast Region is privately owned. Of the 6.8 million acres in the Central Coast Region 70%, or 4.8 million acres, is privately owned, while 30%, or 2.0 million acres, is publicly owned. This public ownership is a combination of federal, state, and county holdings, and lands in private ownership with a dedicated conservation easement.

2.2 Land-Cover Mapping

This section describes the sources of data and the processes used to map land-cover types. The sources provided regional-level data for assessment of the impacts of covered activities on covered species within the Plan Area.

2.2.1 Data Sources

A land-cover map was developed to present the best available data appropriate for a regional assessment of the Plan Area. The data used to generate the land-cover map came from the following sources.

- California Department of Fish and Wildlife Vegetation Classification and Mapping Program (VegCAMP) (California Department of Fish and Wildlife 2017).
- The Classification and Assessment with Landsat of Visible Ecological Groupings (CALVEG) geodatabase (U.S. Forest Service 2017).
- The California Department of Forestry and Fire Protection (CalFire), Fire and Resource Protection Program (FRAP) 2015 Vegetation, (fveg15_1).
- Natomas Basin HCP (City of Sacramento et al. 2003).
- Draft Western Placer HCP/NCCP (Placer County Planning Department 2018).
- Yolo HCP/NCCP (Yolo Habitat Conservancy 2018).
- Extant vernal pools from Witham et. al. (2014).
- Land IQ/California Department of Water Resources (DWR) data.
- National Wetland Inventory (NWI).

Descriptions of these data sources are provided below and citations are provided in Chapter 8, *References Cited*.

Vegetation Classification and Mapping Program

Fish and Game Code Section 1940 requires CDFW to develop and maintain a vegetation mapping standard for the state. This standard is manifested in the Survey of California Vegetation and implemented through VegCAMP. VegCAMP focuses on developing and maintaining maps and classifications of all vegetation and habitats in the state to support conservation and management decisions at the local, regional, and state levels. VegCAMP has minimum mapping units that range from 0.5 acre to 5 acres depending on the vegetation type. PG&E used the latest VegCAMP data as the foundation for its land-cover dataset, and used the California Wildlife Habitat Relationship (CWHR) classification system to represent the various land-cover types. The CWHR is an information system pertaining to California's wildlife and is maintained by CDFW in cooperation with the California Interagency Wildlife Task Group (California Department of Fish and Game 2010).

Classification and Assessment with Landsat of Visible Ecological Groupings

CALVEG is a U.S. Forest Service (USFS) product that serves as an assessment for vegetation-related resources throughout much of California. CALVEG is derived from classified Landsat Thematic Mapper datasets and spatial modeling. Land-cover types are derived from imagery classification and manual digitization. Ecological regions are modeled differently, based primarily on slope, aspect, and, occasionally, soil. The CALVEG effort began in 1978 with ecological zones receiving updates as recently as 2016. The most recent data available was used in this analysis. CALVEG offers a custom classification system but also offers CWHR classifications that PG&E used to represent various land-cover types. CALVEG data was compiled using a minimum mapping unit of 2.5 acres.

California Department of Forestry and Fire Protection, Fire and Resource Protection Program Vegetation

CalFire's FRAP is mandated to assess the amount, extent, and condition of California's forests and rangelands and to identify alternative management and policy guidelines. To fulfill this mandate, FRAP has combined habitat distribution data from numerous sources collected at various times into a format compatible for use within GIS. The goal is to create an accurate depiction of the habitat types across California. FRAP extensively uses CALVEG data. The data span a period from approximately 1990 to 2014. The data is compiled as a raster dataset and is provided at a resolution of 30 meters. PG&E standardized the various datasets using the CWHR system classifications.

Natomas Basin HCP

For the Natomas Basin HCP, the minimum mapping unit for most areas is 10 acres; however, natural features smaller than 10 acres are delineated at a minimum mapping unit of 0.25 acre. The Natomas Basin Habitat Conservancy updates the data annually. PG&E used Natomas Basin HCP data for the following types of wet land cover.

- Fresh emergent marsh
- Fresh emergent marsh (created)
- Open water

- Riparian scrub
- Riparian woodland
- Seasonal wetland

Draft Placer County Conservation Plan

The Placer County Conservation Plan, also known as the Draft Western Placer HCP/NCCP, dataset contains a comprehensive vernal pool layer. PG&E used data for the following types of wet land cover.

- Vernal pool complex
- Aquatic/wetland complex
- Riverine/riparian
- Managed open water

PG&E did not use Draft Western Placer HCP/NCCP data for other land-cover types because much of the data was more than 10 years old.

Yolo HCP/NCCP

The Yolo HCP/NCCP dataset shows the extensive network of drainages and canals that PG&E considered during analysis of impacts on the giant garter snake. PG&E used data for the following land-cover types.

- Alkali sink
- Fresh emergent wetland
- Lacustrine and riverine
- Valley foothill riparian
- Vernal pool complex

To maintain consistency with the broader data assembled for the MRHCP, PG&E did not use Yolo HCP/NCCP data for other land-cover types.

Vernal Pools

Under a grant from USFWS, Carol Witham, Robert Holland and John Vollmar (Witham et al. 2014) evaluated changes in the extent and condition of vernal pool habitat in the Sacramento and San Joaquin Valleys between 2005 and 2012. This mapping effort documented the extent of extant vernal pool habitat in the Sacramento and San Joaquin Valleys and provides the basis for extant vernal pool habitats (i.e., vernal pool complex).

Land IQ

This dataset presents the 2014 agricultural land use for all 58 counties in California. Land IQ, LLC prepared the data and provided it to DWR and other resource agencies. The data are derived from USDA's 2014 National Agricultural Imagery Program (NAIP) imagery, which is based on remote sensing, agronomic analysis, and ground verification.

National Wetland Inventory

The NWI Cowardin classification types within the study area were crosswalked by PG&E to CWHR land-cover types (estuarine, fresh emergent wetland, freshwater emergent marsh, lacustrine, montane riparian, riverine, urban, valley foothill riparian). Montane riparian type is valley foothill riparian type that is located above 5,000 feet elevation. The urban, riverine, and unknown types in NWI were discarded because other wetland sources were better and because the National Hydraulic Dataset (NHD) is used in modeling. In the Sierra foothills, montane riparian was added where the CALVEG land cover was mapped as a conifer type. This NWI data was used to update FRAP features in the Central Coast Region, and CALVEG in the North Coast Region, and CALVEG and FRAP features in the Sacramento Valley and Foothills Region. To maintain the highest resolution data from the other datasets, narrow linear features from NWI, which are mostly buffered stream lines, were not included.

Other Sources Considered

Datasets representing land cover for four national parks (Pinnacles National Park, Sequoia and Kings Canyon National Parks, Whiskeytown National Recreation Area, and Yosemite National Park) were considered by PG&E but were not used because the datasets do not use the CWHR system classifications.

The National Land Cover Database was considered, but, because of the large cell size and nationwide focus, the database is inferior to other datasets such as VegCAMP and CALVEG.

2.2.2 Mapping Procedures

PG&E worked to assemble the highest quality, most accurate datasets to create a comprehensive land-cover dataset for the entire study area. Approximately 75% of the study area is represented by USFS CALVEG, 18% by VegCAMP, 5% by FRAP, and the remainder by other data sources. VegCAMP, CALVEG, and FRAP data all contain classifications that utilize the CWHR system, which allowed for the maintenance of a standard classification system. The data sources used to map the land-cover types are presented graphically in Figure 2-1. The data were combined in the following order, with the first being highest priority and the fifth being the lowest priority:

1. Wet types from overlapping HCPs (e.g., Natomas Basin HCP).
2. Vernal pools from Witham et al. 2014.
3. CDFW VegCAMP.
4. USFS CALVEG.
5. FRAP.

2.2.3 Land-Cover Type

The land-cover type classification system used plant species nomenclature following *The Jepson Manual* (Baldwin et al. 2012). Land-cover types fall into three major categories: natural, cultivated lands, and urban. These categories are shown in Figures 2-2a through 2-2c. Natural land-cover types consist of all types that are not cultivated lands or urban types, including forest, grassland, riparian,

shrubland, wetland, dune, and barren/ruderal. Additional land-cover type classifications are provided below.

2.2.4 Facilities by Land-Cover Type in the Plan Area

The MRHCP GIS database consists of three primary data layers: the Plan Area boundary, PG&E transmission and electric distribution infrastructure, and land-cover types. PG&E calculated maximum ROW (width of mapped ROW varies depending on the size of the voltage), based on the linear mileage of the infrastructure. This method allowed for a calculation of the total area adjacent to the infrastructure that could be affected by covered activities (Plan Area). These estimates were based on the infrastructure size (Table 2-2).

Table 2-2. Type and Size of Facilities and Associated Maximum Width of Buffered ROWs

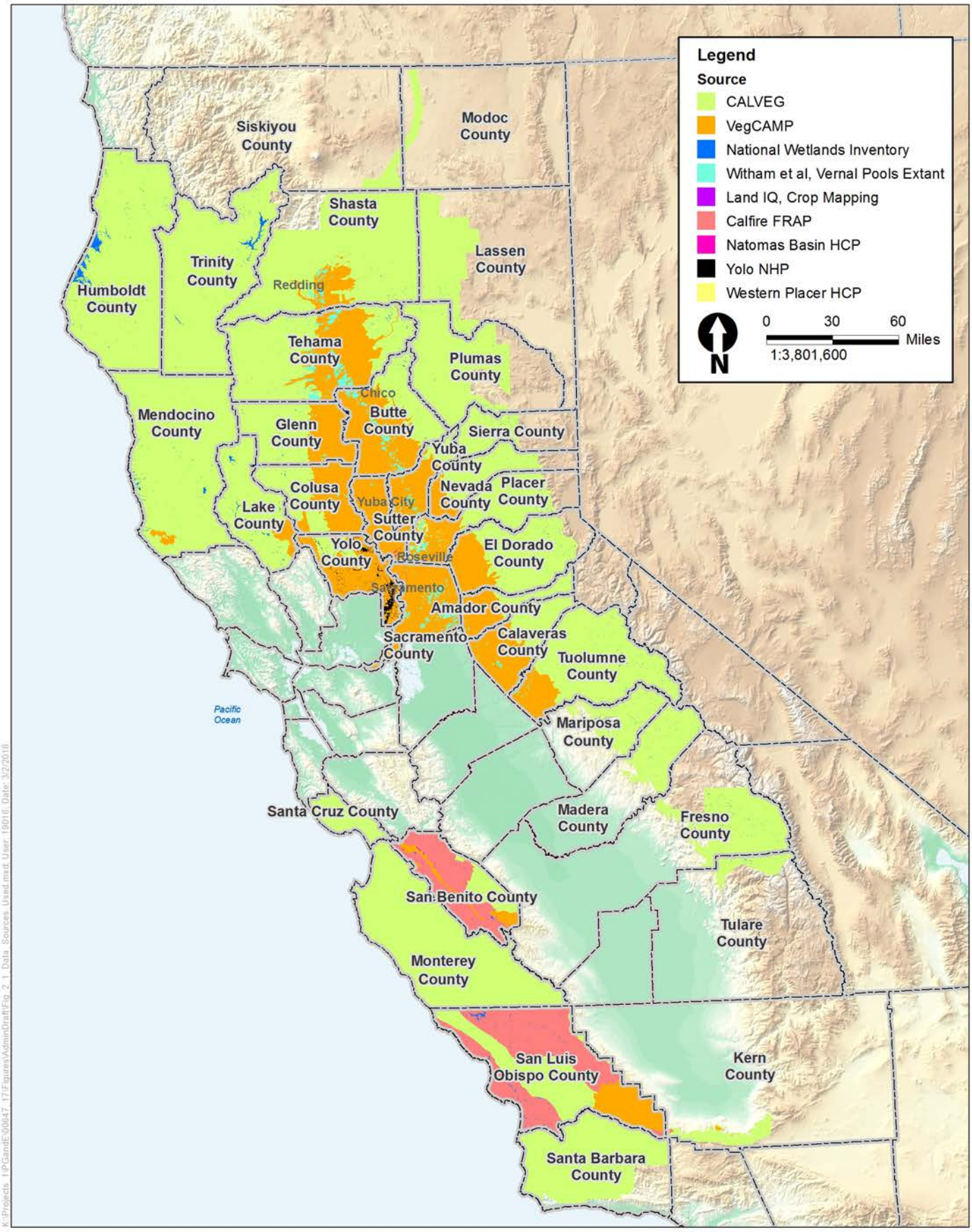
Type of Facility	Size of Facility	Maximum Facility Corridor Width (feet)	Buffer Area (feet)	Total Area (feet)
Electric transmission	500 kV	200	200	400
Electric transmission	230 kV	120	120	240
Electric transmission	60/70/115 kV	80	80	160
Gas transmission	All	150	150	300
All distribution facilities	All	25	25	50

The total area used for analysis is conservative in that the size provides a maximum area in which covered activities might be implemented. The PG&E ROWs and land-cover type data were intersected and the GIS database queried to determine the extent of each land-cover type within the Plan Area.

Table 2-3 presents a summary of land-cover types by region. Approximately 20.8% of the Plan Area is cultivated lands, 18.7% is grassland, 25.5% is urban, and the remaining 35% consists of other natural land-cover types. Tables 2-4, 2-5 and 2-6 present the extent of each land-cover type within gas transmission, gas distribution, electric transmission, and electric distribution buffered ROWs in each MRHCP region. As indicated in these tables, many PG&E facilities are in urban, grassland, and agricultural land-cover types.

Table 2-3. Summary of Plan Area Land Cover by Region (acres)

Land Cover	Sacramento Valley and Foothills Region	North Coast Region	Central Coast Region	Total	Percent
Agriculture	81,851	8,729	23,703	114,284	20.8%
Cultivated Land	81,851	8,729	23,703	114,284	20.8%
Aspen Forest	46	0	0	46	0.0%
Aspen	46	0	0	46	0.0%
Barren/Ruderal	2,855	4,022	4,545	11,422	2.1%
Barren	2,855	4,022	4,545	11,422	2.1%
Conifer Forest	27,281	7,768	1,547	36,596	6.7%



K:\Projects_1\PGandE\00647_17\Figures\AdminDraft\Fig_2_1_Data_Sources_Used.mxd User: lbolli Date: 3/2/2018

Figure 2-1
Data Sources Used to Assemble Land Cover

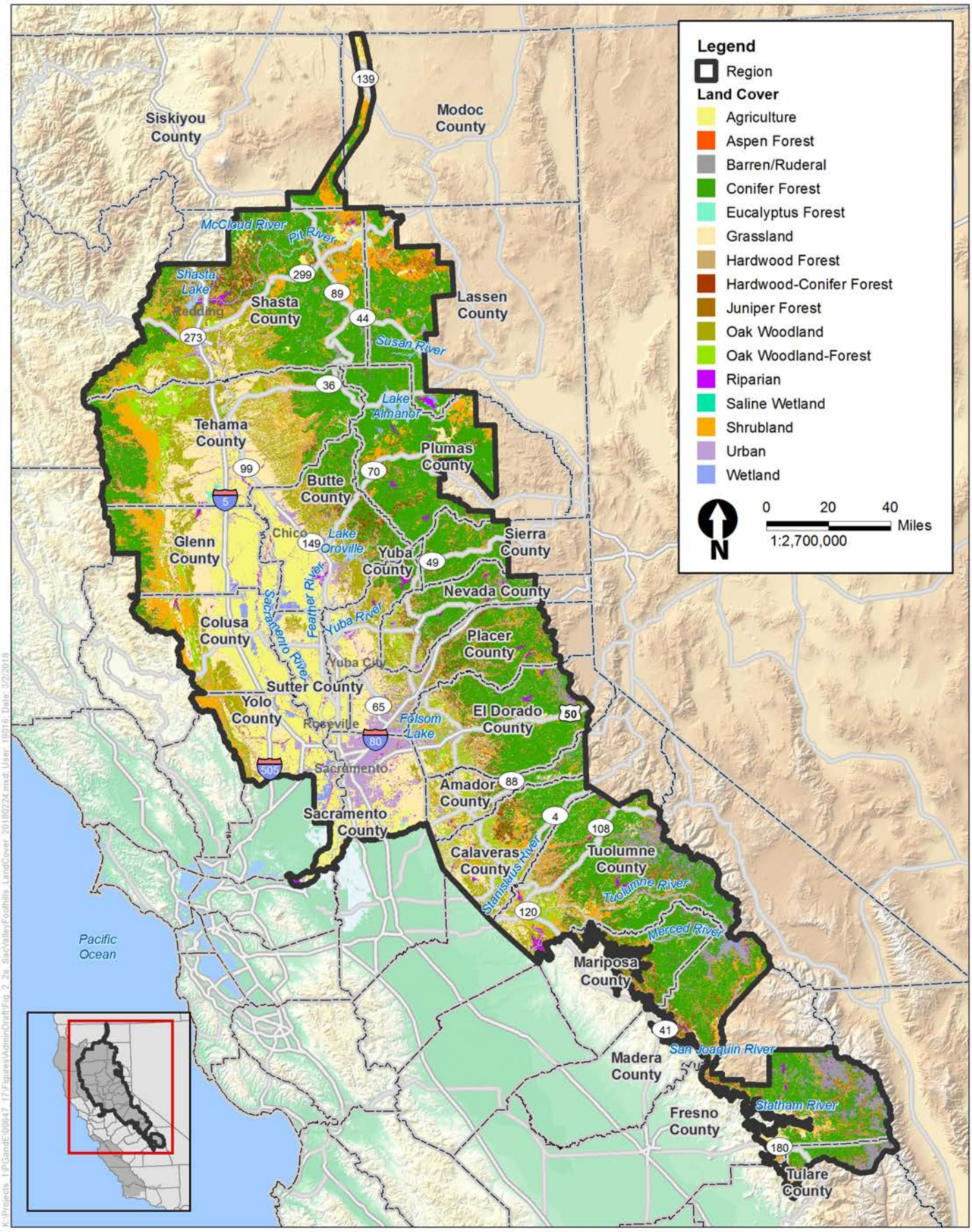


Figure 2.2-a
Sacramento Valley/Foothills Region Land Cover

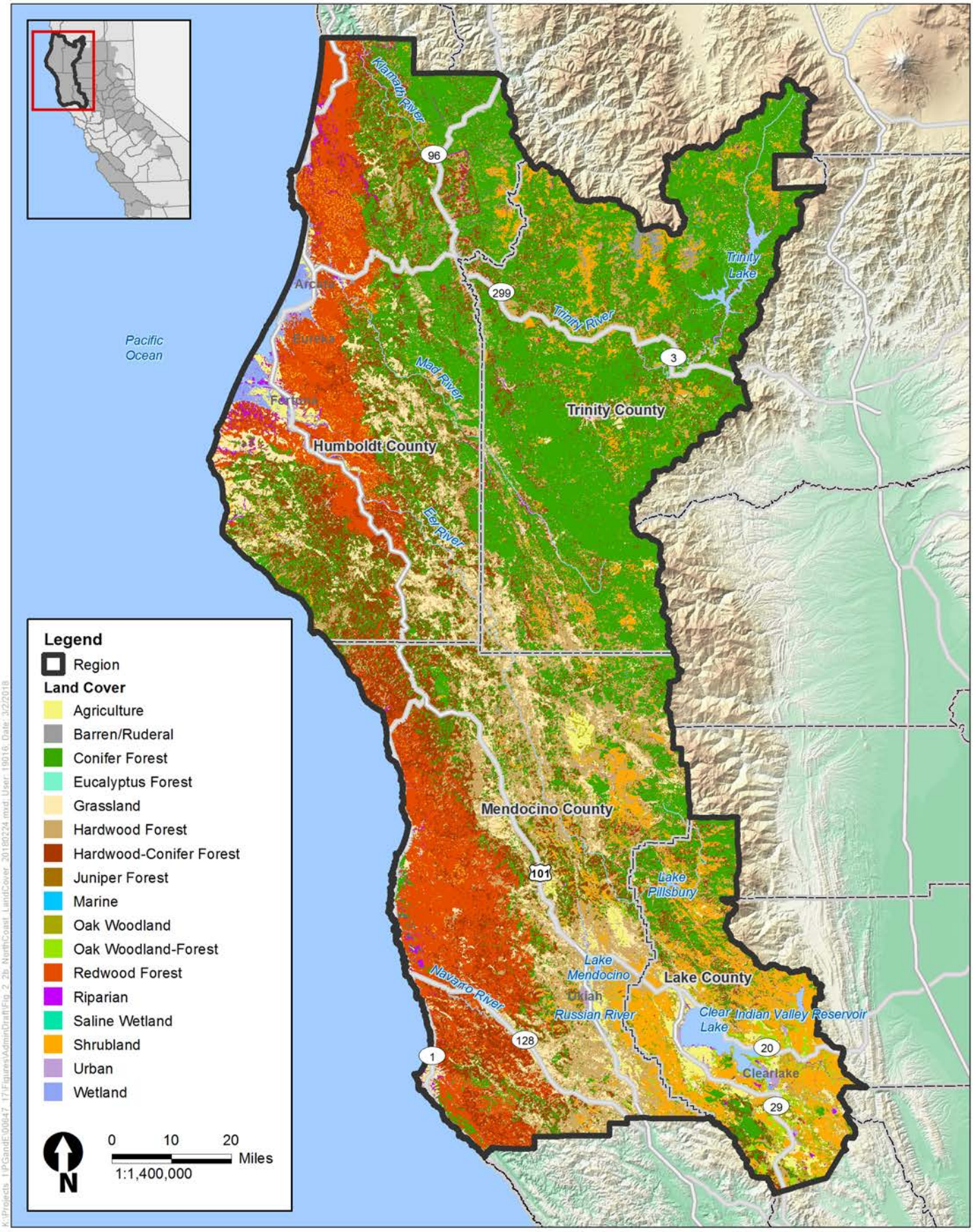


Figure 2.2-b
North Coast Region Land Cover

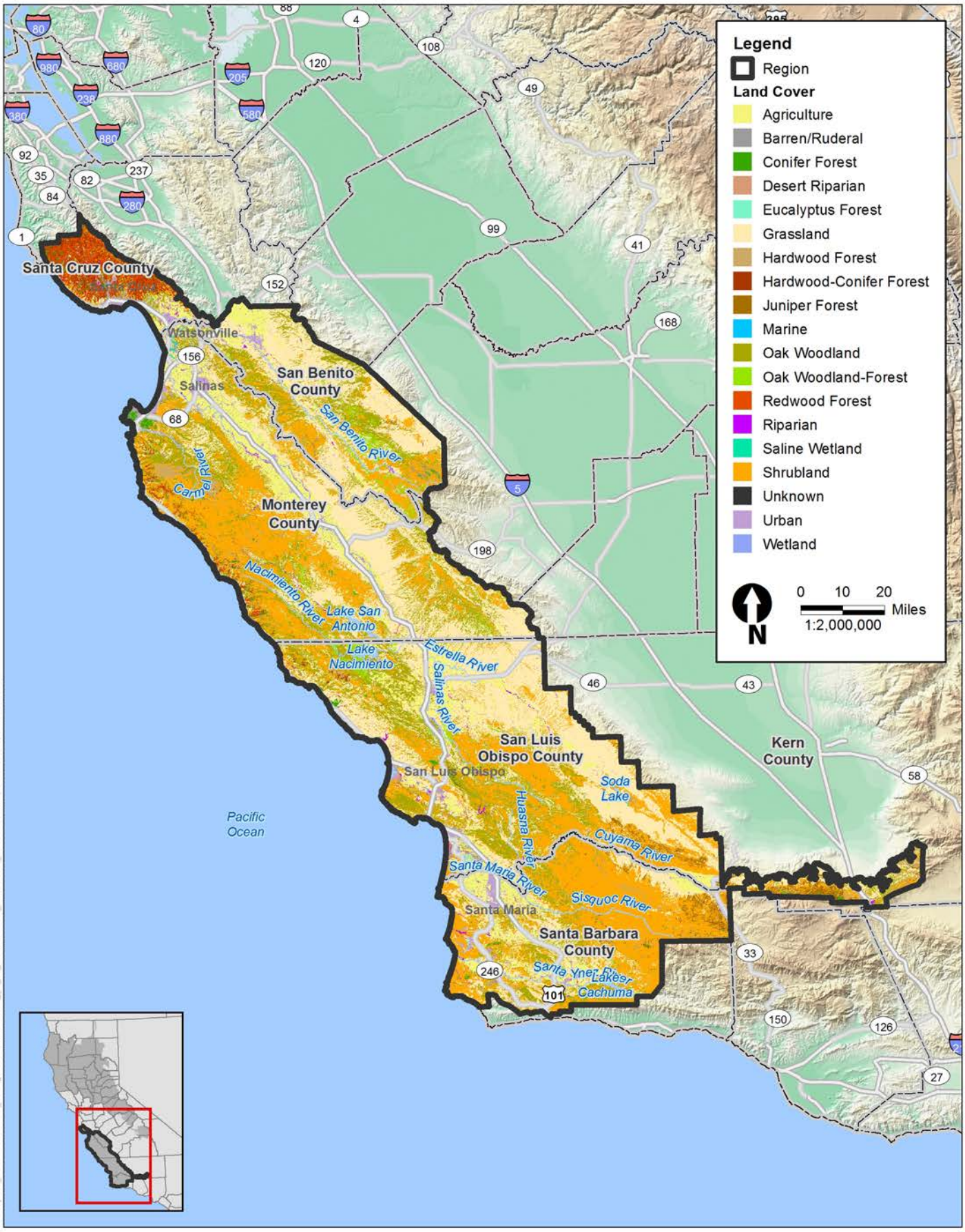


Figure 2.2-c
Central Coast Region Land Cover

Land Cover	Sacramento Valley and Foothills Region	North Coast Region	Central Coast Region	Total	Percent
Closed-Cone Pine-Cypress	376	1,193	1,422	2,991	0.5%
Douglas Fir	222	4,391	22	4,635	0.8%
Eastside Pine	990	0	0	990	0.2%
Jeffrey Pine	134	20	0	154	0.0%
Klamath Mixed Conifer	0	111	0	111	0.0%
Lodgepole Pine	382	0	0	382	0.1%
Ponderosa Pine	10,531	373	99	11,003	2.0%
Red Fir	311	8	0	319	0.1%
Sierran Mixed Conifer	13,890	1,624	4	15,518	2.8%
Subalpine Conifer	2	0	0	2	0.0%
White Fir	444	49	0	493	0.1%
Desert Riparian	0	0	35	35	0.0%
Desert Wash	0	0	35	35	0.0%
Eucalyptus Forest	296	10	609	914	0.2%
Eucalyptus	296	10	609	914	0.2%
Grassland	53,050	12,552	37,561	103,162	18.7%
Annual Grassland	42,903	12,360	37,385	92,648	16.8%
Perennial Grassland	1,494	192	175	1,861	0.3%
Vernal Pool Complex	8,653	0	0	8,653	1.6%
Hardwood Forest	15,822	7,371	532	23,725	4.3%
Montane Hardwood	15,822	7,371	532	23,725	4.3%
Hardwood-Conifer Forest	8,062	3,830	2,025	13,917	2.5%
Montane Hardwood-Conifer	8,062	3,830	2,025	13,917	2.5%
Juniper Forest	302	0	126	428	0.1%
Juniper	301	0	97	398	0.1%
Pinyon-Juniper	2	0	29	30	0.0%
Marine	0	8	3	10	0.0%
Marine	0	8	3	10	0.0%
Oak Woodland	23,233	1,850	14,887	39,970	7.3%
Blue Oak Woodland	21,653	1,415	2,792	25,860	4.7%
Coastal Oak Woodland	11	215	11,563	11,788	2.1%
Valley Oak Woodland	1,569	221	532	2,322	0.4%
Blue Oak Woodland-Forest	11,116	888	959	12,963	2.4%
Blue Oak Woodland-Foothill Pine	11,116	888	959	12,963	2.4%
Redwood Forest	0	6,323	2,409	8,732	1.6%
Redwood	0	6,323	2,409	8,732	1.6%
Riparian	6,098	1,459	1,698	9,255	1.7%
Desert Riparian	3	0	15	18	0.0%
Lacustrine	668	103	197	968	0.2%

Land Cover	Sacramento Valley and Foothills Region	North Coast Region	Central Coast Region	Total	Percent
Montane Riparian	520	1,293	7	1,820	0.3%
Riverine	1,376	48	88	1,511	0.3%
Riverine, Barren	0	0	1	1	0.0%
Valley Foothill Riparian	3,531	17	1,390	4,938	0.9%
Saline Wetland	14	48	90	152	0.0%
Saline Emergent Wetland	14	48	90	152	0.0%
Shrubland	18,032	2,524	11,282	31,837	5.8%
Alkali Desert Scrub	32	0	312	343	0.1%
Alpine Dwarf-Shrub	0	0	0	0	0.0%
Bitterbrush	1,560	0	0	1,560	0.3%
Chamise-Redshank Chaparral	573	482	1,725	2,780	0.5%
Coastal Scrub	37	535	5,875	6,447	1.2%
Desert Scrub	0	0	176	176	0.0%
Low Sage	239	0	0	239	0.0%
Mixed Chaparral	8,599	1,292	3,042	12,933	2.4%
Montane Chaparral	5,260	215	1	5,476	1.0%
Sagebrush	1,732	0	150	1,883	0.3%
Urban	102,524	5,352	32,527	140,403	25.5%
Urban	102,524	5,352	32,527	140,403	25.5%
Wetland	2,350	17	65	2,432	0.4%
Estuarine	0	0	18	18	0.0%
Fresh Emergent Wetland	2,064	0	8	2,073	0.4%
Freshwater Emergent Marsh	0	0	0	0	0.0%
Marsh	0	0	6	6	0.0%
Wet Meadow	286	17	33	335	0.1%
Grand Total	**352,932**	**62,749**	**134,600**	**550,281**	**100.0%**

Table 2-4. Mapped Extent of Land-Cover Types Present in Sacramento Valley and Foothills Region of Plan Area (acres)

Land Cover	Electric Transmission	Electric Distribution	Gas Transmission	Gas Distribution	Total	Percent
Agriculture	22,412	35,140	22,792	1,508	81,851	23.2%
Cultivated Land	22,412	35,140	22,792	1,508	81,851	23.2%
Aspen Forest	27	18	1	1	46	0.0%
Aspen	27	18	1	1	46	0.0%
Barren/Ruderal	936	1,093	279	546	2,855	0.8%
Barren	936	1,093	279	546	2,855	0.8%
Conifer Forest	8,654	16,164	1,983	479	27,281	7.7%

Land Cover	Electric Transmission	Electric Distribution	Gas Transmission	Gas Distribution	Total	Percent
Closed-Cone Pine-Cypress	223	129	21	2	376	0.1%
Douglas Fir	52	116	54	0	222	0.1%
Eastside Pine	401	237	351	0	990	0.3%
Jeffrey Pine	48	85	0	0	134	0.0%
Klamath Mixed Conifer	0	0	0	0	0	0.0%
Lodgepole Pine	215	167	0	0	382	0.1%
Ponderosa Pine	2,537	6,912	701	380	10,531	3.0%
Red Fir	27	284	0	0	311	0.1%
Sierran Mixed Conifer	4,964	7,974	855	97	13,890	3.9%
Subalpine Conifer	0	2	0	0	2	0.0%
White Fir	186	258	0	0	444	0.1%
Desert Riparian	0	0	0	0	0	0.0%
Desert Wash	0	0	0	0	0	0.0%
Eucalyptus Forest	113	57	117	9	296	0.1%
Eucalyptus	113	57	117	9	296	0.1%
Grassland	21,797	20,611	9,680	961	53,050	15.0%
Annual Grassland	16,410	18,618	7,029	847	42,903	12.2%
Perennial Grassland	782	348	355	10	1,494	0.4%
Vernal Pool Complex	4,606	1,645	2,297	105	8,653	2.5%
Hardwood Forest	4,415	10,888	359	161	15,822	4.5%
Montane Hardwood	4,415	10,888	359	161	15,822	4.5%
Hardwood-Conifer Forest	2,097	5,638	165	163	8,062	2.3%
Montane Hardwood-Conifer	2,097	5,638	165	163	8,062	2.3%
Juniper Forest	246	28	28	0	302	0.1%
Juniper	246	27	28	0	301	0.1%
Pinyon-Juniper	0	2	0	0	2	0.0%
Marine	0	0	0	0	0	0.0%
Marine	0	0	0	0	0	0.0%
Oak Woodland	8,058	13,451	1,230	493	23,233	6.6%
Blue Oak Woodland	7,824	12,283	1,126	420	21,653	6.1%
Coastal Oak Woodland	6	5	0	0	11	0.0%

Land Cover	Electric Transmission	Electric Distribution	Gas Transmission	Gas Distribution	Total	Percent
Valley Oak Woodland	229	1,163	104	74	1,569	0.4%
Oak Woodland-Forest	2,703	7,205	945	263	11,116	3.1%
Blue Oak Woodland-Foothill Pine	2,703	7,205	945	263	11,116	3.1%
Redwood Forest	0	0	0	0	0	0.0%
Redwood	0	0	0	0	0	0.0%
Riparian	2,014	2,848	1,055	182	6,098	1.7%
Desert Riparian	1	1	1	0	3	0.0%
Lacustrine	338	292	30	8	668	0.2%
Montane Riparian	129	340	35	16	520	0.1%
Riverine	519	490	353	14	1,376	0.4%
Riverine, Barren	0	0	0	0	0	0.0%
Valley Foothill Riparian	1,026	1,725	637	143	3,531	1.0%
Saline Wetland	3	2	9		14	0.0%
Saline Emergent Wetland	3	2	9	0	14	0.0%
Shrubland	10,438	5,031	2,111	453	18,032	5.1%
Alkali Desert Scrub	3	6	22	1	32	0.0%
Alpine Dwarf-Shrub	0	0	0	0	0	0.0%
Bitterbrush	1,095	1	464	0	1,560	0.4%
Chamise-Redshank Chaparral	180	301	92	0	573	0.2%
Coastal Scrub	5	11	21	1	37	0.0%
Desert Scrub	0	0	0	0	0	0.0%
Low Sage	224	0	15	0	239	0.1%
Mixed Chaparral	3,882	3,885	406	426	8,599	2.4%
Montane Chaparral	3,877	656	703	24	5,260	1.5%
Sagebrush	1,172	172	388	0	1,732	0.5%
Urban	8,255	35,842	13,031	45,396	102,524	29.0%
Urban	8,255	35,842	13,031	45,396	102,524	29.0%
Wetland	897	990	451	12	2,350	0.7%
Estuarine	0	0	0	0	0	0.0%
Fresh Emergent Wetland	768	845	441	11	2,064	0.6%

Land Cover	Electric Transmission	Electric Distribution	Gas Transmission	Gas Distribution	Total	Percent
Freshwater Emergent Marsh	0	0	0	0	0	0.0%
Marsh	0	0	0	0	0	0.0%
Wet Meadow	129	145	11	2	286	0.1%
Grand Total	**93,064**	**155,006**	**54,236**	**50,626**	**352,932**	**100.0%**

Table 2-5. Mapped Extent of Land-Cover Types Present in North Coast Region of Plan Area (acres)

Land Cover	Electric Transmission	Electric Distribution	Gas Transmission	Gas Distribution	Total	Percent
Agriculture	1,978	5,175	1,413	164	8,729	13.9%
Cultivated Land	1,978	5,175	1,413	164	8,729	13.9%
Aspen Forest	0	0	0	0	0	0.0%
Aspen	0	0	0	0	0	0.0%
Barren/Ruderal	1,253	1,544	667	558	4,022	6.4%
Barren	1,253	1,544	667	558	4,022	6.4%
Conifer Forest	3,193	3,243	1,310	22	7,768	12.4%
Closed-Cone Pine-Cypress	324	860	6	3	1,193	1.9%
Douglas Fir	2,028	1,847	497	19	4,391	7.0%
Eastside Pine	0	0	0	0	0	0.0%
Jeffrey Pine	9	1	11	0	20	0.0%
Klamath Mixed Conifer	17	9	84	0	111	0.2%
Lodgepole Pine	0	0	0	0	0	0.0%
Ponderosa Pine	122	237	14	0	373	0.6%
Red Fir	0	0	8	0	8	0.0%
Sierran Mixed Conifer	682	289	654	0	1,624	2.6%
Subalpine Conifer	0	0	0	0	0	0.0%
White Fir	12	0	36	0	49	0.1%
Desert Riparian	0	0	0	0	0	0.0%
Desert Wash	0	0	0	0	0	0.0%
Eucalyptus Forest	0	5	4	1	10	0.0%
Eucalyptus	0	5	4	1	10	0.0%
Grassland	4,033	6,165	1,612	742	12,552	20.0%
Annual Grassland	3,962	6,085	1,590	723	12,360	19.7%
Perennial Grassland	71	80	22	19	192	0.3%
Vernal Pool Complex	0	0	0	0	0	0.0%
Montane Hardwood Forest	2,886	3,622	759	105	7,371	11.7%

Land Cover	Electric Transmission	Electric Distribution	Gas Transmission	Gas Distribution	Total	Percent
Montane Hardwood	2,886	3,622	759	105	7,371	11.7%
Montane Hardwood-Conifer Forest	1,362	2,083	278	108	3,830	6.1%
Montane Hardwood-Conifer	1,362	2,083	278	108	3,830	6.1%
Juniper Forest	0	0	0	0	0	0.0%
Juniper	0	0	0	0	0	0.0%
Pinyon-Juniper	0	0	0	0	0	0.0%
Marine	3	3	0	1	8	0.0%
Marine	3	3	0	1	8	0.0%
Oak Woodland	553	1,259	25	13	1,850	2.9%
Blue Oak Woodland	481	930	4	0	1,415	2.3%
Coastal Oak Woodland	49	159	6	1	215	0.3%
Valley Oak Woodland	23	170	15	13	221	0.4%
Blue Oak Woodland-Forest	391	487	10	0	888	1.4%
Blue Oak Woodland-Foothill Pine	391	487	10	0	888	1.4%
Redwood Forest	1,855	3,508	611	348	6,323	10.1%
Redwood	1,855	3,508	611	348	6,323	10.1%
Riparian	371	723	225	140	1,459	2.3%
Desert Riparian	0	0	0	0	0	0.0%
Lacustrine	15	86	1	0	103	0.2%
Montane Riparian	328	600	224	140	1,293	2.1%
Riverine	22	25	0	0	48	0.1%
Riverine, Barren	0	0	0	0	0	0.0%
Valley Foothill Riparian	5	11	0	0	17	0.0%
Saline Wetland	22	19	7	1	48	0.1%
Saline Emergent Wetland	22	19	7	1	48	0.1%
Shrubland	1,254	1,060	177	33	2,524	4.0%
Alkali Desert Scrub	0	0	0	0	0	0.0%
Alpine Dwarf-Shrub	0	0	0	0	0	0.0%
Bitterbrush	0	0	0	0	0	0.0%

Land Cover	Electric Transmission	Electric Distribution	Gas Transmission	Gas Distribution	Total	Percent
Chamise-Redshank Chaparral	246	236	0	0	482	0.8%
Coastal Scrub	182	208	111	33	535	0.9%
Desert Scrub	0	0	0	0	0	0.0%
Low Sage	0	0	0	0	0	0.0%
Mixed Chaparral	692	593	7	0	1,292	2.1%
Montane Chaparral	133	23	59	0	215	0.3%
Sagebrush	0	0	0	0	0	0.0%
Urban	301	3,144	513	1,394	5,352	8.5%
Urban	301	3,144	513	1,394	5,352	8.5%
Wetland	8	9	0	0	17	0.0%
Estuarine	0	0	0	0	0	0.0%
Fresh Emergent Wetland	0	0	0	0	0	0.0%
Freshwater Emergent Marsh	0	0	0	0	0	0.0%
Marsh	0	0	0	0	0	0.0%
Wet Meadow	8	9	0	0	17	0.0%
Grand Total	**19,463**	**32,047**	**7,609**	**3,630**	**62,749**	**100.0%**

Table 2-6. Mapped Extent of Land-Cover Types Present in Central Coast Region of Plan Area (acres)

Land Cover	Electric Transmission	Electric Distribution	Gas Transmission	Gas Distribution	Total	Percent
Agriculture	5,545	12,906	4,747	506	23,703	17.6%
Cultivated Land	5,545	12,906	4,747	506	23,703	17.6%
Aspen Forest	0	0	0	0	0	0.0%
Aspen	0	0	0	0	0	0.0%
Barren/Ruderal	1,025	2,899	515	105	4,545	3.4%
Barren	1,025	2,899	515	105	4,545	3.4%
Conifer Forest	131	773	194	450	1,547	1.1%
Closed-Cone Pine-Cypress	123	700	179	421	1,422	1.1%
Douglas Fir	5	17	0	0	22	0.0%
Eastside Pine	0	0	0	0	0	0.0%
Jeffrey Pine	0	0	0	0	0	0.0%
Klamath Mixed Conifer	0	0	0	0	0	0.0%
Lodgepole Pine	0	0	0	0	0	0.0%
Ponderosa Pine	0	55	15	29	99	0.1%
Red Fir	0	0	0	0	0	0.0%

Land Cover	Electric Transmission	Electric Distribution	Gas Transmission	Gas Distribution	Total	Percent
Sierran Mixed Conifer	3	1	0	0	4	0.0%
Subalpine Conifer	0	0	0	0	0	0.0%
White Fir	0	0	0	0	0	0.0%
Desert Riparian	23	12	0	0	35	0.0%
Desert Wash	23	12	0	0	35	0.0%
Eucalyptus Forest	89	319	149	53	609	0.5%
Eucalyptus	89	319	149	53	609	0.5%
Grassland	13,598	16,985	6,459	519	37,561	27.9%
Annual Grassland	13,545	16,896	6,429	517	37,385	27.8%
Perennial Grassland	53	89	31	2	175	0.1%
Vernal Pool Complex	0	0	0	0	0	0.0%
Hardwood Forest	239	233	58	2	532	0.4%
Montane Hardwood	239	233	58	2	532	0.4%
Montane Hardwood-Conifer Forest	321	1,460	65	179	2,025	1.5%
Montane Hardwood-Conifer	321	1,460	65	179	2,025	1.5%
Juniper Forest	86	28	11	0	126	0.1%
Juniper	58	27	11	0	97	0.1%
Pinyon-Juniper	28	1	0	0	29	0.0%
Marine	0	1	0	2	3	0.0%
Marine	0	1	0	2	3	0.0%
Oak Woodland	5,164	7,727	1,328	668	14,887	11.1%
Blue Oak Woodland	1,010	1,408	369	6	2,792	2.1%
Coastal Oak Woodland	3,978	6,032	891	662	11,563	8.6%
Valley Oak Woodland	177	287	67	0	532	0.4%
Blue Oak Woodland-Foothill Pine	203	705	49	1	959	0.7%
Blue Oak Woodland-Foothill Pine	203	705	49	1	959	0.7%
Redwood Forest	333	1,823	49	204	2,409	1.8%
Redwood	333	1,823	49	204	2,409	1.8%

Land Cover	Electric Transmission	Electric Distribution	Gas Transmission	Gas Distribution	Total	Percent
Riparian	392	951	272	83	1,698	1.3%
Desert Riparian	0	7	8	0	15	0.0%
Lacustrine	40	134	19	4	197	0.1%
Montane Riparian	0	3	4	0	7	0.0%
Riverine	10	70	8	0	88	0.1%
Riverine, Barren	0	1	0	0	1	0.0%
Valley Foothill Riparian	342	736	233	79	1,390	1.0%
Saline Wetland	55	24	9	2	90	0.1%
Saline Emergent Wetland	55	24	9	2	90	0.1%
Shrubland	5,910	4,459	707	204	11,282	8.4%
Alkali Desert Scrub	270	40	1	0	312	0.2%
Alpine Dwarf-Shrub	0	0	0	0	0	
Bitterbrush	0	0	0	0	0	0.0%
Chamise-Redshank Chaparral	1,029	589	103	4	1,725	1.3%
Coastal Scrub	2,470	2,719	495	191	5,875	4.4%
Desert Scrub	139	37	0	0	176	0.1%
Low Sage	0	0	0	0	0	0.0%
Mixed Chaparral	1,911	1,015	108	9	3,042	2.3%
Montane Chaparral	0	1	0	0	1	0.0%
Sagebrush	92	59	0	0	150	0.1%
Urban	2,357	17,198	3,331	9,641	32,527	24.2%
Urban	2,357	17,198	3,331	9,641	32,527	24.2%
Wetland	32	21	11	1	65	0.0%
Estuarine	15	3	0	1	18	0.0%
Fresh Emergent Wetland	6	2	0	0	8	0.0%
Freshwater Emergent Marsh	0	0	0	0	0	0.0%
Marsh	0	6	0	0	6	0.0%
Wet Meadow	11	11	11	0	33	0.0%
Grand Total	**35,503**	**68,524**	**17,955**	**12,619**	**134,600**	**100.0%**

2.3 Covered Species

2.3.1 Covered Wildlife

This HCP addresses 24 wildlife species as determined by the screening process described in Chapter 1, *Introduction*. Because some of the wildlife species only occur within specific and localized habitat types, PG&E worked with USFWS to create "hot zones" for these select covered species. Hot zones are defined as areas containing a known population of covered species with a small and well-defined range, and where species would be most likely to be affected should covered activities be implemented there. Hot zones were created for Conservancy fairy shrimp, longhorn fairy shrimp, Morro shoulderband snail, Zayante band-winged grasshopper, Mount Hermon June beetle, Ohlone tiger beetle, Santa Cruz long-toed salamander, and Point Arena mountain beaver. A more detailed description of hot zones is provided in Chapter 5, Sections 5.4 and 5.5. PG&E has created maps of these areas and added them to its GIS system, and will utilize the maps to identify sensitive areas and prescribe appropriate AMMs.

2.3.2 Covered Plants

The HCP addresses 12 covered plant species as determined by the screening process described in Chapter 1, *Introduction*. Covered plant species that are broadly distributed may have small, discrete occurrences. Similarly, plants with a narrow range may be relatively widespread throughout that range. Because plants are immobile and often restricted by specific habitat requirements, it is relatively easy to determine whether or not a covered activity would impact known populations by evaluating the proximity of the facilities to known covered species habitat. PG&E conducted a review of aerial photos of known plant populations to locate plant populations and prescribe appropriate AMMs. PG&E created "Map Book zones" identifying areas where future analysis, and possibly surveys, for covered plants may be needed. A Map Book zone is defined as an area of occupied or potentially occupied covered plant species habitat. Additional site-specific evaluation will be conducted if work is anticipated within an occupied or potentially occupied area. A more detailed description of Map Book zone screening is provided in Chapter 5, Section 5.4.2.

2.3.3 Species Accounts

To help the reader understand how PG&E's covered activities could impact covered species, PG&E has provided basic life history information for each covered species at the beginning of the impact analysis (Chapter 4, *Covered Species Impact Analysis*). Further, PG&E developed more detailed species accounts that include information on the species' status, critical habitat (if applicable), range, habitat requirements, population trends and threats, as well as species management and references (Appendix B, *Species Accounts*) to assist with the permitting and regulatory processes.

2.3.4 Species Habitat Models

PG&E created species-specific habitat models with input from USFWS to be aligned with other regional conservation plans and strategies within the Plan Area to estimate the amount of habitat that occurs within the Plan Area and the potential impacts on covered species. The data sources, procedures, habitat classifications, and updates used for the models are described below.

2.3.4.1 Data Sources

The species models use the following data sources.

- CWHR
- CNDDB
- VegCAMP, CALVEG, and FRAP
- Draft Western Placer HCP/NCCP
- Yolo HCP/NCCP
- Natomas Basin HCP
- USFWS Recovery Plan species' range and designated core area
- Peer-reviewed literature identifying other species' ranges
- Expert field surveys identifying other species' ranges
- NHD

2.3.4.2 Procedures

PG&E built its wildlife habitat models through an iterative process. Generally, the process included the following steps.

1. Use the species range information (e.g., CWHR, if available).
2. Use the best available land-cover data (e.g., VegCAMP, CALVEG, and FRAP) and hydrology data (e.g., NHD).
3. Consider each species' life history needs (e.g., foraging, breeding and sheltering habitat).
4. Use USFWS data (e.g., recovery plan data and critical habitat data, if available).
5. Develop conceptual models based on the above information and begin building models in GIS Model Builder.
6. Check the models against species records (e.g., CNDDB).
7. Review the models with USFWS and integrate revisions.
8. Conduct a field assessment of models for select species.
9. Finalize models.

Figure 2-3 illustrates this process. Detailed modeling procedures for covered wildlife species are explained at the end of Appendix B, *Species Accounts*. PG&E did not use habitat models for plants because of the unique microhabitat requirement for these species and because known location information provides guidance to the application of AMMs.

CWHR was used as the basis for most covered wildlife species' ranges because CWHR is an information system pertaining to California's wildlife and is maintained by CDFW in cooperation with the California Interagency Wildlife Task Group (California Department of Fish and Game 2010a).

The CWHR system contains life history, geographic range, habitat relationships, and management information on 694 species of amphibians, reptiles, birds, and mammals known to occur in the state. The system includes the CWHR system software, a community-level matrix model associating California's wildlife to a standardized habitat classification scheme. To support this model, geographic ranges for each species were developed using current published and unpublished biological information and professional judgment by recognized experts on California's wildlife.

Species-level experts and CWHR staff have made every effort, where justified by the distribution of known species observations or known habitat associations, to represent a species' range with standard polygons of major geographic features in California, such as mountain ranges, valleys, buffered river corridors, and ecological subsections. The CWHR species range maps are continually reviewed and updated as new animal occurrence data become available. The range maps have been digitized as GIS layers to support predictions of the CWHR system software and species richness assessments for statewide conservation (California Department of Fish and Game 2010a).

If a CWHR range was not available for a species, PG&E used some combination of the following other data sources to derive a range.

- CNDDB occurrence data, sometimes with an added buffer.
- USFWS Recovery Plan species' range or designated core area.
- Peer reviewed literature identifying other species' ranges.
- Expert field surveys identifying other species' ranges.

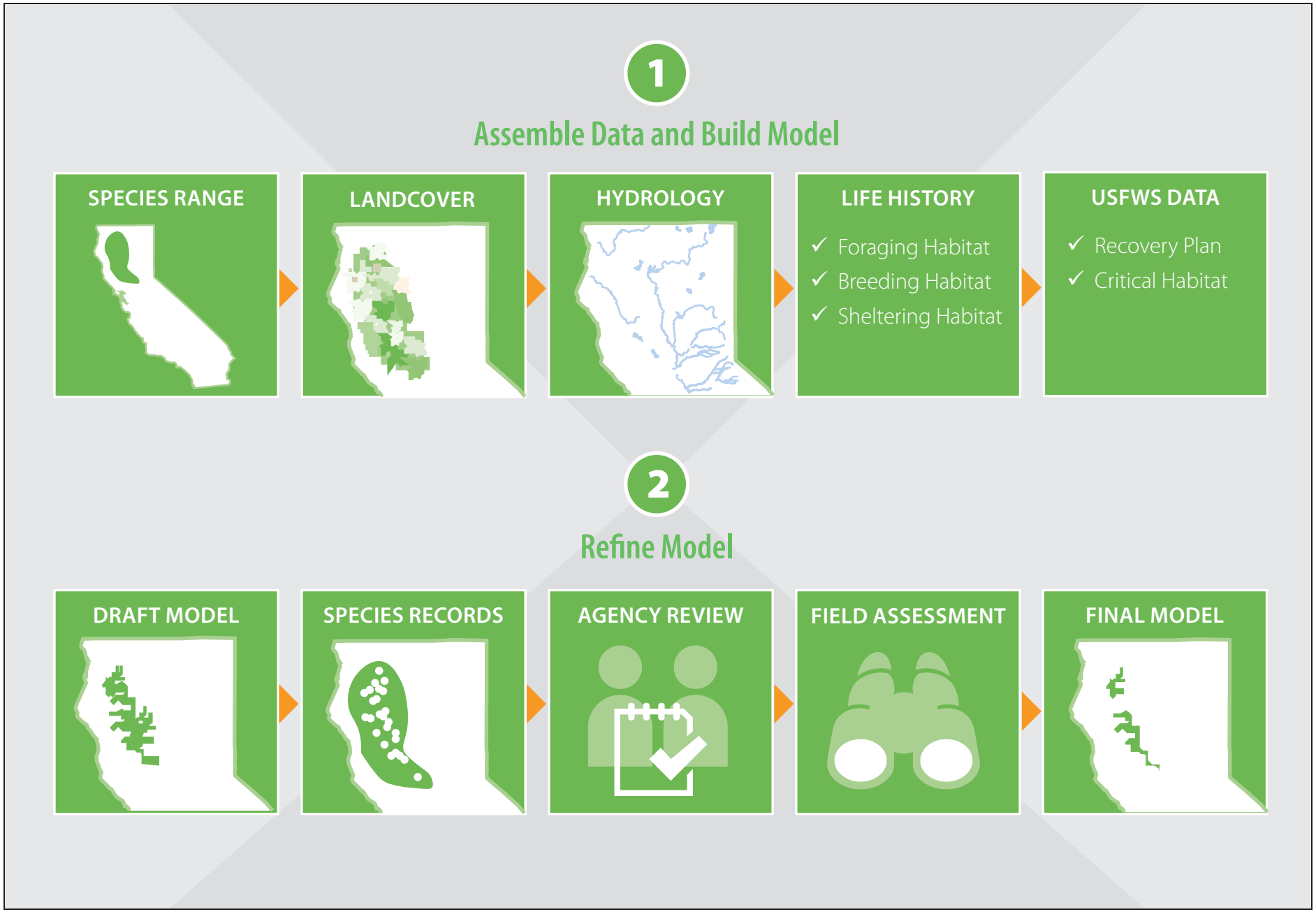
PG&E went through the process described above of developing conceptual models for the species based on habitat requirements, species location information, and land-cover data. PG&E also used habitat models from regional conservation plans to validate the range and habitat information for covered species. Where possible, PG&E used habitat suitability criteria from regional conservation plans to create habitat models in other portions of the Plan Area.

2.3.4.3 Habitat Classification

Table 2-7 presents the estimated extent of each wildlife species' habitat present in the study area and within the Plan Area for each respective region. Table 2-8 presents the estimate extent of wildlife species habitat by facility type. Tables 2-9 through 2-11 identify the amount of habitat by facility type and planning region.

Table 2-7. Estimated Extent of Covered Wildlife Species Habitat in Study Area and in Plan Area of Each Region (in acres)

Covered Species	Range in Study Area	Plan Area within Sacramento Valley and Foothills Region	Plan Area within North Coast Region	Plan Area within Central Coast Region
Invertebrates				
Conservancy fairy shrimp	106,458	2,260	0	0
Longhorn fairy shrimp	57,312	468	0	438
Vernal pool fairy shrimp	614,418	11,233	0	2,076
Vernal pool tadpole shrimp	614,418	11,233	0	2,076
Morro shoulderband snail	4,899	0	0	293



Graphics ... 647.17 (6-6-18) TG

Figure 2-3
Species Habitat Model Development Process

Covered Species	Range in Study Area	Plan Area within Sacramento Valley and Foothills Region	Plan Area within North Coast Region	Plan Area within Central Coast Region
Mount Hermon June beetle	7,739	0	0	577
Ohlone tiger beetle	10,340	0	0	720
Valley elderberry longhorn beetle	108,640	2,997	0	0
Smith's blue butterfly	171,473	0	0	2,890
Zayante band-winged grasshopper	7,739	0	0	577
Amphibians				
California red-legged frog	1,269,353	16,275	1,092	10,804
California tiger salamander (Central California DPS)	2,580,251	14,105	0	32,192
California tiger salamander (Santa Barbara DPS)	212,344	0	0	3,340
Foothill yellow-legged frog	625,781	2,547	1,607	1,275
Mountain yellow-legged frog (northern DPS)	19,444	16	0	0
Santa Cruz long-toed salamander	12,508	0	0	1,248
Sierra Nevada yellow-legged frog	185,618	194	0	0
Yosemite toad	5,936	0	0	0
Reptiles				
Blunt-nosed leopard lizard	645,471	0	0	6,228
Giant garter snake	749,199	17,520	0	0
Birds				
Marbled murrelet	358,826	0	1,881	607
Northern spotted owl	5,525,990	1,392	20,644	0
Mammals				
Giant kangaroo rat	324,802	0	0	5,565
Point Arena mountain beaver	9,976	0	177	0
San Joaquin kit fox	2,412,972	0	0	48,373

Table 2-8. Estimated Extent of Covered Wildlife Species Habitat by Facility Type in the Plan Area

Species/Habitat Classification[a]	Electric Transmission	Electric Distribution	Gas Transmission	Gas Distribution	Total
Invertebrates					
Conservancy fairy shrimp	832	757	621	50	2,260
Longhorn fairy shrimp	444	444	18	0	905
Vernal pool fairy shrimp	6,307	3,351	3,413	238	13,471
Vernal pool tadpole shrimp	6,307	3,351	3,413	238	13,471
Morro shoulderband snail					
Potential Suitable Habitat	0	82	0	0	82
Potential Suitable Urban Habitat	0	212	0	0	212
Mount Hermon June beetle	42	320	98	117	577

Species/Habitat Classification[a]	Electric Transmission	Electric Distribution	Gas Transmission	Gas Distribution	Total
Ohlone tiger beetle	19	403	99	199	720
Valley elderberry longhorn beetle	906	1,393	572	129	2,997
Smith's blue butterfly	441	1,753	201	495	2,890
Zayante band-winged grasshopper	42	320	98	117	577
Amphibians					
California red-legged frog					
Potential Riparian Habitat	1,662	2,910	699	277	5,497
Potential Dispersal Habitat	6,949	13,161	1,996	567	22,673
California tiger salamander (Central California DPS)					
Potential Breeding Habitat	781	145	196	49	1,171
Potential Upland Habitat	15,563	17,084	10,192	2,197	45,036
California tiger salamander (Santa Barbara DPS)					
Potential Breeding Habitat	2	4	0	0	6
Potential Upland Habitat	1,306	2,027	0	0	3,334
Foothill yellow-legged frog					
Potential Breeding Habitat	140	246	21	9	417
Potential Dispersal Habitat	1,427	3,235	192	158	5,012
Mountain yellow-legged frog (northern and southern DPS)					
Potential Riparian Habitat	0	16	0	0	16
Santa Cruz long-toed salamander					
Potential Breeding Habitat	7	41	19	5	71
Potential Upland Habitat	230	521	269	156	1,176
Sierra Nevada yellow-legged frog					
Potential Riparian Habitat	70	124	0	0	194
Yosemite toad	<1	<1	0	0	<1
Reptiles					
Blunt-nosed leopard lizard					
Suitable Habitat	767	672	761	9	2,209
Core Habitat	2,421	1,137	452	8	4,019
Atypical Habitat	0	1	0	0	1
Giant garter snake					
Potential Aquatic Habitat-Wetland and Marsh	893	940	535	47	2,416
Potential Upland Habitat	2,454	2,353	1,739	213	6,758
Potential Aquatic Habitat-Rice	3,610	1,836	2,848	51	8,345
Birds					
Marbled murrelet	681	1,326	435	45	2,488
Northern spotted owl	8,391	9,895	3,048	702	22,036

Species/Habitat Classification[a]	Electric Transmission	Electric Distribution	Gas Transmission	Gas Distribution	Total
Mammals					
Giant kangaroo rat	1,977	2,526	1,025	36	5,565
Point Arena mountain beaver	86	92	0	0	177
San Joaquin kit fox					
High Value Suitable Habitat	1,376	1,097	520	45	3,038
Moderate Value Suitable Habitat	1,520	2,895	1,182	68	5,665
Low Value Suitable Habitat	10,575	18,914	7,626	2,555	39,670

[a] Habitat classifications were derived from other regional conservation plan data and reflect important life history elements for the species or other important habitat characteristics.

Table 2-9. Estimated Extent of Covered Wildlife Species Habitat by Facility Type in Plan Area within Sacramento Valley and Foothills Region

Species/Habitat Classification[a]	Electric Transmission	Electric Distribution	Gas Transmission	Gas Distribution	Total
Invertebrates					
Conservancy fairy shrimp	832	757	621	50	2,260
Longhorn fairy shrimp	313	155	0	0	468
Vernal pool fairy shrimp	5,992	2,220	2,794	226	11,233
Vernal pool tadpole shrimp	5,992	2,220	2,794	226	11,033
Valley elderberry longhorn beetle	906	1,393	572	126	2,997
Amphibians					
California red-legged frog					
Potential Riparian Habitat	1,075	1,675	406	118	3,274
Potential Dispersal Habitat	4,148	7,965	949	248	13,001
California tiger salamander (Central California DPS)					
Potential Breeding Habitat	741	83	159	40	1,024
Potential Upland Habitat	4,942	4,965	2,526	558	12,990
Foothill yellow-legged frog					
Potential Riparian Habitat	69	119	5	2	196
Potential Dispersal Habitat	751	1,534	42	24	2,351
Mountain yellow-legged frog (northern DPS)					
Potential Riparian Habitat	0	16	0	0	16
Sierra Nevada yellow-legged frog					
Potential Riparian Habitat	70	124	0	0	194
Reptiles					
Giant garter snake					
Potential Aquatic Habitat-Wetland and Marsh	893	940	535	47	2,416
Potential Upland Habitat	2,454	2,353	1,739	213	6,758

Species/Habitat Classification[a]	Electric Transmission	Electric Distribution	Gas Transmission	Gas Distribution	Total
Potential Aquatic Habitat-Rice	3,610	1,836	2,848	51	8,345
Birds					
Northern spotted owl	812	286	275	19	1,392

[a] Habitat classifications were derived from other regional conservation plan data and reflect important life history elements for the species or other important habitat characteristics.

Table 2-10. Estimated Extent of Covered Wildlife Species Habitat by Facility Type in Plan Area within North Coast Region

Species/Habitat Classification[a]	Electric Transmission	Electric Distribution	Gas Transmission	Gas Distribution	Total
Invertebrates					
Vernal pool fairy shrimp	0	0	0	0	0
Vernal pool tadpole shrimp	0	0	0	0	0
Amphibians					
California red-legged frog					
Potential Riparian Habitat	49	98	1	0	148
Potential Dispersal Habitat	279	630	35	0	945
Foothill yellow-legged frog					
Potential Riparian Habitat	58	72	13	3	147
Potential Dispersal Habitat	522	780	116	42	1,460
Birds					
Marbled murrelet	504	902	435	40	1,881
Northern spotted owl	7,579	9,608	2,773	683	20,644
Mammals					
Point Arena mountain beaver	86	92	0	0	177

[a] Habitat classifications were derived from other regional conservation plan data and reflect important life history elements for the species or other important habitat characteristics.

Table 2-11. Estimated Extent of Covered Wildlife Species Habitat by Facility Type in Plan Area within Central Coast Region

Species/Habitat Classification[a]	Electric Transmission	Electric Distribution	Gas Transmission	Gas Distribution	Total
Invertebrates					
Longhorn fairy shrimp	131	289	18	0	438
Vernal pool fairy shrimp	315	1,131	619	11	2,076
Vernal pool tadpole shrimp	315	1,131	619	11	2,076
Morro shoulderband snail	0	36	0	0	36
Potential Suitable Habitat	0	82	0	0	82
Potential Suitable Urban Habitat	0	212	0	0	212
Mount Hermon June beetle	42	320	98	117	577
Ohlone tiger beetle	19	403	99	199	720
Smith's blue butterfly	441	1,753	201	495	2,890

Species/Habitat Classification[a]	Electric Transmission	Electric Distribution	Gas Transmission	Gas Distribution	Total
Zayante band-winged grasshopper	42	320	98	177	577
Amphibians					
California red-legged frog					
Potential Riparian Habitat	538	1,137	293	109	2,076
Potential Dispersal Habitat	2,522	4,874	1,012	319	8,728
California tiger salamander (Santa Barbara DPS)					
Potential Breeding Habitat	40	61	37	9	147
Potential Upland Habitat	10,622	12,119	7,666	1,639	32,046
Foothill yellow-legged frog					
Potential Riparian Habitat	2	4	0	0	6
Potential Dispersal Habitat	1,306	2,024	269	0	3,334
Santa Cruz long-toed salamander					
Potential Breeding Habitat	7	41	19	5	71
Potential Upland Habitat	230	521	269	159	1,176
Reptiles					
Blunt-nosed leopard lizard					
Suitable Habitat	767	672	761	9	2,209
Core Habitat	2,421	1,137	452	8	4,019
Atypical Habitat	0	1	0	0	1
Birds					
Marbled murrelet	177	425	0	5	607
Mammals					
Giant kangaroo rat	1,977	2,526	1,025	36	5,565
San Joaquin kit fox					
High Value Habitat	1,376	1,097	520	45	3,038
Moderate Value Habitat	10,575	18,914	7,686	2,555	39,670
Low Value Habitat	1,520	2,895	1,182	68	5,665

[a] Habitat classifications were derived from other regional conservation plan data and reflect important life history elements for the species or other important habitat characteristics.

Extent of Existing Covered Plant Habitats

PG&E explored multiple methods of estimating covered plant habitat in the course of developing the MRHCP. Such methods included evaluating corridors that extended beyond the ROW, creating habitat models (similar to the approach used for wildlife species), and evaluating the frequency and rate of discovery of new locations to create a predictive model of future distribution. However, the techniques tended to overestimate habitat because they included areas that did not have records of species, predicted habitat in areas that do not contain records of species, or resulted in population estimates that overstated actual observed populations. Therefore, PG&E determined that use of these methods would result in expensive and ineffective survey requirements, without significant benefit to the covered species. Therefore, PG&E developed an approach to habitat estimation based

on known populations. This approach uses CNDDB records. CNDDB includes 10 accuracy classes, the first two are specific occurrences (a specific point and a specific polygon[s]), the third is non-specific but bounded, and the fourth is a non-specific circular feature with a 1/10th-mile radius. Accuracy classes 5–10 are non-specific circular features with broader radii ranging from (1/5th-mile to 5 miles); the larger the circle, the more vague the location.

PG&E queried CNDDB records in the Plan Area to estimate the land area of habitat for each covered plant occurrence in the database with an accuracy class of 1 or 2. These accuracy classes were selected because they represent precise data that are accurately mapped. For covered plant occurrences with an accuracy class of 1, the occurrence was assumed to occupy a maximum of 5 acres of habitat, although in many cases this is likely to be an overestimate because the occurrences tend to be clusters of plants. For covered plant occurrences with an accuracy class of 2, the actual land area reported for the occurrence was used. Non-specific occurrences consisting of bounded areas or points with accuracy class rankings of 3 through 10 (least accurate) were not included in the determination of estimated habitat because of the lack of specificity for these locations; many of the non-specific occurrences are historic, and the location and current status of these populations has not been recently verified. Table 2-12 identifies the extent of known and estimated habitat present for each covered plant species in the Plan Area and within the maximum corridor width (200 feet) of PG&E facilities.

Table 2-12. Summary of Covered Plant Species Habitat within Plan Area

Category/ Plant Species	CNDDB Habitat (acres)	CNDDB Habitat within Plan Area[a] (acres)				
		Electric Transmission	Electric Distribution	Gas Transmission	Gas Distribution	All Mapped Facilities[b]
Ione manzanita	6,581.5	3,405.4	6,030.5	2,987.0	4,837.7	6,030.5
Pine Hill ceanothus	1,202.8	564.0	1,202.8	0.0	0.0	1,202.8
Pine Hill flannelbush	2,43.0	18.0	207.0	0.0	3.0	207.0
Stebbins' morning-glory	720.0	210.0	717.0	41.0	0.0	717.0
Layne's ragwort	1,172.0	500.0	752.0	0.0	0.0	900.0
Beach layia	2,911.5	1,430.0	2,058.5	0.0	1,258.5	2,058.5
San Benito evening-primrose	229.0	0.0	54.0	0.0	0.0	54.0
Monterey spineflower	14,171.7	11,923.6	13,528.7	11,443.4	11,672.2	13,528.7
Robust spineflower	210.3	13.0	181.3	85.0	88.3	186.3
Kern mallow	15,614.0	2,199.0	1,925.0	0.0	0.0	4,092.0
Monterey gilia	3,628.4	1,796.0	3,339.4	1,311.0	1,394.0	3,408.4
Yadon's rein orchid	2,124.8	900.0	2,098.8	649.0	1,298.8	2,098.8

[a] Estimate based on intersection of 200-foot corridor and buffer of all mapped facilities with California Natural Diversity Database (CNDDB) records.

[b] *All mapped facilities* may not be a sum of electric transmission, electric distribution, and gas transmission areas because some facilities overlap or are close to one another.

2.3.5 Critical Habitat

Section 7 of the ESA requires that USFWS evaluate the effects of a proposed federal action on designated critical habitat. Critical habitat has been designated or proposed for 18 of the 36 covered wildlife and plant species within the Plan Area. The extent of critical habitat for each covered species in the Plan Area is presented in Table 2-13.

This information is presented to assist USFWS with its internal Section 7 consultation and BO that will be required for USFWS to issue the incidental take permit. PG&E requests that, for covered species with proposed critical habitat, USFWS include in the BO an evaluation of the proposed action's effects on the proposed critical habitat.

Table 2-13. Designated Critical Habitat in Study Area and within Plan Area of Each Region (in acres)

Covered Species	Designation List Date	Total Critical Habitat in California	Critical Habitat in Study Area	Critical Habitat in Plan Area within Sacramento Valley and Foothills Region	Critical Habitat in Plan Area within North Coast Region	Critical Habitat in Plan Area within Central Coast Region
Invertebrates						
Conservancy fairy shrimp	February 10, 2006	161,787	4,349	6	0	0
Longhorn fairy shrimp	February 10, 2006	13,557	9591	0	79	0
Vernal pool fairy shrimp	February 10, 2006	590,247	307,785	2,245	0	2,818
Vernal pool tadpole shrimp	February 10, 2006	228,784	121,215	2,822	0	0
Morro shoulderband snail	2001	2,566	2,556	0	0	41
Valley elderberry longhorn beetle	August 8, 1980	515	515	0.35	0	0
Zayante band-winged grasshopper	2001	10,560	10,560	0	0	1,082
Amphibians						
California red-legged frog	March 17, 2010	1,636,609	768,094	876	283	11,854
California tiger salamander (Central California DPS)	August 10, 2004	199,107	54,007	569	0	813

Covered Species	Designation List Date	Total Critical Habitat in California	Critical Habitat in Study Area	Critical Habitat in Plan Area within Sacramento Valley and Foothills Region	Critical Habitat in Plan Area within North Coast Region	Critical Habitat in Plan Area within Central Coast Region
California tiger salamander (Santa Barbara DPS)		11,180	11,180	0	0	237
Mountain yellow-legged frog	2016	221,498	104,744	0	0	0
Sierra Nevada yellow-legged frog	2016	1,088,849	758,663	1,146	0	0
Yosemite toad	2016	749,448	396,333	208	0	0
Birds						
Marbled murrelet	2016	603,336	392,607	0	953	166
Northern spotted owl	2012	2,101,959	1,318,883	161	2,405	0
Plants						
Monterey spineflower	January 9, 2008	11,055	11,055	0	0	11,055[a]
Robust spineflower	May 28, 2002	469	469	0	0	469[a]
Yadon's rein orchid	October 24, 2007	2,117	2,117	0	0	2,117[a]

[a] Critical habitat in study area within the Central Coast Region.

Chapter 3
Covered Activities

***Summary**: This chapter presents detailed information on activities proposed for coverage in the MRHCP. The O&M and minor new construction activities discussed in this chapter are associated with PG&E's gas and electric transmission and distribution system, as mandated for public safety and reliable energy. The vast majority of O&M activities are small in scope and duration, although larger activities such as pipeline replacement and reconductoring are also covered. Large new greenfield projects and hydropower operations are not included as covered activities.*

3.1 Introduction

This chapter presents detailed information on activities proposed for coverage in the MRHCP. The O&M and minor new construction activities discussed in this chapter are associated with PG&E's gas and electric transmission and distribution system, as mandated for public safety and reliable service. The vast majority of O&M activities are small in scope and duration, although larger activities such as pipeline replacement and reconductoring are also covered. Large new greenfield projects and hydropower operations are not included as covered activities.

The MRHCP addresses those covered activities necessary for the safe and efficient operation of PG&E's gas and electric systems. To meet the needs of customers and satisfy CPUC's requirements to offer "adequate, efficient, just, and reasonable" service, PG&E must construct, operate, and maintain facilities and, in some cases, perform minor new construction for safe and efficient gas and electric service. The MRHCP covers two categories of activities that will be conducted in accordance with CPUC requirements and for which PG&E is requesting incidental take authorization: O&M and minor new construction.

- **O&M**.
    - *Operation activities* include inspecting, monitoring, testing, and operating valves, enclosures, switches, and other components. These covered activities involve utility personnel working at facilities; personnel typically use existing access roads.
    - *Maintenance activities* include repairing and replacing facilities, structures, and access roads. This work includes reconductoring electric transmission and distribution projects and gas pipeline replacement. Maintenance activities also include emergency repair and replacement and vegetation management, including tree pruning and removal.
- **Minor new construction**. These activities involve installing new structures to extend service to new residential or commercial customers. When conducted in natural vegetation or agricultural lands that contain suitable habitat for covered species, new electric or gas line extensions are limited to 2 miles from an existing line. End-to-end extensions exceeding 2 miles are not covered under the MRHCP. Multiple 2-mile extensions in different geographic areas are covered, but each will be treated as a separate activity. The size of a minor new construction project is estimated as the total footprint, expressed in acres. Consistent with the requirements of NEPA, the MRHCP does not allow segmentation of proposed construction to obtain coverage under the

MRHCP. New or replacement structures to upgrade existing facilities are limited to 1.0 acre of new gas pressure limiting stations (PLS) and 3.0 acres per electric substation expansion.

Emergency work is defined in PG&E's Utility Procedure ENV-8003P-01 as, "A project or activity which includes but is not limited to emergency repairs to facilities necessary to maintain service essential to the public health, safety or welfare. Emergency repairs include those that require a reasonable amount of planning where delay of project or activity would result in significant safety or environmental impacts. Furthermore, emergency projects include specific actions necessary to prevent or mitigate an emergency." The covered activities described in this chapter are the same as those conducted for emergency work (i.e., the amount and extent must be the same), with the difference being the timing and urgency of completing the work. Emergency work typically requires immediate repairs and, thus, an abbreviated environmental review process or no environmental review process. If not pre-screened, emergency work will require post-project assessments to determine impacts and associated mitigation.

PG&E frequently uses third party contractors to perform O&M work, including any of the covered activities. PG&E is responsible for the performance of these contractors and they will be covered by the permit. Prior to initiating ground-disturbing activities in habitat of covered species, PG&E will require its contractors to perform the following actions:

- Train employees and subcontractors performing O&M covered activities on the MRHCP requirements that are applicable to their job duties and work.
- Enter into a new or revised contract with PG&E that contains enforceable provisions to comply with provisions of the MRHCP and the permit.

The MRHCP administrator will maintain a record of contractors working in the Plan Area, the status of how they are covered by the MRHCP, and copies of any independent environmental documentation submitted by PG&E contractors.

The following description of the covered activities associated with the Plan Area's natural gas and electric systems is based on standard PG&E procedures. The procedures employed during actual activities in the present or future may vary slightly from standard procedures. However, such activities are expected to have a level of impact similar to or less than the covered activities that are presented in Sections 3.2 through 3.4 and which are further evaluated in Chapter 4, *Covered Species Impact Analysis*.

3.2 Natural Gas System

3.2.1 Transmission and Distribution System

PG&E's natural gas system consists of a transmission system and a distribution system. The transmission system in the Plan Area comprises approximately 3,300 miles of pipeline. The transmission system transports natural gas in steel pipelines buried 3 to 4 feet deep (measured from the surface to the top of the pipe). The pipe diameter ranges from 8 to 42 inches. Gas pressure in transmission pipelines generally exceeds 60 pounds per square inch (psi).

The gas distribution system consists of approximately 19,000 miles of both steel and plastic lines within the Plan Area. Typically, the 0.25- to 24-inch-diameter lines are buried 2 to 4 feet deep. Gas

pressure in distribution pipelines is generally less than 60 psi. The transmission and distribution pipelines are buried in native soil; however, in areas of rocky soil, imported backfill is used to prevent potential damage to the pipes.

The ROW width of the natural gas system varies from 5 to 150 feet. PG&E owns less than 1% of the linear ROW in fee title; the remainder is in private easements and public utility easements (e.g. franchise).

Generally, PG&E has nonexclusive easements without the right to fence the pipeline corridors. PG&E may obtain exclusive easements with the right to construct fences when security fencing is required for valve lots, compressor stations and other aboveground facilities, or subsurface vaults.

3.2.2 Work Methods and Techniques

PG&E performs all work practices in accordance with federal, state, and local environmental, safety, and construction regulations and standards. Where applicable, PG&E conducts the work in accordance with landowner agreements.

PG&E lines of business (LOB) provided this section's general descriptions of the methods PG&E uses for access, staging, clearing, grading, erosion control, trenching and excavating, and crossings during O&M activities typically performed in the PG&E service area. The impact estimates in Chapter 4 include any permanent or temporary loss of natural land-cover types resulting from the methods and techniques described below and calculated in Table 4-1 in Chapter 4, *Covered Species Impact Analysis*.

3.2.2.1 Access

Generally, facilities are located in areas where PG&E crews can use existing public and private roads to access the facilities' ROWs. In general, pickup trucks or small sport utility vehicles are used to access the facilities. PG&E is seeking coverage for its access on roads and for construction of temporary access roads. Rural private roads may be dirt or gravel and periodically may require repair or maintenance. The gas and electric facility road maintenance practices are discussed under the G13b covered activity description. In the event that no road exists or an emergency arises, off-road travel or construction of a new temporary access road may be necessary. PG&E restricts speed limits to those deemed safe for site-specific driving conditions—typically not faster than 15 miles per hour (mph)—and may further restrict speeds if covered species are present. PG&E periodically creates temporary access roads when access to a covered activity site is not readily available. Temporary access roads are typically required for larger-scale activities, such as installing new gas pipelines or accessing pull sites for electric reconductoring projects. Because of the long-term nature of conducting O&M over its broad service area, PG&E does not know where all temporary roads will be located. However, PG&E's environmental staff assesses all road usage and sites all roads to minimize impacts on covered species and their habitats through PG&E's environmental screening process, as described in Chapter 5, *Conservation Strategy*. PG&E creates these roads within a minimum impact area and ultimately decommissions them, restoring the area to preconstruction conditions at the completion of the covered activity. In some instances, however, roads may be left in place to provide site access for annual patrols or annual inspections. The covered activity descriptions below include discussion of construction of temporary access roads, as appropriate.

3.2.2.2 Staging

A staging area is typically required for large-scale covered activities, such as pipeline replacement. PG&E determines the location of the proposed staging areas during the screening process and locates the staging areas to avoid and minimize impacts on sensitive resources. If sensitive resources such as water bodies, wetlands, or modeled habitat are present, a biologist demarcates the sensitive resources with flagging or temporary orange construction fencing before construction begins. PG&E typically uses larger trucks to transport pipes and equipment such as tracked vehicles (i.e., vehicles that run on continuous tracks instead of wheels). Crews park, store, and stage construction equipment in these designated areas. PG&E restores staging areas to preconstruction conditions at the completion of the activity.

3.2.2.3 Clearing

Activities involving clearing conform to agreements with the landowner when the activity is on private property and to permits issued by regulatory and land management agencies. After staking the work site, maintenance personnel remove trees and brush (clear and grub such obstacles as rocks or tree stumps by mechanical means) within the construction ROW to the extent necessary to allow safe and efficient use of construction equipment.

3.2.2.4 Grading

PG&E limits grading to the area necessary to ensure the safe movement of construction equipment in the ROW and designs its covered activities that involve grading to minimize impacts on natural drainage and slope stability. Construction footprint calculations include acreages of areas potentially affected by grading. Where steep terrain requires the ROW to be graded at two elevations (*two-toning*), PG&E recontours such areas after construction to approximate preconstruction topographic conditions and implements erosion control measures to prevent runoff. If the disturbed area is greater than 0.1 acre, PG&E crews also mulch, reseed, and fertilize the area.

Sometimes PG&E must temporarily install prefabricated bridges or culverts in the ROW or in access roads to ensure safe access and reduce environmental impacts in accordance with state and federal regulations. If the bridge is needed for only a short duration, then a portable bridge is assembled onsite and secured with a crane to span the crossing. If a longer term crossing is required, a culvert is installed after PG&E obtains all appropriate permits from the regulatory agencies.

During the grading phase, PG&E segregates topsoil from subsoil and windrows the topsoil within the designated work site. During periods of rain, soil piles are covered, consistent with applicable stormwater permits. The soil is typically covered with plastic sheeting and secured with gravel bags or other weights no more than 10 feet apart to minimize the potential for erosion. Surface rocks, where present and useful for reclamation, are set aside with the topsoil windrow. If not reclaimed, the rocks are taken to a landfill. PG&E makes every attempt to cover the pipeline by placing the subsoil over the pipe first and then spreading the preserved topsoil evenly over the graded area.

3.2.2.5 Erosion Control

PG&E reviews various types of erosion control measures and implements applicable BMPs identified in the *California Stormwater Best Management Practices Handbook* published by the California Stormwater Quality Association (2014). For example, PG&E employs erosion control techniques to preclude pipeline washout, gully development, and sedimentation of local drainages. Standard

erosion control measures may include installation of water bars along temporary or dirt roads, diversion channels and terraces to reduce erosion and runoff, ditch plugs installed in ditches to prevent washout, and other soil stabilization practices such as use of jute mats, wood mulching, straw mulch, and other methods described in the handbook. The types chosen depend on the situation and the condition of the site. PG&E uses permanent articulating cement ground mat systems (i.e., erosion control or "Ercon" mats) and riprap infrequently, and only when other biomechanical methods cannot be used or when repairs are made to existing riprap structures. If biomechanical methods cannot be used or repairs to existing riprap are needed, PG&E uses the minimum riprap necessary to accomplish the activity.

3.2.2.6 Trenching and Excavating

The process of excavating the pipeline trench varies according to location, soil type, and terrain. PG&E conducts trenching and excavating in accordance with California Occupational Safety and Health Administration (Cal-OSHA) requirements for employee and public safety. Self-propelled trenching machines or backhoes are used for trench excavation on moderate terrain. Trenches crossing waterways are excavated using a backhoe, dragline, or clamshell. PG&E schedules trenching for the summer, when the creeks are dry; otherwise, a tunneling method such as jack and bore or horizontal directional drilling (described in Section 3.2.2.7, *Crossings*) is used. If workers encounter rock or rocky formations, tractor-mounted mechanical rippers are used to expedite excavation. In areas where mechanical rippers are not practical or sufficient, rock trenching equipment may be employed. The width and depth of the trench depends on the diameter of the pipe, soil type, terrain, and minimum depth requirements. Typically, the trench is 12 inches wider than the diameter of the pipe. The trench must be deep enough to achieve adequate soil cover over the pipe. The following minimum soil covers apply to the described areas.

- **Uncultivated areas**: 2.5–3 feet.
- **Cultivated areas**: 3–6 feet.
- **Rocky areas**: 1.5–2 feet.

In areas where it is necessary to trench through topsoil and subsoil, a two-pass trenching process is used. The first pass removes topsoil, and the second pass removes subsoil. Removed soils (*spoil*) from each excavation are stored in separate rows. This technique allows proper soil-profile restoration after backfilling. Windrows contain gaps at appropriate locations to prevent stormwater runoff from ponding. Bank stabilization methods depend on site-specific conditions, but, under the MRHCP, work materials and methods will be consistent with species conservation needs and in accordance with any acquired USACE CWA Section 404 and CDFW permits or agreements.[1]

PG&E field crews implement other BMPs as needed to provide erosion control and to prevent construction runoff from entering the streams. In cultivated and improved areas and areas with thin layers of topsoil, it is sometimes necessary to remove and stockpile topsoil within the construction ROW until the trench is backfilled. This effort could last up to 3 weeks. The stockpiled topsoil then is distributed evenly across the disturbed portion of the ROW during cleanup.

PG&E crews clear the trench of loose rocks and, when necessary, provide imported material or other suitable bedding material as a cushion for the pipe. Backhoes are used to clean the trench after ripping, or, in extremely rare circumstances, blasting is implemented after other alternatives, such

[1] Subject to the limitations discussed in Section 3.2.2.5, *Erosion Control*, PG&E will minimize use of riprap.

as rerouting, are exhausted. PG&E minimizes the length of exposed trench to the extent possible and provides access across the trench at convenient intervals for public safety.

3.2.2.7 Crossings

Boring and open trenching are typical construction methods for crossings. PG&E typically uses boring when crossing active waterways, railroads, and major roadways. The three most common boring methods are jack and bore, horizontal directional drilling, and microtunneling. PG&E chooses the method based on the crossing type, soil type, terrain, and type of facility being installed. PG&E generally avoids open trenching unless a waterway is very small or seasonal.

- **Jack and bore**. PG&E often uses this boring method (also referred to as *dry bore*) to cross major highway systems (all federal and state highways) and railroads, as well as places where open cuts are prohibited. Crews excavate each side of the crossing to accommodate the equipment (a boring auger). The displaced fill is either stockpiled or removed, depending on whether the area will be permanently affected or if PG&E will revegetate it following a temporary disturbance. Stockpiling is done within the ROW. The bore could be for a pipe ranging from 2 to 24 inches in diameter. Sacrificial pipe, the same size as the pipe being installed, typically is used as a sleeve for the boring auger. This sleeve is pushed under the crossing as the auger drills through the soil. The permanent gas pipe is then pushed through and attached to the sacrificial pipe. The pipe is cut in short lengths to accommodate the limited excavation area then welded to the inserted piece ahead of it and jacked into place. The average size of the excavation or trenching is 10 feet wide by 40 feet long. PG&E uses the same method if casing pipe is necessary. The casing pipe, sized larger than the carrier pipe, is installed as a sleeve for the boring auger. The gas pipe then is installed through the casing. Cased crossings have vent pipes that extend above ground, have cathodic protection, and are appropriately marked.
- **Horizontal directional drilling**. Longer distances, typically more than 120 feet, can be drilled using this method rather than the jack and bore method. Directional drilling, which PG&E most often uses to cross large waterways, is the preferred method for conduit installation to minimize surface disturbance. The only excavation required is a "mud pit," approximately 6 feet wide by 6 feet long by 3 feet deep. The tunnel is drilled from surface to surface, and a registered engineer determines the pipe's maximum angle of deflection. Workers set up a drilling machine on one side of the crossing at the appropriate location. The auger drills at a predetermined angle from the surface elevation toward the crossing; the angle is prescribed to attain the correct depth below the feature being crossed. During drilling, a mud solution, typically bentonite, is pumped into the tunnel along with other additives to maintain the tunnel's shape and integrity. Crews use nontoxic additives when drilling under streams and typically USACE or CDFW requires a "frac-out" plan as a standard permit condition (see below). This solution reduces friction during installation of the pipeline. The drilling machine pulls the pipeline through the tunnel. The mud solution is pumped into a truck as the pipeline displaces it. Once the pipeline is installed, both ends are excavated and cut off at the appropriate depth to match the rest of the pipeline. PG&E contains the soil removed during drilling within the mud solution and tests it for contaminants prior to hauling the solution offsite and disposing of it at landfills that accept such material.
- **Microtunneling**. This is PG&E's preferred method for stream crossings. PG&E also often uses microtunneling in extremely wet conditions where it is necessary to control the amount of soil being removed as the boring head progresses. Each side of the crossing is excavated to accommodate the boring equipment (i.e., a jetting head and suction equipment). Microtunnel excavation can be a trench as small as 10 feet by 40 feet or as large as 50 feet by 50 feet,

depending on the required depth. A jetting head containing multiple high-pressure water jets is attached to the pipe being installed. Crews use plumbed or tanked water—not water from adjacent streams or rivers. Water forced through the jets dislodges the soil as the head is pushed, and the pipe is installed behind it. Suction equipment controls the amount of soil being removed to accommodate the forward progress of the jetting head and pipeline. Only the soil displaced by the pipeline is removed. PG&E crews capture water used during this process in baker tanks and dispose of it according to state and federal water quality regulations.

- **Open-trench waterway crossings**. PG&E rarely uses an open-trench waterway crossing and does so only when a waterway is very small or seasonal. If PG&E uses the open-trench technique for river crossings, a trench is opened in the streambed using backhoes, backhoes on barges, clamshells, or draglines, depending on the streamflow characteristics. Flow is maintained at water crossings during construction using bypass piping and temporary cofferdams. At large rivers, spoil removed from the trench is stockpiled out of the water within designated work sites but not where it can re-enter surface waters. The pipeline is placed at least 6 feet below scour depth. A plug of unexcavated soil is left at each bank of the stream or river crossing to preserve the integrity of the streambank. PG&E crews do not remove these plugs until necessary for installation of the pipe. The entire length of pipe for the crossing is assembled as a unit, tested and then placed in the trench. After installation, crews backfill the trench and the streambank, stabilize the soil through compaction, and restore the area to approximate preconstruction conditions. PG&E's bank stabilization methods depend on site-specific conditions, but work materials and methods are consistent and in accordance with state and federal water quality regulations.

For safe construction, PG&E conducts hydrologic evaluations for any major planned crossings during the appropriate time of year, as required.

Contingency Planning for Frac-Outs

Drilling fluid fractures, commonly called *frac-outs*, result when the pressure of the drilling lubricant escalates, fractures the soil, and allows the drilling fluids to escape the bore. PG&E crews design and direct the drilling operation to minimize the risk of spills of all types. PG&E prepares a site-specific frac-out plan that outlines standard precautionary measures to control and clean up the drilling lubricant. The frac-out plan includes the following: a point-of-contact list in the event of a frac-out or spill, guidance for when drilling should occur (such as performing drilling during daylight hours so that the loss of bentonite or machine pressure can be visually identified), and a list of tools and equipment required onsite to clean up and remove the drilling fluid. The point-of-contact list also outlines the notification procedure to inform all agencies with jurisdiction of the waterway of the nature of the incident. In addition to permit conditions and frac-out plan guidance, projects that require contingency planning for frac-outs typically require the preparation and implementation of a SWPPP that contains detailed methods and measures to avoid spills.

Crossing Types

- **River, stream, and backwater crossings**. River crossing methods vary according to specific river characteristics, such as width, depth, flow, and riverbed geology. PG&E conducts construction in accordance with permits and agreements issued by USACE, CDFW, USFWS, and other appropriate regulatory agencies. Construction may require separate review and approval in accordance with the terms of the specific permits or agreements. Pipelines crossing major

streams and rivers are coated with concrete prior to installation to provide negative buoyancy and protection from erosion. PG&E installs temporary vehicle crossings for construction traffic only if an existing crossing, such as a bridge, is not available in the vicinity. Temporary vehicle crossings consist of culvert bridges, Flexifloats, and portable bridges.

- **Fault crossings**. Where geologic studies suggest a high potential for ground rupture, PG&E designs the fault crossing to avoid overstressing the pipe in the event of differential movement. Designs of fault crossings vary, depending on the type of fault and the likelihood, amount, and potential consequences of expected fault displacement. To address the potential for fault displacement, the pipeline trench is widened and deepened to accommodate the anticipated fault displacements. The pipeline in the fault zone is completely suspended in granular bedding material to minimize the resistance of the trench backfill to displacement of the pipe. This method allows the pipe to remain fixed relative to movement of the trench as fault displacement takes place.
- **Road, railroad, and utility crossings**. PG&E uses the open-trench method when crossing roads with light traffic and where local authorities or owners of private roads permit this crossing method. PG&E provides a temporary road detour to the shoulder of the road or a construction bridge consisting of plating for trenched thoroughfares. Boring or manually exposing the pipe or cable are generally the methods used to cross under underground utilities. Jack and bore is the typical boring method used at railroad crossings.
- **Aqueduct and canal crossings**. Site-specific circumstances determine the construction method PG&E uses for crossing aqueducts and canals. In most cases, boring is appropriate. Where required or necessary, crews construct an aerial suspension system for the pipeline.

3.2.2.8 Pipe Placement

Large trucks transport lengths of pipe, valves, and fittings to the ROW or work site, and PG&E crews unload the materials. Crews typically assemble sections of pipe requiring angle joints in the field using prefabricated elbow sections so that the pipe conforms to the contours of the terrain. The pipe joints are welded, X-rayed, inspected, and field-coated to prevent corrosion. The material used for field coating depends on the location of the pipe.

Large trucks or track-mounted equipment lower the pipeline into the trench. (Work crews bring this equipment to the covered activity site on a truck.) Typically, the old pipe is filled with slurry and abandoned in place or cut and capped. The trench is backfilled with the excavated material. If the excavated material has too much rock for placing around the pipe, a rock-free material is imported and placed around and over the pipe to a depth of 1 foot. Surplus material is used to form an earthen crown over the trench and allow for settling of the backfill. All excavations and trenches are compacted to be in adherence with the specific requirements at each location. The industry standard minimum compaction requirement for ROWs is 85%.

3.2.2.9 Pipeline Marking

PG&E crews install identifying markers over the centerline of the pipeline. These markers show the general location and direction of the pipeline, identify the owner of the pipeline, and convey emergency information in accordance with applicable regulations. Additional markers (fence post-like structures with attached signs) are placed on streambanks, not in waterways, and on roads, fences, public access crossings, and edges of agricultural fields. The markers are installed in

alignment with the active pipeline. Special markers providing information and guidance to aerial patrol pilots also may be installed.

3.2.2.10 Hydrostatic Testing

Hydrostatic testing is used to test the pressure of a new, existing, or repaired or replaced pipeline. It complies with requirements of CPUC, California Department of Transportation (Caltrans), Regional Water Boards, and Cal-OSHA. PG&E typically conducts testing before backfilling the underground pipeline. PG&E most commonly uses water as the test medium, but compressed air or compressed nitrogen gas occasionally are used for testing small-diameter pipes. Testing pressure and duration are determined by pipe size, pipe specifications, pipe-wall thickness, and elevation. Prefabricated test heads are installed on the section of line to be tested. The section is then filled with water from an available source, such as a fire hydrant. Water can also be transported to the site by water trucks or sent through temporary aboveground water lines. Once the pipeline is filled, a hydrostatic pump is used to increase the internal pressure to the designed test pressure, typically 1.5 times the system's maximum operating pressure. The amount of water used in a hydrostatic test depends on the diameter and length of pipe tested.

Upon successful completion of the hydrostatic test, pressure is reduced, and the water is expelled from the pipeline using air compressors and a cylindrical foam pipeline inspection gauge or device, known as a "pig." PG&E discharges only clean water, and the water is not released under pressure. PG&E obtains any necessary water quality permits, expels and disposes of test water in a manner consistent with local water quality considerations, and implements its water quality BMPs when disposing of test water. Because most of the testing will be conducted in urban areas, PG&E is anticipating it will be able to discharge water to baker tanks or sewers. If baker tanks or sewer systems are not feasible when working in natural vegetation areas, crews would lay temporary plastic or rubber pipe to discharge the test water to non-habitat areas or agricultural land. Soil excavation, soil stockpiling, and the use of construction equipment at each end of the pipeline requires an approximate 20- by 50-foot work site. An additional 100- by 100-foot laydown area and a staging area are also required at each end of the pipeline. Hydrostatically tested pipelines may require a 100- by 100-foot staging area to store the baker tank(s).

3.2.2.11 Cleanup and Restoration

The final phase of pipeline installation involves cleanup and restoration of the ROW to achieve compatibility with preconstruction vegetative conditions, in accordance with standard procedures approved by federal and state regulatory authorities. PG&E removes construction material and re-contours disturbed areas to their pre-project grade. Depending on the nature of the site and the type of installation that took place, several tasks may be involved in the cleanup and restoration. For example, placement of a pipeline or other infrastructure in a trench results in surplus soil that cannot be returned to the trench. The surplus soil normally is distributed evenly over the disturbed section of the ROW. If a property owner objects to this approach, the surplus soil is deposited at an approved local dumping site. Restoration of the ROW surface involves smoothing it with motor graders or disc harrows. Restoration may also require stabilizing slopes by recontouring, creating slope breaks or diversion ditches, or using dirt, sandbags, or other materials to stabilize the soil and direct runoff away from disturbed areas. On cultivated or improved lands, measures are taken to remove rocks and leave the ground surface in a condition satisfactory to landowners. If the disturbed area is greater than 0.1 acre, crews also mulch, reseed, and fertilize, as needed and pursuant to landowner agreement. For some projects (e.g., gas pipeline projects), restoration may

not occur in certain areas, such as riparian areas, serpentine habitats, or blue oak woodlands where the ROW has become overgrown and operational requirements dictate that access to and through the ROW be maintained for annual patrols and inspections, especially at creek and river crossings. In those situations, PG&E mitigates the impacts as permanent impacts.

3.2.2.12 Emergency Work

PG&E responds to emergency work as soon as possible to resolve the service issue and ensure the public and facilities are safe. Emergencies can happen at any time of the day or night, and crews respond immediately to resolve service outages and other safety issues. In most instances, this work is done within hours. In certain situations, work can be planned and resolved within days or weeks. A planner and biologist may be involved in these repairs depending on the nature of the emergency and lead time available to resolve the issue.

PG&E uses its existing facility management software to account for emergency activities that are conducted without planner or biologist input. When emergency activities are conducted with planner and biologist input, PG&E staff evaluates the work site for potential endangered species effects and prescribes avoidance, minimization, mitigation, or restoration, if needed. PG&E staff implements Field Protocols and AMMs when possible during emergency work.

3.2.3 Operation and Maintenance Covered Activities for the Natural Gas System

3.2.3.1 G1. Patrols

Aerial Patrol

PG&E conducts aerial patrols of gas pipelines and associated facilities quarterly using fixed-wing aircraft that fly at an elevation of approximately 500 feet. Helicopters are used periodically as needed.

Ground Patrol

Compliance with CPUC measures requires periodic ground patrols of the gas transmission lines. On a quarterly to annual basis, PG&E conducts ground patrols of the pipelines and associated facilities on foot, with all-terrain vehicles (ATVs), or by using small trucks or sport utility vehicles (SUVs) on existing access and pipeline patrol roads. The purpose of the patrols is to observe surface conditions on and adjacent to the transmission line ROW and look for indications of leaks, ensure that pipeline markers are clearly visible, and record conditions that might affect safety and operation. Ground patrols also read gas meters.

Leak Detection Patrol

PG&E conducts leak detection patrol of the gas facility system at either 6-month or 12-month intervals. Leaking gas from pressurized pipelines can present hazardous conditions that must be corrected. The patrol is conducted on foot or by small trucks, depending on the terrain and accessibility. PG&E uses either a portable hydrogen-flame ionization gas detector or a laser-methane detector to sample air above the gas line to test for leaks. Where vegetation has overgrown in the ROW, vegetation pruning or removal of a 2- to 4-foot-wide path is required to allow safe access for

the crew conducting the patrol. The ROW clearing width varies depending on the site location and vegetation type; the focus is on minimizing impacts on natural vegetation. Section 3.2.3.13, *G13. Pipeline Right-of-Way Vegetation Management and Access Road Maintenance*, which discusses the G13a covered activity, describes and calculates estimated disturbance from vegetation clearing.

3.2.3.2 G2. Inspections

Valves

Valves are located along all pipelines at different intervals depending on the size of the line and number of taps (i.e. other pipelines of the same or smaller size) off the line. PG&E inspects valve sites along the pipelines and tests the valves three to four times per year. Light trucks are used on existing access and pipeline patrol roads. Valves are not marked, but they are located inside vaults or fenced areas and can be accessed by a two- or three-member maintenance crew. Crews lubricate valves as necessary, using a gun pump to apply either motor oil or grease (e.g., 1,033 grease).

Telecommunication Sites

PG&E conducts routine inspections of telecommunication sites, which are used to monitor gas pipeline functions remotely, on a monthly basis unless problems are identified at specific sites. Light trucks use existing access and pipeline patrol roads, or PG&E uses fixed-wing aircraft.

Anode Beds

Anode beds (discussed in detail under Section 3.2.3.8, *G8. Pipeline Cathodic Protection*) are part of the cathodic protection system (CPS) to resist corrosion of the pipeline while underground and usually are placed approximately every 10 to 20 miles along the pipeline. PG&E inspects cathodic protection every 2 months, or as indicated by the integrity management team, by checking the electric current at various Electric Test System (ETS) stations along the line and at anode bed sites. Simple testing instruments are used. Typical surveys may take 10 days to complete at each pipeline. Light trucks use existing access and pipeline patrol roads.

Pressure Limiting Stations

PG&E conducts routine inspections of existing PLS every 2 months along transmission lines and annually along distribution lines. A single light truck uses existing access and pipeline patrol roads, where possible, and travels off-road where necessary.

Land Surveys

PG&E periodically conducts land surveys of facilities and facility ROWs along the alignment. This typically includes a land surveyor and an associate travel in a light truck and use survey equipment to survey the ROW. It is estimated that the entire gas transmission and distribution system is inspected once per year.

3.2.3.3 G3. Pipeline Remedial Maintenance and Internal Pipeline Inspections

G3a. Pipeline Remedial Maintenance

Remedial maintenance corrects erosion and vandalism problems and involves the evaluation of internal pipeline issues. PG&E performs remedial maintenance at approximately 100 locations per year. The majority of these locations are in upland land-cover types, but some are in streams. Maintenance materials used for site-specific solutions to erosion problems may include biodegradable jute netting and, to a lesser extent, the periodic use of concrete, Ercon mats, or concrete pillow systems. The extent of concrete, Ercon mat, or concrete pillow system installation will not be longer than 100 feet or wider than 50 feet on any stream in the Plan Area and will comply with permits for work in waterways. PG&E installs concrete, Ercon mats, or concrete pillow systems very infrequently.

Vandalism can affect any structures located above ground; it usually entails visual (e.g., graffiti) rather than structural impacts. Of approximately 60 sites maintained each year, PG&E estimates that only a small number will require fencing for protection from vandalism (i.e., approximately 12). Fencing these areas requires excavation for fence post installation; this action will need an approximately 50- by 50-foot work site and result in approximately 50 feet by 50 feet of disturbed area for each fenced location.

G3b. Internal Pipeline Inspections (In-Line Inspection)

PG&E inspects the internal coatings of its pipelines annually. Every 7 years, on average, each segment is inspected above ground by electronically measuring the integrity of the pipeline coating. Using technology such as magnetic flux leakage (MFL), PG&E inspects the pipeline with sensors to measure pipe corrosion, cracks, and indentations. During these procedures, the pipeline remains in operation. If problems are indicated, the pipeline is inspected internally using a pig that is inserted into the pipe at an external launch and receiver point. No excavation is required. The pig travels throughout the length of the pipeline employing robotically operated cameras and sensors to look directly inside pipes. Once the "pigging" data are analyzed, the inspection crew conducts a calibration test (i.e., excavates a bell hole) at two or three locations along the pipeline to confirm that the pigging results are accurate. The size of the area exposed depends on the length of pipeline where the pig has indicated possible problems. If corrosion cannot be repaired, pipeline replacement is necessary (see Section 3.2.3.11, *G11. Pipeline Replacement*).

PG&E internally inspects approximately 100 miles of pipeline each year, resulting in 50 inspection locations per year. On average, two or three calibration tests along a 10-foot length of pipe are conducted at each site, requiring a bell hole work site of approximately 10 feet by 10 feet along the exposed pipeline. Soil excavation, soil stockpiling, and construction vehicle travel are within the work site during the inspection.

For the purposes of estimating impacts, PG&E assumed that all internal inspections result in a section of pipeline that needs to be replaced, and that excavation, soil stockpiling, staging, and the use of construction vehicles will disturb an approximately 50- by 50-foot work site. PG&E hydrostatically tests the new section of pipe and disposes of the water using either a baker tank or sewer, as described in Section 3.2.2.10, *Hydrostatic Testing*.

3.2.3.4 G4. Compressor Station Upgrades and Maintenance

Compressor stations occupy developed and fenced sites. PG&E conducts inspections daily and performs maintenance and upgrades as needed. Typical maintenance tasks include overhauling compressors and engines, repairing and replacing piping, painting the station, and drilling or cleaning water wells. In addition, operations and air quality standards may require modifications or upgrades to station equipment. Inspections, maintenance, and upgrades to compressor stations are typically within fenced facility footprints. Access is from existing roads. Crews maintain mow strips outside the perimeter of the facility's fence line to comply with local fire standards.

3.2.3.5 G5. Pipeline Electric Test System Installation

The ETS is a component of the cathodic protection system. Units are installed 1 to 5 miles apart on pipelines to (1) determine protection system effectiveness by measuring electrical conductivity, and (2) help crews locate the pipe prior to excavation. This technology precludes the need to systematically expose the pipe and physically examine it for signs of corrosion. The ETS consists of two wires (leads) that are welded to the pipe; the leads are exposed at the surface inside a 4-foot-tall, 4-inch-diameter plastic tube or valve box. Installation entails exposing a 3- to 5-foot-long section of pipe, attaching the leads with a small weld, and backfilling the excavation. During ETS installation, the pipeline remains in operation. Most sites are accessible from existing access roads. Where an ETS is not accessible from an existing road, workers access it on foot or by using small trucks.

PG&E performs approximately eight ETS installations per year. At each installation site, soil excavation, soil stockpiling, and the use of construction vehicles disturb an approximate 50- by 50-foot work site.

3.2.3.6 G6. Pipeline Valve Maintenance – Recoating

As part of activities G10. *Pipeline Coating Replacement* and G11. *Pipeline Replacement*, PG&E may need to recoat a gas pipeline valve. Mainline valves, which are generally 7 to 20 miles apart, regulate the flow of gas through the pipeline and enable crews to isolate portions of pipeline. Occasionally, these valves malfunction or wear out, causing leaks. Depending on the condition of the valve, PG&E will either recoat or replace approximately six valves annually. Recoating is done by sandblasting the valve over tarps, collecting the debris, and recoating the valve with a specialized epoxy that protects against corrosion. Most valves are located on gravel lots.

3.2.3.7 G7. Pipeline Valve Maintenance – Replacement or Automation

As part of activities G10. *Pipeline Coating Replacement* and G11. *Pipeline Replacement*, PG&E may replace a gas pipeline valve. PG&E is upgrading and automating its existing valves—or installing new automated valves when automation of existing valves is not possible—to ensure overall pipeline system safety and reliability. Once the pipeline valves are automated, PG&E will check them annually to ensure that they work properly.

Disturbance areas account for the anticipated need for facility upgrades and fencing of 10% of the valves, which expands the footprint to a 50- by 50-foot facility. Soil excavation, soil stockpiling, and the use of construction vehicles require an approximately 150- by 150-foot work site. A 50- by 50-foot laydown area to store equipment may also be required.

3.2.3.8 G8. Pipeline Cathodic Protection

Corrosion of underground steel pipes is a continual maintenance issue for gas system pipelines. Pipe generates or carries corrosion-cell current that, as it moves through the soil, can form pits in the pipe. These pits can weaken sections of the pressurized pipe and cause it to fail. PG&E uses cathodic protection to prevent corrosion.

PG&E undertakes approximately 100 cathodic protection activities per year using the methods described below. A work site approximately 100 feet by 10 feet wide is needed to install the cable, excavate the soil, stockpile soil, and house construction equipment. Most installations require 5 to 7 days to complete.

Anode Beds

As a pipeline's coating degrades over time, it requires increased cathodic protection to prevent corrosion. *Cathodic protection* is a technique to control pipeline corrosion by making the pipeline the cathode of an electrochemical cell. A cable rated for the expected current output connects the negative terminal of a *rectifier*, which is a small piece of equipment that is mounted on an existing utility pole, to the pipeline. A cathode protection expert adjusts the operating output of the rectifier to the optimum level after conducting various tests, including measurements of electrochemical potential. Pipe coatings commonly degrade faster in areas of high moisture content (e.g., locales with regular precipitation or irrigation) than in drier areas. Increased cathodic protection current accelerates the consumption of anode beds and decreases their effectiveness. Consequently, anode beds must be replaced periodically, and additional anodes may be needed. The pipeline continues to operate during installation or replacement of the anodes.

Galvanic anode cathodic protection is PG&E's preferred method to control corrosion at distribution facilities and in urban areas. Galvanic anodes do not require an external power source, and installation requires minimal excavation for installation. There is some flexibility as to where the anode beds can be located, with beds usually placed approximately every 10 to 20 miles along the pipeline. The installation of anodes typically can be accomplished in a single day.

Deep-Well Anode Beds

Deep-well anode beds typically have a 20-year life span and are abandoned in place when no longer in use, pursuant to local environmental health department regulations. Installation of deep-well anode beds involves drilling deep ground wells (200 to 300 feet) and installing zinc or magnesium bars, platinum anode rods, or ground mats. PG&E uses this installation method where pipelines are exposed to large amounts of induced alternating current (AC) (typically from adjacent high-voltage electric transmission lines) or where soil conditions dictate. For many applications, the anodes are installed in a 200- to 300-foot-deep (or more), 10-inch-diameter vertical hole and backfilled with conductive coke (a non-toxic carbon material that improves the performance and life of the anodes). Once an anode bed is installed, it is connected to the pipeline and the electric line by an underground cable. The deep-well anode bed typically is located approximately 10 to 15 feet from the gas pipeline and every 10 to 20 miles along the pipeline corridor. Installation of deep-well anodes typically requires 4 days to complete. Work crews distribute leftover fill evenly over the buried work site and grade it to blend in with the existing site, reserving topsoil to spread on top.

Other Types of Anode Beds

Other protection measures include the installation of cathodic protection units (CPUs), anode flex and magnesium anodes, and horizontal anode beds. Although deep anodes are preferable, these other measures can be used for certain soils or in isolated corrosion areas where installing a deep well is not practical.

Installation of CPUs involves trenching a few feet parallel to the pipeline and installing the flex or magnesium anode at the same depth as the pipeline. Trenching for CPU installation varies in width, from approximately 4 inches to 2 feet.

Horizontal anode beds are installed parallel to the pipeline, 400 to 1,000 feet from the ROW centerline, at approximately the same depth as the pipeline. The need to install or replace a horizontal anode bed is relatively infrequent, and PG&E anticipates it will occur less than once per year in the Plan Area. A small underground cable delivers an electric current from the horizontal anode bed to the pipeline.

3.2.3.9 G9. Pipeline Lowering

PG&E may need to lower gas pipelines to increase the depth below surface and thereby improve public safety. The need for pipeline lowering arises mostly in agricultural areas and areas of intense land use, but the need also may arise in other land-cover types or in waterways where pipe structures are exposed.

Pipeline lowering typically involves trenching and installing a new pipeline parallel to, and to a greater depth than, the existing pipeline. Typically, the old pipe is abandoned in place and either capped or filled with slurry and then capped. Pipeline lowering may be needed at any time of year, depending on operational restrictions related to the need to temporarily shut down the pipeline.

PG&E lowers approximately 2 miles of pipeline every 3 years. A 20-foot-wide work corridor is needed for trenching and soil excavation, soil stockpiling, and the use of construction vehicles. The gas pipeline requires hydrostatic testing prior to pressurizing.

3.2.3.10 G10. Pipeline Coating Replacement

PG&E coats natural gas pipelines to protect them from degradation and external corrosion. When a pipeline's coating has deteriorated to the point of requiring replacement, PG&E recoats the pipe with epoxy. To determine whether the coating has maintained its integrity, PG&E induces an electric current on the pipeline at the ETS station and then measures for a loss of voltage, which indicates degradation in coating integrity.

To avoid bending or affecting the integrity of the pipe, the pipeline must be excavated in sections and supported at intervals typically of 40 feet. Workers remove the old coating by jetting, scraping, or sandblasting and typically place plastic sheeting or tarps below the pipe to collect the residue. PG&E performs testing to determine if the material is hazardous and then disposes of it in accordance with regulations. The surface is then prepared for the new wrap by running a self-contained grit- or shot-blasting machine over the pipe. The pipeline continues to operate while a coating machine applies the coating.

PG&E recoats pipeline segments every year. Recoating requires use of construction vehicles, vegetation removal, trenching, soil excavation, and soil stockpiling. Section 3.2.2, *Work Methods and*

Techniques, describes the work methods and techniques to remove and replace the pipe. On average, a 20-foot-wide work site is needed for this activity. The majority of recoating is in upland land-cover types but may periodically be within streams. In intermittent and ephemeral streams, PG&E schedules instream maintenance when the stream is dry. One mile of pipeline coating replacement typically involves three different access locations.

3.2.3.11 G11. Pipeline Replacement

Public safety sometimes necessitates replacing sections of pipe for various reasons, including those listed below.

- Development alongside the pipeline has resulted in a change of class location (see *maintenance classes* in Chapter 10, *Glossary*, for class definitions).
- Aging or corrosion has affected the integrity of the pipeline.
- Pipelines have been damaged by accidental excavation.
- Acts of nature have damaged the pipeline.

In the case of class location changes, PG&E must move or replace the line with stronger pipe to comply with Caltrans- and CPUC-mandated safety regulations. PG&E uses standard pipeline construction techniques, as described in Section 3.2.4.2, *G15. New Customer/Business Pipeline Extension*. As the old pipeline is removed from service for the tie-in to the new line, it is *blown down* (i.e., gas is evacuated to the atmosphere from the affected section of pipe through a blowdown stack). Any gas condensation is captured and removed from the old pipeline and disposed of in compliance with current regulatory standards. Existing pipeline is abandoned in place by filling it with slurry before the pipeline is capped. Typically, the crew will cut and cap the pipeline every 1,000 feet, depending on the location. Slurry is used if the pipeline crosses a water body or needs to be stabilized. In the event a pipeline is abandoned in place, PG&E will typically place the new section of pipe as close to the abandoned pipeline as possible and modify any existing easements by expanding the easement width to accommodate the new section of pipeline. In some cases, PG&E may need to acquire new easement rights to accommodate the new pipeline alignment.

PG&E performs pipeline replacement approximately 18 times per year. The length of pipe affected varies based on the reason for replacement. The minimum length of pipe replaced is typically 40 feet (one joint of pipe), although approximately 1 mile could be replaced during each replacement effort. A 50-foot to 100-foot by 50-foot area for new valve equipment is required along each pipeline replacement. Trenching and soil excavation, soil stockpiling, staging, and construction vehicles disturb a 20-foot-wide work site, which includes the 10-foot excavation area. Once the new pipeline is installed, PG&E hydrostatically tests and backfills the pipeline and disposes of the water using either a baker tank or sewer. PG&E may replace pipeline at any time of year, depending on operational restrictions related to the need to temporarily shut down the pipeline.

3.2.3.12 G12. Pipeline Telecommunication Site Maintenance

A supervisory control and data acquisition (SCADA) system monitors pipeline functions remotely and transmits pipeline operational information to PG&E's operations offices at the Brentwood Gas Terminal via PG&E's utility telecommunications system. Periodic vehicle or helicopter access is required to check the telecommunication facilities, replace batteries, conduct minor maintenance, or make adjustments to the facilities or components. In the event of major storm damage,

reconstruction of the facility or replacement of a component is required as soon as weather permits. A staging area may be required for major maintenance or storm damage repairs. The staging area may be located either next to the site within the temporary work site or at a distant location from which a helicopter transports workers and materials. The pipelines continue to operate during site maintenance.

PG&E performs this activity approximately once per year. A 20- by 20-foot work site is needed for soil excavation, soil stockpiling, and the use of construction vehicles. Also, approximately once per year, PG&E must install new fiber optic cable, which requires an estimated 10- by 1,500-foot work site.

3.2.3.13 G13. Pipeline Right-of-Way Vegetation Management and Access Road Maintenance

G13a. Pipeline Right-of-Way Vegetation Management

PG&E manages vegetation along the pipeline ROWs to prevent damage to the natural gas system, facilitate inspections related to routine O&M tasks, and comply with state and federal regulations that require PG&E to patrol periodically for gas leaks. The gas system vegetation management program is designed to remove weeds, brush, and trees around equipment and facilities for ROW visibility, fire hazard reduction, security, safety, and maintenance access. Trees and brush that interfere with patrols or tree and brush roots that may pose a threat to buried pipelines require periodic removal. To facilitate aerial inspections and maintain the line of sight between gas line markers, PG&E clears any tree canopy and brush that obscures the ROW. PG&E's ROW management associated with vegetation management focuses on the need to be able to patrol, inspect, and protect facilities. To keep incompatible vegetation from growing over the facilities, PG&E does not replant trees within the ROW after vegetation management, although reseeding with compatible low-growing grasses—with the landowner's notification—is routinely performed.

PG&E identifies areas within the ROW that require vegetation removal during routine patrols. A ROW width averages 20 feet over the gas pipeline. The ROW width is dependent on legal easement documentation and the type of vegetation. For example, some easements are 10 feet wide, and others can be up to 65 feet wide. Vegetation management usually is accomplished by manually removing large-diameter woody vegetation with a chainsaw, then mechanically removing other vegetation with a brush hog, hydro-axe, or brush rake, usually to establish a maximum clearance height of 1 foot from the ground (depending on vegetation and the return growth rate), and to allow surveys by foot. If access is poor, vegetation is manually lopped into 6- to 24-inch lengths and scattered within the ROW. PG&E also relies on chemical control (herbicides) for vegetation management. Although herbicide use cannot be included as a covered activity because of the uncertain effects of herbicides on endangered species, the following information provides an overview of PG&E's practices.[2]

PG&E uses herbicides in accordance with label requirements and EPA regulations. Herbicides are applied by a qualified applicator licensed by the California Department of Food and Agriculture. In general, herbicides are used in the gas transmission ROWs and for cut-stump applications. The use of herbicides is subject to landowner notification. Only federal and California EPA-registered

[2] Herbicide use is discussed in this chapter to provide an overview of PG&E's vegetation control practices. It is acknowledged that the use of herbicides is not currently being permitted by USFWS under Section 10 of the ESA.

herbicides are used. These include selective and nonselective, inorganic and organic, contact and translocated, and pre-emergent and post-emergent herbicides. PG&E contracts with licensed and registered pest control advisors to prepare herbicide prescriptions for vegetation control and eradication within ROWs.

The covered activity described in this section is for those instances in which vegetation management is necessary as a distinct and separate action that PG&E crews perform, and not a part of ROW clearing associated with other covered activities, such as pipeline replacement. On average, the ROW is reclaimed 12 times per year by removing 10 feet of vegetation on each side of the pipeline over a 0.5-mile length. Frequency is based on an assumed return interval of 5 years within tree- and shrub-dominated land-cover types.

G13b. Pipeline Access Road Maintenance

Access road maintenance work takes place in the ROW. PG&E maintains the road without altering the road profile. Every 2 to 3 years, PG&E performs surface maintenance on an as-needed basis to keep the access road in operational condition. At approximately six locations a year, a temporary turnout that is approximately 45 feet in length and 10 feet wide is needed. If a culvert is replaced during maintenance activities, PG&E obtains additional required permits (e.g., USACE CWA Section 404 permit).

3.2.4 Minor New Construction Covered Activities

3.2.4.1 G14. Gas Pressure Limiting Station Construction

Human population densities determine the class location designations of pipelines. A change of class location designation may require PG&E to move or replace a pipeline with thicker pipe to increase safety, as mandated by CPUC (see Section 3.2.3.11, *G11. Pipeline Replacement*).

An alternative to replacing the pipeline is installing a PLS that lowers the pressure of the gas in the pipeline. A typical PLS encompasses a footprint area of approximately 250 by 100 feet, including aboveground pipe and valve structures and a small control and monitoring building (usually 100 square feet) surrounded by security fencing. The control building houses pressure flow monitoring and SCADA equipment. The local distribution system or solar panel-charged batteries provide the electricity for the SCADA equipment.

Approximately once every 5 years, PG&E installs a PLS, a process that involves excavating a pipeline joint. A construction corridor approximately 100 feet long by 100 feet wide and a laydown area approximately 100 by 100 feet may be required. In addition, the footprint of the PLS is 250 by 100 feet, including fencing. As part of the PLS installation, a portion of the pipeline is blown down. Once the PLS is in place, the pipeline must be hydrostatically tested.

3.2.4.2 G15. New Customer/Business Pipeline Extension

To serve new residential or commercial customers, PG&E installs new pipelines where needed. Installing new sections of pipeline, up to 2 miles in length, and connecting to existing segments involves clearing and grading the ROW, trenching and excavating, pipe placement (including welding, inspection of welds, field-coating or fiber-wrapping, and backfilling), hydrostatic testing, corrosion protection, marking the pipeline, erosion control, and cleanup and restoration. In most terrains, trenching is used to install the pipeline, unless specific circumstances, such as an open

crossing of a ravine or a similar small open area, dictate construction of aboveground sections. Specialized trenching and boring methods are used at crossings of rivers, streams, backwaters, washes, faults, roads, railroads, utilities, aqueducts, and canals. Section 3.2.2, *Work Methods and Techniques*, describes in detail these methods and the other actions involved in new pipeline installation.

PG&E installs new pipeline extensions approximately once per year. A new 10-foot-wide ROW over the pipeline alignment is required and could be in natural vegetation, city streets, or agricultural settings. Trenching and soil excavation, soil stockpiling, and the use of construction equipment require an approximately 125-foot by 20-foot work site, which includes the 10-foot excavation area on one side of the alignment. In the event that no access road exists or an emergency arises, it may be necessary to construct a new temporary access road to implement this covered activity.

3.3 Electric System

3.3.1 Transmission and Distribution System

PG&E's electric system consists of a transmission system and a distribution system. The electric transmission system in the Plan Area consists of approximately 8,400 miles of transmission lines. Bulk transmission lines (230 kV and 500 kV) are supported on steel-lattice towers or steel poles. Power lines with a 60 kV, 70 kV, or 115 kV rating are most often supported by wood poles, but steel poles, tubular steel poles, and lattice towers are also used in certain areas throughout the Plan Area.

PG&E operates hundreds of transmission substations in the Plan Area. Power from high-voltage transmission lines is transformed to lower voltage at these substations. The in-line spacing of these structures varies. The height of conductors above the ground also varies according to topography and the design of the transmission system. Generally, conductors on 230 kV and 500 kV systems are designed to maintain a minimum clearance of 30 feet above the ground. CPUC General Order (G.O.) 95 dictates the design of electric facilities. Conductor sag varies and is configured on the basis of the towers or poles, the electric load, ambient air temperature, conductor type, and span length. Transmission ROWs are of varying widths and generally are within easements that are negotiated with private landowners or the holders of public lands. PG&E owns less than 1% of these ROWs in fee title; the majority is in easements. Transmission ROW widths depend on system voltage, the number of lines per ROW, terrain, and other factors. The electric transmission system includes a network of fiber optic communications cable associated with the SCADA system. In addition, there may be cables owned by other entities located inside the PG&E ROW and which the MRHCP does not cover. For example, fiber optic communications cable is typically installed on transmission structures with clamping apparatus, either above or below the transmission circuits.

PG&E's electric distribution system provides links between most customers and the transmission system. Approximately 43,000 miles of overhead distribution lines extend through the Plan Area. Wood or steel poles support the distribution conductors. The electric distribution ROW widths vary according to the system voltage, terrain, and other factors. The distribution system includes primary and secondary distribution lines that deliver electricity and distribution transformers that reduce voltage from distribution to utilization levels.

Insulators are positioned between support structures and conductors to support the wires and isolate energized conductors from potential grounding. Most insulators for transmission voltages

are ceramic; however, non-ceramic insulators made of fiberglass rods and rubber shrouds also are used.

3.3.2 Work Methods and Techniques

PG&E performs all work practices in accordance with federal and state environmental, safety, and construction regulations and standards. Where applicable, PG&E conducts work in accordance with landowner agreements.

3.3.2.1 Access

Access to electric facilities is similar to that of gas facilities in that PG&E uses existing public and private roads to access the ROW to the maximum extent possible. However, because the length of electric facilities is greater than that of gas facilities, and because electric facilities are more frequent than gas facilities in remote areas, PG&E must construct new temporary access roads periodically when access to facilities is not readily available. Because of the long-term nature of conducting O&M over its broad service area, PG&E does not know where all temporary roads will be located. However, using AMMs described in Chapter 5, *Conservation Strategy*, PG&E's environmental staff will assess all road usage and site all roads to minimize impacts on covered species and their habitats. PG&E constructs these roads within a minimum footprint area and ultimately decommissions and restores them to preconstruction conditions at the completion of the activity. In some instances, roads may be left in place to provide site access for annual patrols or inspections. The covered activity descriptions below include discussion of construction of permanent and temporary access roads, as appropriate.

3.3.2.2 Staging

A staging area is typically required for large-scale covered activities, such as transmission line reconductoring. The covered activity descriptions discuss the sizes of the staging areas.

3.3.2.3 Clearing

Activities involving clearing conform to landowner agreements or permits issued by regulatory and land management agencies. Clearing for electric facilities begins by staking the construction ROW. Maintenance personnel then clear vegetation, remove obstacles, and grade to the extent necessary to allow safe work practices and access. In the event that minor clearing of privately owned commercial tree species (e.g., orchards) is necessary, construction personnel move and stack the trees in accordance with the landowner's preference. Stump profiles are left as low as required for safe work practices and access. Stumps may be removed where appropriate. Debris generated during clearing of the ROW is either chipped and left onsite or disposed of appropriately. In some instances, PG&E's easement documents dictate the methods for disposal.

3.3.2.4 Grading

PG&E performs grading to allow for safe work practices and access and to ensure the proper installation of electric facilities. PG&E also conducts grading to maintain the structural integrity of an electric facility that is being affected by soil movement. On steep terrain where the ROW must be two-toned, PG&E restores the areas after construction to approximate preconstruction topographic contours.

PG&E separates topsoil from subsoil and windrows the topsoil near the site to preserve topsoil. Surface rocks, if present and useful for reclamation, are set aside. PG&E collects unused rocks and hauls them offsite to a landfill. PG&E restores graded areas after construction to approximate preconstruction topographic contours where possible and, if the impact area is greater than 0.1 acre, PG&E revegetates the impact area. The construction footprint calculations include areas potentially affected by grading.

Sometimes PG&E temporarily installs prefabricated bridges or culverts in the ROW or in access roads to ensure safe access and reduce environmental impacts in accordance with state and federal regulations. If the bridge is only needed for a few hours, then a portable bridge is pieced together onsite and secured with a crane to span the crossing. If a longer-term crossing is required, then PG&E installs a culvert after obtaining the requisite permits from the regulatory agencies.

3.3.2.5 Erosion Control

As it does for gas facilities, PG&E considers various types of erosion control and implements applicable BMPs identified in the *California Stormwater Best Management Practices Handbook* (California Stormwater Quality Association 2014) for electric transmission and distribution facilities. Erosion control techniques are employed to preclude impacts on towers and poles resulting from soil movement, gully development, and sedimentation of local drainages. PG&E uses standard erosion control measures that may include grading; installation of water bars along temporary or dirt roads, diversion channels, and terraces to reduce erosion and runoff; ditch plugs installed in ditches to prevent washout; riprap to repair or maintain bank stability; and other soil stabilization practices such as jute mats, wood mulching, straw mulch, and other methods described in the handbook. The methods PG&E chooses depend on the situation and the condition of the site. Most erosion control work is small and contained within work sites. Larger erosion control efforts to repair or maintain bank stability, for example, are conducted on an infrequent, as-needed, basis. This work typically involves more extensive planning and permitting to gain the necessary approvals from relevant agencies. PG&E infrequently uses riprap in the Plan Area and only if other biomechanical methods cannot be used or when making repairs to existing riprap structures. PG&E does not undertake vegetation removal, grading, or substantial alteration of drainage conditions when performing erosion control work.

3.3.2.6 Trenching and Excavating

The process of excavating the underground electric line trench varies according to location, soil type, and terrain. PG&E conducts trenching and excavating in accordance with Cal-OSHA requirements for employee and public safety.

3.3.2.7 Crossings

Boring and open trenching are typical construction methods for crossings of underground electric line construction. PG&E typically uses boring when crossing active waterways, railroads, and major roadways. The three most common boring methods are jack and bore, horizontal directional drilling, and microtunneling.

3.3.2.8 Cleanup and Restoration

The final phase of large covered activities such as electric transmission reconductoring involves cleanup and restoration of the ROW. The goal of restoration is to achieve compatibility with preconstruction vegetative conditions, in accordance with standard procedures approved by federal and state regulatory authorities. PG&E removes construction material and re-contours disturbed areas to their pre-project grade. Depending on the nature of the site and the type of installation that took place, several tasks may be involved in the cleanup and restoration.

3.3.2.9 Vegetation Management

Vegetation interference with electric lines is one of the most common causes of electric outages throughout the United States. Electric outages may occur when trees or tree limbs grow, fall, or in other ways make contact with electric lines. Outages may also occur when electric lines sag into vegetation below the lines because of increased load or ambient air conditions (e.g., high air temperature or wind). Vegetation that comes into contact with electric lines can also start fires. PG&E responds to numerous vegetation-related outages throughout its service area each year. To address this problem and minimize the threat to public safety and system reliability, PG&E's *vegetation management* refers to maintaining required clearances between vegetation and electric lines and equipment, removing hazard trees, and other vegetation clearing activities to ensure system reliability and reduce fire risk.

When pruning vegetation, there must be enough clearance at the time of pruning to ensure that the pruned vegetation does not grow back into the electric lines before the vegetation maintenance crews inspect the line on the next cycle. Pruning prescriptions depend on the location of the vegetation in relation to the line. If the vegetation is located adjacent to the line, limbs can be pruned along one side of a tree (i.e., side pruning). Vegetation growing under the lines is often pruned using targeted directional pruning to redirect future tree growth away from the conductors. Dead, diseased or dying trees (i.e., hazard trees) or targeted tree species that are growing too close to the line and that pose a particular threat to a line are felled. Most low-growing species are retained, except in areas where poles are cleared as required by regulation.

The vegetation management program operates under the following regulatory requirements.

- **NERC Standard Facilities Design, Connections, and Maintenance (FAC)-003-2**. Addresses the requirements to improve the reliability of the electric transmission system by preventing vegetation-related outages that could lead to cascading on critical electric lines operated at 200 kV or higher.
- **Public Resource Code 4292**. Addresses clearances for poles and towers with specific types of equipment (subject poles) on distribution and transmission overhead electric facilities in State Responsibility Areas (SRAs) and some select Local Responsibility Areas (LRAs) during fire season.
- **Public Resource Code 4293**. Addresses primary distribution and transmission overhead electric conductors in SRAs during fire season.
- **CPUC G.O. 95, Rule 35**. Addresses requirements for all primary and secondary distribution and transmission overhead electric conductors. Additional detail for high-threat fire areas is provided in the tables associated with Case 13 and Case 14 described in this rule.

- **CPUC G.O. 95, Rules 37 and 43:** Address the construction design (minimum ground-to-conductor clearances) of overhead electric facilities, and temperature and maximum electric loads, both of which effect maximum sag of the electric lines.
- **NERC Standard FAC-003-01**. Addresses all NERC-regulated overhead transmission electric lines.

These regulations require varying line clearance distances and other construction and maintenance specifications.

Prescribed clearance distances vary based on line rating, shrub and tree species composition, slope, regional fire risk/threat rating, and tree growth and movement, as well as sag and blow-out distances. *Sag* is the additional distance a line can sag toward the ground when it is carrying an electric load during hot weather. *Blow-out* is the additional distance a line can swing side to side under windy conditions. PG&E also implements programs to reduce wildfire risk including enhanced vegetation management in CPUC-designated high fire-threat areas ("tier 2 and tier 3") and creation of fire defense zones in partnership with customers.

3.3.2.10 Emergency Work

PG&E responds to emergency work as soon as possible to resolve the service issue and ensure the public and facilities are safe. Emergencies can happen at any time of the day or night, and crews respond immediately to resolve service outages and other safety issues. In most instances, this work is the same as described above, but is unscheduled and is done within hours of the emergency. In certain situations, work can be planned and resolved within days or weeks. A planner and biologist may be involved in these repairs depending on the nature of the emergency and lead time available to resolve the issue.

PG&E uses its existing facility management software to total the number of emergency activities that are conducted without planner or biologist input. When emergency activities are conducted with planner and biologist input, PG&E staff evaluates the work site for potential endangered species effects and prescribes avoidance, minimization, mitigation, or restoration, if needed. PG&E staff implements Field Protocols and AMMs when possible during emergency work.

3.3.3 Operation and Maintenance Covered Activities for the Electric System

3.3.3.1 E1. Patrols

Aerial Patrol

PG&E conducts aerial patrols of electric transmission lines, distribution lines, and associated facilities annually (in terms of calendar years) using helicopters only.

Ground Patrol

If electric transmission lines and associated facilities are located in no-fly zones, PG&E personnel conduct ground patrols on foot or with ATVs, or use small trucks or SUVs on existing access roads. These patrols occur on a 2- to 5-year cycle, depending on whether the facility is wood or steel. Vegetation management personnel conduct annual ground patrols of transmission and distribution

lines by vehicle and on foot. It is estimated that 30% of the electric distribution system and 90% of the transmission system is patrolled each year. Approximately 95% of the patrolled system length is accessible from existing roads. The rest is patrolled on foot or by use of a helicopter. Approximately 5% (577 miles) of the electric system requires access by off-road travel using light trucks or ATVs.

3.3.3.2 E2. Inspections

Tower, Pole, and Equipment Inspection

PG&E routinely inspects tower footings and poles to verify stability, structural integrity, and the condition of equipment (e.g., fuses, breakers, relays, cutouts, switches, transformers, paint). Footings and poles are accessed from existing roads or may require off-road travel, either in vehicles or on foot.

Outage Inspection

When outages and CPUC Reportable Incidents occur because of weather, accidents, equipment failure, or other reasons, PG&E inspects lines to determine the location and probable cause of the outage. Lines are accessed from existing roads or may require off-road travel, either in vehicles or on foot.

Substation Inspection

PG&E inspects all transmission and distribution substations every 1 to 2 months to verify equipment operation and conduct safety inspections. Substations are accessed from existing roads in vehicles.

Telecommunication Sites

PG&E conducts routine inspections of telecommunication sites annually unless problems are identified at specific sites. Access is by light truck on existing access and power line ROW roads or by helicopter. Helicopter patrols are infrequent and hovering typically lasts only a few minutes, allowing personnel to collect a GPS point for the site or note the facility location.

Sections of Line

The regular inspection of underground facilities, instrumentation and control, and support systems is critical for safe and reliable operation. PG&E inspects aboveground components at least annually for corrosion, equipment misalignment, loose fittings, and other common mechanical problems. The underground portion of the line is inspected at vault locations annually. Inspections are performed from existing roads or may require off-road travel, either in vehicles or on foot.

Land Surveys

When new construction is proposed by a property owner or land developer, PG&E conducts land surveys of facilities and facility ROWs for construction layouts and other purposes. Data collected include precision measurements regarding length and slope and other geology-related information. Access is by vehicles on existing roads but may include off-road travel or surveys on foot.

3.3.3.3 E3. Insulator Washing or Replacement

Conductive airborne particles or bird droppings that settle on ceramic insulators can provide a path across the insulators, causing contamination-induced electric faults. PG&E personnel periodically wash ceramic insulators to reduce the risk of such faults. Nonceramic insulators tend to perform better in contamination-prone areas. Insulators are washed periodically to prevent faults using a truck- or trailer-mounted spray system or a helicopter. Washing typically is done during energized conditions (i.e., while the power lines are operating). Distilled water is used to wash the insulators; dry washing with ground corn hulls also is used.

PG&E replaces insulators when they have been damaged by gunshot, lightning, or heavy corrosion or when they no longer can be washed. They can be replaced while energized or de-energized, depending on access, loading, and safety. Replacement typically takes a four- to six-person crew with a small truck for hauling crewmembers, tools, and materials. If access is limited, a helicopter may be used to land crewmembers and tools on a tower. Insulators are washed or replaced approximately once annually.

3.3.3.4 E4. Substation Maintenance

Most of PG&E's substations are located near load centers, such as residential, commercial, and industrial areas. Typical minor maintenance tasks at these substations include repair and replacement of transformers, switches, fuses, cutouts, meters, and insulators. Maintenance of substation systems requires this type of work approximately once per year. Load demands may require modifications of station equipment or installation of new facilities. These covered activities could require use of station property or adjacent property for construction staging, materials storage, permanent facilities, and land management.

PG&E conducts vegetation management inside and outside of substation facilities as required to meet CPUC and local regulations and ordinances, reduce and eliminate fire hazards, enhance security for fenced facilities, enhance aesthetics, and reduce potential for illegal dumping and homeless encampments. Covered activities on PG&E lands to control vegetation external to substations may include the mowing of grass and weeds. Treatments include pruning or removal of vegetation on the immediate perimeter of a fenced facility (usually within 3 to 5 feet of the fence).

Occasionally, public agencies, municipalities, or neighboring landowners ask PG&E to conduct additional special projects on PG&E parcels outside of the fenced facility, usually for the purpose of fuel reduction to maintain compliance with local and state fire codes. These projects, aimed at managing fire risk or public nuisances, may include brush and weed mowing and discing, herbicide treatments, tree thinning or pruning, and trash removal. Workers may use tractors, flail mowers, or string trimmers for mowing and discing operations. Tree service crews use chainsaws to manually prune or remove hazard trees and to cut brush. Herbicides may be applied, when appropriate, by use of vehicle-mounted spray equipment on tractors, ATVs, and pickups, or manually applied by backpack sprayer. Herbicide applications on special projects are prescribed by a California Licensed Pest Control Adviser and may include pre-emergent, directed post-emergent, and cut-stump treatments. Substations are located primarily in residential, commercial, and industrial areas. No impacts on natural vegetation will result within the fenced perimeters during maintenance because the grounds are blacktopped or graveled.

3.3.3.5 E5. System Outage Repair

Covered activities involving outage repair are necessary to maintain reliable service and ensure public safety. Weather, equipment failure, accidents, fire, or bird electrocution are typical causes of outages. When an outage is reported, PG&E patrols the line until personnel determine the cause of the outage. Access is primarily on existing roads, although some overland access with small trucks or SUVs is expected. Depending on the cause of the outage, repair may entail anything from reclosing a switch to replacing a transformer or pole. Crews repair and restore circuits as quickly as possible.

PG&E performs outage repair approximately 600 times per year in rural locations throughout the Plan Area. Soil excavation, soil stockpiling, and the use of construction equipment disturbs an approximately 22-foot by 22-foot work site during each repair.

3.3.3.6 E6. Tower and Boardwalk Replacement or Repair

E6a. Tower Replacement or Repair

PG&E tower replacement or repair typically involves tower extensions or strengthening the foundations or superstructures of towers. Superstructures typically are strengthened by replacement, modification, or the addition of pieces of steel lattice, as determined by engineering analysis specific to each tower.

Tower Extensions

Tower extensions are implemented approximately 470 times annually. The most common method to raise a tower involves installing a prefabricated extension at the bottom, waist, or top of the tower. The extension is typically installed using a helicopter or crane, depending on the tower location. If a crane is used, an approximately 25- by 40-foot area is graded adjacent to the tower to serve as a level crane pad. Temporary wood pole supports (shoo-flies) are constructed adjacent to the tower to support the conductors while the crane lifts the tower. The tower extension is installed, the conductors replaced, and the shoo-flies removed.

The second method requires lifting the tower. A tower lifter is driven beneath the tower, and its four arms are clamped to the tower legs. The tower legs are unbolted from the base, the tower is lifted, and leg extensions are installed.

Strengthening Tower Foundations

To strengthen tower foundations, concrete from the existing footings is broken away to expose the steel reinforcements. A new replacement concrete footing, called a grade beam, is poured between reinforcements. When the towers are accessible from existing roads, the old concrete footings are removed and hauled offsite on large trucks. For some project locations the old concrete footings are bagged in a giant tarp with ropes, bundled, removed by helicopter from the tower site, and disposed of according to regulations, typically at a local landfill.

To repair foundations submerged in water, a cofferdam is installed at low tide to allow access to the foundation footing. The wood cofferdam is built around the footing to be repaired and is used to isolate the footing from the water. The mud is removed by hand, and the dam is pushed down to the required depth to expose the solid piling, usually 3 feet below the mud line. Typically, the mud is placed in bags and taken to a landfill. If there is little mud collected, then it is returned to the base of the footing after the cement is poured. The material is staged by helicopter or barge, or a

combination of both. The old concrete pier is chipped away to expose the pile. New pins are inserted, a new rebar cage is installed around the pile, and the concrete is replaced. The cofferdam then is removed by excavating around the outside and hoisting it from the tower.

Where PG&E cannot complete the work from an existing boardwalk, construction crews place a rubber mat at the base of each footing as a work site. If a lot of material is needed at the job site, PG&E builds a temporary section of boardwalk laterally from the existing boardwalk. A helicopter is then used to place the material on the temporary boardwalk, and workers move the material to the work site by hand or wheelbarrow.

If piles are not required for the tower foundation, footing repairs can be done within a work site extending approximately 2 feet from the footing. If piles are required, the work site may need to be extended to 20 feet outside the tower footprint. For a couple of hours, PG&E crews may use rubber mats to temporarily access the area requiring a temporary boardwalk. Workers place the mats in such a way to help protect the vegetation around the temporary boardwalk during its construction.

Strengthening Tower Superstructures

Superstructures typically are strengthened by replacement, modification, or addition of pieces of steel lattice, as determined by engineering analysis specific to each tower. Other minor repairs that require accessing facilities are replacing fuses, breakers, relays, cutouts, switches, and transformers, and painting.

E6b. Access Boardwalk Repair and Replacement

PG&E has some boardwalks that provide access to transmission facilities in the vegetated margins of North Coast facilities. The boardwalks typically extend from levees and provide access across marsh to transmission tower footings. These boardwalks have a 15- to 20-year life and require repair and replacement. Approximately 18 times per year, 1,500 feet of boardwalk are repaired or replaced, which consists of installing replacement piles (spaced approximately 100 feet apart) and replacement planks. PG&E crews perform boardwalk maintenance and construction activities using hand tools and gas-powered tools such as drills and saws. Using a steel bar for leverage, staff pushes replacement piles into the ground. The planking is transported along the boardwalk on special hand-dollies. Planking is slid into place, drilled, and bolted. If the boardwalk is not too degraded (i.e., still walkable), crews do much of the work from the boardwalk and some from areas adjacent to the boardwalk where piles are being replaced. If PG&E is raising the height of an existing boardwalk, crews do the work from the boardwalk. If the boardwalk is substantially degraded, crews do the work within a 10-foot corridor around the boardwalk being replaced. When a 10-foot by 10-foot work site is required, soil excavation and soil stockpiling disturb vegetation.

3.3.3.7 E7. Facility Installations (Shoo-Flies)

PG&E needs to replace or repair poles, towers and related equipment (e.g., anchors, cross arms, insulators, wires, cables, guys, switches) when they fail or become unsafe. New additions to existing transmission line facilities or tap lines from the old facilities may require installation of a shoo-fly, a temporary line to deliver electricity while line repair work is being conducted.

Shoo-fly installations involve adding temporary poles or structures around existing permanent facilities to limit service interruptions until work crews can make permanent repairs. Shoo-flies consist of a number of poles and anchors supporting conductors to bypass facilities needing repairs

or upgrades. In some cases, existing conductors are removed from the old poles or structures and reattached to the shoo-fly structures. In most cases, this is accomplished with one or two poles for every circuit attached to the structure being shoo-flied. For example, one double-circuit 115 kV tower (six wires attached) requires a minimum installation of four poles. Shoo-fly supports are removed when the repair or construction work is complete. Shoo-flies are installed approximately 120 times per year. A work site of approximately 25 by 100 feet is frequently required.

3.3.3.8 E8a. Pole Equipment Repair and Replacement

PG&E repairs or replaces pole equipment (e.g., cross arms, insulators, pins, transformers, wires, cables, guys, anchors, switches, fuses, and paint) when it fails, becomes unsafe, outlasts its usefulness, or is identified for replacement. Replacement and repair of pole equipment typically are performed with the pole in place, using a line truck. Such repairs and replacements take place approximately 570 times per year.

3.3.3.9 E8b. Utility Wood Pole Replacement

When replacing a PG&E distribution or transmission pole, the new pole is framed (i.e., cross arms, pins, insulators, grounds, bonding, markers, and any equipment are installed) on the ground adjacent to the existing pole prior to setting the pole in the ground. To replace a pole, the line is typically de-energized. A line truck augers a hole, the new pole is moved into the new hole, the conductors are moved from the old pole to the new pole, the old pole is typically removed, and the old pole site is backfilled with the augured soil. Existing wood poles may be replaced with new wood poles or light-duty steel poles. PG&E replaces poles approximately 570 times per year.

3.3.3.10 E9. Line Reconductoring

PG&E replaces conductors (wires) once the wires have outlasted their usefulness. Work crews install replacement conductors by temporarily splicing them to the ends of the existing conductors and pulling them through travelers (pulleys) attached to the arms of the towers or pole cross arms. Travelers are installed at each tower or pole using a boom truck. Where a boom truck cannot be used, a winch is used to install the travelers. In some cases, a helicopter is necessary to install the travelers and conductors.

Reconductoring typically is done in 2- to 3-mile sections with the use of pull and tension sites ("pull sites"). *Pull sites* are temporary construction areas that are used during the removal of existing conductors and the placement of new conductors along the transmission line. Pull sites may be used to stage materials and provide work sites for tower or pole work. Pull sites are typically located within relatively flat areas that are in line with the conductor. Several pieces of equipment are used at the pull sites, including tensioners (rope trucks) to feed out the new conductor and adjust tension, conductor reels to receive the existing conductor as it is removed, and reels of new conductors. Trailers pulled by semi-trucks, which also are parked onsite, typically deliver and remove the reels. Onsite cranes move the conductor reels on and off the semi-trucks.

Pull sites are generally rectangular and vary in size, from approximately 50 to 350 feet wide for small pull sites and approximately 100 to 1,250 feet long for large pull sites. Distances between pull sites vary, but on average, approximately 2.7 miles of conductor separates single pull sites or groups of pull sites. Vegetation mowing and minor grading may be required to prepare pull sites for use.

Before pulling the conductor, PG&E crews install clearance structures at road crossings and other locations to prevent conductors from contacting existing electric or communication facilities or passing vehicles. These temporary structures consist of wood poles.

After the conductors are pulled into place, they are tensioned by pulling them to a predetermined sag and tension. The conductors are then permanently attached to the insulators and existing conductors.

Electric distribution reconductoring takes place approximately 285 times a year, and electric transmission reconductoring takes place approximately 10 times a year. One-third of all reconductoring work requires a pull site; the remaining reconductoring work requires installation and removal of travelers on a two-circuit line, resulting in disturbance. Electric transmission reconductoring also requires in a 125-foot by 75-foot work site.

3.3.3.11 E10. Vegetation Management

PG&E performs routine vegetation management on all of its overhead electric distribution and transmission facilities to maintain compliance with Public Resource Code Section 4293, CPUC G.O. 95, Rule 35, and NERC's FAC-003-01 and 02.

The clearance regulations identify, by voltage, specific clearance distances that PG&E must maintain between vegetation and energized conductors. Clearance distances range from 18 inches to 30 feet[3], although PG&E may clear beyond these distances to account for ingrowth and to maintain facility safety and reliability. Additional information on vegetation management's environmental screening process and BMPs is provided in Chapter 5, *Conservation Strategy*.

E10a. Routine Maintenance

Routine Maintenance

Routine vegetation management includes an annual patrol of vegetation growing near overhead distribution and transmission facilities. It also includes pruning or removal of trees that will not remain outside of required clearance distances or that may pose a hazard to electric facilities before the next year's patrol. Approximately 80% of the routine maintenance is pruning the trees to a clearance level dependent on voltage and regulations, and approximately 20% is removal of small in-growth or hazard trees. This activity focuses on tree work outside of the minimum clearance distances on distribution line sections that have a history of high numbers of tree-related outages. This activity affects larger portions of the tree than other routine vegetation maintenance work. The goal is to increase public safety and reliability by reducing the number of outages by preventing power line contacts from tree or branch failures. PG&E prioritizes the distribution line sections that have the worst performance, as measured by either a high number of customers who have been without power or a high number of repeat outages. Once a line section is prioritized, personnel analyze the outage data to determine the pattern of tree decay that has historically caused

[3] General Order 95, Rule 35, including associated exhibits. Further, clearance distances take into account the growth rate of the vegetation in a year's time so that PG&E has to perform maintenance only annually, pruning clearances include the average growth rate in the clearance calculations. For example, in vegetation with a clearance distance of 4 feet and tree growth rate of 8 feet in 1 year, PG&E will clear 12 feet so that the clearance distance will be maintained after 1 year of growth.

vegetation-related outages and a vegetation-specific management prescription is written for trees along those line sections.

Enhanced Vegetation Management

This activity is currently focused on lines within high fire-threat areas, those noted as tier 2 or tier 3 on the CPUC fire threat maps. Work includes maintaining expanded clearances, eliminating overhanging branches and removing hazard trees to reduce fire risk and ensure system reliability, as well as creation of fire defense zones in partnership with customers.

E10b. Pole Clearing

PG&E performs pole clearing around subject poles on its overhead distribution and transmission facilities to maintain compliance with Public Resource Code Section 4292.

There are two subcategories of pole clearing: maintenance of previously cleared poles and maintenance of poles that have never been cleared of vegetation. PG&E implements both subcategories of cleaning annually. Vegetation clearing for existing poles applies to vegetation that has grown over the course of the year (i.e., grasses, forbs, saplings, and branches). Vegetation clearing for new poles requires the removal of all vegetation within 10 feet of a pole that could propagate a fire. In some cases, because of vegetation regrowth, it is necessary to clear a pole more than once during a given season.

Approximately 115 new subject poles are cleared of vegetation in a 10-foot radius around the pole annually in natural vegetation.

E10c. Tree Removal—Small Groups

When appropriate—considering tree species, growth rates, site conditions, landowner notification, and appropriate permits—PG&E removes small groups of trees growing below overhead transmission and distribution facilities while conducting routine maintenance activities (E10a). Trees are removed in groups affecting approximately 0.1 acre (4,350 square feet) at approximately 30 locations each year. Trees are cut off at ground level, with the roots and stump left in place.

E10d. Tree Removal—ROW Clearing

PG&E uses an integrated vegetation management program to manage incompatible vegetation (tall-growing plant communities) and maintain low-growing diverse plant communities that are compatible with transmission ROWs. Properly maintained ROWs are essential for ensuring the safety of the public and workers, minimizing vegetation-related outages, providing access for the inspection and maintenance of facilities, and ensuring the timely restoration of service during emergency conditions. PG&E vegetation management staff prioritizes lines and line sections to be worked annually. Prioritization is based on a NERC-regulated line, line criticality, level of risk of an outage, vegetation density, and property ownership. Goals of transmission ROW vegetation management also include protecting the transmission system in the event of a fire, as well as preventing vegetation-caused fires.

NERC requires transmission owners to have a documented Transmission Vegetation Management Plan (TVMP). The TVMP needs to describe how transmission owners conduct work on their applicable active transmission line ROWs to prevent sustained outages due to vegetation coming into contact with conductors and causing vegetation-related outages leading to blackouts or

cascading outages (Standard FAC-003-2). Compliance with the standard is mandatory, and if a transmission owner allows vegetation to encroach into the Minimum Vegetation Clearance Distance ("imminent threat"), steep fines can be levied. PG&E's TVMP is associated with ROWs for its critical transmission lines, which operate at 200 kV or above, and ROWs for some transmission lines that operate at less than 200 kV.

The first step of the integrated vegetation management program is to clear the ROW of incompatible vegetation (e.g., any vegetation growing within the ROW that has the potential to grow or fall into PG&E minimum clearance distances). ROW clearing typically is accomplished either mechanically or manually. However, because cutting or mowing can stimulate resprouting of incompatible vegetation, PG&E vegetation management staff monitors the ROW for resprouting and reinvasion by incompatible vegetation. When resprouting and reinvasion does occur, staff manages the ROW to achieve the desired outcome. A number of factors are considered in selecting and implementing the appropriate management method or methods.

This covered activity is defined by those instances in which vegetation management is necessary as a distinct and separate action. The long-term goal of an integrated vegetation management program in the transmission ROW is to convert tall-growing plant communities to low-growing communities. Low-growing shrubs, grasslands, or plants are preferred at the belly of the span, which is the middle 50% of the line between towers or poles. Vegetation may be taller near towers. Management toward low-growing communities can be accomplished over a period of many years by selectively controlling incompatible plants while preserving low-growing shrubs, grasses, and plants. With proper management, the low-growing vegetation eventually can dominate the ROW and suppress the growth of the tall-growing vegetation, thereby reducing the need for future treatments.

ROW management is based on the concept of creating wire zones and border zones. The *wire zone*, which comprises the ROW area beneath the transmission wire plus 10 feet on either side, is managed for low-growing shrub-forb-grass plant communities (early successional). The *border zone*, which extends from the wire zone to the edge of the ROW, is managed for taller shrubs and brush communities (transition zone). This management concept is depicted in Figure 3-1.

At approximately 12 locations per year, PG&E removes 1 mile of vegetation in a 25-foot-wide area under the belly of the span and prunes the remaining vegetation in a 75-foot-wide area along all transmission lines from 115 kV to 500 kV. This estimated area is based on an assumption that PG&E removes most trees from under the belly of the span, and, depending on clearance requirements, leaves the trees near towers. In riparian areas, vegetation management is anticipated to be more targeted. Riparian vegetation clearing is not expected to extend beyond 1,000 feet in one continuous area, and 1,000 feet of clearing is anticipated only once every 3 to 5 years. Riparian removals for this activity are illustrated in Figure 3-2 and Figure 3-3. Low-growing trees that stay below the clearance distance height are compatible and are retained. If the trees are incompatible, then they will be removed; however, the compatible understory vegetation will be retained.

E10e. Tower Cage Clearing

PG&E performs vegetation management around poles and towers on its overhead transmission facilities to maintain the visibility necessary to inspect the footings for structural. Managing vegetation around poles and towers also keeps the interior of the tower clear of woody vegetation. Vegetation management includes patrol of poles and towers and removal of all trees, tree seedlings, and any material that obstructs the ability to visually inspect the tower and pole footings. The work

is scheduled throughout the year and the work type depends on the plant material to be removed. Vegetation management involves cutting vegetation with string trimmers or chainsaws.

PG&E performs this activity approximately 90 times a year. Approximately 10% of the time (nine times annually), vegetation is pruned or removed within a 1,600-square-foot area.

E10f. Fee Strip Maintenance

To comply with city and county ordinances for fuels reduction and beautification, PG&E performs weed abatement work on PG&E-owned land under electric transmission facilities approximately once a year along a 1-mile ROW corridor. Work type and timing varies depending on requirements defined in each local ordinance. Ongoing vegetation management includes removing material by chemical, mechanical, or physical methods, depending on the site conditions, environmental considerations, types of vegetation, and size of the area. Methods may include mowing, discing, and the use of string trimmers.

3.3.3.12 E11. Wood Pole Test and Treat

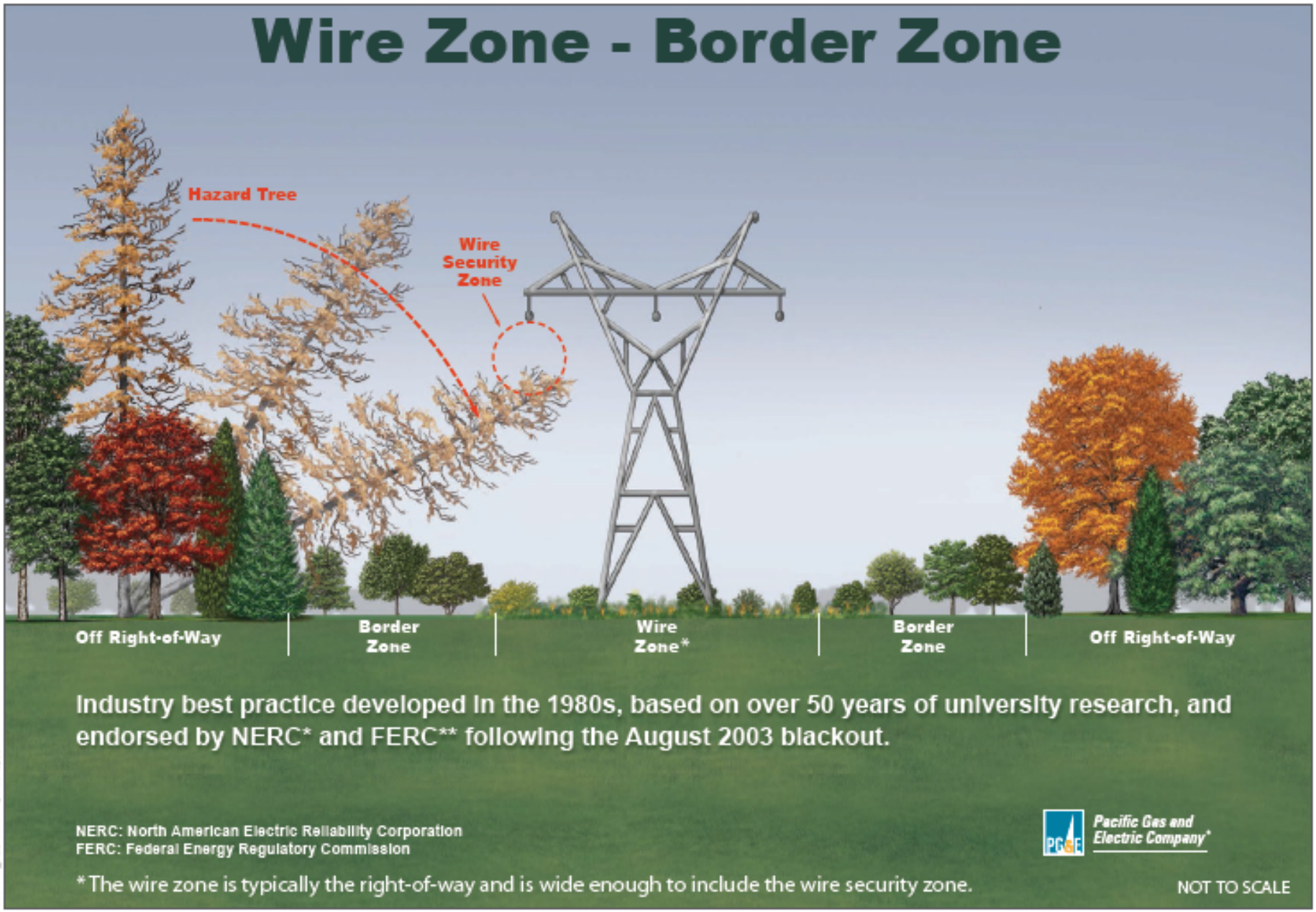
E11a. Inspection and Maintenance

PG&E identifies the line segments for inspection and testing based on age and condition. Staff evaluates all transmission and distribution wood poles that are at least 10 years old to determine whether they are suitable candidates for replacement, trussing, stubbing, or fiber-wrapping. Within a 3-foot radius around the pole, construction crews excavate 20 inches of soil and bore a minimum of three $^{9}/_{16}$-inch holes at 45° angles to the axis of the pole. Each successive boring is 120° to the right and 12 inches above the previous bore. The shell thickness and circumference of the pole are used to determine whether the pole is a candidate for replacement or reinforcement.

Inspection and maintenance occurs frequently, roughly 60,000 times per year. Approximately 10% (7,000) of these poles are in non-urban areas. The excavation of soil within the 3-foot radius of the existing pole results in disturbance.

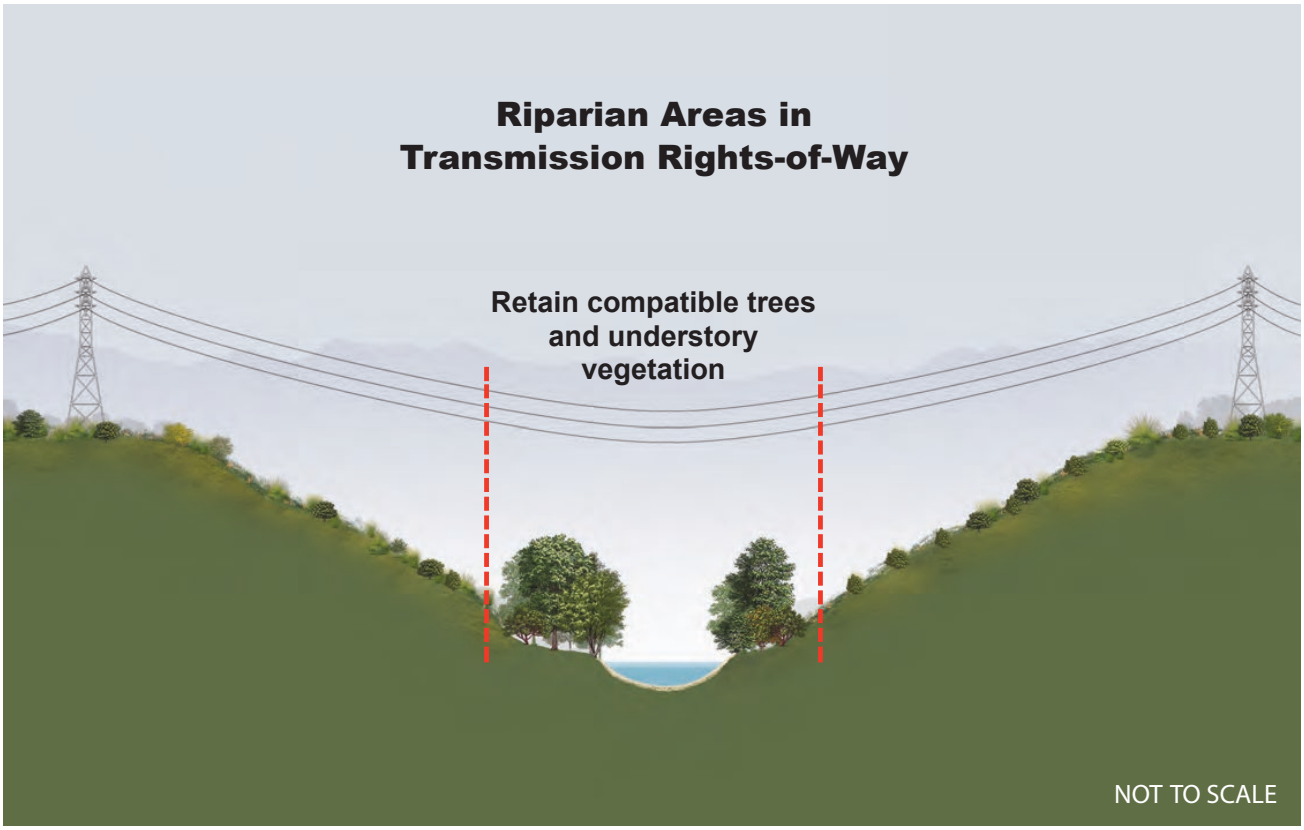
E11b. Reinforcement

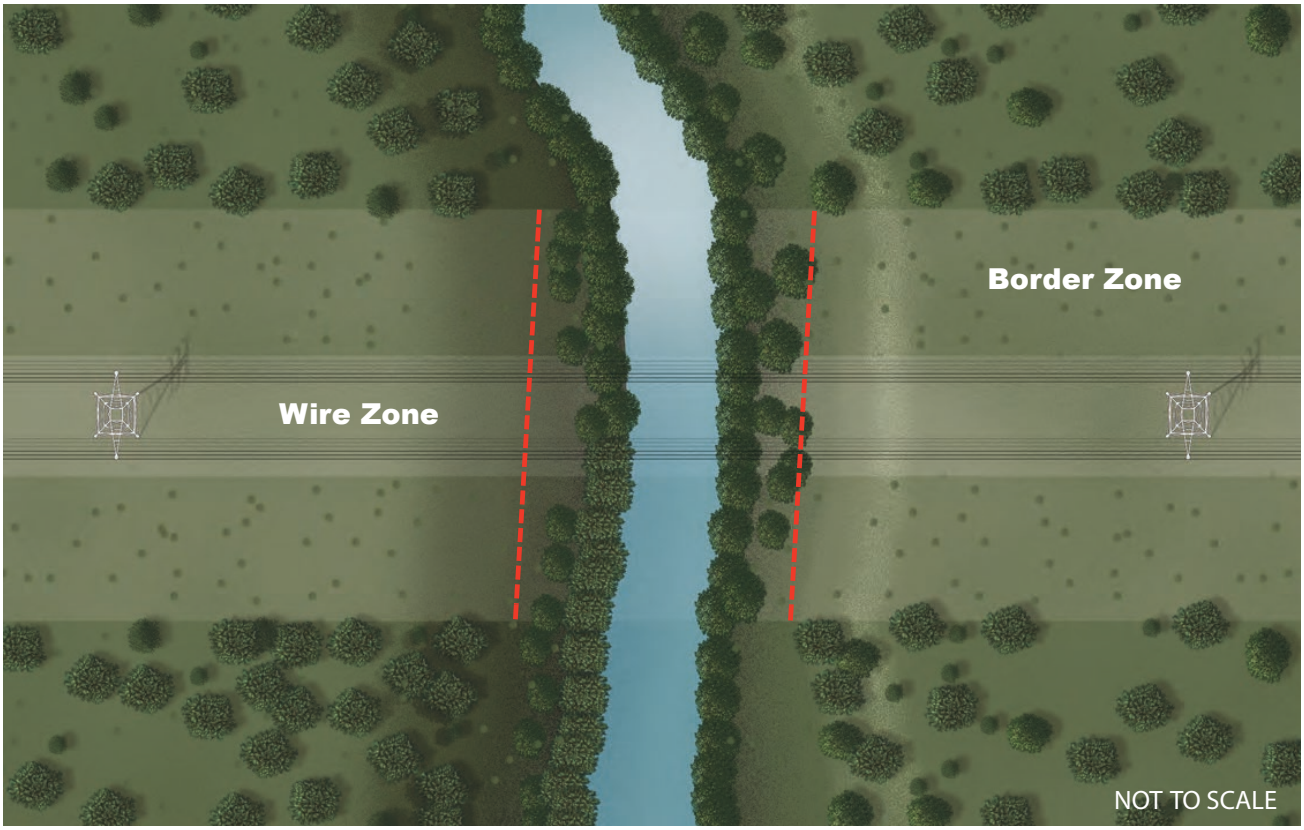
Approximately 200 poles (or 3% of the 7,000 wood poles in non-urban areas) that PG&E inspects will need reinforcement annually. Staff determines the type of reinforcement method—stubbing or trussing—after reviewing the testing results of an inspected line segment. Stubbing and trussing entail driving or setting a short steel truss or wood pole into the ground and attaching it to the existing pole to provide the support originally afforded by the pole butt. Fiber-wrapping is performed on poles that are not candidates for trussing or replacement. This entails fiber-wrapping the pole at or below ground level with a material that has been impregnated with preservatives to retard external deterioration of the pole. Excavation of soil within the 6-foot radius of the existing pole results in disturbance.



0084717_PGE-MR HCP 01-06-15 SS

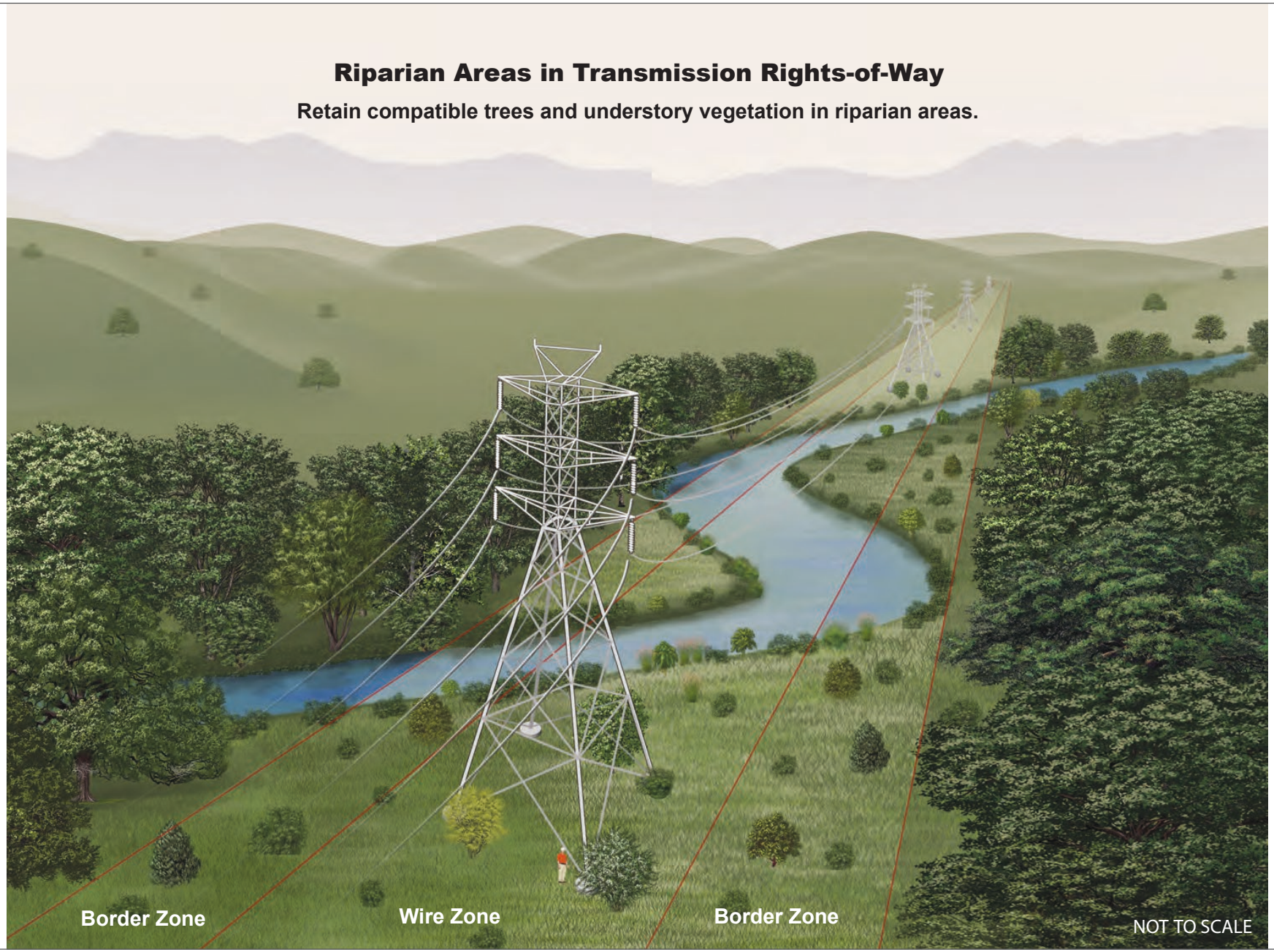
Figure 3-1
Wire Zone/Border Zone ROW Management Concept





00647.17_PGE-MRHCP (01-08-15) SS

Figure 3-2
Vegetation Management for Transmission Lines Perpendicular to Riparian Areas



00647.17_PGE-MRHCP (01-08-15) SS

Figure 3-3
Vegetation Management for Transmission Lines Parallel to Riparian Areas

3.3.4 Minor New Construction Covered Activities

3.3.4.1 E12. New Distribution and Transmission Line Construction or Relocation

To provide additional service to customers in approved developments, 2-mile extensions of distribution and transmission lines on new wood poles or light-duty steel poles are installed approximately twice a year. Each line extension requires the following.

- Approximately 15 wood or directly embedded light-duty steel or self-supporting steel poles per mile. Each work site is approximately 10 feet by 10 feet.
- A pull site of approximately 50 feet by 50 feet, or similar to the site necessary for electric line reconductoring.
- A staging area of approximately 75 feet by 75 feet.

Access to the new transmission or distribution section may require construction of a new 10- by 1,000-foot unsurfaced access road. Similarly, degraded or eroding access roads may need to be repaired or replaced.

Once construction crews survey and stake the centerline for the new line, pole sites, pull sites, access roads, and laydown areas are cleared, if necessary. PG&E uses a machine auger to excavate the site of the new pole and any necessary anchor holes. The width and depth of the setting hole depend on the size of the pole, soil type, span, and wind loading. Typically, minimum pole-setting depths range from 4 to 14 feet.

Poles are framed (cross arms, pins, insulators, grounds, bonding, markers), and any equipment is installed. Any anchors and guys are installed before the pole is set. After the pole is set, conductors are strung (see Section 3.3.3.8, *E8a. Pole and Equipment Repair and Replacement*, and Section 3.3.3.9, *E8b. Utility/Wood Pole Replacement*).

3.3.4.2 E13. Tower Line Construction

To provide additional service to customers, approximately twice a year during the permit term PG&E may construct up to 2 miles of new transmission lines as an extension from existing transmission lines. These extensions may be constructed in natural vegetation and on agricultural lands that contain suitable habitat for covered species. These new lines will be supported by steel-lattice towers, light-duty steel poles, or tubular steel poles (TSPs) with concrete foundations. Each line requires the following.

- A new ROW (maximum of 200 feet wide) no longer than 2 miles.
- Approximately 10 towers, each requiring an approximately 25-foot by 100-foot work site.
- Three pull sites with an average size of 50 feet by 150 feet.
- A laydown area of approximately 100 feet by 100 feet.

Once survey crews stake the centerline for the new line, tower sites, pull sites, access roads, and laydown areas, construction of the new line can begin. Crews excavate an area of 25 by 100 feet for the foundation and concrete footings are poured. A crane or helicopter is used to erect the tower,

depending on the tower type. After the tower is erected, conductors are strung (see Section 3.3.3.10, *E9. Electric Line Reconductoring*).

3.3.4.3 E14. Minor Substation Expansion

Substations typically are constructed close to residential, commercial, or industrial development but may be located in natural vegetation. Minor substation expansions under the MRHCP will typically be limited to an average of approximately 3 acres per substation. However, in some cases, the expanded substation footprint may require up to 10 acres of permanent vegetation removal. This construction footprint is required to accommodate the latest engineering designs for breakers and buses, and transformers. Additional spacing is required for facility and worker safety. The expansion area also may be used for setbacks, landscaping, and access. PG&E grades, paves, or surfaces the substation sites and fence the area for safety and security reasons. PG&E typically owns excess land around each substation to accommodate growth, improvements, or modifications.

The MRHCP assumes a maximum of 10 electric substation expansions over the permit term in undisturbed areas.

3.3.4.4 E15. Underground Line Construction

Underground line construction is conducted almost exclusively in urban settings. For both transmission and distribution lines, underground cable installation is accomplished using a cut-and-cover construction method (open trenching) for the underground power line, duct banks, and splice vaults. For this activity, the construction specifications for a 115 kV transmission line were considered as the average size; however, construction area dimensions vary with the voltage capacity of the line and are frequently smaller than those necessary for constructing a 115 kV line. Although this width varies, typically, a minimum access width of 65 feet is required to allow for the trench excavation and construction of the duct bank. The covered activity construction area length varies based on the length of the line. During construction, trench excavation spoil is removed and stored. If hazardous material is present, construction crews haul the material offsite and dispose of it appropriately. PG&E constructs underground line about once every 5 years.

Duct Bank Installation

As the trench for the underground cable is completed, crew installs the cable conduit, reinforcement bar, ground wire, and concrete conduit encasement duct bank. The duct bank typically consists of polyvinyl chloride (PVC) conduits that contain the underground cables.

The typical trench dimensions for installation of a single circuit are approximately 3 feet wide by 5 feet deep; however, trench depths vary, depending on soil stability and the presence of existing substructures. Dewatering, if necessary because of a high groundwater table, is conducted using a pump to remove water from the trench. Construction crews then pump the water into baker tanks and haul it away for proper disposal.

Once the PVC conduits are installed, thermal-select or controlled backfill is imported, placed, and compacted. A road base backfill or slurry concrete cap then is installed.

Vault Installation

Vaults are installed in urban areas within public utility easements at intervals that vary with the voltage capacity of the conductor. The vaults are used initially to pull the cables through the conduits and splice cables together. During operation, vaults provide access to the underground cables for maintenance inspections and repairs. Vaults are constructed of prefabricated steel-reinforced concrete and are typically about 20 feet long, 10 feet wide, and 8 feet deep. The total excavation footprint for a vault is typically about 22 feet long, 12 feet wide, and 10 feet deep.

Cable Pulling, Splicing, and Termination

After installation of the conduit, cables are installed in the duct banks. Each cable segment is pulled into the duct bank, spliced at each of the vaults along the route, and terminated at the bus structures (switchboard) inside the switchyards. To pull the cable through the duct bank, a cable reel is placed at one end and a pulling rig is placed at the other. With a fish line, a larger wire rope is pulled into the duct. The wire rope is attached to cable-pulling eyes for pulling. To ease pulling tensions, a lubricant is applied to the cable as it enters the duct. Cables are spliced at vaults after they are completely pulled through the ducts. A splice trailer is positioned directly above the vault manhole openings for each access. At each end, cables will rise out of the ground on a transition pole and terminate at a bus structure in the switchyards.

Special Construction Methods

To minimize surface disturbance, horizontal directional drilling is the preferred method for conduit installation (see Section 3.2.2.7, *Crossings*).

3.4 Other Covered Activities

3.4.1 Biological Surveys and Handling

PG&E's personnel or its contractors will perform biological surveys for covered species in hot zones and for large activities. The individuals conducting the surveys will have the qualifications specified in USFWS survey guidelines (U.S. Fish and Wildlife Service 2005; U.S. Fish and Wildlife Service and California Department of Fish and Game 2003) or as otherwise approved by USFWS. If surveys require physical capture and immediate release of covered species, such as California tiger salamander, California red-legged frog and giant garter snake, an *authorized* biologist will be used. A biologist is person who has the educational background, training, and work experience (handling experience or permits) required to perform a specific biological task. For the purposes of this HCP, the term *biologist* also applies to a botanist, where applicable, for specific plant-related tasks. An *authorized* biologist, is a PG&E biologist or PG&E biological contractor, who is authorized to handle, relocate, or translocate a covered species after being approved by USFWS. Approval will be granted by USFWS, as appropriate, as part of the take authority in the Section 7 Biological Opinion on the HCP. Such activities are considered take under the ESA and require permit coverage. Biologists will also conduct surveys for covered species on private land within the study area being considered for purchase to provide mitigation of impacts on covered species. Although these surveys are not expected to require handling of individuals in most instances, incidental take of covered species may

result if handling is needed or if individuals are killed by vehicle strikes. Such surveys and take will be covered by the permit.

3.4.2 Management of Lands Purchased or Conserved for Mitigation

PG&E may have an ongoing obligation to manage mitigation lands where it holds title in fee. In the course of conducting standard maintenance and monitoring under a USFWS-approved management plan, take could result. The MRHCP will cover management activities (e.g., fencing, surveying, conducting pre-activity biological surveys, conducting habitat enhancements, driving on these lands) and the potential for take, including management activities carried out by any independent land manager with whom PG&E has contracted to perform such activities on PG&E's behalf. Further, restoration actions on conservation lands may also result in impacts that will provide a long-term improvement of species' habitat. One to five acres of disturbance per year is anticipated.

Chapter 4
Covered Species Impact Analysis

***Summary**: This chapter estimates the impacts of covered activities on covered species and their habitats within the Plan Area, which is a subset of the study area. The Plan Area consists of the three regions in 34 counties where PG&E would perform covered activities. This chapter details the approach used to calculate the proportional extent of impacts in acres for each covered activity across the Plan Area, and evaluates the potential for covered activities to result in temporary and permanent loss of covered species' habitat.*

4.1 Impact Definition and Analytical Methods

This section defines use of terms that will commonly be used throughout this chapter and outlines methods used to prepare data for analysis and discussion of when, where, and how covered activities translate to impacts on covered species.

4.1.1 Impact Definition

Throughout this chapter, use of the term *impact* refers to consequences (or effects) on a plant or wildlife resource that would result from covered activities, including any short-term or long-term changes to habitat. *Impact*, as defined here, is meant to include *take* of individual wildlife species, as defined by ESA regulations, or damage or removal of plants. *Take*, as defined by ESA regulation, does not apply to plants. Although individuals of the species can be directly impacted by O&M activities, as discussed later in this chapter, impacts on habitat are more common and, because of the difficulty of detecting many of the covered species, use of acreage as a means of estimating and evaluating such impacts provides a more reliable approach.

Impacts associated with covered activities were categorized as causing *permanent habitat loss* or *temporary habitat loss*. The distinction between the two involves the time required for habitat functions and values to return to baseline conditions and whether a covered activity results in installation of new facilities or the expansion of the footprint of an existing facility or structure.

Permanent habitat loss would result from any of the following activities or conditions.

- New facilities located in a new right-of-way (ROW) (i.e., minor new construction).
- Conversion of the existing land cover for a covered species to a developed land cover or to a habitat that would no longer be usable by a covered species.
- Any activity that causes an impact lasting more than 12 months.
- ROW expansion or management that results in land cover conversion.
- A long-term, substantial increase in the frequency and magnitude of covered activity impacts such that the habitat is no longer available to the species.

Covered activities that could result in permanent habitat loss include gas pipeline maintenance and replacement, substation expansions, some vegetation management activities (e.g., ROW clearing), and construction of new permanent access roads where existing roads cannot be utilized or restored. These activities are discussed in detail in Chapter 3, *Covered Activities*. Permanent impacts

on plants are defined as absence of the plant after the restoration period has ended or for more than 1 year after it is impacted.

Temporary habitat loss is attributed to covered activities that involve excavation, grading, equipment staging, or stockpiling of soil that alters existing vegetation, soils, topography, and hydrology for a period of days, weeks, or months, but no longer than 12 months. Although these activities may have an impact on habitat values for covered species, impacts on habitat are temporary in nature and allow habitat functions and values to return within a year. Temporary impacts on plants are defined as pruning or temporarily removing topsoil and seedbank, where plants recover. Temporary impacts on habitat are expected to result in take, both direct and indirect, of individuals of the covered species.

4.1.2 Analytical Methods

In order to quantify and estimate habitat and species impacts, as well as assess the likelihood of take for each covered species that could result from covered activities, PG&E completed the following steps, relying extensively on GIS analysis:

1. For each covered activity, impact estimates were calculated based on the extent or area (in acres) required to complete the activity. The expected annual frequency at which each activity was determined and annual totals were classified as either temporary or permanent, based on the nature of the covered activity.
2. The extent of modeled habitat in each region of the Plan Area was determined for each covered wildlife species.
3. The extent of possible impacts (temporary and permanent) on habitat for covered wildlife species in each region was determined for each of PG&E's four major utility infrastructure types—Electric Transmission (ET), Electric Distribution (ED), Gas Transmission (GT), and Gas Distribution (GD)—using estimated annual totals from step 1 (above), based on the proportion of the facility corridor acreage coinciding with modeled habitat.
4. Annual impact estimates (temporary and permanent) were revised using qualitative criteria.
5. For covered species with designated critical habitat, revised annual impact totals (in acres) were used to estimate amounts of critical habitat that could be impacted in each region.
6. Potential impacts on covered plant species were estimated using CNDDB record review and analysis of aerial photographs of known populations.

Each of these components is discussed in further detail in the subsequent sections of this chapter, where relevant data are presented.

4.1.3 Covered Activity Impact Calculations in the Plan Area

To determine the extent of possible impacts that could result from covered activities in the Plan Area, the area required to complete each covered activity was calculated. These totals were classified as either a temporary impact, a permanent impact, or apportioned between the two, depending on the nature of the activity, as described in Chapter 3, *Covered Activities*. By multiplying the anticipated annual frequency at which covered activities could be implemented in the Plan Area, the total number of acres required to complete annual covered activities for the gas and electric system in the Plan Area was determined (Table 4-1); activity frequencies and required work areas are averages

and can be larger or smaller than shown in the table. Annual impacts were summed for activities on gas and electric facilities to establish annual permanent and temporary totals useful in further modeling and impact calculations. Totals from Table 4-1 were multiplied by the proportion of facilities (by type) within each region (Table 4-2) to arrive at annual impact estimate totals by facility type for each region (Table 4-3). The annual impact totals represent the average extent of impacts distributed evenly throughout the Plan Area, which could occur in urban areas, roads, or other development, as well as habitat.

Table 4-1. Estimated Acreages Impacted by MRHCP Covered Activities in the Plan Area

Activity	Annual Frequency[a]	Estimated Permanent Impacts		Estimated Temporary Impacts	
		Impacts per Activity[b] (acres)	Annual Impacts (acres)	Impacts per Activity[b] (acres)	Annual Temporary Impacts (acres)
Gas					
G1. Patrols[c]	1	–	–	–	–
G2. Inspections[c]	1	–	–	–	–
G3a. Remedial Maintenance – Fencing	12	0.06	0.72	0.06	0.72
G3a. Remedial Maintenance – ERCON Mats	2	0.15	0.3	0.5	1.0
G3b. Internal Pipeline Inspection	58	–	–	0.06	3.48
G4. Compressor Station Upgrades and Maintenance	2	–	–	0.28	0.56
G5. Pipeline ETS Installations	8	–	–	0.06	0.48
G6. Valve Maintenance	6	–	–	–	–
G7. Valve Maintenance – Replacement or Automation	18	–	–	0.57	10.26
G8. Pipeline Cathodic Protection	100	–	–	0.02	2.0
G9. Pipeline Lowering	1	–	–	4.26	4.26
G10. Pipeline Coating Replacement	1	–	–	2.42	2.42
G11. Pipeline Replacement	18	1.0	18	3.0	54.0
G12. Telecom Site Maintenance	2	–	–	0.34	0.68
G13a. Pipeline ROW Vegetation Mgmt.	12	2.1	25.2	5.1	61.2
G13b. Pipeline Access Road Management	6	0.51	3.06	2.05	12.3
G14. Gas Pressure Limiting Station Con.	1	0.55	0.55	1.0	1.0
G15. New Customer Pipeline Installation	2	2.42	4.85	0.06	0.12
Subtotal Gas			**52.7**		**154.5**
Electric					
E1. Patrols[c]	1	–	–	–	–
E2. Inspections[c]	1	–	–	–	–
E3. Insulator Washing or Replacement	1.2	–	–	0.002	0.002
E4. Substation Maintenance	1.2	–	–	0.46	0.55
E5. Outage Repair	600	–	–	0.01	6
E6a. Tower Replacement or Repair (including attachments)	468	0.001	0.47	0.02	9.36
E6b. Boardwalk Repair and Replacement	18	–	–	–	0.03
E7. Facility Installations (Shoo-Fly)	120	–	–	0.06	7.2
E8a. Pole Equipment Repair/Replacement	570	–	–	0.0016	0.93–

Activity	Annual Frequency[a]	Estimated Permanent Impacts		Estimated Temporary Impacts	
		Impacts per Activity[b] (acres)	Annual Impacts (acres)	Impacts per Activity[b] (acres)	Annual Temporary Impacts (acres)
E8b. Utility/Wood Pole Replacement	570	–	–	0.0016	0.93
E9a. Line Reconductoring – Transmission	12	0.036	0.43	21.36	256.4
E9b. Line Reconductoring – Distribution	285	–	–	–	0.65
E10a. Veg. Mgmt.—Routine Maintenance	24	0.2	4.8	–	–
E10b. Veg. Mgmt.—Pole Clearing	114	–	–	–	–
E10c. Veg. Mgmt.—Removal Activities	30	0.10	3	–	–
E10d. Veg. Mgmt.—Transmission Vegetation/ROW Management	12	3.03	36.36	1.88	22.56
E10e. Cage Clearing—Electric Transmission Structures	9.6	–	–	0.04	0.38
E10f. Fee Strip Maintenance—Electric Transmission Line ROW	1.2	–	–	3.03	3.64
E11a. Wood Pole Test and Treat—Inspection and Maintenance	6,840	–	–	0.0002	1.37
E11b. Wood Pole Test and Treat—Reinforcement	205.2	–	–	0.0008	0.16
E12. New Distribution and Transmission Line Construction or Relocation	2.4	0.23	0.55	0.25	0.6
E13. Elec. Tower Line Construction	2.4	0.29	0.70	0.26	0.62
E14. Minor Substation Expansion	0.4	3.00	1.2	–	–
E15. Elec. Underground Line Construction	0.24	–	–	0.30	0.07
Subtotal Electric			**47.5**		**310.8**
Total Gas and Electric			**100.2**		**465.3**

[a] These numbers represent the average annual frequency; the number of activities conducted annually will vary.

[b] These numbers represent the average area of impact; the impact area for an activity will vary. Activities with no values typically result in less than 0.001 acre of impact.

[c] Patrols and inspections are non-ground disturbing and occur on most facilities once per each year.

Table 4-2. Proportion of Facilities within Each Region of the MRHCP

	Sacramento Valley and Foothills	North Coast	Central Coast	Total
Electric Transmission	23%	5%	9%	37%
Electric Distribution	38%	8%	17%	63%
Subtotal				**100%**
Gas Transmission	37%	5%	12%	54%
Gas Distribution	35%	2%	9%	46%
Subtotal				**100%**

Table 4-3. MRHCP Annual Impact Estimates (acres) by Utility Infrastructure Type and Region

	Sacramento Valley and Foothills	North Coast	Central Coast	Total
Permanent				
Electric Transmission	11.0	2.3	4.2	17.4
Electric Distribution	18.2	3.8	8.1	30.1
Gas Transmission	19.5	2.7	6.5	28.7
Gas Distribution	18.2	1.3	4.5	24.0
Subtotal	**66.9**	**10.1**	**23.3**	**100.2**
Temporary				
Electric Transmission	71.7	15.0	27.3	114.0
Electric Distribution	119.4	24.7	52.8	196.8
Gas Transmission	57.1	8.0	18.9	84.1
Gas Distribution	53.3	3.8	13.3	70.4
Subtotal	**301.5**	**51.5**	**112.3**	**465.3**

4.1.4 Extent of Modeled Habitat in the Plan Area

To facilitate analysis of impacts on wildlife species, it was necessary to determine where covered species have the potential to occur within PG&E's Plan Area. A predictive habitat model was developed in cooperation with the USFWS and was useful in establishing agreement concerning which factors contribute to defining habitat for a particular species. This approach eliminates future debate about habitat quality, suitability, and/or occupancy. Where possible, PG&E drew from existing habitat modeling information, incorporating data from the following conservation planning efforts: *Natomas Basin Habitat Conservation Plan*, *Draft Western Placer County Conservation Program*, and *Yolo Habitat Conservation Plan/Natural Community Conservation Plan*. Where gaps remained, PG&E created habitat models in conjunction with USFWS, using an approach and analysis similar to that of the regional conservation planning efforts mentioned above. Species occurrence (i.e., occupancy) was extrapolated using a combination of CDFW's California Wildlife Habitats Relationship (CWHR) system and the CNDDB (see Table 2-3 in Chapter 2, *Environmental Setting*, for the source used to determine each species' range). Chapter 2, Section 2.3.1, *Covered Wildlife*, discusses the approach used to determine covered wildlife species' ranges in more detail. The habitat models include the land cover types that typically support the life-history needs of the species, but may overestimate habitat since they do not account for species density, barriers to movement, or microhabitat requirements. For example, for California tiger salamander, the habitat models include grasslands as suitable dispersal and upland habitat, irrespective of site-specific burrow densities, past ground impacts, or distance from stock ponds or vernal pools.

The total area (in acres) of modeled habitat for each covered wildlife species was calculated for the four major utility infrastructure groups—ET, ED, GT and GD—by MRHCP region (Table 4-4). The extent (acres) of modeled habitat within facility corridors was converted to a percentage of total area within each facility type corridor, for each region (Table 4-5).

4.1.5 Extent of Estimated Impacts in the Plan Area

To arrive at the extent of modeled habitat within a facility corridor of each region, the acres of modeled habitat within the facility corridor were divided by the acres of the total facility corridor (Table 4-6). PG&E multiplied the impact estimates by region (for both gas and electric, permanent and temporary) (Table 4-3) by the percentage of habitat in facility corridors (by species) within each region (Table 4-6), to arrive at an estimate of impacts by species (Table 4-7 and Table 4-8).

The wildlife habitat modeling and impact assessment process is graphically illustrated in Figure 4-1. To illustrate how impact estimates are derived, an example is shown below both for estimated permanent impacts and temporary impacts associated with annual gas transmission, electric transmission, gas distribution, and electric distribution activities in the Central Coast Region for California tiger salamander (Central California DPS) upland habitat.

Annual Permanent Impacts on California Tiger Salamander Upland Habitat in the Central Coast Region

Gas transmission impacts (6.5 acres) × percent habitat (42.7%) = 2.75 acres

Electric transmission impacts (4.2 acres) × percent habitat (29.92%) = 1.25 acres

Gas distribution impacts (4.5 acres) × percent habitat (12.99%) = 0.59 acres

Electric distribution impacts (8.1 acres) × percent habitat (17.69%) = 1.43 acres

Sum of gas and electric permanent impacts in Central Coast = **6.02** (Table 4-7)

Annual Temporary Impacts on California Tiger Salamander Upland Habitat in the Central Coast Region

Gas transmission impacts (18.9 acres) × percent habitat (42.7%) = 8.08 acres

Electric transmission impacts (27.3 acres) × percent habitat (29.92%) = 8.18 acres

Gas distribution impacts (13.3 acres) × percent habitat (12.99%) = 1.73 acres

Electric distribution impacts (52.8 acres) × percent habitat (17.69%) = 9.33 acres

Sum of gas and electric temporary impacts in Central Coast = **27.31** (Table 4-8)

Figure 4-1 illustrates the impact assessment process for California tiger salamander in the Central Coast Region. The quantitative analysis presents a worst-case scenario of what could result from covered activities on an annual basis (assuming all covered activities were planned and executed without the implementation of AMMs).

4.1.6 Qualitative Analysis to Revise Take Estimates in the Plan Area

To arrive at a final estimate of annual permanent and temporary impacts, and the overall take estimate for each covered species, PG&E reviewed the calculated estimates and proposed a decrease or increase in the acreages, to arrive at a final set of annual impacts and take estimates. These adjustments were based on the following considerations.

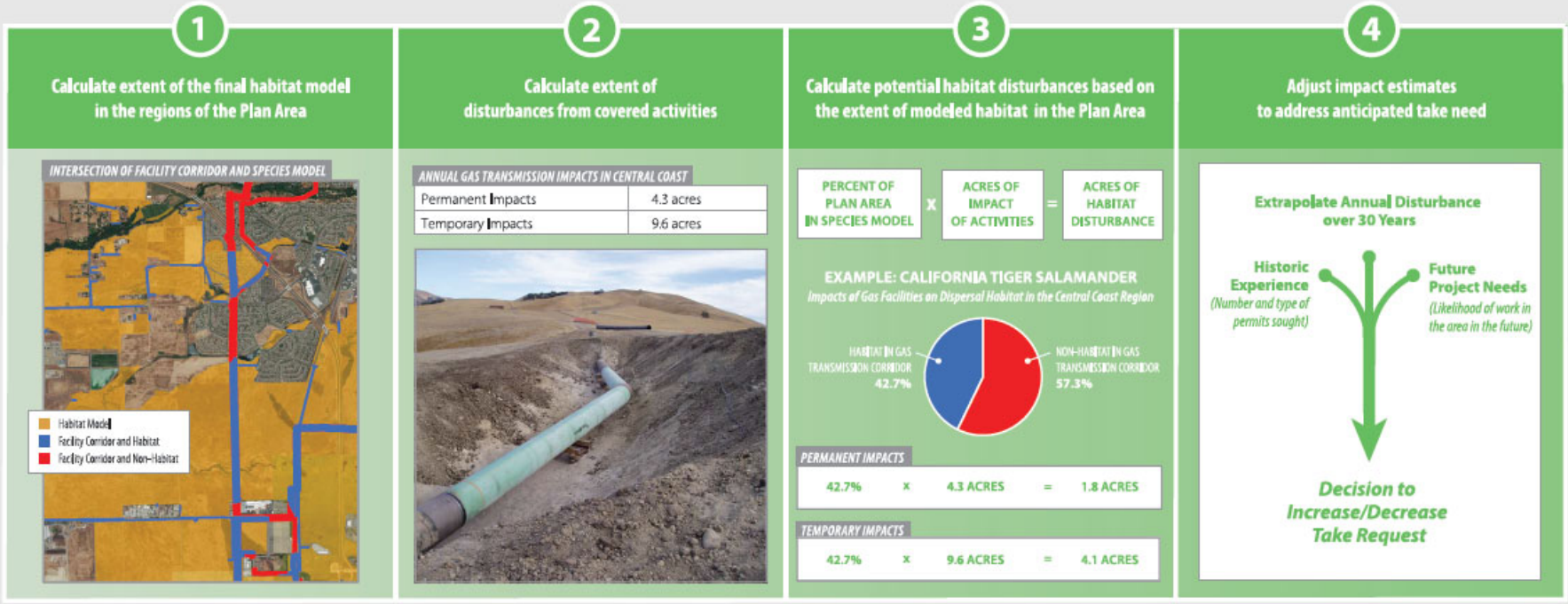


Figure 4-1
Process for Estimating Impacts on Covered Wildlife Species

- Past experience regarding annual impacts of covered species' habitat.
- Past experience obtaining permits for covered species.
- Estimated future need based on extent and range of modeled habitat (e.g., anticipated increase in vegetation management activities related to PG&E's *Community Wildfire Safety Program*).
- Proximity of facilities to habitat (e.g., facilities spanning habitat does not always indicate there will be impacts).
- Density of suitable habitat elements (i.e., host plants) within habitat.
- Avoidance and minimization measures that are likely to be implemented by PG&E planners and biologists.
- Discussion with USFWS regarding the status of the species.

Based on these considerations, the take request, in the form of permanent and temporary impacts on habitat by species, is shown in the *Proposed* columns of Tables 4-7, 4-8, and 4-9. Annual impacts were multiplied by 30 to account for the amount of impact that could result over the term of the HCP (i.e., over the next 30 years); this number was selected because long-term maintenance activities could be required over the next 30 years. These impacts are still likely to represent a worst-case analysis of take authorization, as PG&E has typically not caused this amount of habitat disturbance on an annual basis.

4.1.7 Designated Critical Habitat

Critical habitat is not required to be addressed under Section 10 of the ESA. The amount of requested habitat impact that could occur in critical habitat is presented in this chapter to facilitate USFWS review of the Section 10 permit application during its intra-Section 7 consultation on the issuance of an Incidental Take Permit. The acreage of impact likely to occur in designated or proposed critical habitat for each species was determined through a GIS-based analysis using the latest USFWS maps of critical habitat unit boundaries. PG&E facility location data layers were overlaid onto critical habitat layers to determine the extent of facility corridors in critical habitat. Using species-by-region totals from Tables 4-7, 4-8, and 4-9, the total covered activity impact (temporary and permanent impacts for each species, by region) for a given species was multiplied by the proportion of critical habitat to modeled habitat to calculate an overall estimate of the amount of habitat impact by covered activities that would occur in critical habitat over 30 years (Table 4-10). The potential maximum impacts on critical habitat are also included in the table and assume the unlikely scenario that all estimated impacts for a covered species in a given region occurred in critical habitat. Generally, impacts within specific critical habitat and individual critical habitat units are expected to be in proportion to the extent of the Plan Area within which that critical habitat unit is situated (Table 4-10 and Table 4-11).

This page was intentionally left blank.

Table 4-4. Extent of Modeled Habitat (acres) by Covered Species within Facility Corridors by MRHCP Region, Acres by Region

Species/Habitat	Modeled Habitat the Study Area	Sacramento Valley and Foothills				North Coast				Central Coast				Total			
		ET	ED	GT	GD	ET	ED	GT	GD	ET	ED	GT	GD	ET	ED	GT	GD
Aquatic Invertebrates																	
Conservancy fairy shrimp	106,581	832	757	621	50	–	–	–	–	–	–	–	–	832	757	621	50
Longhorn fairy shrimp	57,312	313	155	–	–	–	–	–	–	131	289	18	0	444	444	18	0
Vernal pool tadpole shrimp	614,418	5,992	2,220	2,794	226	–	–	–	–	315	1,131	619	11	6,307	3,351	3,413	238
Vernal pool fairy shrimp	614,418	5,992	2,220	2,794	226	–	–	–	–	315	1,131	619	11	6,307	3,351	3,413	238
Terrestrial Invertebrates																	
Morro shoulderband snail natural habitat	3,305	–	–	–	–	–	–	–	–	–	82	–	–	–	82	–	–
Morro shoulderband snail urban habitat	1,594	–	–	–	–	–	–	–	–	–	212	–	–	–	212	–	–
Mount Hermon (=barbate) June beetle	7,739	–	–	–	–	–	–	–	–	42	320	98	117	42	320	98	117
Ohlone tiger beetle	10,340	–	–	–	–	–	–	–	–	19	403	99	199	19	403	99	199
Valley elderberry longhorn beetle	108,640	906	1,393	572	126	–	–	–	–	–	–	–	–	906	1,393	572	126
Smith's blue butterfly	171,473	–	–	–	–	–	–	–	–	441	1,753	201	495	441	1,753	201	495
Zayante band–winged grasshopper	7,739	–	–	–	–	–	–	–	–	42	320	98	117	42	320	98	117
Amphibians																	
California red-legged frog breeding habitat	254,913	1,075	1,675	406	118	49	98	1	0	538	1,137	293	109	1,662	2,910	699	227
California red-legged frog upland habitat	1,014,440	4,148	7,656	949	248	279	630	35	0	2,522	4,874	1,012	319	6,949	13,161	1,996	567
California tiger salamander (Central California DPS) breeding habitat	75,491	741	83	159	40	–	–	–	–	40	61	37	9	781	145	196	49
California tiger salamander (Central California DPS) upland habitat	2,504,760	4,942	4,965	2,526	558	–	–	–	–	10,622	12,119	7,666	1,639	15,563	17,084	10,192	2,197
California tiger salamander (Santa Barbara County DPS) breeding habitat	194	–	–	–	–	–	–	–	–	2	4	–	–	2	4	–	–
California tiger salamander (Santa Barbara County DPS) upland habitat	212,150	–	–	–	–	–	–	–	–	1,306	2,027	–	–	1,306	2,027	–	–
Foothill yellow-legged frog breeding habitat	50,442	69	119	5	2	58	72	13	3	12	55	3	3	140	246	21	9
Foothill yellow-legged frog dispersal habitat	575,339	751	1,534	42	24	522	780	116	42	154	921	34	92	1,427	3,235	192	158
Mountain yellow-legged frog	19,444	–	16	–	–	–	–	–	–	–	–	–	–	–	16	–	–

Species/Habitat	Modeled Habitat the Study Area	Sacramento Valley and Foothills				North Coast				Central Coast				Total			
		ET	ED	GT	GD	ET	ED	GT	GD	ET	ED	GT	GD	ET	ED	GT	GD
Santa Cruz long-toed salamander breeding habitat	1,044	–	–	–	–	–	–	–	–	7	41	19	5	7	41	19	5
Santa Cruz long-toed salamander upland habitat	11,464	–	–	–	–	–	–	–	–	230	521	269	156	230	521	269	156
Sierra Nevada yellow-legged frog	185,618	70	124	–	–	–	–	–	–	–	–	–	–	70	124	–	–
Yosemite toad[a]	5,936	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Reptiles																	
Blunt-nosed leopard lizard suitable habitat	167,733	–	–	–	–	–	–	–	–	767	672	761	9	767	672	761	9
Blunt-nosed leopard lizard core habitat	477,623	–	–	–	–	–	–	–	–	2,421	1,137	452	8	2,421	1,137	452	8
Giant garter snake aquatic habitat—wetland and marsh	137,263	893	940	535	47	–	–	–	–	–	–	–	–	893	940	535	47
Giant garter snake upland habitat	167,751	2,454	2,353	1,739	213	–	–	–	–	–	–	–	–	2,454	2,353	1,739	213
Giant garter snake aquatic habitat—rice	444,185	3,610	1,836	2,848	51	–	–	–	–	–	–	–	–	3,610	1,836	2,848	51
Birds																	
Marbled murrelet	358,826	–	–	–	–	504	902	435	40	177	425	–	5	681	1,326	435	45
Northern spotted owl	5,525,990	812	286	275	19	7,579	9,608	2,773	683	–	–	–	–	8,391	9,895	3,048	702
Giant kangaroo rat	324,802	–	–	–	–	–	–	–	–	1,977	2,526	1,025	36	1,977	2,526	1,025	36
Point Arena mountain beaver	9,210	–	–	–	–	86	92	–	–	–	–	–	–	86	92	–	–
San Joaquin kit fox high-value suitable habitat	216,417	–	–	–	–	–	–	–	–	1,376	1,097	520	45	1,376	1,097	520	45
San Joaquin kit fox moderate-value suitable habitat	308,845	–	–	–	–	–	–	–	–	1,520	2,895	1,182	68	1,520	2,895	1,182	68
San Joaquin kit fox low-value suitable habitat	1,887,710	–	–	–	–	–	–	–	–	10,575	18,914	7,626	2,555	10,575	18,914	7,626	2,555

[a] Modeled habitat for this species is near the facility ROW but not within it in Tuolumne, Madera, Merced and Fresno Counties.

Table 4-5. Extent of Modeled Habitat by Covered Wildlife Species within Facility Corridors by MRHCP Region, as Percent of Total Corridor

	Sacramento Valley and Foothills				North Coast				Central Coast				Total			
Species/Habitat	ET	ED	GT	GD	ET	ED	GT	GD	ET	ED	GT	GD	ET	ED	GT	GD
Aquatic Invertebrates																
Conservancy fairy shrimp	0.89%	0.49%	1.15%	0.10%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.56%	0.30%	0.78%	0.07%
Longhorn fairy shrimp	0.34%	0.10%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.37%	0.42%	0.10%	0.00%	0.30%	0.17%	0.02%	0.00%
Vernal pool tadpole shrimp	6.44%	1.43%	5.15%	0.45%	0.00%	0.00%	0.00%	0.00%	0.89%	1.65%	3.45%	0.09%	4.31%	1.34%	4.28%	0.36%
Vernal pool fairy shrimp	6.44%	1.43%	5.15%	0.45%	0.00%	0.00%	0.00%	0.00%	0.89%	1.65%	3.45%	0.09%	4.31%	1.34%	4.28%	0.36%
Terrestrial Invertebrates																
Morro shoulderband snail natural habitat	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.12%	0.00%	0.00%	0.00%	0.03%	0.00%	0.00%
Morro shoulderband snail urban habitat	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.31%	0.00%	0.00%	0.00%	0.08%	0.00%	0.00%
Mount Hermon (=barbate) June beetle	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.12%	0.47%	0.55%	0.93%	0.03%	0.13%	0.12%	0.17%
Ohlone tiger beetle	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.05%	0.59%	0.55%	1.58%	0.01%	0.16%	0.12%	0.30%
Valley elderberry longhorn beetle	0.97%	0.90%	1.05%	0.25%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.61%	0.55%	0.72%	0.19%
Smith's blue butterfly	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	1.24%	2.56%	1.12%	3.93%	0.30%	0.69%	0.25%	0.74%
Zayante band-winged grasshopper	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.12%	0.47%	0.55%	0.93%	0.03%	0.13%	0.12%	0.17%
Amphibians																
California red-legged frog breeding habitat	1.16%	1.08%	0.75%	0.23%	0.25%	0.30%	0.01%	0.01%	1.52%	1.66%	1.63%	0.86%	1.12%	1.14%	0.88%	0.34%
California red-legged frog upland habitat	4.46%	4.94%	1.75%	0.49%	1.43%	1.97%	0.46%	0.01%	7.10%	7.11%	5.64%	2.53%	4.69%	5.15%	2.50%	0.85%
California tiger salamander (Central California DPS) breeding habitat	0.80%	0.05%	0.29%	0.08%	0.00%	0.00%	0.00%	0.00%	0.11%	0.09%	0.20%	0.07%	0.53%	0.06%	0.25%	0.07%
California tiger salamander (Central California DPS) upland habitat	5.31%	3.20%	4.66%	1.10%	0.00%	0.00%	0.00%	0.00%	29.92%	17.69%	42.70%	12.99%	10.51%	6.68%	12.77%	3.29%
California tiger salamander (Santa Barbara County DPS) breeding habitat	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.01%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
California tiger salamander (Santa Barbara County DPS) upland habitat	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	3.68%	2.96%	0.00%	0.00%	0.88%	0.79%	0.00%	0.00%
Foothill yellow-legged frog breeding habitat	0.07%	0.08%	0.01%	0.00%	0.30%	0.22%	0.17%	0.09%	0.04%	0.08%	0.01%	0.03%	0.09%	0.10%	0.03%	0.01%
Foothill yellow-legged frog dispersal habitat	0.81%	0.99%	0.08%	0.05%	2.68%	2.43%	1.52%	1.17%	0.43%	1.34%	0.19%	0.73%	0.96%	1.27%	0.24%	0.24%
Mountain yellow-legged frog	0.00%	0.01%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.01%	0.00%	0.00%
Santa Cruz long-toed salamander breeding habitat	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.02%	0.06%	0.10%	0.04%	0.00%	0.02%	0.02%	0.01%

	Sacramento Valley and Foothills				North Coast				Central Coast				Total			
Species/Habitat	ET	ED	GT	GD	ET	ED	GT	GD	ET	ED	GT	GD	ET	ED	GT	GD
Santa Cruz long-toed salamander upland habitat	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.65%	0.76%	1.50%	1.24%	0.16%	0.20%	0.34%	0.23%
Sierra Nevada yellow-legged frog	0.08%	0.08%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.05%	0.05%	0.00%	0.00%
Yosemite toad	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Reptiles																
Blunt-nosed leopard lizard suitable habitat	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	2.16%	0.98%	4.24%	0.07%	0.52%	0.26%	0.95%	0.01%
Blunt-nosed leopard lizard core habitat	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	6.82%	1.66%	2.52%	0.07%	1.64%	0.44%	0.57%	0.01%
Giant garter snake aquatic habitat–wetland and marsh	0.96%	0.61%	0.99%	0.09%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.60%	0.37%	0.67%	0.07%
Giant garter snake upland habitat	2.64%	1.52%	3.21%	0.42%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	1.66%	0.92%	2.18%	0.32%
Giant garter snake aquatic habitat–rice	3.88%	1.18%	5.25%	0.10%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	2.44%	0.72%	3.57%	0.08%
Birds																
Marbled murrelet	0.00%	0.00%	0.00%	0.00%	2.59%	2.81%	5.72%	1.11%	0.50%	0.62%	0.00%	0.04%	0.46%	0.52%	0.55%	0.07%
Northern spotted owl	0.87%	0.18%	0.51%	0.04%	38.94%	29.98%	36.44%	18.81%	0.00%	0.00%	0.00%	0.00%	5.67%	3.87%	3.82%	1.05%
Mammals																
Giant kangaroo rat	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	5.57%	3.69%	5.71%	0.29%	1.34%	0.99%	1.29%	0.05%
Point Arena mountain beaver	0.00%	0.00%	0.00%	0.00%	0.44%	0.29%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.06%	0.04%	0.00%	0.00%
San Joaquin kit fox high-value habitat	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	3.88%	1.60%	2.90%	0.36%	0.93%	0.43%	0.65%	0.07%
San Joaquin kit fox moderate-value habitat	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	4.28%	4.22%	6.58%	0.54%	1.03%	1.13%	1.48%	0.10%
San Joaquin kit fox low-value habitat	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	29.79%	27.60%	42.48%	20.25%	7.14%	7.40%	9.56%	3.82%

Table 4-6. Extent of Modeled Habitat by Covered Wildlife Species within Facility Corridors

	Acres of Modeled Habitat in Plan Area					Extent of Modeled Habitat within Facility Corridor (Acres of Modeled Habitat/Acres of Facility Corridor = Percent of Modeled Habitat in Facility Corridor)			
Species/Habitat	Elec. Dist. (A)	Elec. Trans. (B)	Gas Dist. (C)	Gas Trans. (D)	Total Plan Area	Elec. Dist. (A/255,578)	Elec. Tran. (B/148,030)	Gas Dist. (C/66,875)	Gas Trans. (D/79,796)
Invertebrates									
Conservancy fairy shrimp	757	832	50	621	2,260	0.30%	0.56%	0.07%	0.78%
Longhorn fairy shrimp	444	444	0	18	905	0.17%	0.30%	0.00%	0.02%
Vernal pool fairy shrimp	3,436	6,385	238	3,413	13,472	1.34%	4.31%	0.36%	4.28%
Vernal pool tadpole shrimp	3,436	6,385	238	3,413	13,472	1.34%	4.31%	0.36%	4.28%
Morro shoulderband snail	293	0	0	0	293	0.11%	0.00%	0.00%	0.00%
Mount Hermon June beetle	320	42	117	98	577	0.13%	0.03%	0.17%	0.12%
Ohlone tiger beetle	403	19	199	99	720	0.16%	0.01%	0.30%	0.12%
Valley elderberry longhorn beetle	1,393	906	126	572	2,997	0.55%	0.61%	0.19%	0.72%
Smith's blue butterfly	1,753	441	495	201	2,890	0.69%	0.30%	0.74%	0.25%
Zayante band-winged grasshopper	320	42	117	98	577	0.13%	0.03%	0.17%	0.12%
Amphibians and Reptiles									
California red-legged frog breeding habitat	2,910	1,662	227	699	5,497	1.14%	1.12%	0.34%	0.88%
California red-legged frog upland habitat	13,161	6,949	567	1,996	22,673	5.15%	4.69%	0.85%	2.50%
California tiger salamander (Central California DPS) breeding habitat	145	781	49	196	1,171	0.06%	0.53%	0.07%	0.25%
California tiger salamander (Central California DPS) upland habitat	17,084	15,563	2,197	10,192	45,036	6.68%	10.51%	3.29%	12.77%
California tiger salamander (Santa Barbara DPS) breeding habitat	4	2	0	0	6	0.00%	0.00%	0.00%	0.00%
California tiger salamander (Santa Barbara DPS) upland habitat	2,027	1,306	0	0	3,334	0.79%	0.88%	0.00%	0.00%
Foothill yellow-legged frog breeding habitat	246	140	9	21	417	0.10%	0.09%	0.01%	0.03%
Foothill yellow-legged frog dispersal habitat	3,235	1,427	158	192	5,012	1.27%	0.96%	0.24%	0.24%
Mountain yellow-legged frog	16	0	0	0	16	0.01%	0.00%	0.00%	0.00%
Santa Cruz long-toed salamander breeding habitat	41	7	5	19	71	0.02%	0.00%	0.01%	0.02%
Santa Cruz long-toed salamander upland habitat	521	230	156	269	1,176	0.20%	0.16%	0.23%	0.34%
Sierra Nevada yellow-legged frog	124	70	0	0	194	0.05%	0.05%	0.00%	0.00%
Yosemite toad	0	0	0	0	0	0.00%	0.00%	0.00%	0.00%

Species/Habitat	Acres of Modeled Habitat in Plan Area					Extent of Modeled Habitat within Facility Corridor (Acres of Modeled Habitat/Acres of Facility Corridor = Percent of Modeled Habitat in Facility Corridor)			
	Elec. Dist. (A)	Elec. Trans. (B)	Gas Dist. (C)	Gas Trans. (D)	Total Plan Area	Elec. Dist. (A/255,578)	Elec. Tran. (B/148,030)	Gas Dist. (C/66,875)	Gas Trans. (D/79,796)
Blunt-nosed leopard lizard suitable habitat	672	767	9	761	2,209	0.26%	0.52%	0.01%	0.95%
Blunt-nosed leopard lizard core habitat	1,137	2,421	8	452	4,019	0.44%	1.64%	0.01%	0.57%
Giant garter snake aquatic habitat—wetland and marsh	940	893	47	535	2,416	0.37%	0.60%	0.07%	0.67%
Giant garter snake upland habitat	2,353	2,454	213	1,739	6,758	0.92%	1.66%	0.32%	2.18%
Giant garter snake aquatic habitat—rice	1,836	3,610	51	2,848	8,345	0.72%	2.44%	0.08%	3.57%
Birds									
Marbled murrelet	1,326	681	45	435	2,488	0.52%	0.46%	0.07%	0.55%
Northern spotted owl	9,895	8,391	702	3,048	22,036	3.87%	5.67%	1.05%	3.82%
Mammals									
Giant kangaroo rat	2,526	1,977	36	1,025	5,565	0.99%	1.34%	0.05%	1.28%
Point Arena mountain beaver	92	86	0	0	177	0.04%	0.06%	0.00%	0.00%
San Joaquin kit fox high-value habitat	1,097	1,376	45	520	3,038	0.43%	0.93%	0.07%	0.65%
San Joaquin kit fox moderate-value habitat	2,895	1,520	68	1,182	5,665	1.13%	1.03%	0.10%	1.48%
San Joaquin kit fox low-value habitat	18,914	10,575	2,555	7,626	39,670	7.40%	7.14%	3.82%	9.56%

Table 4-7. Summary of Estimated Permanent Impacts and Requested Take for Covered Wildlife Species by Region (acres)

	Sacramento Valley and Foothills					North Coast					Central Coast					Plan Area	
	Calculated			Proposed		Calculated			Proposed		Calculated			Proposed		Total Proposed	
Species/Habitat	Annual Total	30-Year Total	Adjustment?[a]	Annual Total	30-Year Total	Annual Total	30-Year Total	Adjustment?[a]	Annual Total	30-Year Total	Annual Total	30-Year Total	Adjustment?[a]	Annual Total	30-Year Total	Annual Total	30-Year Total
Aquatic Invertebrates																	
Conservancy fairy shrimp	0.43	12.84	Decrease (a)	0.25	7.50	–	–	–	–	–	–	–	–	–	–	0.25	7.50
Longhorn fairy shrimp	0.06	1.65	Maintain	0.06	1.65	–	–	–	–	–	0.06	1.67	Maintain	0.06	1.67	0.11	3.32
Vernal pool fairy shrimp	2.05	61.55	Decrease (a)	1.00	30.00	–	–	–	–	–	0.40	11.90	Maintain	0.40	11.90	1.40	41.97
Vernal pool tadpole shrimp	2.05	61.55	Decrease (a)	1.00	30.00	–	–	–	–	–	0.40	11.90	Maintain	0.40	11.90	1.40	41.97
Terrestrial Invertebrates																	
Morro shoulderband snail	–	–	–	–	–	–	–	–	–	–	0.004	0.13	Increase	0.10	3.00	0.10	3.00
Mount Hermon (=barbate) June beetle	–	–	–	–	–	–	–	–	–	–	0.12	3.59	Increase	0.25	7.50	0.25	7.50
Ohlone tiger beetle	–	–	–	–	–	–	–	–	–	–	0.16	4.70	Increase	0.25	7.50	0.25	7.50
Valley elderberry longhorn beetle	2.63	78.93	Maintain	2.63	78.93	–	–	–	–	–	–	–	–	–	–	2.63	78.93
Smith's blue butterfly	–	–	–	–	–	–	–	–	–	–	0.51	15.25	Maintain	0.51	15.25	0.51	15.25
Zayante band-winged grasshopper	–	–	–	–	–	–	–	–	–	–	0.12	3.59	Maintain	0.12	3.59	0.12	3.59
Amphibians																	
California red-legged frog breeding habitat	0.51	15.35	Increase (b)	1.00	30.00	0.02	0.53	Increase (b)	0.10	3.00	0.34	10.24	Increase (b)	0.50	15.00	1.60	48.00
California red-legged frog upland habitat	1.82	54.58	Increase (b)	2.00	60.00	0.12	3.59	Increase (b)	0.25	7.50	1.35	40.46	Increase (b)	2.00	60.00	4.25	127.50
California tiger salamander (Central California DPS) breeding habitat	0.17	5.06	Maintain	0.17	5.06	–	–	–	–	–	0.03	0.85	Maintain	0.03	0.85	0.2	5.91
California tiger salamander (Central California DPS) upland habitat	2.27	68.22	Maintain	2.27	68.22	–	–	–	–	–	6.02	180.59	Maintain	6.02	180.59	8.29	248.81
California tiger salamander (Santa Barbara DPS) breeding habitat	–	–	–	–	–	–	–	–	–	–	0.001	0.02	Maintain	0.001	0.02	0.001	0.02
California tiger salamander (Santa Barbara DPS) upland habitat	–	–	–	–	–	–	–	–	–	–	0.39	11.77	Maintain	0.39	11.77	0.39	11.77
Foothill yellow-legged frog breeding habitat	0.02	0.75	Maintain	0.02	0.75	0.02	0.64	Maintain	0.02	0.60	0.01	0.30	Maintain	0.01	0.30	0.06	1.69
Foothill yellow-legged frog dispersal habitat	0.29	8.78	Maintain	0.29	8.78	0.21	6.30	Maintain	0.21	6.30	0.17	5.15	Maintain	0.17	5.15	0.67	20.23
Mountain yellow-legged frog	0.002	0.06	Increase	0.02	0.60	–	–	–	–	–	–	–	–	–	–	0.02	0.60
Santa Cruz long-toed salamander breeding habitat	–	–	–	–	–	–	–	–	–	–	0.01	0.42	Increase (b, c)	0.10	3.00	0.10	3.00
Santa Cruz long-toed salamander upland habitat	–	–	–	–	–	–	–	–	–	–	0.24	7.23	Increase (b, c)	0.50	15.00	0.50	15.00
Sierra Nevada yellow-legged frog	0.02	0.68	Maintain	0.02	0.68	–	–	–	–	–	–	–	–	–	–	0.02	0.68

	Sacramento Valley and Foothills					North Coast					Central Coast					Plan Area	
	Calculated			Proposed		Calculated			Proposed		Calculated			Proposed		Total Proposed	
Species/Habitat	Annual Total	30-Year Total	Adjustment?[a]	Annual Total	30-Year Total	Annual Total	30-Year Total	Adjustment?[a]	Annual Total	30-Year Total	Annual Total	30-Year Total	Adjustment?[a]	Annual Total	30-Year Total	Annual Total	30-Year Total
Yosemite toad	0.00	0.00	Increase (b)	0.02	0.5	–	–	–	–	–	–	–	–	–	–	0.02	0.50
Reptiles																	
Blunt-nosed leopard lizard suitable habitat	–	–	–	–	–	–	–	–	–	–	0.45	13.38	Maintain	0.45	13.28	0.45	13.28
Blunt-nosed leopard lizard core habitat	–	–	–	–	–	–	–	–	–	–	0.58	17.52	Maintain	0.58	17.52	0.58	17.52
Giant garter snake aquatic habitat—wetland and marsh	0.43	12.75	Maintain	0.43	12.75	–	–	–	–	–	–	–	–	–	–	0.43	12.75
Giant garter snake upland habitat	1.27	38.01	Maintain	1.27	38.01	–	–	–	–	–	–	–	–	–	–	1.27	38.01
Giant garter snake aquatic habitat—rice	1.68	50.48	Maintain	1.68	50.48	–	–	–	–	–	–	–	–	–	–	1.68	50.48
Birds																	
Marbled murrelet	–	–	–	–	–	0.32	9.48	Increase (d)	1.00	30.00	0.07	2.10	Increase (d)	0.50	15.00	1.50	45.00
Northern spotted owl	0.23	7.04	Increase	0.50	15.00	3.26	97.94	Increase (d)	5.00	150.00	–	–	–	–	–	5.50	165.00
Mammals																	
Giant kangaroo rat	–	–	–	–	–	–	–	–	–	–	0.91	27.34	Increase (c)	1.00	30.00	1.00	30.00
Point Arena mountain beaver	–	–	–	–	–	0.02	0.62	Increase (c)	0.10	3.00	–	–	–	–	–	0.10	3.00
San Joaquin kit fox high-value suitable habitat	–	–	–	–	–	–	–	–	–	–	0.49	14.82	Increase (c)	0.50	15.00	0.50	15.00
San Joaquin kit fox moderate-value suitable habitat	–	–	–	–	–	–	–	–	–	–	0.97	29.06	Maintain	0.97	29.06	0.97	29.06
San Joaquin kit fox low-value suitable habitat	–	–	–	–	–	–	–	–	–	–	7.13	213.86	Maintain	7.13	213.86	7.13	213.86

[a] Notes regarding factors influencing the decision to adjust the take authorization request: (a) activities will substantially avoid wetted habitat impacts; (b) despite efforts to avoid and minimize impacts, additional impacts, beyond extrapolated estimates, could result; (c) totals were increased to minimize the potential of running out of take authorization before the end of the permit term; (d) vegetation management work could result in additional habitat impacts.

Table 4-8. Summary of Estimated Temporary Impacts and Requested Take for Covered Wildlife Species by Region (acres)

	Sacramento Valley and Foothills					North Coast					Central Coast					Plan Area	
	Calculated			Proposed		Calculated			Proposed		Calculated			Proposed		Total Proposed	
Species/Habitat	Annual Total	30-Year Total	Adjustment?[a]	Annual Total	30-Year Total	Annual Total	30-Year Total	Adjustment?[a]	Annual Total	30-Year Total	Annual Total	30-Year Total	Adjustment?[a]	Annual Total	30-Year Total	Annual Total	30-Year Total
Aquatic Invertebrates																	
Conservancy fairy shrimp	1.93	57.92	Maintain	1.93	57.92	–	–	–	–	–	–	–	–	–	–	1.93	57.92
Longhorn fairy shrimp	0.36	10.81	Maintain	0.36	10.81	–	–	–	–	–	0.34	10.25	Maintain	0.34	10.25	0.70	21.06
Vernal pool fairy shrimp	9.51	285.17	Maintain	9.51	285.17	0.13	3.75	Maintain	0.13	3.75	1.78	53.32	Maintain	1.78	53.32	11.41	342.24
Vernal pool tadpole shrimp	9.51	285.17	Maintain	9.51	285.17	0.13	3.75	Maintain	0.13	3.75	1.78	53.32	Maintain	1.78	53.32	11.41	342.24
Terrestrial Invertebrates																	
Morro shoulderband snail	–	–	–	–	–	–	–	–	–	–	0.03	0.84	Increase (b, c)	0.20	6.00	0.20	6.00
Mount Hermon (=barbate) June beetle	–	–	–	–	–	–	–	–	–	–	0.51	15.15	Increase (b, c)	0.75	22.50	0.75	22.50
Ohlone tiger beetle	–	–	–	–	–	–	–	–	–	–	0.64	19.16	Increase (b, c)	0.75	22.50	0.75	22.50
Valley elderberry longhorn beetle	9.39	281.67	Maintain	9.39	281.67	–	–	–	–	–	–	–	–	–	–	9.39	281.67
Smith's blue butterfly	–	–	–	–	–	–	–	–	–	–	2.42	72.69	Maintain	2.42	72.69	2.42	72.69
Zayante band-winged grasshopper	–	–	–	–	–	–	–	–	–	–	0.51	15.15	Maintain	0.51	15.15	0.51	15.15
Amphibians																	
California red-legged frog breeding habitat	2.67	80.07	Increase (b, c)	3.0	90.0	0.11	3.42	Increase (b, c)	0.20	6.00	1.71	51.37	Increase (b, c)	3.00	90.00	6.20	186.00
California red-legged frog upland habitat	10.35	310.52	Maintain	10.35	310.52	0.74	22.12	Increase (b, c)	1.00	30.00	7.1	212.94	Increase (b, c)	10.00	300.00	21.35	640.52
California tiger salamander (Central California DPS) breeding habitat	0.85	25.36	Maintain	0.85	25.36	–	–	–	–	–	0.13	3.78	Maintain	0.13	3.78	0.97	29.13
California tiger salamander (Central California DPS) upland habitat	10.88	326.31	Maintain	10.88	326.31	–	–	–	–	–	27.31	819.4	Maintain	27.31	819.4	38.19	1,145.71
California tiger salamander (Santa Barbara DPS) breeding habitat	–	–	–	–	–	–	–	–	–	–	0.005	0.14	Maintain	0.005	0.14	0.005	0.14
California tiger salamander (Santa Barbara DPS) upland habitat	–	–	–	–	–	–	–	–	–	–	2.57	77.01	Maintain	2.57	77.01	2.57	77.01
Foothill yellow-legged frog breeding habitat	0.15	4.59	Maintain	0.15	4.59	0.12	3.53	Maintain	0.12	3.53	0.06	1.76	Maintain	0.06	1.76	0.33	9.88
Foothill yellow-legged frog dispersal habitat	1.83	54.87	Maintain	1.80	54.87	1.17	35.07	Maintain	1.17	35.07	0.96	28.82	Maintain	0.96	28.82	3.96	118.76
Mountain yellow-legged frog	0.01	0.37	Increase (b, c)	0.10	3.00	–	–	–	–	–	–	–	–	–	–	0.10	3.00
Santa Cruz long-toed salamander breeding habitat	–	–	–	–	–	–	–	–	–	–	0.06	1.85	Increase (b, c)	0.10	3.00	0.10	3.00
Santa Cruz long-toed salamander upland habitat	–	–	–	–	–	–	–	–	–	–	1.03	30.79	Increase (b, c)	1.50	45.00	1.50	45.00

	Sacramento Valley and Foothills					North Coast					Central Coast					Plan Area	
	Calculated			Proposed		Calculated			Proposed		Calculated			Proposed		Total Proposed	
Species/Habitat	Annual Total	30-Year Total	Adjustment?[a]	Annual Total	30-Year Total	Annual Total	30-Year Total	Adjustment?[a]	Annual Total	30-Year Total	Annual Total	30-Year Total	Adjustment?[a]	Annual Total	30-Year Total	Annual Total	30-Year Total
Sierra Nevada yellow-legged frog	0.15	4.48	Maintain	0.15	4.48	–	–	–	–	–	–	–	–	–	–	0.15	4.48
Yosemite toad	0.00	0.00	Increase (b, c)	0.07	2.00	–	–	–	–	–	–	–	–	–	–	0.07	2.00
Reptiles																	
Blunt-nosed leopard lizard suitable habitat	–	–	–	–	–	–	–	–	–	–	1.92	57.56	Maintain	1.92	57.56	1.92	57.56
Blunt-nosed leopard lizard core habitat	–	–	–	–	–	–	–	–	–	–	3.22	96.75	Maintain	3.22	96.75	3.22	96.75
Giant garter snake aquatic habitat—wetland and marsh	2.03	60.76	Increase (b, c)	3.00	90.00	–	–	–	–	–	–	–	–	–	–	3.00	90.00
Giant garter snake upland habitat	5.76	172.72	Increase (b, c)	10.00	300.00	–	–	–	–	–	–	–	–	–	–	10.00	300.00
Giant garter snake aquatic habitat—rice	7.25	217.44	Increase (b, c)	10.00	300.00	–	–	–	–	–	–	–	–	–	–	10.00	300.00
Birds																	
Marbled murrelet	–	–	–	–	–	1.47	44.01	Increase (c, d)	2.0	60.00	0.45	13.56	Increase (c, d)	0.75	22.50	2.75	82.50
Northern spotted owl	1.16	34.65	Increase (c, d)	2.0	60.00	16.88	506.28	Increase (c, d)	20.00	600.00	–	–	–	–	–	22.00	660.00
Mammals																	
Giant kangaroo rat	–	–	–	–	–	–	–	–	–	–	4.59	137.58	Increase (c)	5.00	150.00	5.00	150.00
Point Arena mountain beaver	–	–	–	–	–	0.14	4.09	Increase (b, c)	0.25	7.50	–	–	–	–	–	0.25	7.50
San Joaquin kit fox high-value suitable habitat	–	–	–	–	–	–	–	–	–	–	2.50	75.00	Increase (c)	3.00	90.00	3.00	90.00
San Joaquin kit fox moderate-value suitable habitat	–	–	–	–	–	–	–	–	–	–	4.72	141.49	Maintain	4.72	141.49	4.72	141.49
San Joaquin kit fox low-value suitable habitat	–	–	–	–	–	–	–	–	–	–	33.43	1,003.0	Maintain	33.43	1,003.0	33.43	1,003.0

[a] Notes regarding factors influencing the decision to adjust the take authorization request: (a) activities will be able to substantially avoid wetted habitat impacts; (b) despite efforts to avoid and minimize impacts, additional impacts, beyond extrapolated estimates, could occur; (c) totals were increased to minimize the potential of running out of take authorization before the end of the permit term; (d) vegetation management work could result in additional habitat impacts.

Table 4-9. Summary of Requested Take for Covered Wildlife Species by Region

	Permanent and Temporary Impacts (acres)													
	Sacramento Valley and Foothills				North Coast				Central Coast				Plan Area	
	Annual		30-Year		Annual		30-Year		Annual		30-Year		30-Year	
Species/Habitat	Perm.	Temp.	Perm.	Temp.	Perm.	Temp.	Perm.	Temp.	Perm.	Temp.	Perm.	Temp.	Perm.	Temp.
Aquatic Invertebrates														
Conservancy fairy shrimp	0.25	1.93	7.5	57.92	–	–	–	–	–	–	–	–	7.5	57.92
Longhorn fairy shrimp	0.06	0.36	1.65	10.81	–	–	–	–	0.06	0.34	1.67	10.25	3.32	21.06
Vernal pool fairy shrimp	1.00	9.51	30.0	285.17	–	–	–	–	0.40	1.78	12.0	53.40	42.0	338.57
Vernal pool tadpole shrimp	1.00	9.51	30.0	285.17	–	–	–	–	0.40	1.78	12.0	53.40	42.0	338.57
Terrestrial Invertebrates														
Morro shoulderband snail	–	–	–	–	–	–	–	–	0.10	0.2	3.0	6.0	3.0	6.0
Mount Hermon (=barbate) June beetle	–	–	–	–	–	–	–	–	0.25	0.75	7.5	22.5	7.5	22.5
Ohlone tiger beetle	–	–	–	–	–	–	–	–	0.25	0.75	7.5	22.5	7.5	22.5
Valley elderberry longhorn beetle	2.63	9.39	78.93	281.67	–	–	–	–	–	–	–	–	78.93	281.67
Smith's blue butterfly	–	–	–	–	–	–	–	–	0.51	2.42	15.25	72.69	15.25	72.69
Zayante band-winged grasshopper	–	–	–	–	–	–	–	–	0.12	0.51	3.59	15.15	3.59	15.15
Amphibians														
California red-legged frog breeding habitat	1.00	3	30.0	90.0	0.1	0.2	3.0	6.0	0.50	3	15.0	90.0	48.0	186.0
California red-legged frog upland habitat	2.00	10.35	60.0	310.52	0.25	1.00	7.5	30.0	2.00	10.00	60.0	300.0	127.5	640.52
California tiger salamander (Central California DPS) breeding habitat	0.17	0.85	5.06	25.36	–	–	–	–	0.03	0.13	0.85	3.78	5.91	29.13
California tiger salamander (Central California DPS) upland habitat	2.27	10.88	68.22	326.31	–	–	–	–	6.02	27.31	180.59	819.4	248.81	1,145.71
California tiger salamander (Santa Barbara DPS) breeding habitat	–	–	–	–	–	–	–	–	0.00	0.005	0.02	0.14	0.02	0.14
California tiger salamander (Santa Barbara DPS) upland habitat	–	–	–	–	–	–	–	–	0.39	2.57	11.77	77.01	11.77	77.01
Foothill yellow-legged frog breeding habitat	0.02	0.15	0.75	4.59	0.02	0.12	0.6	3.53	0.01	0.06	0.30	1.76	1.69	9.88
Foothill yellow-legged frog dispersal habitat	0.29	1.8	8.78	54.87	0.21	1.17	6.3	35.07	0.17	0.96	5.15	28.82	20.23	118.76
Mountain yellow-legged frog	0.02	0.1	0.60	3.0	–	–	–	–	–	–	–	–	0.6	3.0
Santa Cruz long-toed salamander breeding habitat	–	–	–	–	–	–	–	–	0.1	0.1	3,0	3.0	3.0	3.0
Santa Cruz long-toed salamander upland habitat	–	–	–	–	–	–	–	–	0.5	1.5	15.0	45.0	15.0	45.0
Sierra Nevada yellow-legged frog	0.02	0.15	0.68	4.48	–	–	–	–	–	–	–	–	0.68	4.48
Yosemite toad	0.02	0.07	0.5	2.0	–	–	–	–	–	–	–	–	0.5	2.0

	Permanent and Temporary Impacts (acres)													
	Sacramento Valley and Foothills				North Coast				Central Coast				Plan Area	
	Annual		30-Year		Annual		30-Year		Annual		30-Year		30-Year	
Species/Habitat	Perm.	Temp.	Perm.	Temp.	Perm.	Temp.	Perm.	Temp.	Perm.	Temp.	Perm.	Temp.	Perm.	Temp.
Reptiles														
Blunt-nosed leopard lizard suitable habitat	–	–	–	–	–	–	–	–	0.45	1.92	13.28	57.56	13.28	57.56
Blunt-nosed leopard lizard core habitat	–	–	–	–	–	–	–	–	0.58	3.22	17.52	96.75	17.52	96.75
Giant garter snake aquatic habitat—wetland and marsh	0.43	3	12.75	90.0	–	–	–	–	–	–	–	–	12.75	90.0
Giant garter snake upland habitat	1.27	10	38.01	300.0	–	–	–	–	–	–	–	–	38.01	300.0
Giant garter snake aquatic habitat—rice	1.68	10	50.48	300.0	–	–	–	–	–	–	–	–	50.48	300.0
Birds														
Marbled murrelet	–	–	–	–	1.00	2.00	30.0	60.0	0.50	0.75	15.0	22.5	45.0	82.5
Northern spotted owl	0.50	2.00	15.0	60.0	5.00	20.00	150.0	600.0	–	–	–	–	165.0	660.0
Mammals														
Giant kangaroo rat	–	–	–	–	–	–	–	–	1.00	5.0	30.0	150.0	30.0	150.0
Point Arena mountain beaver	–	–	–	–	0.1	0.25	3.0	7.5	–	–	–	–	3.0	7.5
San Joaquin kit fox high-value suitable habitat	–	–	–	–	–	–	–	–	0.50	3.0	15.0	90.0	15.0	90.0
San Joaquin kit fox moderate-value suitable habitat	–	–	–	–	–	–	–	–	0.97	4.72	29.06	141.49	29.06	141.49
San Joaquin kit fox low-value suitable habitat	–	–	–	–	–	–	–	–	7.13	33.43	213.86	1,003.0	213.86	1,003.0

Table 4-10. Summary of Permanent and Temporary Impacts on Covered Species' Critical Habitat

Covered Species	All Critical Habitat Designated (ac)	Sacramento Valley and Foothills Region							North Coast Region							Central Coast Region							30-Year Impacts on All Critical Habitat in the Plan Area			
		Sac Valley Foothills			Potential Maximum		Model (Expected)		North Coast			Potential Maximum		Model (Expected)		Central Coast			Potential Maximum		Model (Expected)		Potential Maximum		Model (Expected)	
		Critical Habitat in Plan Area	Modeled Habitat in Region	Critical Habitat/ Modeled Habitat	Max 30-year Perm Impact to Critical Habitat (ac)	Max 30-yr Temp Impact to Critical Habitat (ac)	30-Yr Permanent Proportionate Critical Habitat acres in Region, 30-Yr Permanent Impact	30-Yr Temporary Proportionate Critical Habitat acres in Region, 30-Yr Temporary Impact	Critical Habitat in Plan Area	Modeled Habitat in Region	Percentage of Modeled Habitat that is Critical Habitat	Max 30-year Perm Impact to Critical Habitat (ac)	Max 30-yr Temp Impact to Critical Habitat (ac)	30-Yr Permanent Proportionate Critical Habitat acres in Region, 30-Yr Permanent Impact	30-Yr Temporary Proportionate Critical Habitat acres in Region, 30-Yr Temporary Impact	Critical Habitat in Plan Area	Modeled Habitat in Region	Percentage of Modeled Habitat that is Critical Habitat	Max 30-year Perm Impact to Critical Habitat (ac)	Max 30-yr Temp Impact to Critical Habitat (ac)	30-Yr Permanent Proportionate Critical Habitat acres in Region, 30-Yr Permanent Impact	30-Yr Temporary Proportionate Critical Habitat acres in Region, 30-Yr Temporary Impact	Max 30-year Perm Impact to Critical Habitat (ac)	Max 30-yr Temp Impact to Critical Habitat (ac)	Modeled 30-year Perm Impact to Critical Habitat (ac)	Modeled 30-yr Temp Impact to Critical Habitat (ac)
Invertebrates																										
Conservancy fairy shrimp	161,786	6	2,260	0.26%	6	6	0.02	0.15	–	–	NA	0	0	0	0	–	–	NA	0	0	0	0	6	6	0.003	0.003
Longhorn fairy shrimp	13,557	0	468	0.00%	0	0	0.00	0.00	–	–	NA	0	0	0	0	79	437	18.05%	1.80	10.20	0.32	1.84	1.80	10.20	0.32	1.84
Vernal pool fairy shrimp	597,821	2,245	11,233	19.99%	30	285.3	6.00	57.03	–	163	0.00%	0	0	0	0	2,818	2,076	100.00%	12.00	53.40	12.00	53.40	42.00	338.70	18.00	110.43
Vernal pool tadpole shrimp	228,785	2,822	11,233	25.12%	30	285.3	7.54	71.66	–	163	0.00%	0	0	0	0	–	2,076	0.00%	0.00	0.00	0.00	0.00	30.00	285.30	7.54	71.66
Morro shoulderband snail	2,566	0	0	NA	0	0	0.00	0.00	–	–	NA	0	0	0	0	41	36	100.00%	3.00	6.00	3.00	6.00	3.00	6.00	3.00	6.00
Valley elderberry longhorn beetle	515	0.35	2,997	0.01%	0.35	0.35	0.01	0.03	-	-	NA	0	0	0	0	-	-	NA	0	0	0	0	0.35	0.35	0.00	0.00
Zayante band-winged grasshopper	10,560	0	0	NA	0	0	0.00	0.00	–	–	NA	0	0	0	0	1,082	577	100.00%	3.60	15.30	3.60	15.30	3.60	15.30	3.60	15.30
Amphibians and Reptiles																										
California red-legged frog	1,636,609	876	16,275	5.38%	90	400.5	4.84	21.56	283	1,092	25.89%	10.5	36	2.719	9.321	11,854	10,804	100.00%	75.00	390.00	75.00	390.00	175.50	826.50	82.56	420.88
California tiger salamander (Central California DPS)	199,109	569	14,015	4.06%	73.2	351.9	2.97	14.30	–	–	NA	0	0	0	0	813	32,192	2.53%	181.50	823.20	4.59	20.80	254.70	1175.10	7.56	35.09
California tiger salamander (Santa Barbara DPS)	11,182	0	0	NA	0	0	0.00	0.00	–	–	NA	0	0	0	0	237	3,340	7.11%	11.73	77.40	0.83	5.50	11.73	77.40	0.83	5.50
Mountain yellow-legged frog	221,498	0	16	0.00%	0	0	0.00	0.00	–	–	NA	0	0	0	0	–	–	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Sierra Nevada yellow-legged frog	1,082,146	1,146	194	100.00%	0.6	4.5	0.60	4.50	–	–	NA	0	0	0	0	–	–	NA	0.00	0.00	0.00	0.00	0.60	4.50	0.60	4.50
Yosemite toad	750,926	208	0	NA	0	0	0.00	0.00	–	–	NA	0	0	0	0	–	–	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Birds																										
Marbled Murrelet	3,698,100	0	0	NA	0	0	0.00	0.00	953	1,735	54.93%	30	60	16.478	32.957	166	585	28.43%	15.00	22.50	4.26	6.40	45.00	82.50	20.74	39.35
Northern Spotted owl	9,577,969	161	1,392	11.56%	15	60	1.73	6.94	2,405	20,644	11.65%	150	600	17.473	69.893	–	–	NA	0.00	0.00	0.00		165.00	660.00	19.21	76.83

Note: Impacts on critical habitat for plants are described within each plant specific analysis.

This page was intentionally left blank.

Table 4-11. Potentially Impacted Critical Habitat Units

Covered Species	Critical Habitat Units with Possible Impacts (Percent of Plan Area in Critical Habitat Unit)
Invertebrates	
Conservancy fairy shrimp	1A (0.18%), 1E (0.23%)
Longhorn fairy shrimp	LONFS 3 (0.82%)
Vernal pool fairy shrimp	11 (3.84%), 12A (4.48%), 12B (1.14%), 13 (1.51%), 14A (0.53%), 28 (0.87%), 29A (2.36%), 29B (0.05%), 29C (3.83%), 29E (1.35%), 29F (1.97%), 29G (2.55%), 29H (2.67%), 30 (0.82%), 31 (1.06%), 5 (1.82%), 6 (3.06%), 7A (0.18%), 7E (0.23%), 7F (1.10%), 8 (3.95%), 9 (6.58%)
Vernal pool tadpole shrimp	1 (1.82%), 10 (0.83%), 2A (1.99%), 2B (2.47%), 3A (0.18%), 3E (0.23%), 3F (1.10%), 4A (6.58%), 4B (14.31%), 4C (0.14%), 4D (4.14%), 4E (2.62%), 4F (7.32%), 6 (10.17%), 7 (3.84%), 8 (1.51%), 9B (0.53%)
Morro shoulderband snail	1 (0.94%), 2 (2.19%), 3 (3.93%)
Valley elderberry longhorn beetle	Sacramento Zone (1.32%), American River Parkway Zone (0.01%)
Zayante band-winged grasshopper	1 (0.94%), 2 (2.19%), 3 (3.93%)
Amphibians and Reptiles	
California red-legged frog	Cal-1 (11.02%), Eld-1 (4.88%), Men-1 (1.30%), Mnt-1 (5.72%), Mnt-2 (1.88%), Mnt-3 (0.94%), Nev-1 (2.27%), Pla-1 (0.78%), Scz-1 (1.93%), Scz-2 (5.83%), Slo-1 (0.74%), Slo-2 (1.56%), Slo-3 (3.27%), Slo-4 (0.21%), Snb-1 (2.45%), Snb-2 (4.02%), Snb-3 (0.82%), Stb-2 (1.45%), Stb-4 (0.02%), Stb-5 (0.42%), Stb-6 (0.12%), Stb-7 (0.01%), Stc-2 (0.01%), Yub-1 (1.69%)
California tiger salamander (Central California DPS)	Cc (0.65%), Cv (0.59%), Eb (1.06%)
California tiger salamander (Santa Barbara County DPS)	Ela (2.04%), Esm (2.04%), Srs (5.07%, Wsmo (3.19%)
Sierra Nevada yellow-legged frog	Cc (0.65%), Cv (0.59%), Eb (1.06%)
Yosemite toad	1 (0.19%), 2 (0.16%)
Birds	
Marbled murrelet	CA-01-c (0.04%), CA-02-b (0.07%), CA-02-c (3.98%), CA-04-a (0.39%), CA-04-b (1.96%), CA-05-a (0.04%), CA-05-b (0.06%) CA-06-a (0.42%), CA-06-b (0.08%), CA-07-a (0.73%), CA-07-b (1.29%), CA-11-b (0.06%), CA-14-b (0.24%), CA-14-c (0.20%), CA-15 (1.40%)
Northern spotted owl	RC (0.26%), KW (0.03%), ICC (0.19%)
Plants	
Monterey spineflower	Fo (1.08%), Fb (13.58%), Man (8.77%), Mar (0.23%), Ml (0.45%), Pru (8.85%), So (3.34%)
Robust spineflower	1 (0.00%), 2 (0.00%), Sunset (0.0007%), Pogonip (0.0013%), Branciforte (0.0001%), Aptos (0.0005%), Freedom (0.0001%), Buena Vista (0.0011%)
Yadon's rein orchid	Br (0.15%), Map (0.88%), Mop (1.62%), Plr (0.54%), Vc (24.73%)

4.1.8 Calculation of Covered Plant Impacts

The approach to determining potential habitat impacts on covered plant species from covered activities differed from the approach to evaluate wildlife impacts. An approach using broad land cover categories as was used for covered wildlife could not be used to calculate impacts on covered plants because most species exhibit microhabitat requirements at a finer scale than the level of available mapping resolution.

Determining the impacts that covered activities could have on covered plant species over the next 30 years is challenging because of the variability of covered activity locations and the lack of precise data for some species occurrences. CNDDB records for covered plant species occurring in the Plan Area include both point and polygon location records. Specific point records provide a precise location but do not report the extent of the occurrence, and non-specific point records provide neither the precise location nor the extent of the occurrence. Specific polygon records provide both a precise location and a precise extent of the occurrence, although the accuracy may be limited by the mapping technique (i.e., GPS vs. manual recordation on maps or aerial photos). Non-specific polygon records generally encompass the full extent of an occurrence but do not specify the precise location or extent of the population within the occurrence. Therefore, a two-step approach was employed to determine impacts of covered activities on covered plant species.

First, a GIS-based analysis was conducted by overlaying CNDDB plant location data onto PG&E facility location data layers to determine where a covered activity could affect a plant species' habitat. Wherever a PG&E facility crossed or came within 200 feet of a plant species occurrence, a more detailed analysis of individual species occurrences was performed using aerial photography interpretation to examine possible impacts on individual plant occurrences. For specific point and polygon occurrences, the precise locations of poles, towers, and pipelines were evaluated with respect to the occurrence boundaries. For non-specific point and polygon occurrences, potential habitat for the species was identified and the locations of facilities within the potential habitat were evaluated. In a few cases, the location or habitat information was insufficient to determine whether there would be an actual impact.

To determine an area of potential impact on each covered plant species attributable to covered activities, this analysis assumed that covered activity impacts would be implemented in a corridor within a width of 100 feet of the centerline of existing facilities. For electric distribution lines, pole clearing was assumed to affect a 15-foot radius, and a similar area would be impacted by pole replacement. For electric transmission lines, an impact area of 25 by 40 feet was assumed to be needed for tower maintenance. For off-road travel between poles or towers during inspection, maintenance, or reconductoring, a travel corridor 12 feet wide was assumed. However, this assumption may overestimate the impact if travel were done without grading or clearing vegetation or if it were done outside of the growing season.

For each plant species occurrence, the direct impact calculation was based on the number of poles and towers present, on the length of pipeline crossing the occurrence, and on the length of boardwalk crossing the occurrence. Where pipelines crossed an occurrence within 50 feet of a pole or tower, only the pipeline impact was calculated because it encompassed a larger footprint that captured the impact of the pole or tower. Impacts on covered plant habitat and the portion of habitat range potentially impacted are described in the *Plants* subsections of Section 4.2, *Overview of Impact Mechanisms*. Indirect impacts are described but were not quantified because AMMs are expected to reduce these potential impacts.

The number of individual plants that would be directly impacted by covered activities was estimated for CNDDB occurrences based on reported population sizes. The number of individual plants directly impacted was calculated from the population density (reported plants/acre) multiplied by the estimated area of effects. However, population data is not provided for all occurrences, and impacts on those occurrences were estimated based on the area of impact and an estimate of population density. Where population numbers were not reported, plant densities were estimated from the mean density of the occurrences for which population numbers were reported

for that species. Where the distribution of population densities was highly skewed, the median density was used. In addition, the calculation was based on the assumption that individuals are uniformly distributed within the occurrences. Population numbers can vary annually, so using the population density based on the highest reported count provides an estimate of the maximum number of plants that could be impacted.

The number of plants impacted at an occurrence is a very general estimate, especially for annual plants. Population numbers vary from year to year, and the number of plants directly impacted at any occurrence depends on the number of plants present when the covered activities are implemented and the frequency of a covered activity. The timing of the activities also affects the number of plants impacted; for example, implementation of an activity during the blooming period of an annual species may affect many plants, whereas implementation of an activity after the species has gone to seed may have little or no impact. In the impacts table for each species, the number of plants impacted in an occurrence represents a worst-case scenario in which a species is impacted during its blooming periods. The total number of plants impacted represents the total number of plants that would be impacted under the worst-case scenario, with each occurrence being impacted once. The actual number of plants impacted over the 30-year term of the MRHCP would depend on the frequency of activities at each occurrence. Covered activity impacts on critical habitat for covered plant species was based on the locations of occurrence records within facility corridors.

4.2 Overview of Impact Mechanisms

This section provides a region-by-region impact analysis for each covered species, by taxonomic group, according to their predicted occurrence in the Sacramento Valley and Foothills Region, North Coast Region, and Central Coast Region. This analysis relies on the assumptions that modeled habitat is, by definition, suitable and that it is occupied (even though the species may not occupy some areas where modeled habitat has been developed). Because impact calculations used for various covered activities are based on the largest area required for an activity, the area of impact that would result from covered activities may be overestimated. The extent (in acres) of annual impacts (i.e., permanent, temporary) discussed for each species also represent an estimated average, with greater impacts during some years and fewer impacts during other years. Thirty-year impacts can result anywhere within the Plan Area but represent a ceiling of impacts (i.e., a cap) that cannot be exceeded without a major amendment to the permit.

Table 4-12 lists the individual activities and their likelihood to impact covered wildlife species' habitat. Assuming that a covered activity can be implemented anywhere in the Plan Area, the table considers the typical scope of each activity and categorizes an impact on covered species as likely, possible, or unlikely, while accounting for species life history, habitat, and distribution in the Plan Area. The categorization assumes that travel to and along the facilities is generally unlikely to result in impacts, given that each activity would be implemented in habitat where facilities have generally long been established. However, even though some activities are classified as unlikely to have an impact, they may still result in incidental take of covered species. For a more detailed analysis of potential impacts on each covered wildlife and plant species, by region, the following aspects are addressed as they pertain to the nature and extent of estimated impacts.

4.2.1 Species Distribution

General distribution of species will be presented, typically by County within each region, and based on CNDDB records and/or predictive modeling. Additional information on the species' listing status, range, ecology, population trends and threats, and management tools, as well as full citations for sources considered in the literature review, are provided in Appendix B, *Species Accounts*.

4.2.2 Direct Impacts and Conservation Measures

Direct impacts are the means by which a covered activity may result in injury to, or mortality of, an individual species, incidental to the performance of a covered activity. Possible direct impacts on a wildlife species are generally the same for most species and include crushing, killing, injuring, entombment, or capturing (inadvertent or otherwise) during an activity (e.g., in an excavator bucket or in fencing), regardless of the life stage or habitat type (aquatic versus terrestrial). Likewise for plants, which could be damaged or destroyed by personnel, vehicles, or equipment. Where a meaningful distinction exists concerning direct impacts, it is described. To avoid and minimize direct impacts on covered species, conservation measures are presented in this section for all species where they are considered important to avoidance and reduction of impacts. These measures are comprised of field protocols (FPs), Avoidance and Minimization Measures (AMMs), species-specific AMMs, and/or covered plant AMMs and are described in detail in Chapter 5, *Conservation* Strategy, Section 5.5.1, *Avoidance and Minimization of Impacts*. The FPs and AMMs are intended to reduce impacts where possible, but it should be noted that PG&E must conduct its maintenance activities and some impacts on species are expected to result. For wildlife, the impacts were further described as permanent and temporary. For plants, the analysis focused on acres and numbers of plants impacted.

4.2.3 Permanent Impacts

Permanent impacts are based on criteria established in the beginning of this chapter. Annual permanent impact estimates have been calculated for each species, using methods described previously. These impacts are presented in acres and include annual estimates as well as 30-year totals. Where more than one habitat type has been defined for a species (i.e., aquatic and upland habitat, etc.), estimates are presented for each habitat type. Permanent impacts can include loss of individuals of the species, as well as habitat.

4.2.4 Temporary Impacts

Temporary impacts are also based on criteria established in the beginning of this chapter and are calculated and presented in the same manner as permanent impacts. Temporary impacts can include interruptions to breeding, feeding, or sheltering of individuals of wildlife species.

Table 4-12. Likelihood of Specific Activities to Directly Impact Covered Wildlife Species Habitat

Activity	Conservancy fairy shrimp	Longhorn fairy shrimp	Vernal pool fairy shrimp	Vernal pool tadpole shrimp	Morro shoulderband snail	Mount Hermon June beetle	Ohlone tiger beetle	Valley elderberry longhorn beetle	Smith's blue butterfly	Zayante band-winged grasshopper	California red-legged frog	California tiger salamander-Central California and Santa Barbara DPS	Foothill yellow-legged frog	Mountain yellow-legged frog-northern DPS	Santa Cruz long-toed salamander	Sierra Nevada yellow-legged frog	Yosemite toad	Blunt-nosed leopard lizard	Giant garter snake	Marbled murrelet	Northern spotted owl	Giant kangaroo rat	Point Arena mountain beaver	San Joaquin kit fox
G1. Patrols	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	◖	◖	○	○	○
G2. Inspections	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
G3a. Remedial Maintenance	◖	◖	◖	◖	◖	◖	◖	◖	◖	◖	●	●	●	●	●	●	●	◖	●	◖	◖	◖	◖	◖
G3a. Remedial Maintenance	○	○	○	○	○	○	○	◖	○	○	●	●	●	●	●	●	●	◖	●	◖	◖	◖	◖	◖
G3b. Internal Pipeline Inspection	◖	◖	◖	◖	◖	◖	◖	◖	◖	◖	○	◖	○	○	○	○	○	◖	◖	○	○	◖	○	◖
G4. Compressor station upgrades and maintenance	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	◖	○	○	○	○	○
G5. Pipeline ETS installation	◖	◖	◖	◖	◖	◖	◖	◖	◖	◖	○	○	○	○	○	○	○	◖	◖	○	○	◖	○	◖
G6. Valve Maintenance	◖	◖	◖	◖	◖	◖	◖	◖	◖	◖	◖	●	◖	◖	●	◖	◖	●	●	◖	◖	●	○	●
G7. Valve Maintenance	◖	◖	◖	◖	◖	◖	◖	◖	◖	◖	◖	●	◖	◖	●	◖	◖	●	●	◖	◖	●	○	●
G8. Pipeline cathodic protection	◖	◖	◖	◖	◖	◖	◖	◖	◖	◖	◖	●	◖	◖	●	◖	◖	●	●	◖	◖	●	○	●
G9. Pipeline lowering	◖	◖	◖	◖	◖	◖	◖	◖	◖	◖	◖	●	◖	◖	●	◖	◖	◖	●	◖	◖	●	○	◖
G10. Pipeline coating rep.	◖	◖	◖	◖	◖	◖	◖	◖	◖	◖	●	●	●	●	●	●	●	●	●	◖	◖	●	○	◖
G11. Pipeline replacement	◖	◖	◖	◖	◖	◖	◖	◖	◖	◖	◖	◖	◖	◖	◖	◖	◖	◖	◖	◖	●	●	○	●
G12. Telecom Site Maintenance	○	○	○	○	○	◖	◖	○	◖	◖	◖	◖	◖	◖	◖	◖	◖	◖	◖	◖	◖	◖	○	◖
G13a. Pipeline ROW Vegetation Management	○	○	○	○	○	◖	◖	●	●	◖	●	●	●	●	●	●	●	◖	◖	◖	◖	◖	○	◖
G13b. Pipeline Access road maintenance	◖	◖	◖	◖	◖	◖	◖	◖	◖	◖	◖	●	◖	◖	●	◖	◖	●	◖	○	○	●	○	◖
G14. Gas pressure limiting station construction	◖	◖	◖	◖	◖	◖	◖	◖	◖	◖	◖	◖	◖	◖	◖	◖	◖	◖	◖	○	○	◖	◖	◖
G15. New Customer Pipeline Installation	◖	◖	◖	◖	◖	◖	◖	◖	◖	◖	◖	◖	◖	◖	◖	◖	◖	◖	◖	◖	◖	◖	◖	◖
Electric System Activities																								
E1. Patrols	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	◖	◖	○	○	○
E2. Inspections	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	◖	◖	○	○	○
E3. Insulator washing or replacement	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	◖	◖	○	○	○
E4. Substation maintenance	○	○	○	○	○	◖	◖	◖	◖	◖	◖	◖	○	○	◖	○	○	◖	○	◖	◖	○	◖	◖
E5. Outage Repair	●	●	●	●	●	●	●	◖	●	●	●	●	●	●	●	●	●	●	●	●	●	●	◖	◖

Activity	Conservancy fairy shrimp	Longhorn fairy shrimp	Vernal pool fairy shrimp	Vernal pool tadpole shrimp	Morro shoulderband snail	Mount Hermon June beetle	Ohlone tiger beetle	Valley elderberry longhorn beetle	Smith's blue butterfly	Zayante band-winged grasshopper	California red-legged frog	California tiger salamander-Central California and Santa Barbara DPS	Foothill yellow-legged frog	Mountain yellow-legged frog-northern DPS	Santa Cruz long-toed salamander	Sierra Nevada yellow-legged frog	Yosemite toad	Blunt-nosed leopard lizard	Giant garter snake	Marbled murrelet	Northern spotted owl	Giant kangaroo rat	Point Arena mountain beaver	San Joaquin kit fox
E6a. Tower replacement or repair (including Telecommunication Attachments)	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	◖	◖	●	◖	●
E6b. Boardwalk repair and replacement	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	◖	○	○	○	○
E7. Facility installations (Shoo-Fly)	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	◖	◖	●	◖	●
E8a. Pole equipment repair and replacement	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
E8b. Utility/wood pole replacement	◖	◖	◖	◖	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
E9a. Line Reconductoring - Transmission	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	◖	◖	●	◖	●
E9b. Line Reconductoring-Distribution	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	◖	◖	●	◖	●
E10a. Veg. Mgmt. – Routine Maintenance	○	○	○	○	○	◖	◖	●	●	◖	●	●	●	●	●	●	●	◖	◖	◖	◖	◖	◖	◖
E10b. Veg. Mgmt. – Pole Clearing	○	○	○	○	○	○	○	●	○	○	○	○	○	○	○	○	○	○	○	◖	◖	○	○	○
E10c. Veg. Mgmt. – Removal Activities	○	○	○	○	○	◖	◖	●	●	◖	●	●	●	●	●	●	●	○	○	○	○	○	○	○
E10d. Veg. Mgmt. – Transmission Vegetation/ROW Management	○	○	○	○	○	◖	◖	●	●	◖	●	●	●	●	●	●	●	◖	◖	◖	◖	◖	◖	◖
E10e. Cage Clearing – Electric Transmission Structures	◖	◖	◖	◖	◖	◖	◖	●	●	◖	●	●	●	●	●	●	●	◖	◖	◖	◖	◖	◖	◖
E10f. Fee Strip Maintenance – Electric Transmission Line ROW	○	○	○	○	○	◖	◖	◖	●	◖	●	●	●	●	●	●	●	◖	◖	◖	◖	◖	◖	◖
E11a. Wood Pole Test and Treat – Inspection and Maintenance	○	○	○	○	○	○	○	◖	○	○	○	◖	○	○	◖	○	○	◖	○	○	○	◖	○	○
E11b. Wood Pole Test and Treat - Reinforcement	○	○	○	○	○	○	○	◖	○	○	○	◖	○	○	◖	○	○	◖	○	○	○	◖	○	○
E12. New Distribution and Transmission Line Construction or Relocation	●	●	●	●	●	●	●	◖	●	●	●	●	●	●	●	●	●	●	●	◖	◖	●	◖	●

Activity	Conservancy fairy shrimp	Longhorn fairy shrimp	Vernal pool fairy shrimp	Vernal pool tadpole shrimp	Morro shoulderband snail	Mount Hermon June beetle	Ohlone tiger beetle	Valley elderberry longhorn beetle	Smith's blue butterfly	Zayante band-winged grasshopper	California red-legged frog	California tiger salamander-Central California and Santa Barbara DPS	Foothill yellow-legged frog	Mountain yellow-legged frog-northern DPS	Santa Cruz long-toed salamander	Sierra Nevada yellow-legged frog	Yosemite toad	Blunt-nosed leopard lizard	Giant garter snake	Marbled murrelet	Northern spotted owl	Giant kangaroo rat	Point Arena mountain beaver	San Joaquin kit fox
E13. Elec. Tower Line Construction	●	●	●	●	●	●	●	◖	●	●	●	●	●	●	●	●	●	●	●	◖	◖	●	◖	●
E14. Minor Substation Expansion	◖	◖	◖	◖	◖	◖	◖	◖	◖	◖	◖	◖	◖	◖	◖	◖	◖	◖	◖	◖	◖	◖	◖	◖
E15. Elec. Underground Line Construction	◖	◖	◖	◖	◖	◖	◖	◖	◖	◖	◖	●	◖	◖	●	◖	◖	●	◖	◖	◖	●	◖	◖

● = Likely, ◖ = Possible, ○ = Unlikely

This page was intentionally left blank.

4.2.5 Critical Habitat Impacts

Temporary and permanent impacts on designated critical habitat are presented. Where such impacts could occur across a portion of the total critical habitat for a species in a given region, calculations show these impacts on critical habitat as a subset of the overall regional totals based on the expected, proportionate distribution of impacts throughout the species' modeled habitat. In the unlikely event that all permanent and temporary impacts were to occur entirely within critical habitat for a covered species, a maximum possible impact is calculated. Within a region where the entire modeled habitat for a covered species is within critical habitat, the modeled habitat impacts are the same as the possible maximum permanent and temporary impacts.

4.2.6 Indirect Impacts

A qualitative assessment of specific indirect impacts are described for most covered species. Indirect impacts are defined under the ESA regulations as those impacts that are reasonably certain to occur, are caused by covered activities, but occur later in time (50 CFR 402.02). Generally, indirect impacts for each species include introduction of invasive plant species, sedimentation, or pollutants caused by a covered activity near species habitat or off-site, possibly leading to eventual degradation of habitat. Such impacts would be avoided and minimized by implementation of BMPs and other conservation measures as discussed in Chapter 5, *Conservation Strategy*.

Because one or more aspects of an impact analysis for a given species may also apply to another species, the reader may be referred to an earlier region, section, or species discussion to avoid repetition of text.

4.2.7 Impacts Associated with Mitigation

Habitat acquisition, enhancement, and restoration are intended to be conducted in ways that would benefit covered species; however, during the course of conservation strategy implementation, some adverse impacts could result. For example, maintenance and monitoring of mitigation lands (e.g., fencing, surveying, conducting biological surveys, and conducting habitat enhancements) could result in impacts. Similarly, restoration efforts may require the use of machinery and equipment, and ground-disturbing activities that could temporarily adversely affect covered species. The magnitude of these potential impacts would depend on the size and type of activity, its proximity to individuals or a population, the life stage of the species, and duration of the impacts on habitat characteristics. However, restoration plans and management plans would take these potential impacts into account and PG&E would apply AMMs for covered species. The amount and extent of take from these activities is expected to be small but will be reported to USFWS as part of the Annual Report. Details of the Annual Report are discussed in Chapter 6, *Plan Implementation and Funding*.

4.2.8 Sacramento Valley and Foothills Region

Table 4-13 summarizes the take estimates for covered wildlife species in the Sacramento Valley and Foothills Region. Table 4-13 is the distillation of impacts identified in Tables 4-7 and 4-8. Table 4-14 summarizes estimated impacts on covered species' designated critical habitat in the region.

Table 4-13. Summary of Estimated Impacts for Covered Wildlife Species in the Sacramento Valley and Foothills Region (acres)

	Permanent Impacts		Temporary Impacts	
Species and Habitat	Annual Total	30-year Total	Annual Total	30-year Total
Invertebrates				
Conservancy fairy shrimp habitat	0.25	7.50	1.93	57.92
Longhorn fairy shrimp habitat	0.06	1.65	0.36	10.81
Vernal pool fairy shrimp habitat	1.00	30.00	9.51	285.17
Vernal pool tadpole shrimp habitat	1.00	30.00	9.51	285.17
Valley elderberry longhorn beetle habitat	2.63	78.93	9.39	281.67
Amphibians				
California red-legged frog breeding habitat	1.00	30.00	3.0	90.0
California red-legged frog upland habitat	2.00	60.00	10.35	310.52
California tiger salamander (Central California DPS) breeding habitat	0.17	5.06	0.85	25.36
California tiger salamander (Central California DPS) upland habitat	2.27	68.22	10.88	326.31
Foothill yellow-legged frog breeding habitat	0.02	0.75	0.15	4.59
Foothill yellow-legged frog dispersal habitat	0.29	8.78	1.80	54.87
Mountain yellow-legged frog habitat	0.02	0.60	0.10	3.00
Sierra Nevada yellow-legged frog habitat	0.02	0.68	0.15	4.48
Yosemite toad habitat	0.02	0.5	0.07	2.00
Reptiles				
Giant garter snake aquatic habitat—wetland and marsh	0.43	12.75	3.00	90.00
Giant garter snake upland habitat	1.27	38.01	10.00	300.00
Giant garter snake aquatic habitat—rice	1.68	50.48	10.00	300.00
Birds				
Northern spotted owl habitat	0.50	15.00	2.00	60.00

Table 4-14. Summary of Impacts on Critical Habitat in the Sacramento Valley and Foothills Region

Covered Species	All Critical Habitat Designated (ac)	Sacramento Valley and Foothills															
		Sac Valley Foothills			Potential Maximum (High/Max)						Sum of Total 30-Year Maximum Impacts as % of Critical Habitat	Model (Expected/Target)					
		Critical Habitat in Plan Area	Modeled Habitat in Region	Critical Habitat/ Modeled Habitat	Annual Permanent Impact[b] (ac)	Annual Temporary Impact (ac)	Max 30-year Perm Impact to Critical Habitat (ac)	Max 30-yr Temp Impact to Critical Habitat (ac)	Max 30-yr Perm Impact Total as % of all Critical Habitat	Max 30-yr Temp Impact Total as % of all Critical Habitat		Proportionate Annual Permanent Impact to Critical Habitat (ac)	Proportionate Annual Temporary Impact to Critical Habitat (ac)	Proportionate Critical Habitat acres in Region, 30-Yr Permanent Impact	Proportionate Critical Habitat acres in Region, 30-Yr Temporary Impact	30-Year Perm Impact Total as % of all Critical Habitat	30-Year Temp Impact Total as % of all Critical Habitat
Invertebrates																	
Conservancy fairy shrimp	161,786	6	2,260	0.26%	0.25	1.93	6.0	6.0	0.004%	0.004%	0.004%	0.00	0.00	0.00	0.00	0.00001%	0.00001%
Vernal pool fairy shrimp	597,821	2,245	11,233	19.99%	1.00	9.51	30	285.3	0.005%	0.048%	0.053%	0.20	1.90	6.00	57.03	0.00100%	0.00954%
Vernal pool tadpole shrimp	228,785	2,822	11,233	25.12%	1.00	9.51	30	285.3	0.013%	0.125%	0.138%	0.25	2.39	7.54	71.66	0.00329%	0.03132%
Valley elderberry longhorn beetle	515	0.35	2,997	0.01%	2.63	9.39	0.35	0.35	0.067%	0.067%	0.067%	0.00	0.00	0.00	0.00	0.067%	0.067%
Amphibians and Reptiles																	
California red-legged frog	1,636,609	876	16,275	5.38%	3.00	13.35	90	400.5	0.005%	0.024%	0.029%	0.16	0.72	4.84	21.56	0.00030%	0.00132%
California tiger salamander (Central CA DPS)	199,109	569	14,015	4.06%	2.44	11.73	73.2	351.9	0.037%	0.177%	0.214%	0.10	0.48	2.97	14.30	0.00149%	0.00718%
Sierra Nevada yellow-legged frog	1,082,146	1,146	194	100.00%	0.02	0.15	0.6	4.5	0.000%	0.000%	0.000%	0.02	0.15	0.60	4.50	0.00006%	0.00042%
Birds																	
Northern Spotted owl	9,577,969	161	1,392	11.56%	0.50	2	15	60	0.000%	0.001%	0.001%	0.06	0.23	1.73	6.94	0.00002%	0.00007%

4.2.8.1 Invertebrates

In this region, Conservancy fairy shrimp, longhorn fairy shrimp, vernal pool fairy shrimp, and vernal pool tadpole shrimp share similar life history, direct and indirect impact mechanisms, and have the same avoidance and minimization measures. The extent of habitat and impacts, however, vary among species.

Conservancy Fairy Shrimp

Species Distribution

Conservancy fairy shrimp (COFS) is a vernal pool invertebrate. Detailed life history for the species is included in Appendix B. This species is known to occur in Sutter, Tehama, Butte, Glenn, Colusa, Yuba, Placer, Yolo, and Sacramento Counties (Table 2-7, Figure 4-2). Approximately 2,260 acres of habitat are modeled in the Plan Area within the Sacramento Valley and Foothills Region.

Direct Impacts

Covered activities have the potential to result in direct mortality, life cycle impacts, and reduced habitat quality for COFS. Vehicles and equipment could crush or bury shrimp cysts, immature shrimp, and adults when entering or passing through vernal pools or swales during travel to work sites, inspections, and other incidental activities. Shrimp cysts could be buried by soil moved into vernal pools or swales during ground-disturbing activities, which could prevent these cysts from hatching the following wet season. During the wet season COFS could also be impacted by changes to hydrology, within or between pools (e.g., reduced water quality, connectivity to other pools). Direct impacts on shrimp could also result from vehicles or equipment leaking or spilling oil or other contaminants into a pool or swale.

Although there is potential for covered activities to cause direct injury to individual COFS, the majority of impacts would be to the species' habitat. Conservation measures described in Section 5.5.1, Avoidance and Minimization of Impacts, would ensure that the covered activities avoid and minimize impacts on species and habitat. Specifically, these measures are: FP-04, to minimize access route impacts; FP-11, for erosion and sediment control; FP-12, for limiting and covering soil stockpiles; FP-15, to prohibit vehicle refueling within 250 feet from wetlands; FP-16, to maintain a work buffer of 250 feet around wetlands and streams; Hot Zone-2, to prohibit ground-disturbing activities during the wet season within 250 feet of the edge of vernal pools, unless conducted from an existing roadway; and Wetland-1, to maintain buffer of 250 feet around vernal pools (Table 5-1).

Permanent Impacts on Habitat

Covered activities that have the greatest potential for permanent impacts on COFS habitat generally include trenching and excavations to replace a gas transmission pipeline, auguring for electric pole removals and replacements, and blading and maintenance of access roads. These activities could result in the loss of COFS habitat through changes to the soil profile (e.g., breaking through restrictive soil layers) or topography such that the hydrology of the habitat is changed and areas no longer pool to sufficient depths or durations to support vernal pool invertebrates. Covered activities would permanently impact 0.25 acre of COFS habitat in the region annually and no more than 7.5 acres over 30 years (Table 4-13).

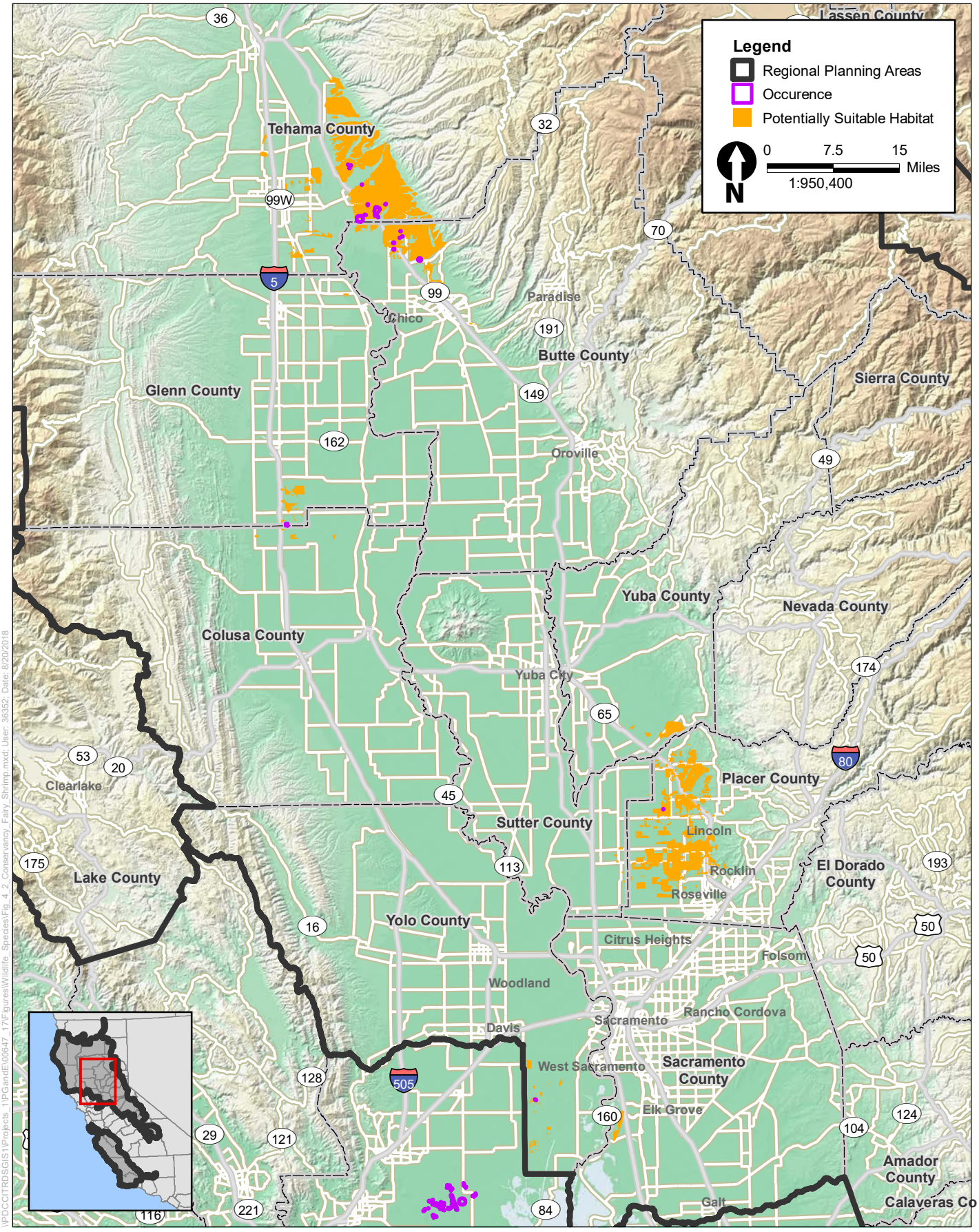


Figure 4-2
Conservancy Fairy Shrimp Modeled Habitat

Temporary Impacts on Habitat

Covered activities with temporary impacts on COFS habitat are those that would occur in or near a vernal pool or swale without causing permanent loss of habitat through installation of a new facility or otherwise increasing the footprint of an existing facility. Covered activities would temporarily impact 1.93 acres of COFS habitat annually and no more than 57.92 acres over 30 years (Table 4-13).

Impacts on Critical Habitat

There are 6 acres of COFS critical habitat in the Plan Area within the Sacramento Valley and Foothills Region, representing approximately 0.26% of modeled habitat in the region (Table 4-10). It is estimated that covered activities would permanently impact 0.001 acre of critical habitat and temporarily impact 0.01 acre of critical habitat for this species annually. Over the 30-year term of the MRHCP, the estimated permanent (0.02 acre) and temporary (0.15 acre) impact total is 0.17 acre. Combined, this represents 0.0001% of the entire critical habitat designation for this species (Table 4-10). The maximum possible 30-year impact on critical habitat would be 6 acres for permanent impacts and 6 acres for temporary impacts which, when combined, represent 0.008% of the entire critical habitat designation (Table 4-14).

Indirect Impacts

Indirect impacts are effects that are caused by or will result from the covered activities and are later in time, but are still reasonably certain to occur. The inadvertent introduction of an invasive plant species by construction equipment, personnel, or contaminated seed or straw is an indirect effect that would be caused by the project and for which negative consequences for vernal pool invertebrates are reasonably certain to occur later in time. Invasive plants can displace native vernal pool/swale plant species by outcompeting them for space, sun, and water, and lead to changes in water quality.

For purposes of this analysis, it is assumed that construction activities within 250 feet of vernal pools could indirectly impact vernal pool invertebrates present in such pools by altering the hydrology that supports this habitat (e.g., altering surface runoff patterns, breaking through hardpan or claypan restrictive layers) or by increasing human intrusion, introducing invasive species (discussed above), and/or otherwise causing or creating pollution of the habitat. These impacts may not be apparent until sometime after the activity has been completed. However, such impacts are anticipated to be negligible since PG&E would implement measures to avoid or minimize these types of indirect impacts: FP-11, for erosion and sediment control; FP-12, for limiting and covering soil stockpiles; and Wetland-1, to maintain buffer of 250 feet around vernal pools.

Longhorn Fairy Shrimp

Species Distribution

Longhorn fairy shrimp (LOFS) is a vernal pool invertebrate. Detailed life history for the species is included in Appendix B. This species is known to occur in Alameda, Contra Costa, Kern, San Joaquin, and San Luis Obispo Counties (Table 2-7, Figure 4-3). Approximately 468 acres of habitat are modeled in the Plan Area within the Sacramento Valley and Foothills Region (Table 4-4).

Direct Impacts

The mechanisms for direct impacts on LOFS are the same as those described for COFS. In LOFS habitat, implementation of the following measures would occur: FP-04, to minimize access route impacts; FP-11, for erosion and sediment control; FP-12, for limiting and covering soil stockpiles; FP-15, to prohibit vehicle refueling within 250 feet from wetlands; FP-16, to maintain a work buffer of 250 feet around wetlands and streams; Hot Zone-2, to prohibit ground-disturbing activities during the wet season within 250 feet of the edge of vernal pools, unless conducted from an existing roadway; and Wetland-1, to maintain buffer of 250 feet around vernal pools (Table 5-1)

Permanent Impacts on Habitat

Permanent impact mechanisms are the same as those discussed for COFS. Covered activities would permanently impact 0.06 acre of LOFS habitat annually and no more than 1.65 acres over 30 years (Table 4-13).

Temporary Impacts on Habitat

Temporary impact mechanisms are the same as those discussed for COFS. Covered activities would temporarily impact 0.36 acres of LOFS habitat annually and no more than 10.81 acres over 30 years (Table 4-13).

Impacts on Critical Habitat

No critical habitat for this species lies in the Plan Area within the Sacramento Valley and Foothills Region (Table 4-10).

Indirect Impacts

The mechanisms for indirect impacts on LOFS are the same as those described above for COFS.

Vernal Pool Fairy Shrimp

Species Distribution

Vernal pool fairy shrimp (VPFS) is a vernal pool invertebrate. Detailed life history for the species is included in Appendix B. This species is known to occur in Shasta County in the north to Santa Barbara County in the south. There are approximately 11,233 acres of modeled habitat in the Plan Area within the Sacramento Valley and Foothills Region (Table 2-7, Table 4-4, Figure 4-4).

Direct Impacts

The mechanisms for direct impacts on VPFS are the same as those described for COFS. In VPFS habitat, implementation of the following measures would occur: FP-04, to minimize access route impacts; FP-11, for erosion and sediment control; FP-12, for limiting and covering soil stockpiles; FP-15, to prohibit vehicle refueling within 250 feet from wetlands; FP-16, to maintain a work buffer of 250 feet around wetlands and streams; Hot Zone-2, to prohibit ground-disturbing activities during the wet season within 250 feet of the edge of vernal pools, unless conducted from an existing roadway; and Wetland-1, to maintain buffer of 250 feet around vernal pools (Table 5-1).

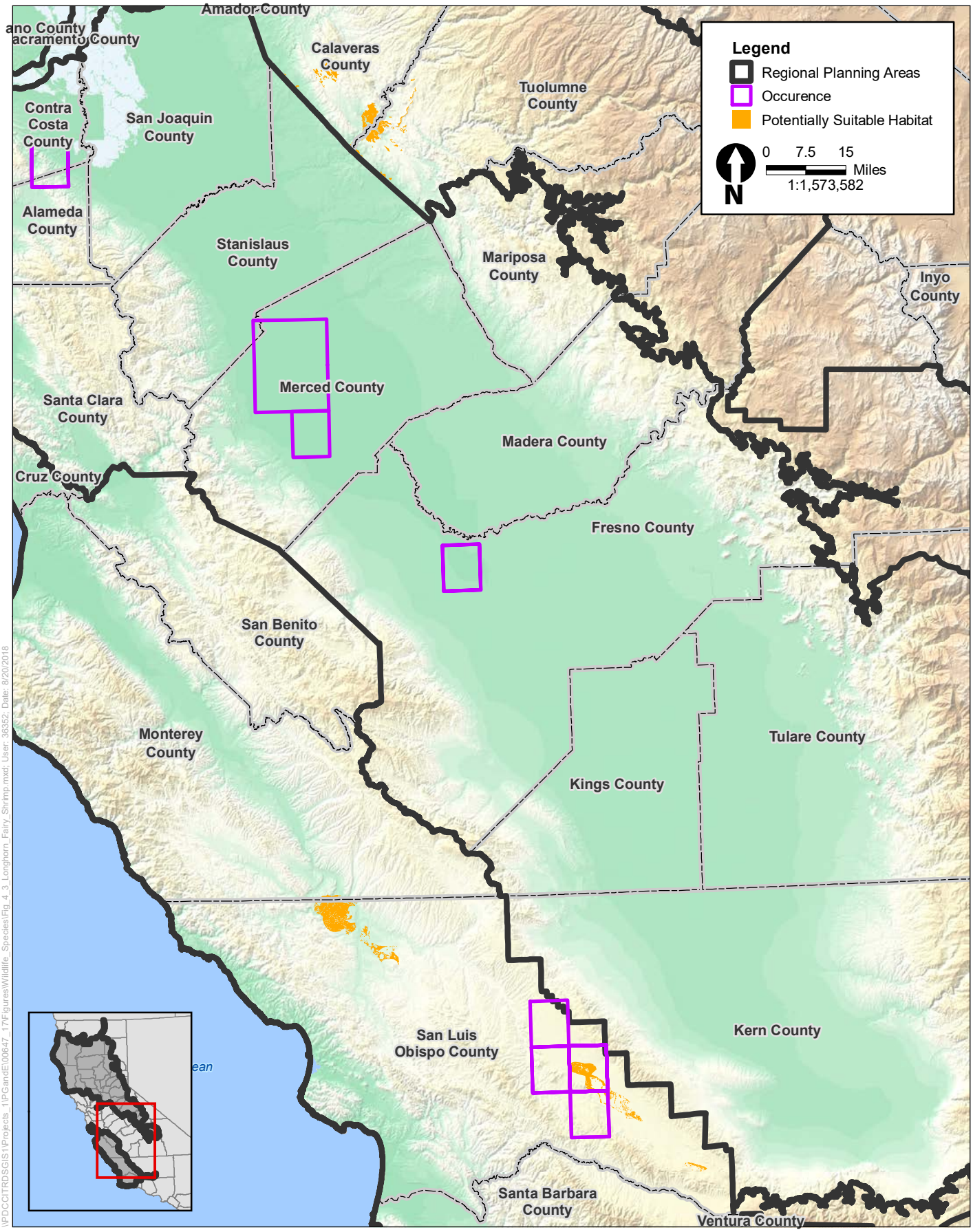
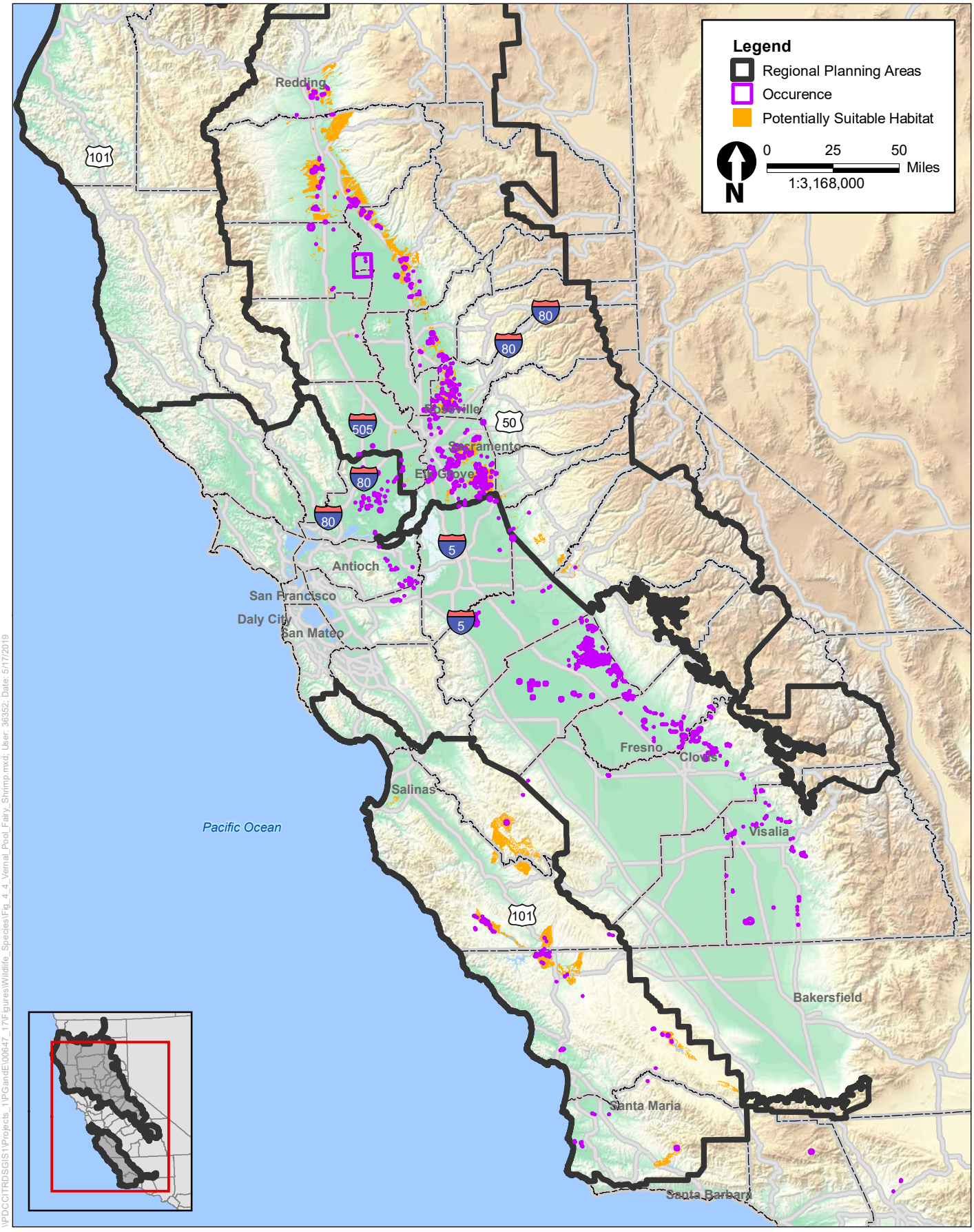


Figure 4-3
Longhorn Fairy Shrimp Modeled Habitat



\PDCCITRDSGIS1\Projects_1\PGandE\00647_17\Figures\Wildlife_Species\Fig_4_4_Vernal_Pool_Fairy_Shrimp.mxd: User: 36352: Date: 5/17/2019

Figure 4-4
Vernal Pool Fairy Shrimp Modeled Habitat

Permanent Impacts on Habitat

Permanent impact mechanisms are the same as those discussed for COFS. Covered activities would permanently impact 1.0 acre of VPFS habitat in the Plan Area annually and no more than 30 acres over 30 years (Table 4-13).

Temporary Impacts on Habitat

Temporary impact mechanisms are the same as those discussed for COFS. Covered activities would temporarily impact 9.51 acres of VPFS habitat annually and no more than 285.17 acres over 30 years (Table 4-13).

Impacts on Critical Habitat

There are 2,245 acres of VPFS critical habitat in the Plan Area within the Sacramento Valley and Foothills Region, representing approximately 20% of modeled habitat in the region (Table 4-10). It is estimated that covered activities would permanently impact 0.2 acre of critical habitat and temporarily impact 1.9 acres of critical habitat for this species annually. Over the 30-year term of the MRHCP, the estimated permanent (6.0 acres) and temporary (57.0 acres) impact total is 63 acres. Combined, this represents 0.011% of the entire critical habitat designation for this species (Table 4-10). The maximum possible 30-year impact on critical habitat is 30.0 acres for permanent impacts and 285.3 acres for temporary impacts which, when combined, represent 0.053% of the entire critical habitat designation (Table 4-14).

Indirect Impacts

The mechanisms for indirect impacts on VPFS are the same as those described above for COFS.

Vernal Pool Tadpole Shrimp

Species Distribution

Vernal pool tadpole shrimp (VPTS) is a vernal pool invertebrate. Detailed life history for the species is included in Appendix B. This species is known to occur in Shasta County south to Santa Barbara County (Table 2-7, Figure 4-5). There are approximately 11,233 acres of modeled suitable habitat in the Plan Area within the Sacramento Valley and Foothills Region (Table 4-4).

Direct Impacts

The mechanisms for direct impacts on VPTS are the same as those described for COFS. In VPTS habitat, implementation of the following measures would occur: FP-04, to minimize access route impacts; FP-11, for erosion and sediment control; FP-12, for limiting and covering soil stockpiles; FP-15, to prohibit vehicle refueling within 250 feet from wetlands; FP-16, to maintain a work buffer of 250 feet around wetlands and streams; Hot Zone-2, to prohibit ground-disturbing activities during the wet season within 250 feet of the edge of vernal pools, unless conducted from an existing roadway; and Wetland-1, to maintain buffer of 250 feet around vernal pools (Table 5-1).

Permanent Impacts on Habitat

Permanent impact mechanisms are the same as those discussed for COFS. Covered activities would permanently impact 1.0 acre of VPTS habitat in the region annually and no more than 30 acres over 30 years (Table 4-13).

Temporary Impacts on Habitat

Temporary impact mechanisms are the same as those discussed for COFS. Covered activities would temporarily impact 9.51 acres of VPTS habitat annually and no more than 285.17 acres over 30 years (Table 4-13).

Impacts on Critical Habitat

There are 2,822 acres of VPTS critical habitat in the Plan Area within the Sacramento Valley and Foothills Region, representing approximately 25% of modeled habitat in the region (Table 4-10). It is estimated that covered activities would permanently impact 0.25 acre and temporarily impact 2.39 acres of critical habitat annually. Over the 30-year permit term of the MRHCP, the estimated permanent (7.5 acres) and temporary (71.7 acres) impact total is approximately 79 acres. Combined, this represents 0.035% of the entire critical habitat designation for this species (Table 4-10). The maximum possible 30-year impact on critical habitat would be 30.0 acres for permanent impacts and 285.3 acres for temporary impacts which, when combined, represent 0.138% of the entire critical habitat designation (Table 4-14).

Indirect Impacts

The mechanisms for indirect impacts on VPTS are the same as those described above for COFS.

Valley Elderberry Longhorn Beetle

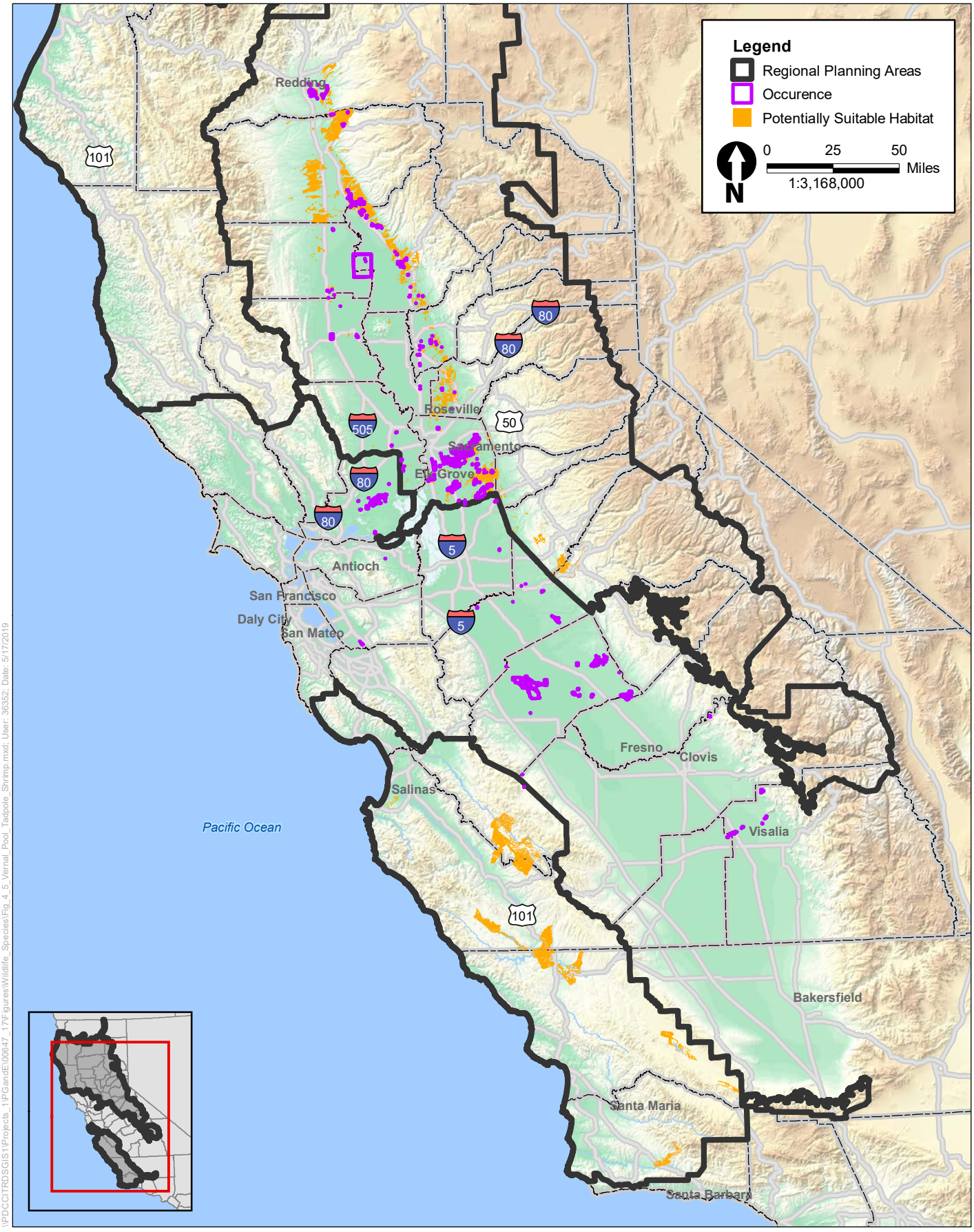
Species Distribution

Valley elderberry longhorn beetle (VELB) is a found only in association with its host plant, elderberry (*Sambucus* spp.). Detailed life history for the species is included in Appendix B. This species has a patchy distribution and only occurs in association with its host plant at elevations below 500 feet in Tehama, Butte, Glenn, Colusa, Sutter, Yuba. Nevada, Placer, Yolo, Sacramento, El Dorado, Amador, Calaveras, Tuolumne, and Mariposa Counties (Table 2-7, Figure 4-6). Approximately 108,640 acres of habitat, all of which are below 500 feet, are modeled in the Plan Area within the Sacramento Valley and Foothills Region.

Direct Impacts

Covered activities could result in direct mortality of VELB. Elderberry stems that are at least 1 inch in diameter may contain one or more VELB eggs, larvae, pupae, or pre-emergent adults, and damage to, or removal of, these stems could impact VELB. In these life stages within the elderberry host plant, individuals could be crushed and killed, or eventually die, as a result of the death and decay of host plant material subsequent to damage or its removal from the growing host plant. During adult emergence, feeding, or dispersal, beetles could be injured or killed by vehicles or equipment during covered activities.

Because elderberry shrubs are the only known VELB host plant and are relatively easy to identify, individual shrubs are the most effective and appropriate unit for use in identification and tracking of impacts on VELB. This approach is in contrast to the use of acreage of modeled habitat (which may or may not include elderberry shrubs) when tracking impacts on other species covered by the MRHCP. However, similar to tracking of impacts on other covered species habitat, which are defined as either temporary or permanent, impacts on VELB habitat (i.e., shrubs) are also considered temporary or permanent, based on the extent of such impacts and the tendency of shrubs to regrow



\\PDCCITRDSGIS1\Projects_1\PGandE\00647_17\Figures\Wildlife_Species\Fig_4_5_Vernal_Pool_Tadpole_Shrimp.mxd: User: 36352: Date: 5/17/2019

Figure 4-5
Vernal Pool Tadpole Shrimp Modeled Habitat

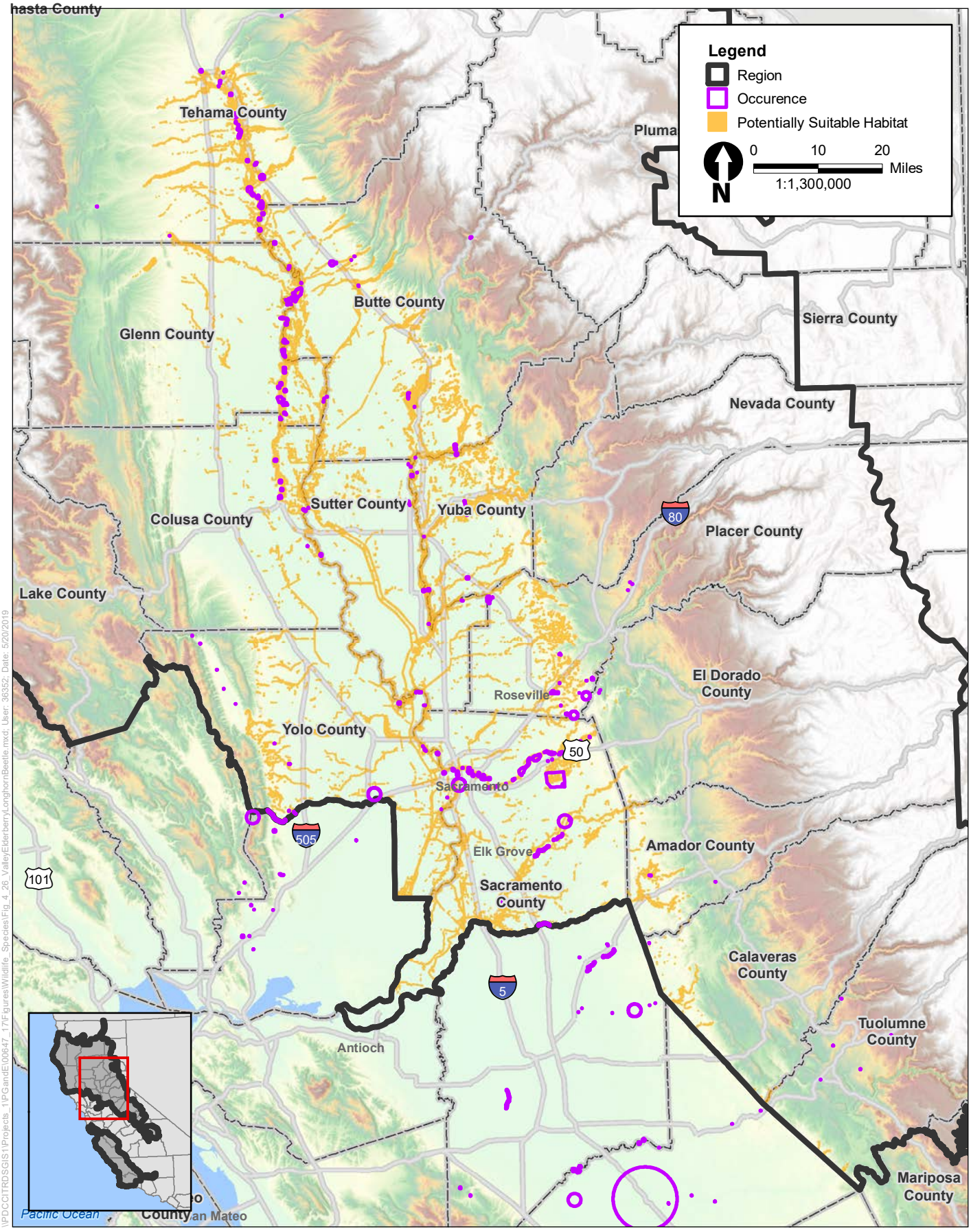


Figure 4-6
Valley Elderberry Longhorn Beetle

or continue to serve as a host to VELB for any part of its life cycle. Talley and Holyoak (2009) found that effects on exterior habitat of pruned shrubs lasted 3 to 4 years resulting in no detectable change in beetle occupancy (as determined by presence of exist holes) at the end of the 4-year study. It is anticipated that most operations and maintenance activities that affect VELB habitat would involve maintaining vegetation clearance away from energized powerline facilities, which typically involves the upper canopy of elderberry shrubs. Thus, pruning, rather than removal, of elderberry shrubs is performed where feasible.

PG&E has been implementing VELB avoidance, minimization, and mitigation since 2003. These efforts have included training staff in shrub identification, avoiding and minimizing impacts, tracking impacts on shrubs, and mitigating impacts on shrubs. Internally, this information is codified in PG&E's VELB Standard and a VELB Procedure. A large percentage (up to 60%) of the shrubs that PG&E prunes is located in agriculture, urban, or other degraded habitat conditions and approximately one-third (up to 35%) is located in riparian areas.

PG&E proposes a distinction between temporary and permanent impacts that accommodates shrub accounting and annual mitigation based on impacts on VELB habitat, species life history, and past discussions with USFWS regarding impacts. A more consistent ability to track and mitigate impacts on VELB is assisted by the definitions below:

Permanent impact on VELB habitat. Any covered activity that results in removal of an entire elderberry shrub with at least one stem greater than 1-inch diameter at ground level will be counted as a permanent impact on one shrub.

Temporary impact on VELB habitat. Any covered activity that results in pruning of one or more elderberry shrub stems greater than 1-inch diameter at ground level, where pruning is at 6-feet or below in height, when the plant is left in place will be counted as a temporary impact. Any covered activity that results in pruning of elderberry shrub stems, regardless of stem diameter, beyond 6 feet above ground level during the months of March through May, when adult VELB is most likely to be present (Lindsey et al. 1972) will also be counted as a temporary impact.

Operations and maintenance activities that result in permanent or temporary impacts will be overseen by a qualified individual, who will also make stem size determinations and collect other relevant information pertaining to the facility involved, location, and date of the impact. These activities are considered necessary for safe and reliable utility operations and must be conducted throughout the year. Shrubs in riparian and non-riparian habitats can be affected, and take of VELB beetles, pupae, larvae, or eggs could result regardless of whether the activity results in temporary or permanent impacts on VELB habitat.

All permanent and temporary impacts will be tracked at the shrub level in PG&E's existing VELB database. This database receives and stores inputs from hand-held field devices that track vegetation maintenance recommendations for trees, shrubs, and brush that may encroach facility rights-of-way. Once vegetation is recommended for removal and removal crews are scheduled, the impacts on elderberry shrubs are noted as completed, whether resulting from permanent removal or pruning, according to the definitions above. The VELB database is used to track the general location, date and type of elderberry shrub impact and will generate an annual summary of such impacts, which will be included in the MRHCP annual report

In VELB habitat (i.e., in or near elderberry shrubs), implementation of the following measures would ensure that covered activities avoid and minimize impacts on VELB: FP-02 would restrict vehicles and equipment to designated areas; FP-03 would minimize the development of new roads; FP-04 would minimize access route impacts on vegetation; and, VELB-1 would limit impacts to elderberry (and VELB) to only those necessary for public safety and reliability of gas and electric service and ROW management. The accounting methodology for impacts on VELB habitat as a result of elderberry pruning and removal is based on the *Framework for Assessing Impacts to the Valley Elderberry Longhorn Beetle*, in which one shrub equals 0.041 acre (U.S. Fish and Wildlife Service 2017). This size is larger than in PG&E's previous data collection efforts, which show removals averaging 0.027 acre and prunings averaging 0.009 acre. However, the larger number is used to ensure PG&E does not exceed its take authorization.

Permanent Impacts on Habitat

Permanent impacts on VELB habitat would consist of entire elderberry shrub removal with at least one stem equal to, or larger than, 1 inch diameter. Covered activities would permanently impact approximately 2.63 acres (or 64 shrubs × 0.041 acre) of VELB habitat annually, and approximately 78.93 acres (or 1,925 shrubs × 0.041 acre) over the 30-year term of the MRHCP (Table 4-13).

Temporary Impacts on Habitat

Temporary impacts on VELB habitat would consist of elderberry pruning of one or more elderberry shrub stems greater than 1-inch diameter at ground level and where the plant is left in place. Adults are most likely to be affected in the canopy during the flight period when flowers are present from March through May; therefore, PG&E's take estimate accounts for these effects. Covered activities are estimated to temporarily impact approximately 9.39 acres (or 229 shrubs × 0.041 acre) of VELB habitat annually, and no more than 281.67 acres (or 6,870 shrubs × 0.041 acre) over the 30-year term of the MRHCP (Table 4-13).

Impacts on Critical Habitat

There are 515 acres of VELB critical habitat in the Study Area within the Sacramento Valley and Foothills Region. Approximately 0.35 acre of critical habitat for this species is in the Plan Area. It is estimated that covered activities would permanently impact 0.0003 acre of critical habitat and temporarily impact 0.001 acre of critical habitat for this species annually. Over the 30-year term of the MRHCP, the estimated permanent (0.01 acre) and temporary (0.03 acre) impact total is 0.04 acre. This represents approximately 0.008% of the entire critical habitat designation for this species. Because critical habitat for this species is relatively limited and there is only 0.35 acre of critical habitat in the Plan Area, the maximum possible 30-year impact on critical habitat would be 0.35 acre, representing 0.067% of the entire critical habitat designation (Table 4-14).

Indirect Impacts

Indirect impacts on VELB could result from vegetation (elderberry) removal, causing a reduction in VELB productivity through the reduction or loss of habitat and food sources.

4.2.8.2 Amphibians

In this section, amphibian species are considered to share many common aspects of life history, including the need for aquatic breeding sites, direct and indirect impact mechanisms, and they share

the same or similar avoidance and minimization measures. Where there are differences, they will be discussed in the appropriate subsection. The extent of habitat and impacts in the region, however, vary widely between species.

California Red-Legged Frog

Species Distribution

California red-legged frog (CRLF) is strongly associated with aquatic habitats. Detailed life history for the species is included in Appendix B. This species is distributed throughout all counties of the Sacramento Valley and Foothills Region (Table 2-7, Figure 4-7), and there are approximately 16,275 acres of modeled habitat in the Plan Area within this region. This habitat is composed of 3,274 acres of potential aquatic/breeding habitat and 13,001 acres of potential upland habitat (Table 4-4).

Direct Impacts

Covered activities have the potential to result in direct impacts on CRLF that include mortality or injury. Individual frogs, could be crushed or buried by vehicles or equipment performing vegetation removal, grading, trenching, or excavation work in upland habitat, particularly when in close proximity to CRLF breeding habitat (e.g., riparian areas or stock ponds) or where individual CRLF are estivating in small animal burrows or may be moving between aquatic habitats or in search of more favorable conditions. Tadpoles and eggs could be crushed by vehicles or equipment operating in, or moving through, aquatic habitat. All life stages could be impacted by reduced water quality (through sedimentation or pollution) or quantity (through changes to hydrology) as a result of covered activities in or near habitat such that, if changes were large enough, they could result in mortality of one or more individuals.

Except in emergency conditions, crews perform covered activities during daylight hours, when the potential for death or injury of dispersing frogs is lower. A storm-related or other emergency would be the exception, when construction crews could be active at night and could take adult and juvenile frogs that happen to be dispersing through a work site during winter rains.

Covered activities may occasionally need to be implemented in or near aquatic habitat where there is the potential for death or injury of eggs, larvae, or adults. In CRLF habitat, implementation of the following measures would occur: FP-02 would restrict vehicles and equipment to designated areas; FP-03 would minimize the development of new roads; FP-04 would keep vehicles and equipment out of wet areas and minimize impacts on natural vegetation; FP-11 would avoid soil and sediment runoff into water bodies; FP-12 would limit stockpiles and require covering of spoils; FP-13 would require escape ramps in open trenches and steep-walled holes; FP-15 would prohibit refueling within 250 feet of vernal pools, ponds, and streams; FP-16 would maintain a 250-foot buffer around vernal pools and/or require biological monitoring; and Wetland-2 would maintain a 50-foot buffer around wetlands, ponds, and riparian areas (see Table 5-1).

Additional measures implemented for working near stream-dependent amphibian habitat include FP-06 for inspection of materials and pipes prior to moving materials on-site; FP-08 for prohibition of trash dumping on-site; FP-10 for minimization of footprint and time on site; FP-17 for felling trees away from exclusion zones; and FP-01 for training construction crews on these requirements.

Permanent Impacts on Habitat

Permanent impacts on breeding habitat would result from covered activities that permanently reduce the surface area of aquatic breeding habitat through installation of permanent facilities or expansion of an existing facility footprint. Permanent impacts on upland habitat would result from installation of new permanent facilities or the expansion of an existing facility footprint in upland habitat. Covered activities would permanently impact 1.0 acre of breeding habitat (i.e., the wetted area and the adjacent riparian areas) annually. These impacts would not exceed 30.0 acres over 30 years. Covered activities would permanently impact 2.0 acres of upland habitat annually and 60.0 acres of upland habitat over 30 years (Table 4-13).

Temporary Impacts on Habitat

Covered activities with temporary impacts are those that occur in aquatic or upland habitat without causing permanent loss of habitat through installation of a new facility or otherwise increasing the footprint of an existing facility. Covered activities would temporarily impact 3.0 acres of California red-legged frog breeding habitat (i.e., wetted area and the adjacent riparian areas) annually and up to 90.0 acres over 30 years. Covered activities would have temporary impacts on 10.35 acres of upland habitat annually, and 310.52 acres of upland habitat over 30 years (Table 4-13).

Impacts on Critical Habitat

Critical habitat for CRLF encompasses 876 acres in the Plan Area within the Sacramento Valley and Foothills Region, representing approximately 5.4% of modeled habitat in the Plan Area within this region. It is estimated that covered activities would permanently impact 0.16 acres of critical habitat and temporarily impact 0.72 acres of critical habitat for this species annually. Over the 30-year term of the MRHCP, the estimated permanent (4.8 acres) and temporary (21.6 acres) impact total is 26.4 acres. Combined, this represents 0.0016% of the entire critical habitat designation for this species (Table 4-10). The maximum possible 30-year impact on critical habitat would be 90.0 acres for permanent impacts and 400.5 acres for temporary impacts which, when combined, represent 0.03% of the entire critical habitat designation (Table 4-14).

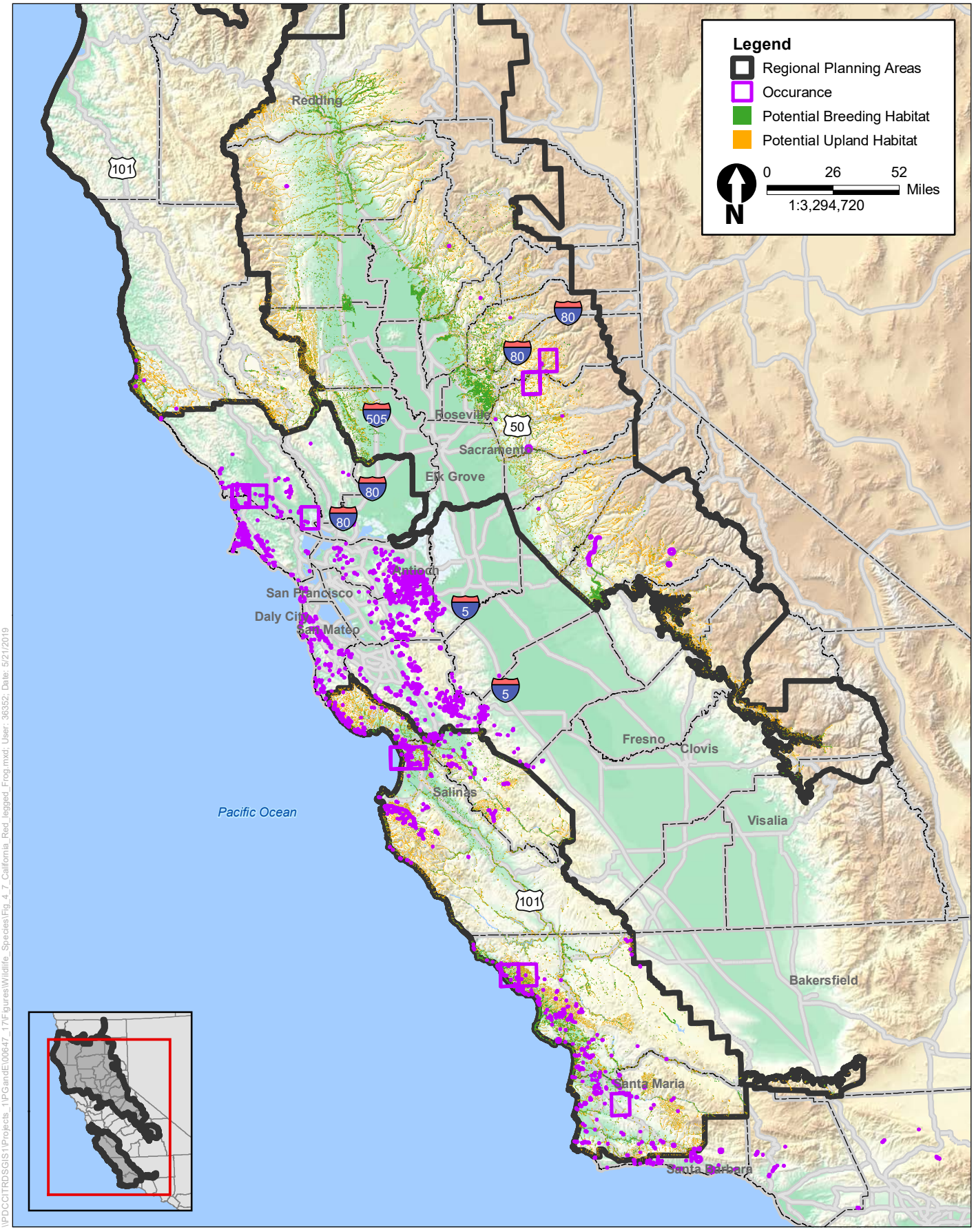
Indirect Impacts

Potential indirect impacts caused by covered activities could include 1) inadvertently introducing invasive plant species by means of construction equipment, personnel, or contaminated seed or straw, and 2) altering hydrology of breeding habitat. Invasive plants could overrun riparian or other aquatic breeding habitat or adjacent suitable upland areas by outcompeting native plant species. This could reduce the quality of the habitat for CRLF or eventually make habitat unsuitable. Depending on topography and rainfall, construction activities up to 300 feet beyond riparian areas could indirectly affect breeding habitat by altering the hydrology or reducing water quality if PG&E's restoration actions or sediment control measures fail, and water quality is degraded by runoff and sedimentation.

California Tiger Salamander (Central California DPS)

Species Distribution

California tiger salamander (CTS) is a member of the salamander family. Detailed life history for the species is included in Appendix B. In the Sacramento Valley and Foothills Region, the Central California DPS of CTS occurs in Butte, Sutter, Yolo, Sacramento, Amador, Calaveras, and Tuolumne



\PDCCITRDSGIS1\Projects_1\PGandE\00647_17\Figures\Wildlife_Species\Fig_4_7_California_Red_legged_Frog.mxd; User: 36352; Date: 5/21/2019

Figure 4-7
California Red-legged Frog Modeled Habitat

Counties (Figure 4-8). There are approximately 14,015 acres of modeled habitat in the Plan Area within this region. This habitat includes approximately 1,024 acres of potential aquatic/breeding habitat and 12,990 acres of the potential upland habitat (Table 4-4).

Direct Impacts

Direct impacts on CTS are similar to those discussed previously for CRLF, although, CTS are associated with small mammal burrows (in which CTS could be crushed or buried) farther from aquatic habitats where they estivate during hot, dry periods. In addition, to minimize direct mortality in an area that will be trenched, there may be instances where PG&E would excavate burrows by hand. Although this technique is considered the best way to salvage individual salamanders, which could die during salvage, it is likely to result in take in the form of harm and harassment rather than direct mortality. California tiger salamanders found in burrows would be relocated to the closest suitable burrow or refuge.

Covered activities may occasionally need to be implemented in or near aquatic habitat where there is the potential for death or injury of eggs, larvae, or adults. In CTS habitat, implementation of the following measures would occur: FP-02 would restrict vehicles and equipment to designated areas; FP-03 would minimize the development of new roads; FP-04 would keep vehicles and equipment out of wet areas and minimize impacts on natural vegetation; FP-11 would avoid soil and sediment runoff into water bodies; FP-12 would limit stockpiles and require covering of spoils; Wetland-1 would maintain a 250-foot buffer around vernal pools; Wetland-2 would maintain a 50-foot buffer around wetlands, ponds and riparian areas; and Hot Zone-6 would require flagging and avoidance of vernal pools (see Table 5-1). These measures would be implemented in or near aquatic habitat and, accordingly, impacts on breeding areas are expected to be minimal and infrequent.

The same measures would be implemented in upland habitat, with the addition of the following: FP-13 would require escape ramps in open trenches and steep-walled holes; FP-15 would prohibit refueling within 250 feet of vernal pools, ponds, and streams; FP-16 would maintain a 250-foot buffer around vernal pools and/or require biological monitoring (Table 5-1).

Permanent Impacts on Habitat

Permanent impact mechanisms are the same as those discussed for CRLF. Covered activities are estimated to permanently impact approximately 0.17 acre of CTS breeding habitat annually, and no more than approximately 5.06 acres over the 30-year term of the MRHCP. Covered activities are estimated to permanently impact approximately 2.27 acres of upland habitat annually, and no more than approximately 68.22 acres over 30-years (Table 4-13).

Temporary Impacts on Habitat

Temporary impact mechanisms are the same as those discussed for CRLF. Covered activities are estimated to temporarily impact approximately 0.85 acre of CTS breeding habitat annually, and no more than approximately 25.36 acres over the 30-year term of the MRHCP (Table 4-8). Covered activities are estimated to temporarily impact approximately 10.88 acres of upland habitat annually, and no more than approximately 326.31 acres over 30-years (Table 4-13).

Impacts on Critical Habitat

Designated critical habitat for CTS (Central California DPS) encompasses 569 acres in the Plan Area within the Sacramento Valley and Foothills Region, representing approximately 4% of modeled

habitat in the Plan Area within the region (Table 4-10). It is estimated that covered activities would permanently impact 0.10 acre of critical habitat and temporarily impact 0.48 acre of critical habitat for this species annually. Over the 30-year term of the MRHCP, the estimated permanent (3.0 acres) and temporary (14.3 acres) impact total is 17.3 acres. Combined, this represents 0.009% of the entire critical habitat designation for this species (Table 4-10). The maximum possible 30-year impact on critical habitat would be 73.2 acres for permanent impacts and 352.0 acres for temporary impacts which, when combined, represent 0.21% of the entire critical habitat designation (Table 4-14).

Indirect Impacts

Indirect impacts on CTS are similar to those described for CRLF, except that vernal pools (rather than riparian habitat) could be more easily indirectly impacted by invasive weeds, altered hydrology or reduced water quality as a result of covered activities within 250 feet of breeding habitat as a result of failed or inadequate sediment control measures.

Foothill Yellow-Legged Frog

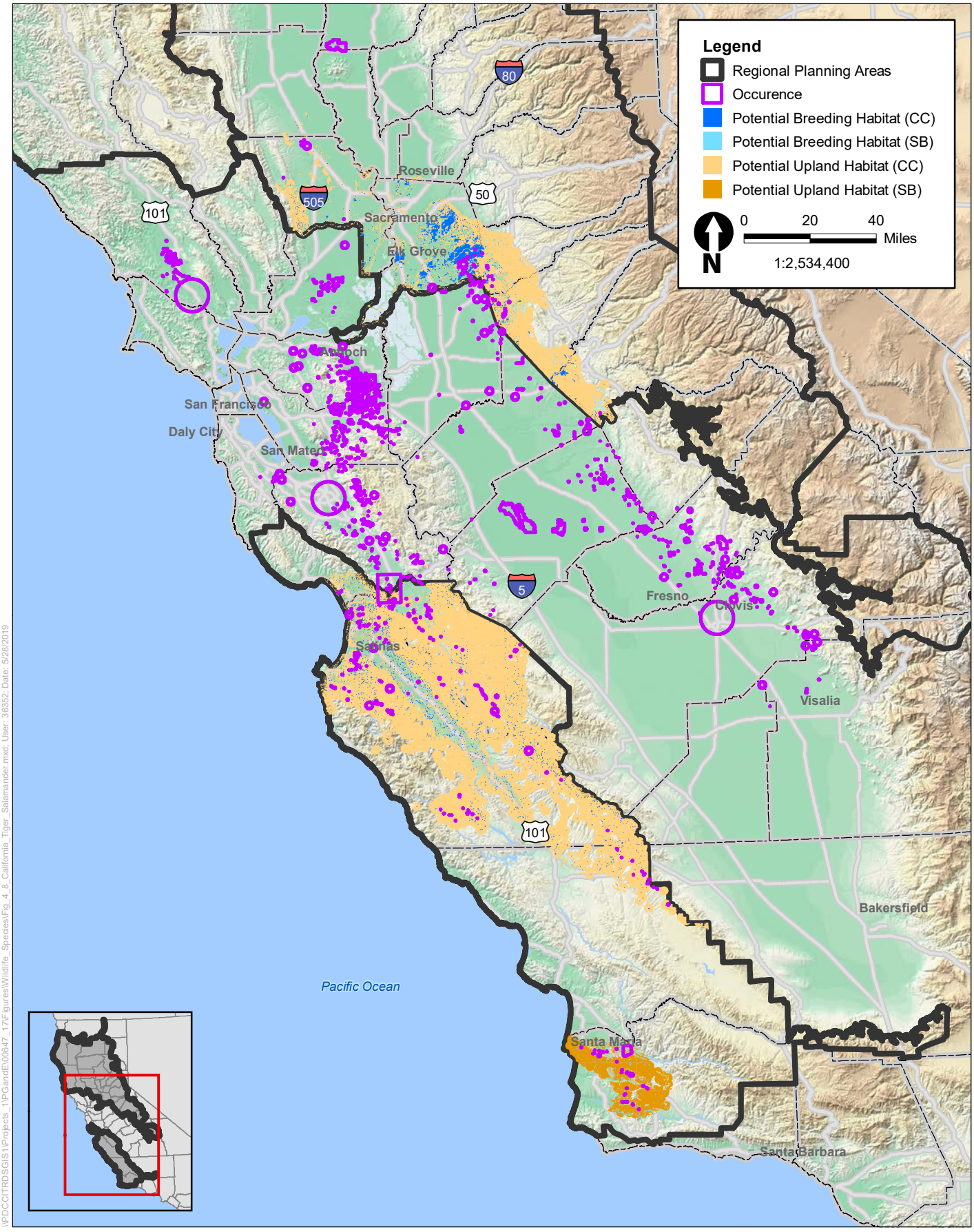
Species Distribution

Foothill yellow-legged frog (FYLF) is an amphibian associated with perennial streams. Detailed life history for the species is included in Appendix B. With the exception of Sutter County, FYLF occurs in each county of the Sacramento Valley and Foothills Region (Figure 4-9). In the Plan Area within the region, there are approximately 2,547 acres of modeled habitat, composed of 197 acres of breeding habitat and 2,351 acres of upland (Table 4-4).

Direct Impacts

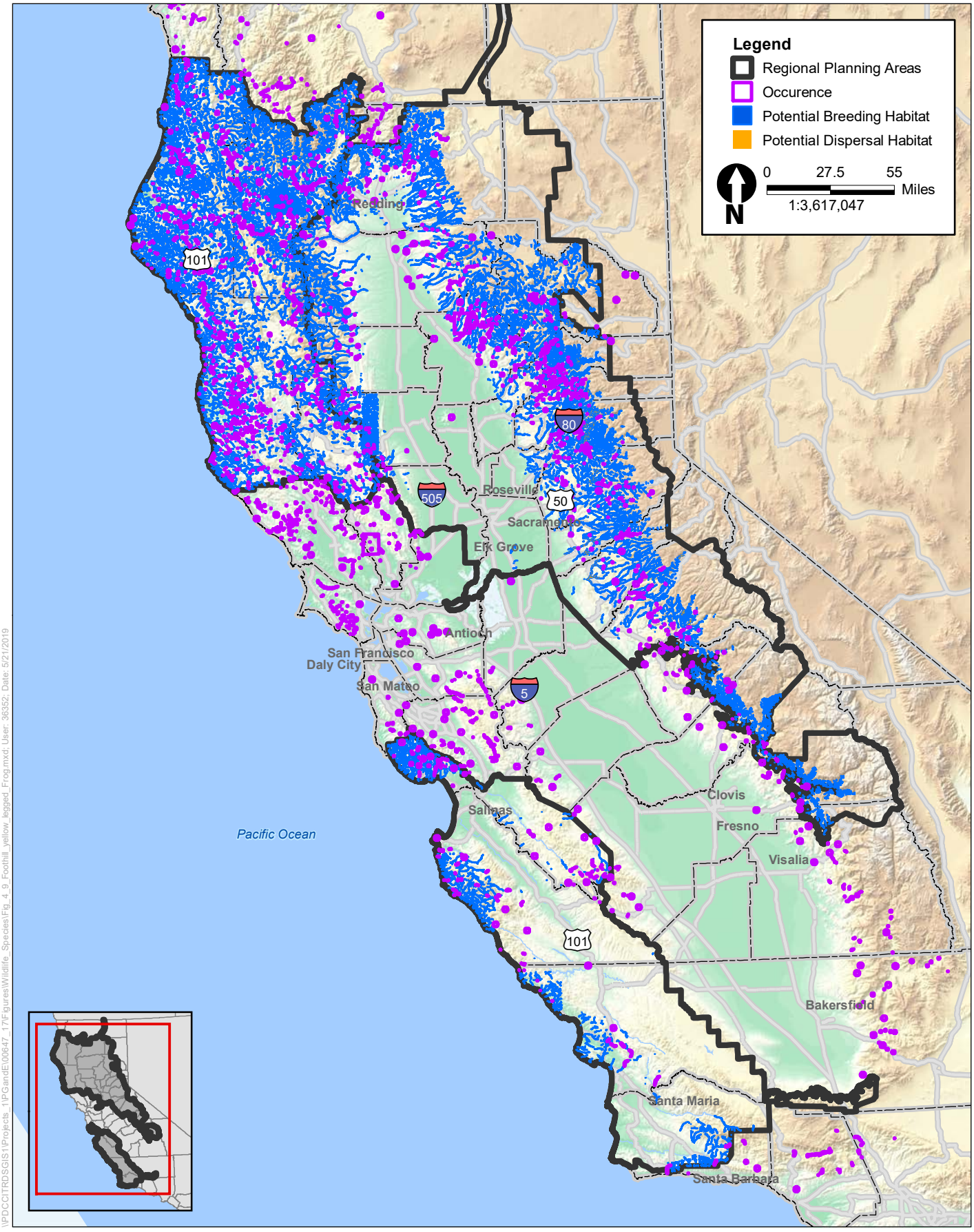
Although there are few facilities in FYLF habitat, direct impacts on FYLF are similar to those discussed previously for CRLF with the distinction that eggs are laid only in streams or rivers. Covered activities may occasionally need to be implemented in or near riparian habitat or dispersal habitat where there is the potential for death or injury of eggs, larvae, tadpoles, metamorphs, or adults. In FYLF habitat, the following measures would be implemented: FP-02 would restrict vehicles and equipment to designated areas; FP-03 would minimize the development of new roads; FP-04 would keep vehicles and equipment out of sensitive areas and minimize impacts on natural vegetation; FP-11 would avoid soil and sediment runoff into water bodies; FP-12 would limit stockpiles and require covering of spoils; FP-13 would require escape ramps in open trenches and steep-walled holes; FP-15 would prohibit refueling within 250 feet of vernal pools, ponds, and streams; FP-16 would maintain a 250-foot buffer around vernal pools and/or require biological monitoring; and Wetland-2 would maintain a 50-foot buffer around wetlands, ponds, and riparian areas (see Table 5-1). These measures would ensure that the covered activities avoid and minimize potential impacts on FYLF and its habitat.

Additional measures implemented for working near stream-dependent amphibian habitat include FP-06 for inspection of materials and pipes prior to moving materials on-site; FP-08 for prohibition of trash dumping on-site; FP-10 for minimization of footprint and time on site; FP-17 for felling trees away from exclusion zones; and FP-01 for training construction crews on these requirements.



\\PDCCITRDSGIS11\Projects_1\PGandE\00647_17\Figures\Wildlife_Species\Fig_4_8_California_Tiger_Salamander.mxd: User: 36352: Date: 5/28/2019

Figure 4-8
California Tiger Salamander Modeled Habitat



\PDCCITRDSGIS1\Projects_1\PGandE\00647_17\Figures\Wildlife_Species\Fig_4_9_Foothill_yellow_legged_Frog.mxd; User: 36352; Date: 5/21/2019

Figure 4-9
Foothill Yellow-legged Frog Modeled Habitat

Permanent Impacts on Habitat

Permanent impact mechanisms are the same as those discussed for CRLF. Covered activities are estimated to permanently impact approximately 0.02 acre of FYLF breeding habitat annually, and no more than 0.75 acre over the 30-year term of the MRHCP. Covered activities are estimated to permanently impact approximately 0.29 acre of FYLF upland dispersal habitat annually, and no more than 8.78 acres over 30 years (Table 4-13).

Temporary Impacts on Habitat

Temporary impact mechanisms are the same as those discussed for CRLF. Covered activities in the region are estimated to temporarily impact approximately 0.15 acre of FYLF breeding habitat annually, and no more than 4.59 acres over the 30-year term of the MRHCP. Covered activities are estimated to temporarily impact approximately 1.80 acre of FYLF upland dispersal habitat annually, and no more than 54.87 acres over 30 years (Table 4-13).

Impacts on Critical Habitat

Critical habitat has not been designated for FYLF.

Indirect Impacts

Indirect impacts on FYLF are similar to those described for CRLF to the extent that they pertain to stream channels and riparian habitat, rather than ponds or pools.

Mountain Yellow-Legged Frog

Species Distribution

Mountain yellow-legged frog (MYLF) is strongly associated with perennial mountain streams. Detailed life history for this species is included in Appendix B. Approximately 16 acres of modeled habitat are present in the southern reaches of the Plan Area within the Sacramento Valley and Foothills Region, near the Fresno County-Tulare County border (Table 2-7, Figure 4-10).

Direct Impacts

Because there are few PG&E facilities in MYLF habitat, there is very limited potential for ground-disturbing activities to impact habitat and reduce MYLF habitat connectivity across the landscape. Direct impacts on MYLF are similar to those discussed previously for CRLF. Should covered activities occur in or near MYLF habitat, implementation of the following measures would occur: FP-02 would restrict vehicles and equipment to designated areas; FP-03 would minimize the development of new roads; FP-04 would keep vehicles and equipment out of wet areas and minimize impacts on natural vegetation; FP-11 would avoid soil and sediment runoff into water bodies; FP-12 would limit stockpiles and require covering of spoils; FP-13 would require escape ramps in open trenches and steep-walled holes; FP-15 would prohibit refueling within 250 feet of vernal pools, ponds, and streams; FP-16 would maintain a 250-foot buffer around vernal pools and/or require biological monitoring; and Wetland-2 would maintain a 50-foot buffer around wetlands, ponds, and riparian areas (see Table 5-1). These measures would ensure that the covered activities avoid and minimize potential impacts on MYLF and its habitat.

Additional measures implemented for working near stream-dependent amphibian habitat include FP-06 for inspection of materials and pipes prior to moving materials on-site; FP-08 for prohibition

of trash dumping on-site; FP-10 for minimization of footprint and time on site; FP-17 for felling trees away from exclusion zones; and FP-01 for training construction crews on these requirements.

Permanent Impacts on Habitat

Permanent impact mechanisms are the same as those discussed for CRLF. PG&E ROWs are only found in a small portion of suitable habitat along Kings River, and covered activities are estimated to permanently impact approximately 0.02 acre of MYLF habitat annually and no more than 0.6 acre over the 30-year term of the MRHCP (Table 4-13).

Temporary Impacts on Habitat

Temporary impact mechanisms are the same as those discussed for CRLF. Covered activities are estimated to temporarily affect approximately 0.10 acre of MYLF habitat annually, and no more than 3.0 acres over the 30-year term of the MRHCP (Table 4-13).

Impacts on Critical Habitat

Critical habitat for MYLF totals 221,498 acres. However, none of this species' designated critical habitat is defined within the region.

Indirect Impacts

Indirect impacts on MYLF are similar to those described for CRLF.

Sierra Nevada Yellow-Legged Frog

Species Distribution

Sierra Nevada yellow-legged frog (SYLF) inhabits riverbanks, meadow streams, isolated pools, and lake borders in the Sierra Nevada. Detailed life history for the species is included in Appendix B. Highly suitable habitat is located in all of the small creeks in the Sacramento Valley and foothills Region, from the north starting below Lake Almanor to the south in Kings Canyon. There are approximately 194 acres of modeled habitat in the Plan Area within the region (Table 2-7, Figure 4-11).

Direct Impacts

There are few PG&E facilities in SYLF habitat and, therefore, there is very limited potential for ground-disturbing activities to impact habitat and reduce SYLF habitat connectivity across the landscape. Direct impacts on SYLF are similar to those discussed previously for CRLF. Should covered activities occur in or near SYLF habitat, implementation of the following measures would occur: FP-02 would restrict vehicles and equipment to designated areas; FP-03 would minimize the development of new roads; FP-04 would keep vehicles and equipment out of wet areas and minimize impacts on natural vegetation; FP-11 would avoid soil and sediment runoff into water bodies; FP-12 would limit stockpiles and require covering of spoils; FP-13 would require escape ramps in open trenches and steep-walled holes; FP-15 would prohibit refueling within 250 feet of vernal pools, ponds, and streams; FP-16 would maintain a 250-foot buffer around vernal pools and/or require biological monitoring; and Wetland-2 would maintain a 50-foot buffer around wetlands, ponds, and riparian areas (see Table 5-1). These measures would ensure that the covered activities avoid and minimize potential impacts on SYLF and its habitat.

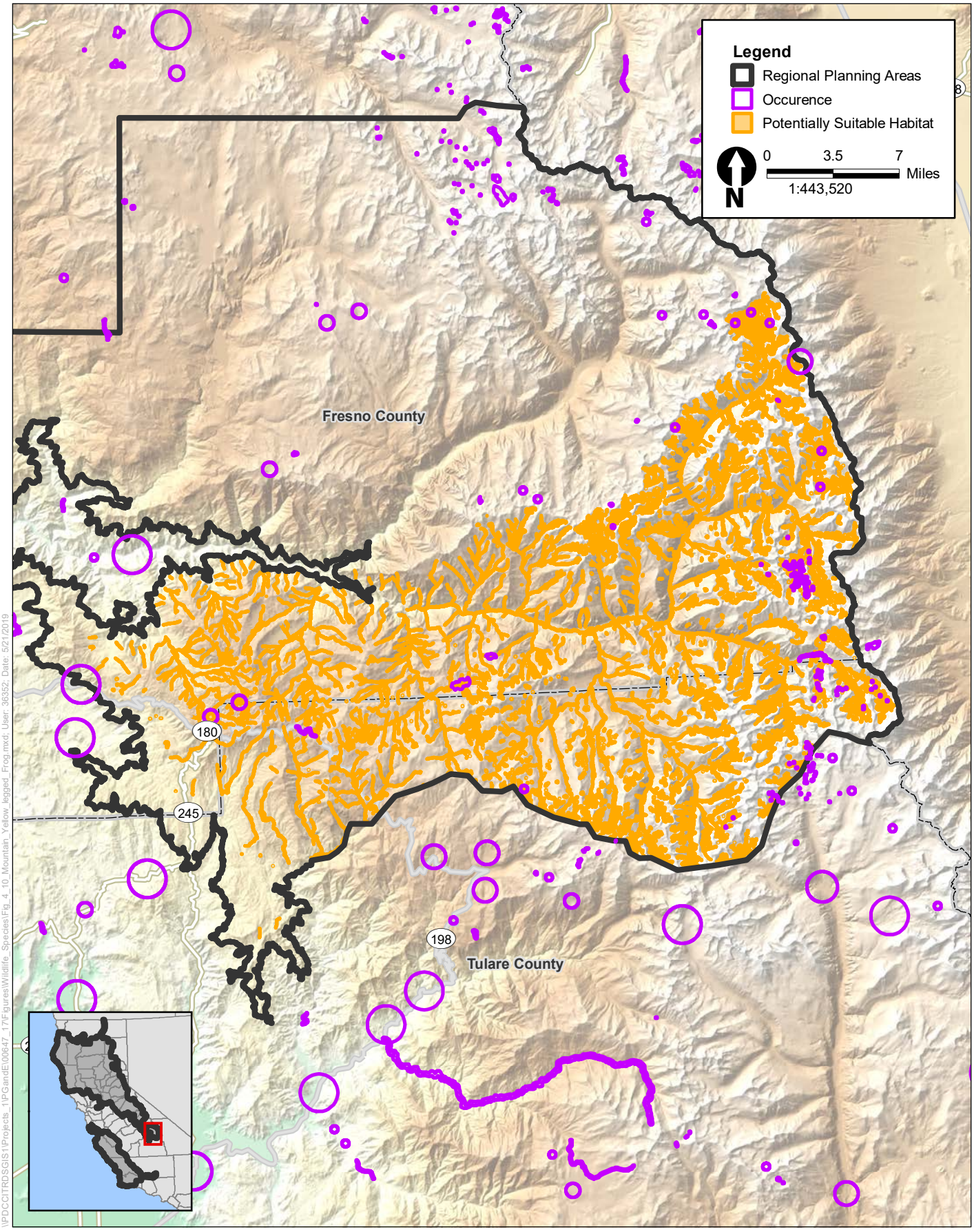


Figure 4-10
Mountain Yellow-legged Frog Modeled Habitat

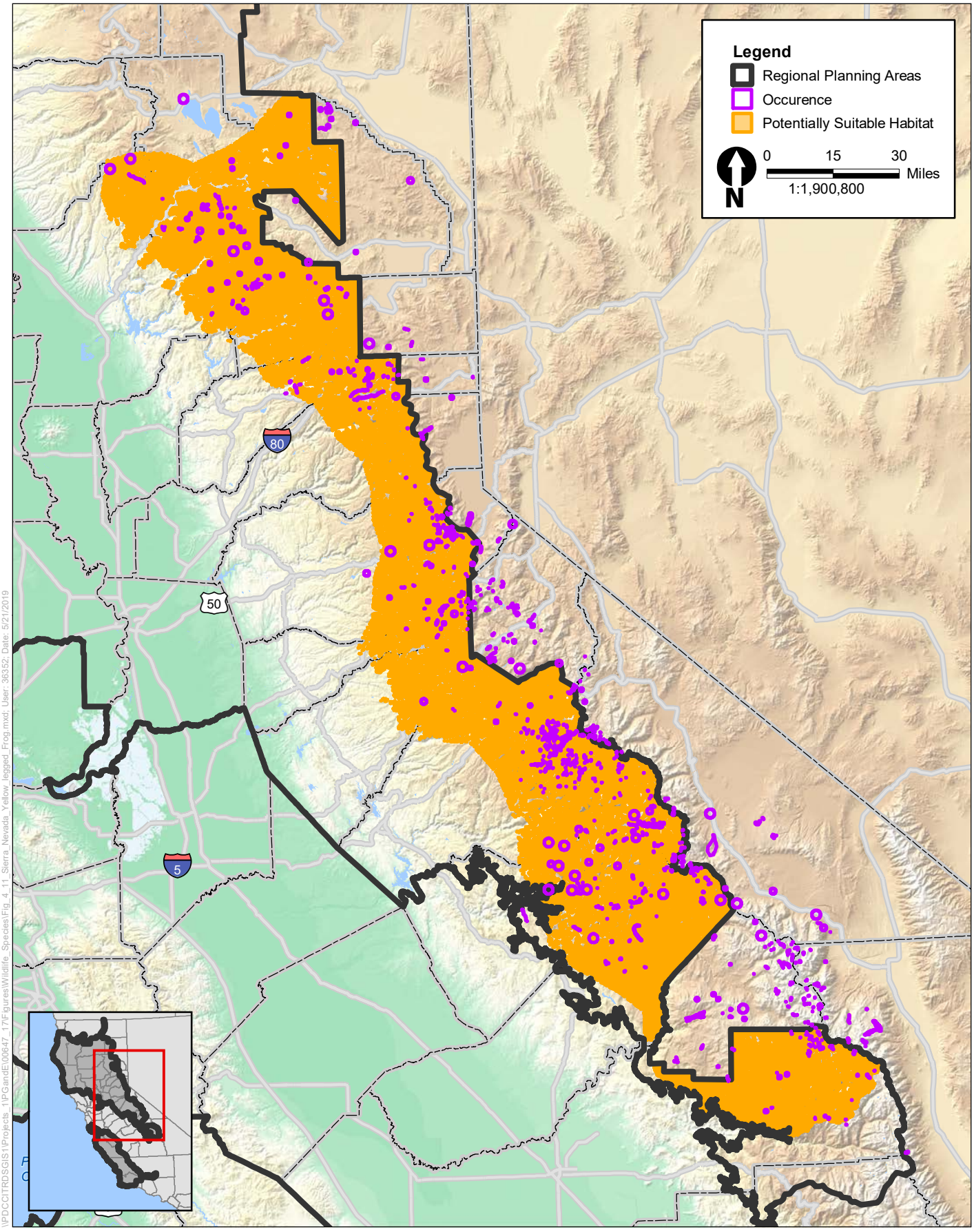


Figure 4-11
Sierra Nevada Yellow-legged Frog Modeled Habitat

Additional measures implemented for working near stream-dependent amphibian habitat include FP-06 for inspection of materials and pipes prior to moving materials on-site; FP-08 for prohibition of trash dumping on-site; FP-10 for minimization of footprint and time on site; FP-17 for felling trees away from exclusion zones; and FP-01 for training construction crews on these requirements.

Permanent Impacts on Habitat

Permanent impact mechanisms are the same as those discussed for CRLF. Covered activities are estimated to permanently impact approximately 0.02 acre of SYLF habitat annually, and no more than 0.68 acre over the 30-year term of the MRHCP (Table 4-13).

Temporary Impacts on Habitat

Temporary impact mechanisms are the same as those discussed for CRLF. Covered activities are estimated to temporarily impact approximately 0.15 acre of SYLF habitat annually, and no more than approximately 4.48 acres over the 30-year term of the MRHCP (Table 4-13)

Impacts on Critical Habitat

Critical habitat designated for SYLF includes 1,146 acres in the Plan Area within the Sacramento Valley and Foothills Region. All modeled habitat for this species in the region is within critical habitat for this species. It is estimated that covered activities would permanently impact 0.02 acre of critical habitat and temporarily impact 0.15 acre of critical habitat for this species annually. Over the 30-year term of the MRHCP, the estimated permanent (0.6 acre) and temporary (4.5 acres) impact total is approximately 5.1 acres. Combined, this represents 0.0005% of the entire critical habitat designation for this species (Table 4-10).

Indirect Impacts

Indirect impacts on SYLF are similar to those described for CRLF.

Yosemite Toad

Species Distribution

Yosemite toad (YOTO) is endemic to shallow, quiet streams in higher elevations of the Sierra Nevada Mountains. Detailed life history for the species is included in Appendix B. The species is limited to Tuolumne, Mariposa, Madera, and Fresno Counties in the southern reaches of the Sacramento Valley and Foothills Region, where there is less than 1 acre of modeled habitat in one of the larger suitable habitat areas for this species near the PG&E ROW, just east of State Route 41 in Mariposa County (Table 2-7, Figure 4-12).

Direct Impacts

Direct impacts on YOTO are very similar to those discussed previously for CRLF, although the amount of modeled habitat in proximity to facilities in the region is extremely small. Should covered activities occur in or near YOTO habitat, implementation of the following measures would occur: FP-02 would restrict vehicles and equipment to designated areas; FP-03 would minimize the development of new roads; FP-04 would keep vehicles and equipment out of wet areas and minimize impacts on natural vegetation; FP-11 would avoid soil and sediment runoff into water bodies; FP-12 would limit stockpiles and require covering of spoils; FP-13 would require escape

ramps in open trenches and steep-walled holes; FP-15 would prohibit refueling within 250 feet of vernal pools, ponds, and streams; FP-16 would maintain a 250-foot buffer around vernal pools and/or require biological monitoring; and Wetland-2 would maintain a 50-foot buffer around wetlands, ponds, and riparian areas (see Table 5-1). These measures would ensure that the covered activities avoid and minimize potential impacts on YOTO and its habitat.

Additional measures implemented for working near stream-dependent amphibian habitat include FP-06 for inspection of materials and pipes prior to moving materials on-site; FP-08 for prohibition of trash dumping on-site; FP-10 for minimization of footprint and time on site; FP-17 for felling trees away from exclusion zones; and FP-01 for training construction crews on these requirements.

Permanent Impacts on Habitat

Permanent impact mechanisms are the same as those discussed for CRLF. Covered activities are estimated to permanently impact approximately 0.02 acre of YOTO habitat, annually, and no more than 0.5 acre over the 30-year term of the MRHCP (Table 4-13).

Temporary Impacts on Habitat

Temporary impact mechanisms are the same as those discussed for CRLF. Covered activities are estimated to temporarily impact approximately 0.07 acre of YOTO habitat annually, and no more than 2.0 acres over the 30-year term of the MRHCP (Table 4-13).

Impacts on Critical Habitat

Critical habitat designated for YOTO includes 208 acres in the Plan Area within the Sacramento Valley and Foothills Region. If all impacts were in critical habitat, it is estimated covered activities would permanently impact 0.02 acre of critical habitat and temporarily impact 0.07 acre of critical habitat for this species annually. Over the 30-year term of the MRHCP, the estimated permanent (0.5 acre) and temporary (2.0 acres) impact total is approximately 2.5 acres. Combined, this represents 0.0003% of the entire critical habitat designation for this species (Table 4-10).

Indirect Impacts

Indirect impacts on YOTO are similar to those described for CRLF.

4.2.8.3 Reptiles

Giant Garter Snake

Species Distribution

Giant garter snake (GGS) is a highly aquatic snake which inhabits primarily fresh permanent wetland, flooded cropland, and slow-moving drainages of the valley floor. Detailed life history for the species is included in Appendix B. GGS is distributed throughout portions of Sacramento, Sutter, Butte, Colusa, and Glenn Counties; along the western border of the Yolo Bypass in Yolo County, west to the vicinity of Woodland in Yolo County; and along the eastern fringes of the Sacramento-San Joaquin River Delta from the Laguna Creek/Elk Grove region of central Sacramento County southward (Figure 4-13). The Plan Area within the Sacramento Valley and Foothills Region is estimated to encompass approximately 17,520 acres of modeled habitat consisting of 2,416 acres of

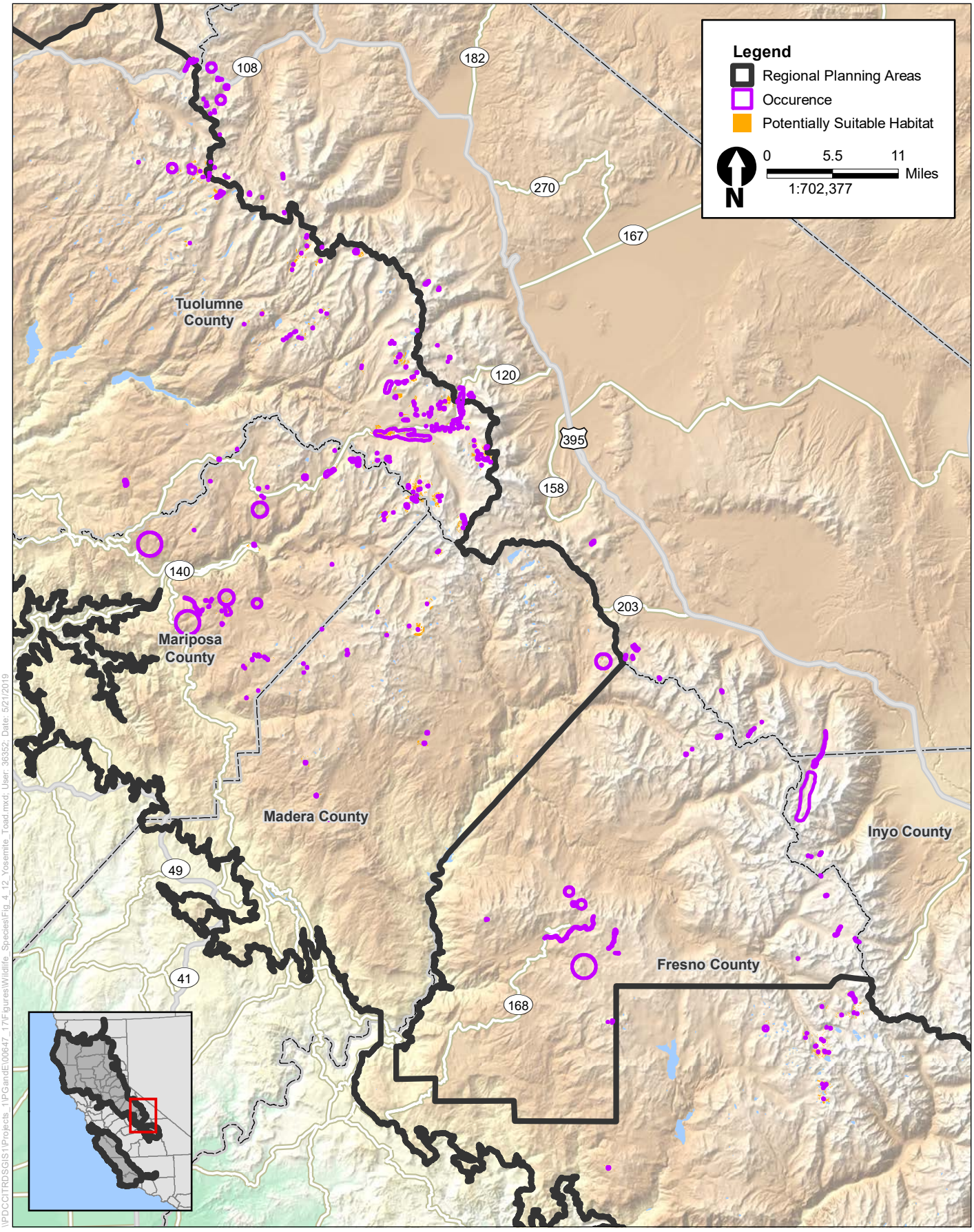


Figure 4-12
Yosemite Toad Modeled Habitat

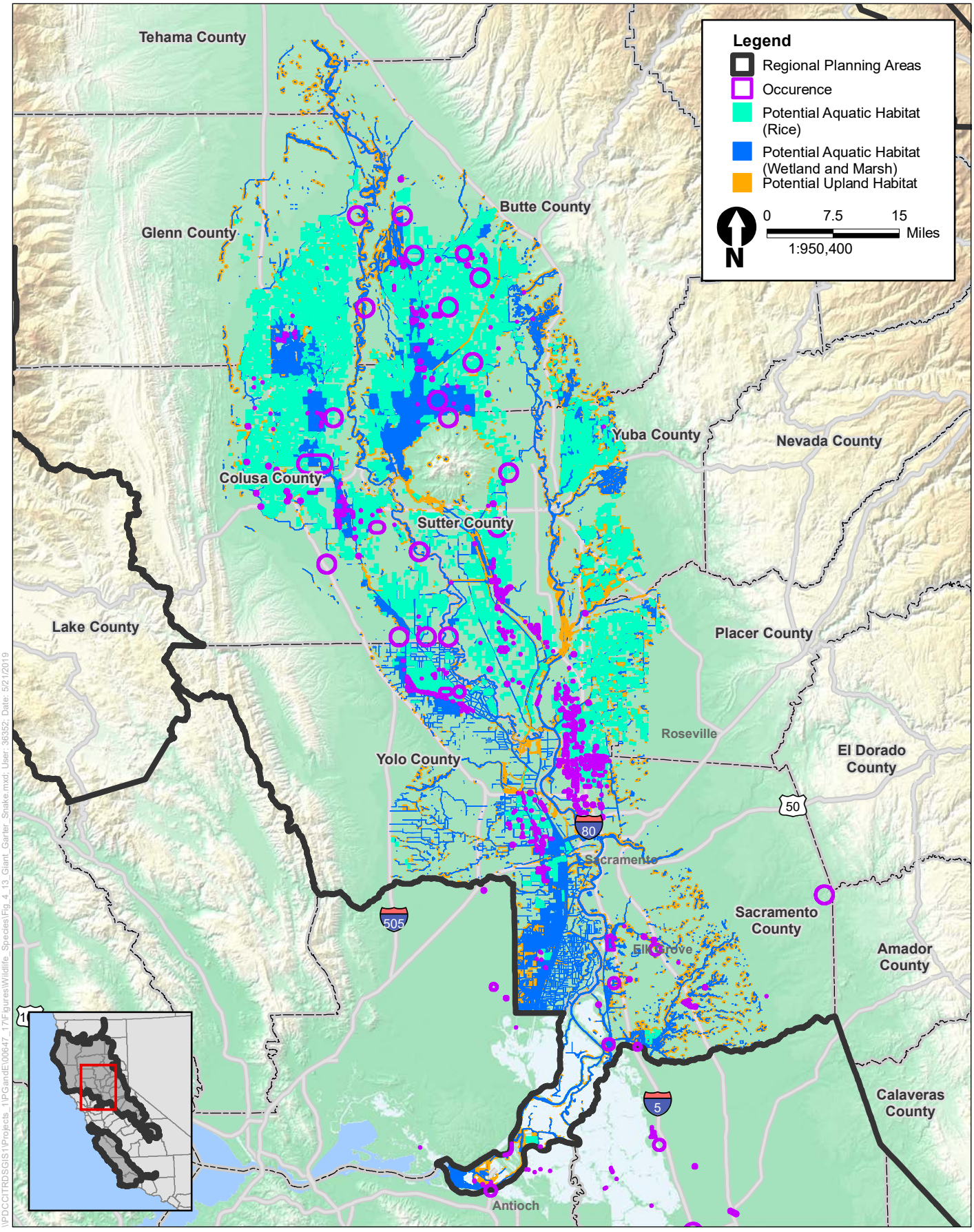


Figure 4-13
Giant Garter Snake Modeled Habitat

potential wetland and marsh habitat, 6,758 acres of upland habitat, and 8,345 acres of other aquatic (rice) habitat (Table 2-7, Table 4-4).

Direct Impacts

Covered activities could result in direct mortality or reduced habitat quality for GGS. Juveniles and adults could be crushed or buried by vehicles and equipment performing covered activities in or near aquatic habitats or in upland areas within 200 feet of suitable aquatic habitat used for basking, foraging, or refuge. GGS are generally vulnerable to impacts on aquatic habitat during their active, breeding season (early spring to mid-fall) and to impacts on upland habitat during their inactive season (late fall though winter).

Measures to avoid and minimize covered activity impacts on GGS and its habitat include: FP-13, to install escape ramps in excavations or cover excavations nightly during construction; FP-15, to prohibit refueling within 250 feet of waterways; and FP-16, to maintain a buffer of 250 feet from waterways. Additional species-specific AMMs for GGS include performing work activities during the active season for the species (GGS-1), as well as the use of setbacks around aquatic habitat (Wetland-2).

Permanent Impacts on Habitat

Permanent impact mechanisms are the same as those discussed for CRLF. Covered activities are estimated to permanently impact approximately 0.43 acre of potential wetland and marsh habitat for GGS annually, and no more than 12.75 acres over the 30–year term of the MRHCP. Permanent impacts on potential upland habitat are estimated at 1.27 acres per year, with no more than 38.01 acres impacted over the 30-year term. Permanent impacts on other aquatic (rice) habitat are estimated at 1.68 acres annually, with no more than 50.48 acres impacted over the 30-year term (Table 4-13).

Temporary Impacts on Habitat

Temporary impact mechanisms are the same as those discussed for CRLF. Covered activities are estimated to temporarily impact approximately 3.0 acres of potential wetland and marsh habitat for GGS annually, and no more than 90 acres over the 30-year term of the MRHCP. Temporary impacts on potential upland habitat are estimated at 10.0 acres per year, with no more than 300 acres impacted over the 30-year term. Temporary impacts on other aquatic (rice) habitat are estimated at 10.0 acres annually, with no more than 300 acres impacted over the 30-year term (Table 4-13).

Impacts on Critical Habitat

Critical habitat has not been designated for GGS.

Indirect Impacts

Indirect impacts on GGS are similar to those described for CRLF.

4.2.8.4 Birds

Northern Spotted Owl

Species Distribution

Northern spotted owl (NSO) inhabits cool, old-growth forests throughout California, from sea level to 7,600 feet in elevation. Detailed life history for this species is included in Appendix B. The NSO occurs in Siskiyou, Modoc, Shasta, Tehama, Glenn, and Colusa Counties within the Sacramento Valley and Foothills Region, which encompasses approximately 1,392 acres of modeled northern spotted owl habitat (Table 2-7, Table 4-4, Figure 4-14).

Direct Impacts

Direct impacts are most likely to occur during nesting season as a result of covered activities, including vegetation management activities that remove occupied nest trees or pruning of branches that remove nests. The removal of nesting habitat is expected to be an infrequent event because most of the ROW has been cleared. ROW widening and hazard tree removal activities have the greatest potential for impact, although tree size class and species composition are not expected to be suitable for nesting in most instances. Furthermore, the intent of PG&E's O&M actions are to reduce the potential for future forest fires. If they are conducted, these activities could result in injury to or mortality of NSO eggs or young. Other covered activities that generate noise or are otherwise perceived as a threat by NSO in proximity to an active nest could result in nest abandonment by adults or young during the incubation, brooding, or fledgling period, leading to failure of egg development or mortality of juveniles through starvation. Measures to ensure that covered activities would avoid and minimize impacts on NSO include: FP-17, to fall trees away from sensitive areas or exclusion zones; FP-18, for the avoidance of nests with eggs or chicks; and NSO-1, which requires surveys and seasonal work restrictions for covered activities within 0.25 mile of NSO nesting habitat (Table 5-1).

Permanent Impacts on Habitat

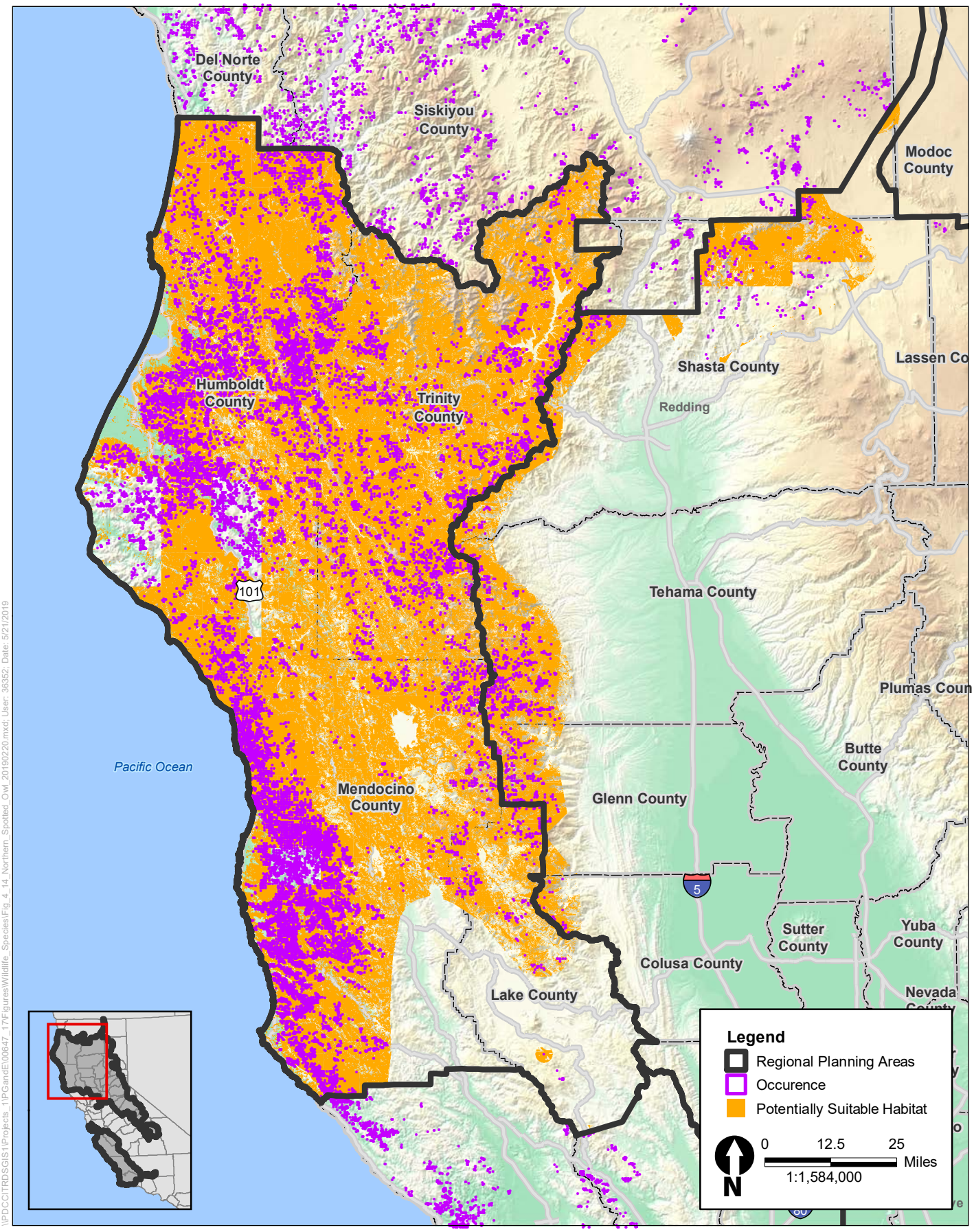
Permanent impacts on NSO habitat would result from those activities that would remove a nesting site for 1 year or more. Covered activities are estimated to permanently impact approximately 0.5 acre of northern spotted owl habitat annually, and no more than 15.0 acres over the 30-year term of the MRHCP (Table 4-13).

Temporary Impacts on Habitat

Temporary impacts on NSO habitat are those that would affect NSO or habitat for only several hours to less than 1 year. In most cases, these temporary impacts would be associated with noise from covered activities or pruning vegetation that is unsuitable for nesting. Covered activities are estimated to temporarily impact approximately 2.0 acres of northern spotted owl habitat annually, and no more than 60.0 acres over the 30-year term of the MRHCP (Table 4-13).

Impacts on Critical Habitat

There are 161 acres of NSO critical habitat in the Plan Area within the Sacramento Valley and Foothills Region, representing approximately 11.6% of modeled habitat in the Plan Area within the region (Table 4-10). It is estimated that covered activities would permanently impact 0.06 acre of critical habitat and temporarily impact 0.23 acre of critical habitat for this species annually. Over the



\PDC\CITRDSGIS1\Projects_1\PGandE\00647_17\Figures\Wildlife_Species\Fig_4_14_Northern_Spotted_Owl_20190220.mxd: User: 36352: Date: 5/21/2019

Figure 4-14
Northern Spotted Owl Modeled Habitat

30-year term of the MRHCP, the estimated permanent (1.7 acres) and temporary (6.9 acres) impact total is approximately 8.7 acres. This represents 0.0001% of the entire critical habitat designation for this species (Table 4-10). The maximum possible 30-year impact on critical habitat would be 15.0 acres for permanent impacts and 60.0 acres for temporary impacts which, when combined, represent 0.001% of the entire critical habitat designation (Table 4-14).

Indirect Impacts

Indirect impacts on NSO would include a reduction in its prey base as a result of covered activities. Such a reduction from maintenance or minor new construction of gas or electric facilities, however, is unlikely.

4.2.8.5 Plants

This section provides an analysis of each covered plant species, including direct and indirect impacts on habitat, individual plants, and impacts on critical habitat. The impacts of implementing the covered activities are described for each of the covered plant species and their respective habitats. Table 4-15 summarizes the acreage of covered plant species' habitat and the number of individual plants potentially subject to impacts over the 30-year term of the MRHCP. Additional species information and full citations for sources considered in the literature review appear in Appendix B, *Species Accounts.* The species accounts in Appendix B supplement this chapter and provide additional information, including habitat requirements and land cover type associations.

Table 4-15. Summary of Estimated Impacts on Covered Plant Species in the Sacramento Valley and Foothills Region.

Species	Percent of Habitat with the Potential to be Directly Affected	Habitat (acres)	Impacted Plants
Ione manzanita	0.19%	12.25	64
Pine Hill ceanothus	0.28%	3.67	33
Pine Hill flannelbush	0.49%	1.19	2
Stebbins' morning-glory	0.49%	2.31	787
Layne's ragwort	0.24%	2.86	103

Ione Manzanita (*Arctostaphylos myrtifolia)*

Habitat Impacts

Habitat for Ione manzanita totals about 6,582 acres of potential and occupied habitat. Ten occurrences mapped as specific polygons total 4,522 acres, and five non-specific occurrences have an estimated 2,060 acres of potential habitat. Covered activities could affect 12.25 acres of habitat occupied by Ione manzanita (Table 4-16).

Direct Impacts on Ione Manzanita

Covered activities have the potential to result in direct loss of plants. Based on population sizes reported for three occurrences, plant density in Ione manzanita populations ranges from three to 41 plants per acre. Based on plant density (using a mean of 23.4, as applicable) and assuming that plants are uniformly distributed across the occurrences, but recognizing that this may not account

for local habitat quality, approximately 64 Ione manzanita plants could be expected to be lost from covered activities (Table 4-16). Less than 1% of any occurrence would be impacted by covered activities.

The degree of the impact would vary at each element occurrence (EO) based on the amount of habitat impacted and habitat quality. The amount of the habitat impacted at the occurrences would range from 0.01% to 0.3%. The habitat is of good quality (California Department of Fish and Wildlife 2018). For EO2, one small polygon is bisected by a distribution line and one large expansive polygon is bisected in only one location on its boundary by a distribution line. EO2 is contains good quality habitat but portions are threatened by mining activities and a network of roads also crosses the majority of the polygons. EO4 contains good quality, intact habitat and is only intersected by a distribution line at the northern end of the occurrence polygon. EO5 is crossed by a network of gas and electric lines and is heavily disturbed by off-highway vehicle use and clay mining (California Department of Fish and Wildlife 2018). Of the numerous polygons that compose EO6, only one is bisected by a distribution line; however, roads intersect some of the other polygons. EO18 is a non-specific occurrence that has not been documented since 1967; therefore, this population is unlikely to be present and impacts are unlikely to result. Impacts from vehicle access on Ione manzanita occurrences in the Plan Area would be short-term and temporary; however, vehicles could spread *Phytophthora cinnamomi* into uninfected areas. Extensive die off from the fungal infection has already occurred within EO5 (California Department of Fish and Wildlife 2018).

Table 4-16. Potential Impacts on Ione Manzanita in Sacramento Valley and Foothills Region

Occurrence Number	Number of Polygons	Precision	Habitat (acres)	Population Size	Impact Type	Potential Direct Impacts		
						% of Habitat	Habitat (acres)	Plants
2	7	Specific	266	Not reported	Electric Facility and Access	0.2%	0.44	10
4	1	Specific	219	Not reported	Electric Facility	0.01%	0.02	1
5	1	Specific	2,987	>10,000	Gas and Electric Facilities, Access	0.3%	10.17	30
6	29	Specific	192	Not reported	Electric Facility and Access	0.2%	0.40	9
18	1	Non-specific polygon	303	Not reported	Electric Facility and Access	0.2%	0.61	14
Other[a]		Specific and non-specific polygons	2,614	Varies, <100 to 10,000	–	0.00%	0.00	0
Totals	**–**		**6,582**		**–**	**0.19%**	**12.25**	**64**

[a] Occurrences 1, 3, 9 through 14, 16, and 17 are not near facility corridors and are not likely to be directly or indirectly impacted by covered activities.

Impacts on Critical Habitat

Critical habitat has not been designated for Ione manzanita.

Pine Hill Ceanothus (*Ceanothus roderickii*)

Habitat Impacts

Habitat for Pine Hill ceanothus totals about 1,293 acres of occupied and potential habitat. Covered activities could impact six occurrences and 3.67 acres of habitat occupied by Pine Hill ceanothus (Table 4-17).

Direct Impacts on Pine Hill Ceanothus

Covered activities have the potential to result in direct loss of plants (Table 4-17). Extrapolating from reported population sizes and the amount of habitat potentially affected, about 33 Pine Hill ceanothus plants could be lost from covered activities (Table 4-17). Less than 1% of the population would be impacted at each occurrence.

The degree of the impact would vary at each EO based on the amount of habitat impacted and habitat quality. The amount of the habitat impacted at the occurrences would range from 0.013% to 0.7%; the habitat quality is fair to excellent (California Department of Fish and Wildlife 2018). All of the Pine Hill ceanothus occurrences are overlapped or surrounded by residential developments, with varying degree levels of fragmentation based on the intensity of development. The habitat at EO1 is surrounded by high-density residential development and it is likely that the species has been extirpated in some of the occurrence polygons. EOs 10 and 14 are located in rural residential areas where suitable habitat remains interspersed throughout the development. EO23 is heavily developed and little suitable habitat remains; the polygon at this occurrence is intersected by multiple distribution lines. EOs 4 and 5 contain the most intact suitable habitat; four polygons are intersected by distribution lines at EO4 and only one polygon at EO5 is intersected by a distribution line. Impacts from vehicle access on Pine Hill ceanothus occurrences in the Plan Area would be short-term and temporary.

Table 4-17. Potential Impacts on Pine Hill Ceanothus in Sacramento Valley and Foothills Region

Occurrence Number	Number of Polygons	Precision	Habitat (acres)	Population Size	Impact Type	Potential Direct Impacts		
						% of Habitat	Habitat (acres)	Plants
1	21	Specific	654	4,000	Electric Facility and Access	0.4%	2.67	16
4	18	Specific	112	2,000	Electric Facility and Access	0.5%	0.60	11
5	7	Specific	464	12,000	Electric Facility and Access	0.03%	0.13	3
10	2	Specific	10	15	Electric Facility	1.0%	0.10	0
14	1	Non-specific area	28	Not reported	Electric Facility and Access	0.3%	0.09	2
23	1	Non-specific area	10	Not reported	Electric Facility and Access	0.7%	0.07	1
Other[a]	–	Specific and non-specific polygons	5	Not reported	–	0.0%	0.00	0
Totals	**–**		**1,293**		**–**	**0.28%**	**3.67**	**33**

[a] Occurrence 20 is not near facility corridors and is not likely to be directly or indirectly impacted by covered activities.

Impacts on Critical Habitat

Critical habitat has not been designated for Pine Hill ceanothus.

Pine Hill Flannelbush (*Fremontodendron decumbens*)

Habitat Impacts

Habitat for Pine Hill flannelbush totals about 243 acres of occupied and potential habitat. Covered activities could affect 1.16 acres of habitat occupied by Pine Hill flannelbush (Table 4-18).

Direct Impacts on Pine Hill Flannelbush

Covered activities have the potential to result in direct loss of plants. Population sizes reported for Pine Hill flannelbush are small, generally consisting of fewer than 100 plants per occurrence. Extrapolating from the reported population sizes and the amount of habitat potentially affected, about two plants could be lost from covered activities (Table 4-18). About 1% of the population would be impacted.

The degree of the impact would vary at each EO based on the amount of habitat impacted and habitat quality. The amount of the habitat impacted at the occurrences would range from 0.01% to 0.8%; the habitat quality is poor to excellent (California Department of Fish and Wildlife 2018). At EO1, seven of the 18 occurrence polygons are intersected by an electric facility, but only three of these polygons are bisected by the facility. EO1 is ranked as having excellent habitat quality. EOs 4 and 15 are intersected by electric facilities and are ranked as having fair habitat quality because of human disturbance and lack of management, respectively. EO6 contains one polygon that is intersected by a distribution line on its eastern boundary; this occurrence has not been documented in CNDDB since 1986. EO13 contains two polygons of which only one is intersected by a distribution line on its northern boundary. This occurrence is ranked as having poor quality habitat because of heavy disturbance and invasion by nonnative plants. Impacts from vehicle access on Pine Hill flannelbush occurrences in the Plan Area would be short-term and temporary,

Table 4-18. Potential Impacts on Pine Hill Flannelbush in Sacramento Valley and Foothills Region

Occurrence Number	Number of Polygons	Precision	Habitat (acres)	Population Size	Impact Type	Potential Direct Impacts		
						% of Habitat	Habitat (acres)	Plants
1	18	Specific	116	<200	Electric Facility and Access	0.8%	0.94	2
2	3	Specific	29	50	Electric Facility	0.3%	0.10	0
4	3	Specific	10	<20	Electric Facility and Access	0.8%	0.08	0
6	1	Specific	8	13	Electric Facility	0.4%	0.03	0
13	2	Specific	21	17	Electric Facility	0.1%	0.03	0
15	1	Specific	5	3	Electric Facility	0.4%	0.02	0
Other[a]	–	Specific and non-specific polygons	54	Varies, 3 to 100	–	0.0%	0.00	0
Totals	**–**		**243**	**471**	**–**	**0.49%**	**1.19**	**2**

[a] Occurrences 5, 8, 9, 11,12, and 14 are not near facility corridors and are not likely to be directly or indirectly impacted by covered activities.

Impacts on Critical Habitat

Critical habitat has not been designated for Pine Hill flannelbush.

Stebbins' Morning-Glory *(Calystegia stebbinsii*)

Habitat Impacts

Habitat for Stebbins' morning-glory totals about 720 acres of occupied and potential habitat. Covered activities could impact seven occurrences and 2.31 acres of habitat occupied by Stebbins' morning-glory habitat (Table 4-19).

Direct Impacts on Stebbins' Morning-Glory

Covered activities have the potential to result in direct loss of plants. Reported population sizes for Stebbins' morning-glory are highly variable. Extrapolating from reported population sizes and the amount of habitat potentially affected, about 787 Stebbins' morning-glory plants could be lost from covered activities, mostly within occurrence 2 (Table 4-19). Much less than 1% of each population would be impacted.

The degree of the impact would vary at each EO based on the amount of habitat impacted and habitat quality. The amount of the habitat impacted at the occurrences would range from 0.1% to 0.8%; the habitat quality is fair to excellent (California Department of Fish and Wildlife 2018). EOs 1 and 2 both contain numerous polygons, of which five polygons and three polygons, respectively, are intersected by electric facilities. The habitat at both occurrences is disturbed by development and recreation. EO6 is located in suitable habitat between residential developments to the north and south; electric distribution lines intersect four polygons within this occurrence. EO18 contains four polygons, two of which are bisected by a gas distribution line and two of which are bisected by an electric distribution line. EO22 contains nine occurrence polygons, five of which are intersected by distribution lines. The population at EO26 is attributed to an area with residential development and has not been recorded in CNDDB since 1997, when 15 plants were observed (California Department of Fish and Wildlife 2018). Impacts from vehicle access on Stebbins' morning-glory occurrences in the Plan Area would be short-term and temporary,

Table 4-19. Potential Impacts on Stebbins' Morning-Glory in Sacramento Valley and Foothills Region

Occurrence Number	Number of Polygons	Precision	Habitat (acres)	Population Size	Impact Type	Potential Direct Impacts		
						% of Habitat	Habitat (acres)	Plants
1	15	Specific	192	4,000	Electric Facility and Access	0.8%	1.56	33
2	22	Specific	379	<1,500,000	Electric Facility and Access	0.1%	0.19	752
6	9	Specific	15	>350	Electric Facility	0.1%	0.02	1
18	4	Specific	41	>20	Electric and Gas Facilities	0.8%	0.32	0
21	1	Specific	7	Possibly extirpated	Electric Facility	0.3%	0.02	0
22	9	Specific	35	714	Electric Facility	0.2%	0.06	1
26	1	Non-specific area	5	15	Electric Facility and Access	2.6%	0.13	0

Occurrence Number	Number of Polygons	Precision	Habitat (acres)	Population Size	Impact Type	Potential Direct Impacts		
						% of Habitat	Habitat (acres)	Plants
Other[a]	–	Specific and non-specific polygons	46	Varies, 4 to 130	–	0.0%	0.00	0
Totals	**–**		**720**	**1,505,293**	**–**	**0.32%**	**2.31**	**787**

[a] Occurrences 4, 7, 13, 20, 24, 25, 27, and 28 are not near facility corridors and are not likely to be directly or indirectly impacted by covered activities.

Impacts on Critical Habitat

Critical habitat has not been designated for Stebbins' morning-glory.

Layne's Ragwort (*Packera layneae*)

Habitat Impacts

Habitat for Layne's ragwort totals about 1,172 acres of occupied and potential habitat. Covered activities could affect 20 occurrences and 2.86 acres of habitat (Table 4-20). Much of the habitat within the range of Layne's ragwort is fragmented by rural development; electric distribution lines cross 20 occurrences in these areas.

Direct Impacts on Layne's Ragwort

Covered activities have the potential to result in direct loss of plants. Extrapolating from the reported population sizes and the amount of habitat potentially impacted, about 103 Layne's ragwort plants could be impacted by covered activities (Table 4-20).

The degree of the impact would vary at each EO based on the amount of the habitat impacted and habitat quality. The amount of the habitat impacted would range from 0.04% to 5%; this habitat quality ranges from poor to excellent (California Department of Fish and Wildlife 2018). In addition, four of the Layne's ragwort occurrences have non-specific locations and, thus, may or may not be present where they have been mapped in CNDDB. Most of the occurrences are degraded and disturbed by moderate to heavy development. EOs 12 and 50 are the only occurrence with habitat quality ranked as poor. EO12 has not been observed since the 1980s and no plants were observed in 2011. EO50 is located on public land leased as a recreational park. EO1 is the only occurrence with habitat quality ranked as excellent, likely because of a lack of threats and robust population, although some of the occurrence polygons appear to have been impacted by rural residential development. EO33 is the only occurrence considered possibly extirpated because most or all of the habitat has been removed by roadwork. Impacts from vehicle access on Layne's ragwort occurrences in the Plan Area would be short-term and temporary,

Table 4-20. Potential Impacts on Layne's Ragwort in Sacramento Valley and Foothills Region

Occurrence Number	Number of Polygons	Precision	Habitat (acres)	Population Size	Impact Type	Potential Direct Impacts		
						% of Habitat	Habitat (acres)	Plants
1	16	Specific	100	<1,000	Electric Facility and Access	0.7%	0.66	7
2	34	Specific	327	1,000	Electric Facility	0.09%	0.30	1

Occurrence Number	Number of Polygons	Precision	Habitat (acres)	Population Size	Impact Type	Potential Direct Impacts		
						% of Habitat	Habitat (acres)	Plants
3	1	Non-specific	10	Not reported	Electric Facility	0.8%	0.08	2
4	1	Non-specific	10	80	Electric Facility	0.6%	0.06	0
11	2	Specific	12	48	Electric Facility	0.3%	0.03	0
12	1	Specific	3	Not reported	Electric Facility	1.0%	0.03	1
13	1	Specific	148	<10.000	Electric Facility and Access	0.6%	0.95	64
14	5	Specific	47	<1,000	Electric Facility	0.1%	0.06	1
18	6	Specific	54	3,550	Electric Facility	0.09%	0.05	3
27	1	Nonspecific	3	<50	Electric Facility and Access	5.0%	0.15	3
33	1	Specific	9	Possibly extirpated	Electric Facility	0.6%	0.05	0
38	6	Specific	45	>2,500	Electric Facility	0.04%	0.02	1
39	1	Specific	5	Not reported	Electric Facility	0.6%	0.03	1
42	3	Specific	13	168	Electric Facility	0.2%	0.02	0
43	5	Specific	13	<800	Electric Facility	0.9%	0.11	7
44	5	Specific	21	1,294	Electric Facility	0.3%	0.06	4
48	1	Non-specific	7	Not reported	Electric Facility	0.7%	0.05	1
50	1	Specific	3	200	Electric Facility	1.0%	0.03	2
59	3	Specific	17	>1,000	Electric Facility	0.5%	0.08	5
62	1	Specific	1	<10	Electric Facility	3.0%	0.03	0
Other[a]	–	Specific and non-specific polygons	322	Varies, 3 to 7,950	–	0.0%	0.00	0
Totals	**–**		**1,170**	**>35,600**	**–**	**0.24%**	**2.86**	**103**

[a] Occurrences 15, 16, 24 through 26, 29 through 32, 34, 40, 41, 45 through 47, 49, 51 through 58, 60, 61, 63 through 67, and 69 are not near facility corridors and are not likely to be directly or indirectly impacted by covered activities.

Impacts on Critical Habitat

Critical habitat has not been designated for Layne's ragwort.

4.2.9 North Coast Region

Table 4-21 summarizes the take estimates for covered wildlife species in the North Coast Region. This table is the distillation of impacts identified in Tables 4-7 and 4-8. Table 4-22 summarizes estimated impacts on covered species' critical habitat in the North Coast Region.

Table 4-21. Summary of Estimated Impacts Covered Wildlife Species in the North Coast Region (acres)

Species and Habitat	Permanent Impacts		Temporary Impacts	
	Annual Total	30-Year Total	Annual Total	30-Year Total
Amphibians				
California red-legged frog breeding habitat	0.10	3.00	0.20	6.00
California red-legged frog upland habitat	0.25	7.50	1.00	30.00
Foothill yellow-legged frog breeding habitat	0.02	0.60	0.12	3.35
Foothill yellow-legged frog dispersal habitat	0.21	6.30	1.17	35.07
Birds				
Marbled murrelet habitat	1.00	30.00	2.00	60.00
Northern spotted owl habitat	5.00	150.00	20.00	600.00
Mammals				
Point Arena mountain beaver habitat	0.10	3.00	0.25	7.50

Table 4-22. Summary of Impacts on Critical Habitat in the North Coast Region

Covered Species	All Critical Habitat Designated (ac)	North Coast															
		North Coast			Potential Maximum (High/Max)							Model (Expected/Target)					
		CH in Plan Area	Modeled Habitat in Region	Percentage of Modeled Habitat that is Critical Habitat	Annual Permanent Impact[b] (ac)	Annual Temporary Impact (ac)	Maximum 30-year Permanent Impact on Critical Habitat (acres)	Maximum 30-yr Temporary Impact on Critical Habitat (acres)	Maximum 30-yr Permanent Impact Total as % of all Critical Habitat	Maximum 30-yr Temporary Impact Total as % of all Critical Habitat	Sum of Total 30-Year Maximum Impacts as % of Critical Habitat	Proportionate Annual Permanent Impact on Critical Habitat (acres)	Proportionate Annual Temporary Impact on Critical Habitat (ac)	Proportionate Critical Habitat acres in Region, 30-Yr Permanent Impact	Proportionate Critical Habitat acres in Region, 30-Yr Temporary Impact	30-Year Permanent Impact Total as % of all Critical Habitat	30-Year Temporary Impact Total as % of all Critical Habitat
Amphibians and Reptiles																	
California red-legged frog	1,636,609	283	1092	25.89%	0.35	1.2	10.5	36	0.001%	0.002%	0.003%	0.091	0.311	2.719	9.321	0.00017%	0.00057%
Birds																	
Marbled Murrelet	3,698,100	953	1735	54.93%	1	2	30	60	0.001%	0.002%	0.003%	0.549	1.099	16.478	32.957	0.00045%	0.00089%
Northern Spotted owl	9,577,969	2405	20644	11.65%	5	20	150	600	0.002%	0.006%	0.008%	0.582	2.330	17.473	69.893	0.00018%	0.00073%

4.2.9.1 Invertebrates

Vernal pool invertebrates do not inhabit the Plan Area within the North Coast Region.

4.2.9.2 Amphibians

Amphibians in the North Coast Region, CRLF and FYLF, also occur in the Sacramento Valley and Foothills Region. Refer to Section 4.2.8.2 for discussion of direct and indirect impact mechanisms. The extent of habitat and estimated impacts that follow, however, are unique to the North Coast Region.

California Red-Legged Frog

Species Distribution

Detailed life history for this species is included in Appendix B. Approximately 1,092 acres of habitat are modeled in Mendocino and Lake Counties in the Plan Area within the North Coast Region. The modeled habitat in the Plan Area consists of 148 acres of potential aquatic/breeding habitat and 945 acres of potential upland habitat (Table 2-7, Table 4-4, Figure 4-7).

Direct Impacts

Direct impact mechanisms are the same as those described for the species in Section 4.2.8.2. Conservation measures to avoid and minimize impacts on the species would include the following: FP-02 would restrict vehicles and equipment to designated areas; FP-03 would minimize the development of new roads; FP-04 would keep vehicles and equipment out of wet areas and minimize impacts on natural vegetation; FP-11 would avoid soil and sediment runoff into water bodies; FP-12 would limit stockpiles and require covering of spoils; FP-13 would require escape ramps in open trenches and steep-walled holes; FP-15 would prohibit refueling within 250 feet of vernal pools, ponds, and streams; FP-16 would maintain a 250-foot buffer around vernal pools and/or require biological monitoring; and Wetland-2 would maintain a 50-foot buffer around wetlands, ponds, and riparian areas (see Table 5-1).

Additional measures implemented for working near stream-dependent amphibian habitat include FP-06 for inspection of materials and pipes prior to moving materials on-site; FP-08 for prohibition of trash dumping on-site; FP-10 for minimization of footprint and time on site; FP-17 for felling trees away from exclusion zones); and FP-01 for training construction crews on these requirements.

Permanent Impacts on Habitat

Permanent impact mechanisms are the same as those described for the species in Section 4.2.8.2. Covered activities would permanently impact 0.10 acre of CRLF breeding habitat (i.e., the wetted area and the adjacent riparian areas) annually, and permanent impacts would not exceed 3.0 acres over 30 years. Covered activities would permanently impact 0.25 acres of upland habitat annually and 7.50 acres of upland habitat over 30 years (Table 4-21).

Temporary Impacts on Habitat

Temporary impact mechanisms are the same as those described for the species in Section 4.2.8.2. Covered activities would temporarily disturb 0.20 acres of CRLF breeding habitat (i.e., wetted area

and the adjacent riparian areas) annually. Over 30 years, 6.0 acres of CRLF breeding habitat would be temporarily impacted. Covered activities would have temporary impacts on 1.00 acre of upland habitat annually, and 30.00 acres of upland habitat over 30 years (Table 4-21).

Impacts on Critical Habitat

There are 283 acres of CRLF critical habitat in the Plan Area within the North Coast Region, representing approximately 26% of modeled habitat in the Plan Area within the region (Table 4-10). It is estimated that covered activities would permanently impact 0.09 acre of critical habitat and temporarily impact 0.31 acre of critical habitat for this species annually. Over the 30-year term of the MRHCP, the estimated permanent (2.7 acres) and temporary (9.3 acres) impact total is approximately 12.0 acres. Combined, this represents 0.0007% of the entire critical habitat designation for this species (Table 4-10). The maximum possible 30-year impact on critical habitat would be 10.5 acres for permanent impacts and 36.0 acres for temporary impacts which, when combined, represent 0.003% of the entire critical habitat designation (Table 4-22).

Indirect Impacts

Indirect impacts are the same as those described for the species in Section 4.2.8.2.

Foothill Yellow-Legged Frog

Species Distribution

Detailed life history for the species is included in Appendix B. FYLF occurs throughout the North Coast Region (Table 2-7, Figure 4-9). Modeled habitat for this species within the Plan Area of the North Coast Region encompasses 147 acres of breeding habitat and 1,460 acres of upland/dispersal habitat (Table 2-7, Table 4-4).

Direct Impacts

Direct impact mechanisms are the same as those discussed for the species in Section 4.2.8.2. In FYLF habitat, implementation of the following measures would occur: FP-02 would restrict vehicles and equipment to designated areas; FP-03 would minimize the development of new roads; FP-04 would keep vehicles and equipment out of wet areas and minimize impacts on natural vegetation; FP-11 would avoid soil and sediment runoff into water bodies; FP-12 would limit stockpiles and require covering of spoils; FP-13 would require escape ramps in open trenches and steep-walled holes; FP-15 would prohibit refueling within 250 feet of vernal pools, ponds, and streams; FP-16 would maintain a 250-foot buffer around vernal pools and/or require biological monitoring; and Wetland-2 would maintain a 50-foot buffer around wetlands, ponds, and riparian areas (see Table 5-1). These measures would ensure that the covered activities avoid and minimize potential impacts on FYLF and its habitat.

Additional measures implemented for working near stream-dependent amphibian habitat include FP-06 for inspection of materials and pipes prior to moving materials on-site; FP-08 for prohibition of trash dumping on-site; FP-10 for minimization of footprint and time on site; FP-17 for felling trees away from exclusion zones; and FP-01 for training construction crews on these requirements.

Permanent Impacts on Habitat

Permanent impact mechanisms are the same as those described for CRLF in Section 4.2.8.2. Covered activities are estimated to permanently impact approximately 0.02 acre of FYLF breeding habitat annually, and no more than 0.6 acre over the 30-year term of the MRHCP (Table 4-7). Covered activities are estimated to permanently impact approximately 0.21 acre of FYLF upland habitat annually, and no more than 6.30 acres over 30 years (Table 4-21).

Temporary Impacts on Habitat

Temporary impact mechanisms are the same as those described for CRLF in Section 4.2.8.2. Covered activities are estimated to temporarily impact approximately 0.12 acre of FYLF breeding habitat annually, and no more than 3.53 acres over the 30-year term of the MRHCP (Table 4-8). Covered activities are estimated to temporarily impact approximately 1.17 acre of FYLF upland habitat annually, and no more than 35.07 acres over 30 years (Table 4-21).

Impacts on Critical Habitat

Critical habitat has not been designated for FYLF.

Indirect Impacts

Indirect impacts are the same as those described for CRLF in Section 4.2.8.2.

4.2.9.3 Birds

Marbled Murrelet

Species Distribution

Marbled murrelet (MAMU) is a seabird that is often found in bays, inlets and other calm or protected waters up the California coast, from Point Sal in Santa Barbara County and north to the Oregon border. Detailed life history for the species is included in Appendix B. MAMU is known to occur in Humboldt County and Mendocino County in the North Coast Region (Table 2-7, Figure 4-15). The Plan Area within the North Coast Region contains 1,735 acres of modeled habitat for MAMU (Table 4-4).

Direct Impacts

Direct impact mechanisms to MAMU are the same as those described for NSO in Section 4.2.8.4. These impacts may be particularly acute in areas with nesting MAMU because this species has high site fidelity. The following measures would ensure that covered activities would avoid and minimize impacts on MAMU: FP-17, to fall trees away from sensitive areas or exclusion zones; FP-18, for the avoidance of known nests; and MM-1, which requires surveys and seasonal work restrictions for covered activities in MAMU nesting or critical habitat (Table 5-1).

Permanent Impacts on Habitat

Permanent impacts on MAMU habitat would result from those activities that would remove nesting habitat. As described in NSO, most trees that would be removed are not be of a suitable size class to be nesting trees. Furthermore, removal of branches of a suitable size class to support nesting would be infrequent. However, in an abundance of caution, and assuming there are some impacts, covered

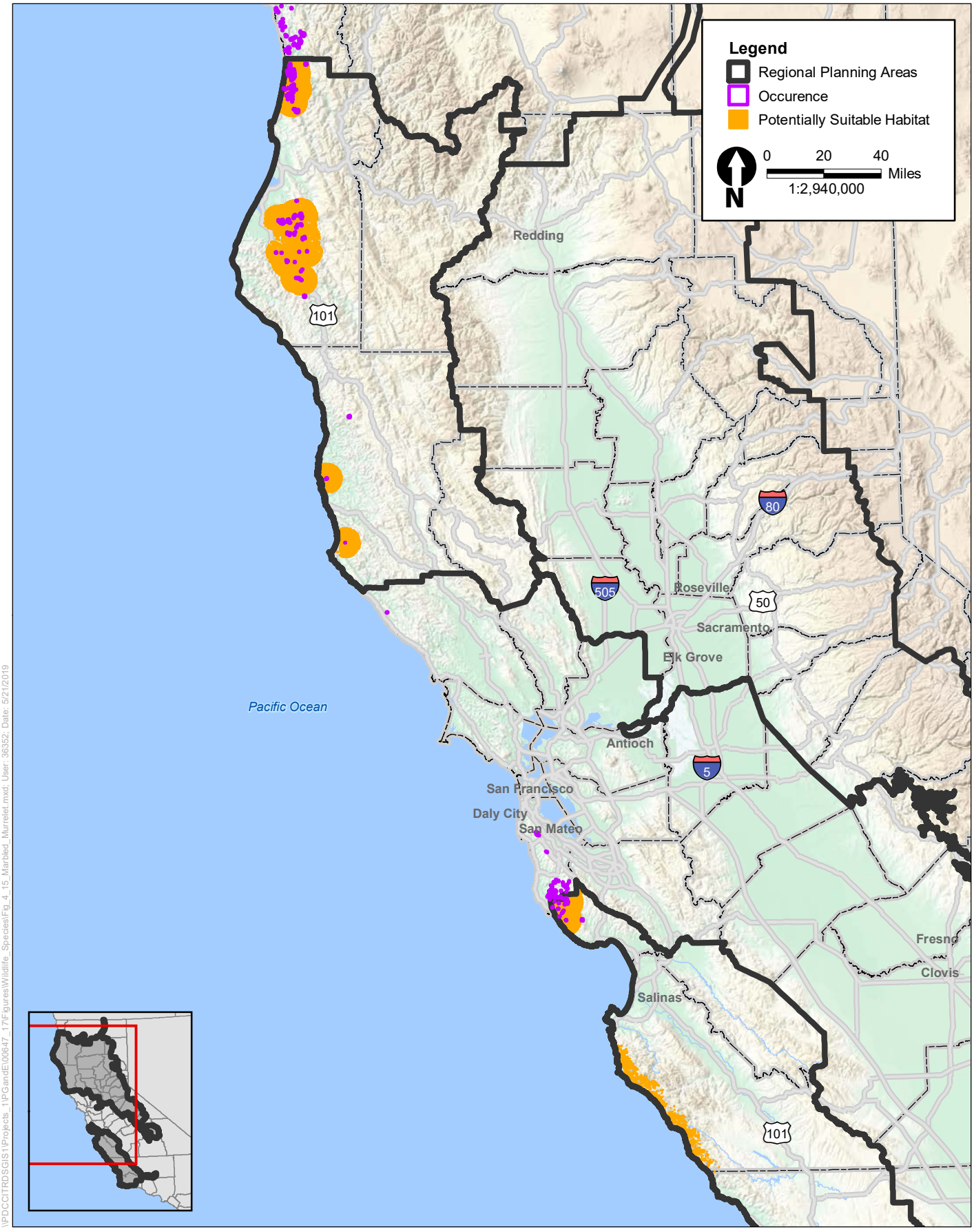


Figure 4-15
Marbled Murrelet Modeled Habitat

activities are estimated to permanently impact approximately 1.00 acre of MAMU habitat annually, and no more than approximately 30.00 acres over the 30-year term of the MRHCP (Table 4-21). These impacts are based on canopy removal of vegetation, only a small portion of which is expected to be suitable habitat.

Temporary Impacts on Habitat

Temporary impacts on MAMU habitat would result from activities that affect MAMU or habitat for only several hours to less than 1 year. Covered activities are estimated to temporarily impact approximately 2.00 acres of MAMU habitat annually, and no more than approximately 60.00 acres over the 30-year term of the MRHCP (Table 4-21).

Impacts on Critical Habitat

There are 953 acres of MAMU critical habitat in the Plan Area within the North Coast Region, representing approximately 55% of modeled habitat in the region's Plan Area (Table 4-10). It is estimated that covered activities would permanently impact 0.55 acre of critical habitat and temporarily impact 1.10 acres of critical habitat for this species annually. Over the 30-year term of the MRHCP, the estimated permanent (16.5 acres) and temporary (33.0 acres) impact total is 49.5 acres. Combined, this represents 0.0013% of the critical habitat designation for this species (Table 4-10). The maximum possible 30-year impact on critical habitat would be 30.0 acres for permanent impacts and 60.0 acres for temporary impacts which, when combined, represent 0.002% of the entire critical habitat designation (Table 4-22).

Indirect Impacts

Indirect impacts on MAMU are unlikely to result from covered activities.

Northern Spotted Owl

Species Distribution

Detailed life history for this species is included in Appendix B. In the North Coast Region, NSO is known to occur in Humboldt, Trinity, Shasta, and Lake Counties (Table 2-7, Figure 4-14). There are approximately 20,644 acres of modeled NSO habitat in the Plan Area within the region (Table 2-7, Table 4-4).

Direct Impacts

Direct impacts mechanisms are discussed for this species in Section 4.2.8.4. Measures to ensure that covered activities would avoid and minimize impacts on NSO include: FP-17, to fall trees away from sensitive areas or exclusion zones; FP-18, for the avoidance of nests with eggs or chicks; and NSO-1, which requires surveys and seasonal work restrictions for covered activities within 0.25 mile of NSO nesting habitat (Table 5-1).

Permanent Impacts on Habitat

Permanent impacts on NSO habitat would result from those activities that would remove a nesting site for 1 year or more. Covered activities are estimated to permanently impact approximately 5.00 acres of NSO habitat, annually, and no more than 150.00 acres over the 30-year term of the MRHCP (Table 4-21).

Temporary Impacts on Habitat

Temporary impacts on NSO habitat would result from activities that affect NSO or habitat for only several hours to less than 1 year. Covered activities are estimated to temporarily impact approximately 20.00 acres of NSO habitat, annually, and no more than 600.00 acres over the 30-year term of the MRHCP (Table 4-21).

Impacts on Critical Habitat

There are 2,405 acres of NSO critical habitat in the Plan Area within the North Coast Region, representing approximately 11.7% of modeled habitat in the region's Plan Area. It is estimated that covered activities would permanently impact 0.58 acre of critical habitat and temporarily impact 2.33 acres of critical habitat for this species annually. Over the 30-year term of the MRHCP, the estimated permanent (17.5 acres) and temporary (69.9 acres) impact total is 87.4 acres. Combined, this represents 0.0009% of the entire critical habitat designation for this species (Table 4-10). The maximum possible 30-year impact on critical habitat would be 150.0 acres for permanent impacts and 600.0 acres for temporary impacts which, when combined, represent 0.008% of the entire critical habitat designation (Table 4-22).

Indirect Impacts

Indirect impacts on NSO would include a reduction in its prey base as a result of covered activities. Such a reduction from maintenance or minor new construction of gas or electric facilities is unlikely.

4.2.9.4 Mammals

Point Arena Mountain Beaver

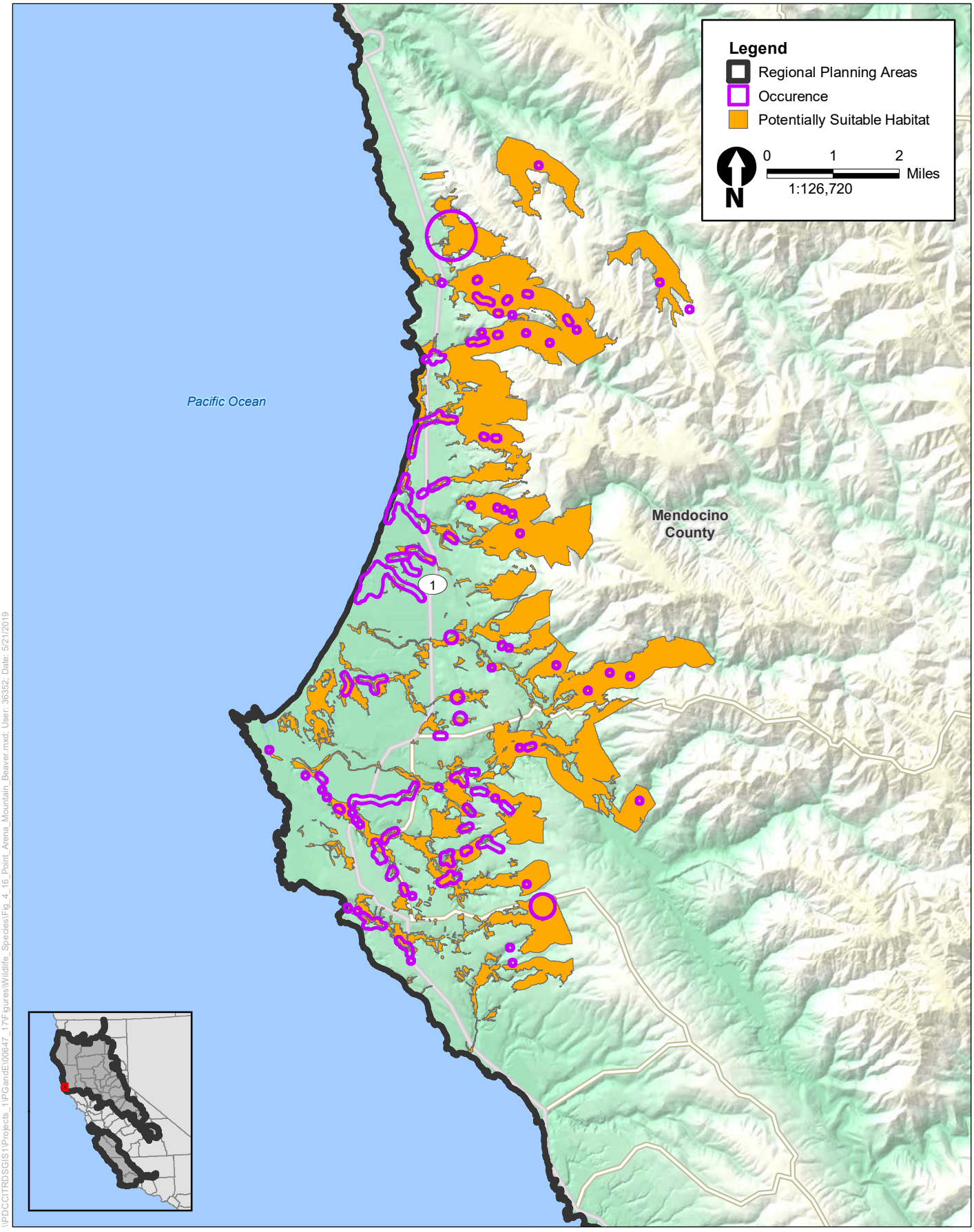
Species Distribution

Point Arena mountain beavers (PAMB) reside entirely in western Mendocino County in the North Coast Region (Table 2-7). The Plan Area within the region contains approximately 177 acres of modeled PAMB habitat (Table 2-7, Table 4-4, and Figure 4-16). Detailed life history for the species is included in Appendix B.

Direct Impacts

Because PAMB spend a significant portion of their lives in underground burrows, covered activities are most likely to result in direct impacts on PAMB while they are underground. Vegetation removal and excavation activities that affect burrow entrances could expose PAMB to an elevated risk of predation. These activities also could alter the micro-climate and remove critical food plants for the species. Vehicles or equipment operating over a burrow entrance could collapse the burrow entrance and entomb an animal or its young. Although PAMB burrows are generally deep, vehicles or equipment could crush and kill or injure individuals in burrows. If a PAMB is above ground, it could be struck by vehicles or equipment.

Conservation measures to avoid and minimize impacts on PAMB include: FP-02, to restrict vehicles and equipment to designated areas; FP-03, to limit access road development; FP-04, to avoid traffic impacts on natural vegetation and mammal burrows; FP-13, to use escape ramps overnight for open excavations; and Hot Zone-13, for pre-construction biological field assessment and seasonal work restrictions in PAMB habitat.



\\PDCCITRDSGIS11\Projects_1\PGandE\00647_17\Figures\Wildlife_Species\Fig_4_16_Point_Arena_Mountain_Beaver.mxd: User: 36352: Date: 5/21/2019

Figure 4-16
Point Arena Mountain Beaver Modeled Habitat

Permanent Impacts on Habitat

Permanent impacts on PAMB habitat would result from covered activities that make the species habitat unsuitable (i.e., installation of new facilities). Covered activities are estimated to permanently impact approximately 0.10 acre of modeled PAMB habitat annually, and no more than 3.0 acres over the 30-year term of the MRHCP (Table 4-21).

Temporary Impacts on Habitat

Temporary impacts on PAMB habitat would result from those activities that affect habitat temporarily, do not cause loss of burrows, or result in installation or expansion of a permanent facility footprint. Covered activities are estimated to temporarily impact approximately 0.25 acre of PAMB habitat annually, and no more than 7.5 acres over the 30-year term of the MRHCP (Table 4-21).

Impacts on Critical Habitat

Critical habitat has not been designated for PAMB.

Indirect Impacts

Indirect impacts on PAMB could result from ground vibration caused by large activities, which could affect behavior during breeding season. Permanent removal of forage vegetation could reduce habitat quality.

4.2.9.5 Plants

This section provides an analysis of each covered plant species, including direct and indirect impacts on habitat, individual plants, and impacts on critical habitat. The impacts of implementing the covered activities are described for each of the covered plant species and their respective habitats. Table 4-23 summarizes the acreage of covered plant species' habitat and the number of individual plants potentially subject to impacts over the 30-year term of the MRHCP. Additional species information and full citations for sources considered in the literature review appear in Appendix B, *Species Accounts.* The species accounts in Appendix B supplement this chapter and provide additional information, including habitat requirements and land cover type associations.

Table 4-23. Summary of Estimated Impacts on Covered Plant Species in the North Coast Region

Species	Percent Habitat with the Potential to be Directly Affected	Affected Habitat (acres)	Impacted Plants
Beach layia	<0.01%	0.22	142

Beach Layia (*Layia carnosa*)

Habitat Impacts

Habitat for beach layia totals about 2,333 acres in the North Coast Region. Covered activities in the North Coast Region could affect one occurrence and 0.22 acre of habitat occupied by beach layia (Table 4-24).

Direct Impacts on Beach Layia

Covered activities have the potential to result in direct loss and reduced habitat quality. Based on the population size reported for the impacted occurrence, about 142 beach layia plants could be lost as a result of covered activities in the North Coast Region (Table 4-24). Much less than 1% of the population would be impacted.

Covered activities also have the potential to disrupt the seedbank as a result of excavation if seeds are removed from the soil or desiccate from exposure at the ground surface during the dry season. Seedbank disruption could result in reduced regrowth of beach layia once the soil is replaced. Seeds could also be buried by grading or lost where new facilities are constructed. However, given that beach layia would only be impacted by covered activities associated with electric facilities, most impacts would be aboveground (e.g., as a result of access, staging equipment, work on overhead wires) and restricted to localized areas where existing electric poles are replaced or new electric poles are installed.

Table 4-24. Potential Impacts on Beach Layia in North Coast Region

						Potential Direct Impacts		
Occurrence Number	Number of Polygons	Precision	Habitat (acres)	Population Size	Impact Type	% of Habitat	Habitat (acres)	Plants
11	15	Specific	775	<500,000	Electric Facility	<0.1%	0.22	142
Other[a]	–	Specific and non-specific polygons	1,558	Varies, 500 to >20,000	–	0.0%	0.00	0
Totals	**15**		**2,333**	**>113,600**		**<0.01%**	**0.22**	**142**

[a] Occurrences 9, 10, 12, 13 through 15, 27, 29, and 30 are not near facility corridors and are not likely to be directly or indirectly impacted by covered activities.

Impacts on Critical Habitat

Critical habitat for beach layia has not been designated.

4.2.10 Central Coast Region

Table 4-25 summarizes the take estimates for covered species in the Central Region. This table is the distillation of impacts identified in Tables 4-7 and 4-8. Table 4-26 summarizes impacts on covered species' critical habitat in the Central Coast Region.

Table 4-25. Summary of Estimated Impacts on Covered Wildlife Species in the Central Coast Region (acres)

	Permanent Impacts		Temporary Impacts	
Species and Habitat	Annual Total	30-Year Total	Annual Total	30-Year Total
Aquatic Invertebrates				
Longhorn fairy shrimp habitat	0.06	1.67	0.34	10.25
Vernal pool fairy shrimp habitat	0.40	11.90	1.78	53.32
Vernal pool tadpole shrimp habitat	0.40	11.90	1.78	53.32
Terrestrial Invertebrates				

Species and Habitat	Permanent Impacts		Temporary Impacts	
	Annual Total	30-Year Total	Annual Total	30-Year Total
Morro shoulderband snail habitat	0.10	3.00	0.20	6.00
Mount Hermon June beetle habitat	0.25	7.50	0.75	22.50
Ohlone tiger beetle habitat	0.25	7.50	0.75	22.50
Smith's blue butterfly habitat	0.51	15.25	2.42	72.69
Zayante band-winged grasshopper habitat	0.12	3.59	0.51	15.15
Amphibians				
California red-legged frog breeding habitat	0.50	15.00	3.00	90.00
California red-legged frog upland habitat	2.00	60.00	10.00	300.00
California tiger salamander (Central California DPS) breeding habitat	0.03	0.85	0.13	3.78
California tiger salamander (Central California DPS) upland habitat	6.02	180.59	27.31	819.40
California tiger salamander (Santa Barbara DPS) breeding habitat	0.001	0.02	0.005	0.14
California tiger salamander (Santa Barbara DPS) upland habitat	0.39	11.77	2.57	77.01
Foothill yellow-legged frog breeding habitat	0.01	0.30	0.06	1.76
Foothill yellow-legged frog dispersal habitat	0.17	5.15	0.96	28.82
Santa Cruz long-toed salamander breeding habitat	0.10	3.00	0.10	3.00
Santa Cruz long-toed salamander upland habitat	0.50	15.00	1.5	45.00
Reptiles				
Blunt-nosed leopard lizard suitable habitat	0.45	13.28	1.92	57.56
Blunt-nosed leopard lizard core habitat	0.58	17.52	3.22	96.75
Birds				
Marbled murrelet habitat	0.50	15.00	0.75	22.5
Mammals				
Giant kangaroo rat habitat	1.00	30.00	5.00	150.00
San Joaquin kit fox high-value suitable habitat	0.50	15.00	3.00	90.00
San Joaquin kit fox low-value suitable habitat	7.13	213.86	33.43	1,002.99
San Joaquin kit fox moderate-value suitable habitat	0.97	29.06	4.72	141.49

Table 4-26. Summary of Impacts on Critical Habitat in Central Coast Region

Covered Species	All Critical Habitat Designated (ac)	Central Coast															
		Central Coast			Potential Maximum (High/Max)							Model (Expected/Target)					
		Critical Habitat in Plan Area	Modeled Habitat in Region	Percentage of Modeled Habitat that is Critical Habitat	Annual Permanent Impact[b] (ac)	Annual Temporary Impact (ac)	Maximum 30-year Permanent Impact on Critical Habitat (acres)	Maximum 30-yr Temporary Impact on Critical Habitat (acres)	Maximum 30-yr Permanent Impact Total as % of all Critical Habitat	Maximum 30-yr Temporary Impact Total as % of all Critical Habitat	Sum of Total 30-Year Maximum Impacts as % of Critical Habitat	Proportionate Annual Permanent Impact to Critical Habitat (ac)	Proportionate Annual Temporary Impact to Critical Habitat (ac)	Proportionate Critical Habitat acres in Region, 30-Yr Permanent Impact	Proportionate Critical Habitat acres in Region, 30-Yr Temporary Impact	30-Year Perm Impact Total as % of all Critical Habitat	30-Year Temp Impact Total as % of all Critical Habitat
Invertebrates																	
Longhorn fairy shrimp	13,557	79	437	18.05%	0.06	0.34	1.800	10.200	0.013%	0.075%	0.088%	0.0108	0.0614	0.325	1.841	0.002%	0.014%
Vernal pool fairy shrimp	597,821	2818	2076	100.00%	0.4	1.78	12.000	53.400	0.002%	0.009%	0.001%	0.4000	1.7800	12.000	53.400	0.002%	0.009%
Morro shoulderband snail	2,566	41	36	100.00%	0.1	0.2	3.000	6.000	0.117%	0.234%	0.351%	0.1000	0.2000	3.000	6.000	0.117%	0.234%
Zayante band-winged grasshopper	10,560	1082	577	100.00%	0.12	0.51	3.600	15.300	0.034%	0.145%	0.179%	0.1200	0.5100	3.600	15.300	0.034%	0.145%
Amphibians and Reptiles																	
California red-legged frog	1,636,609	11854	10804	100.00%	2.5	13	75.000	390.000	0.005%	0.024%	0.029%	2.5000	13.0000	75.000	390.000	0.005%	0.024%
California tiger salamander (Central CA DPS)	199,109	813	32192	2.53%	6.05	27.44	181.500	823.200	0.091%	0.413%	0.504%	0.1528	0.6932	4.585	20.797	0.002%	0.010%
California tiger salamander (Santa Barbara DPS)	11,182	237	3340	7.11%	0.391	2.58	11.730	77.400	0.105%	0.692%	0.800%	0.0278	0.1833	0.834	5.500	0.007%	0.049%
Birds																	
Marbled Murrelet	3,698,100	166	585	28.43%	0.5	0.75	15.000	22.500	0.000%	0.001%	0.001%	0.0000	0.2132	4.264	6.396	0.000%	0.000%

4.2.10.1 Invertebrates

Vernal pool invertebrates in the Central Coast Region, VPFS, VPTS, and LOFS, also occur in the Sacramento Valley and Foothills Region, where they share similar life history with COFS, which is described in Section 4.2.8.1. This section provides an overview of life history, as well as direct and indirect impact mechanisms. The extent of habitat and estimated impacts that follow for these species, however, are unique to the Central Coast Region.

Longhorn Fairy Shrimp

Species Distribution

Approximately 437 acres of LOFS habitat are modeled in the Plan Area in San Luis Obispo County within the Central Coast Region (Table 2-7, Table 4-4, Figure 4-3). Detailed life history for LOFS is included in Appendix B.

Direct Impacts

The mechanisms for direct impact on LOFS are the same as those described for COFS in Section 4.2.8.1. In LOFS habitat, implementation of the following measures would occur: FP-04, to minimize access route impacts; FP-11, for erosion and sediment control; FP-12, for limiting and covering soil stockpiles; FP-15, to prohibit vehicle refueling within 250 feet from wetlands; FP-16, to maintain a work buffer of 250 feet around wetlands and streams; Hot Zone-2, to prohibit ground-disturbing activities during the wet season within 250 feet of the edge of vernal pools, unless conducted from an existing roadway; and Wetland-1, to maintain a buffer of 250 feet around vernal pools (Table 5-1).

Permanent Impacts on Habitat

Permanent impact mechanisms are the same as those discussed for COFS in Section 4.2.8.1. Covered activities would permanently impact 0.06 acre of LOFS habitat in the Central Coast Region annually and no more than 1.67 acres over 30 years (Table 4-25).

Temporary Impacts on Habitat

Temporary impact mechanisms are the same as those discussed for COFS in Section 4.2.8.1. Covered activities would temporarily impact 0.34 acre of LOFS habitat annually and no more than 10.25 acres over 30 years (Table 4-25).

Impacts on Critical Habitat

There are 79 acres of LOFS critical habitat in the Plan Area within the Central Coast Region, representing approximately 18% of modeled habitat in the region's Plan Area (Table 4-10). It is estimated that covered activities would permanently impact 0.01 acre of critical habitat and temporarily impact 0.06 acre of critical habitat for this species annually. Over the 30-year term of the MRHCP, the estimated permanent (0.33 acre) and temporary (1.84 acre) impact total is 2.17 acres. Combined, this represents 0.016% of the entire critical habitat designation for this species (Table 4-10). The maximum possible 30-year impact on critical habitat would be 1.8 acres for permanent impacts and 10.2 acres for temporary impacts which, when combined, represent 0.089% of the entire critical habitat designation (Table 4-26).

Indirect Impacts

The mechanisms for indirect impacts on LOFS are the same as those described for COFS in Section 4.2.8.1.

Vernal Pool Fairy Shrimp

Species Distribution

Detailed life history for VPFS is included in Appendix B. There are approximately 2,076 acres of modeled habitat for this species in the Plan Area within the Central Coast Region (Table 2-7, Table 4-4, Figure 4-4).

Direct Impacts

The direct impact mechanisms for VPFS are the same as those described for COFS in Section 4.2.8.1. In VPFS habitat, implementation of the following measures would occur: FP-04, to minimize access route impacts; FP-11, for erosion and sediment control; FP-12, for limiting and covering soil stockpiles; FP-15, to prohibit vehicle refueling within 250 feet from wetlands; FP-16, to maintain a work buffer of 250 feet around wetlands and streams; Hot Zone-2, to prohibit ground-disturbing activities during the wet season within 250 feet of the edge of vernal pools, unless conducted from an existing roadway; and Wetland-1, to maintain a buffer of 250 feet around vernal pools (Table 5-1).

Permanent Impacts on Habitat

Permanent impact mechanisms are the same as those discussed for COFS in Section 4.2.8.1. Covered activities would permanently impact 0.40 acre of VPFS habitat in the Central Coast Region annually and no more than 11.90 acres over 30 years (Table 4-25).

Temporary Impacts on Habitat

Temporary impact mechanisms are the same as those discussed for COFS in Section 4.2.8.1. Covered activities would temporarily impact 1.78 acres of VPFS habitat annually and no more than 53.32 acres over 30 years (Table 4-25).

Impacts on Critical Habitat

There are 2,818 acres of VPFS critical habitat in the Plan Area within the Central Coast Region. All modeled habitat for this species in the region is within critical habitat for this species. It is estimated that covered activities would permanently impact 0.40 acre of critical habitat and temporarily impact 1.78 acres of critical habitat for this species annually. Over the 30-year term of the MRHCP, the estimated permanent (12.0 acres) and temporary (53.4 acres) impact total is 65.4 acres. Combined, this represents 0.011% of the entire critical habitat designation for this species (Table 4-10).

Indirect Impacts

The mechanisms for indirect impacts on VPFS are the same as those described for COFS in Section 4.2.8.1.

Vernal Pool Tadpole Shrimp

Species Distribution

Detailed life history for VPTS is included in Appendix B. There are approximately 2,076 acres of modeled habitat in the Plan Area within the Central Coast Region (Table 2-7, Table 4-4, Figure 4-5).

Direct Impacts

The direct impact mechanisms for VPTS are the same as those described for COFS in Section 4.2.8.1. In VPTS habitat, implementation of the following measures would occur: FP-04, to minimize access route impacts; FP-11, for erosion and sediment control; FP-12, for limiting and covering soil stockpiles; FP-15, to prohibit vehicle refueling within 250 feet from wetlands; FP-16, to maintain a work buffer of 250 feet around wetlands and streams; Hot Zone-2, to prohibit ground-disturbing activities during the wet season within 250 feet of the edge of vernal pools, unless conducted from an existing roadway; and Wetland-1, to maintain a buffer of 250 feet around vernal pools (Table 5-1).

Permanent Impacts on Habitat

Permanent impact mechanisms are the same as those discussed for COFS in Section 4.2.8.1. Covered activities would permanently impact 0.40 acre of VPTS habitat in the region annually and no more than 11.9 acres over 30 years (Table 4-25).

Temporary Impacts on Habitat

Temporary impact mechanisms are the same as those discussed for COFS in Section 4.2.8.1. Covered activities would temporarily impact 1.78 acres of VPTS habitat annually and no more than 53.32 acres over 30 years (Table 4-25).

Impacts on Critical Habitat

There is no designated critical habitat for VPTS in the Central Coast Region.

Indirect Impacts

The mechanisms for indirect impacts on VPTS are the same as those described in Section 4.2.8.1 for COFS.

Morro Shoulderband Snail

Species Distribution

Morro shoulderband snail (MSBS) occurs only in western San Luis Obispo County, in the area bordering Morro Bay (Figure 4-17). Detailed life history for the species is included in Appendix B. There are 294 acres of modeled MSBS habitat (82 acres natural habitat and 212 acres urban habitat) in the Plan Area within the Central Coast Region (Table 2-7, Table 4-4).

Direct Impacts

Covered activities could result in the direct mortality of MSBS. Regardless of the type of covered activity, foot traffic and operation of vehicles or equipment in habitat could crush and kill individual

snails (eggs, young or adults), which are often concealed in vegetation or leaf litter. In MSBS habitat, implementation of the following measures would occur: FP-02 would restrict vehicles and equipment to designated areas; FP-03 would minimize the development of new roads; FP-04 would minimize access route impacts on vegetation; and Hot Zone-12 would require pre-construction biological survey and salvage of MSBS when work cannot be conducted from paved roads or non-vegetated areas. Hot Zone-12 would also require pre-construction surveys and salvage of MSBS when ground-disturbing O&M activities are conducted in urban environments where MSBS may be found in landscaping or horticultural vegetation and cannot be avoided.

Permanent Impacts on Habitat

Permanent impacts on MSBS habitat would consist of vegetation removal that does not recover for more than 1 year, or the installation, or expansion, of a permanent facility footprint. Covered activities are estimated to permanently impact approximately 0.10 acre of MSBS natural habitat annually, and no more than 3.0 acres over the 30-year term of the MRHCP Table (4-14). Impacts in urban areas are not counted as permanent loss of habitat.

Temporary Impacts on Habitat

Temporary impacts on MSBS habitat would consist of those activities affecting vegetation recovers within a year and/or do not result in installation, or expansion, of facility footprint. Covered activities are estimated to temporarily impact approximately 0.20 acre of MSBS natural habitat annually, and no more than 6.0 acres over the 30-year term of the MRHCP Table (Table 4-14). Impacts in urban areas are not counted as temporary loss of habitat.

Impacts on Critical Habitat

There are 41 acres of MSBS critical habitat in the Plan Area within the Central Coast Region. All modeled habitat for this species in the region's Plan Area is within critical habitat for this species. It is estimated that covered activities would permanently impact 0.1 acre of critical habitat and temporarily impact 0.2 acres of critical habitat for this species annually. Over the 30-year term of the MRHCP, the estimated permanent (3.0 acres) and temporary (6.0 acres) impact total is 9.0 acres. This represents 0.35% of the entire critical habitat designation for this species (Table 4-26).

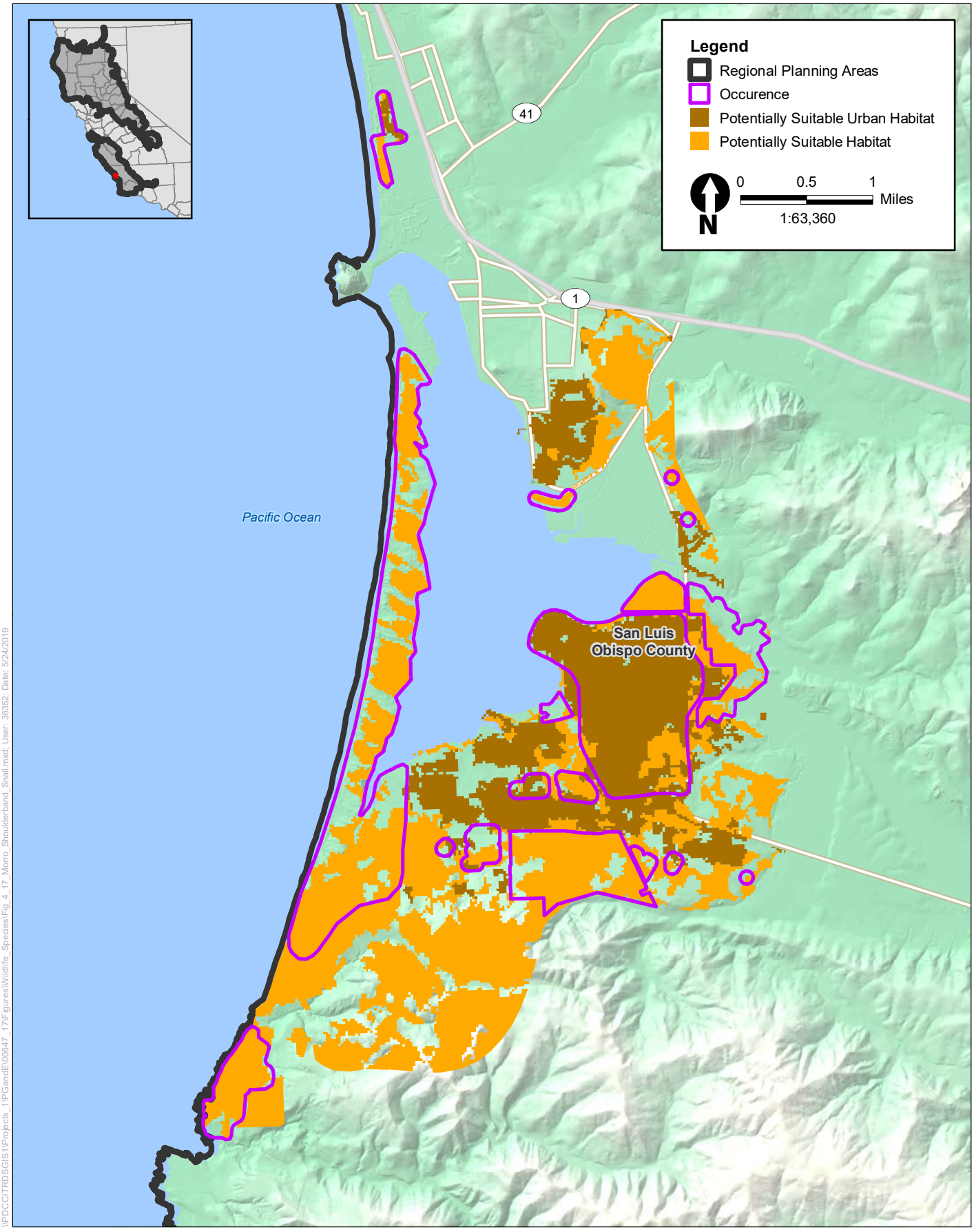
Indirect Impacts

Indirect impacts on MSBS could result from vegetation management activity, which has the potential to expose individuals to the sun, leading to desiccation and death.

Mount Hermon June Beetle

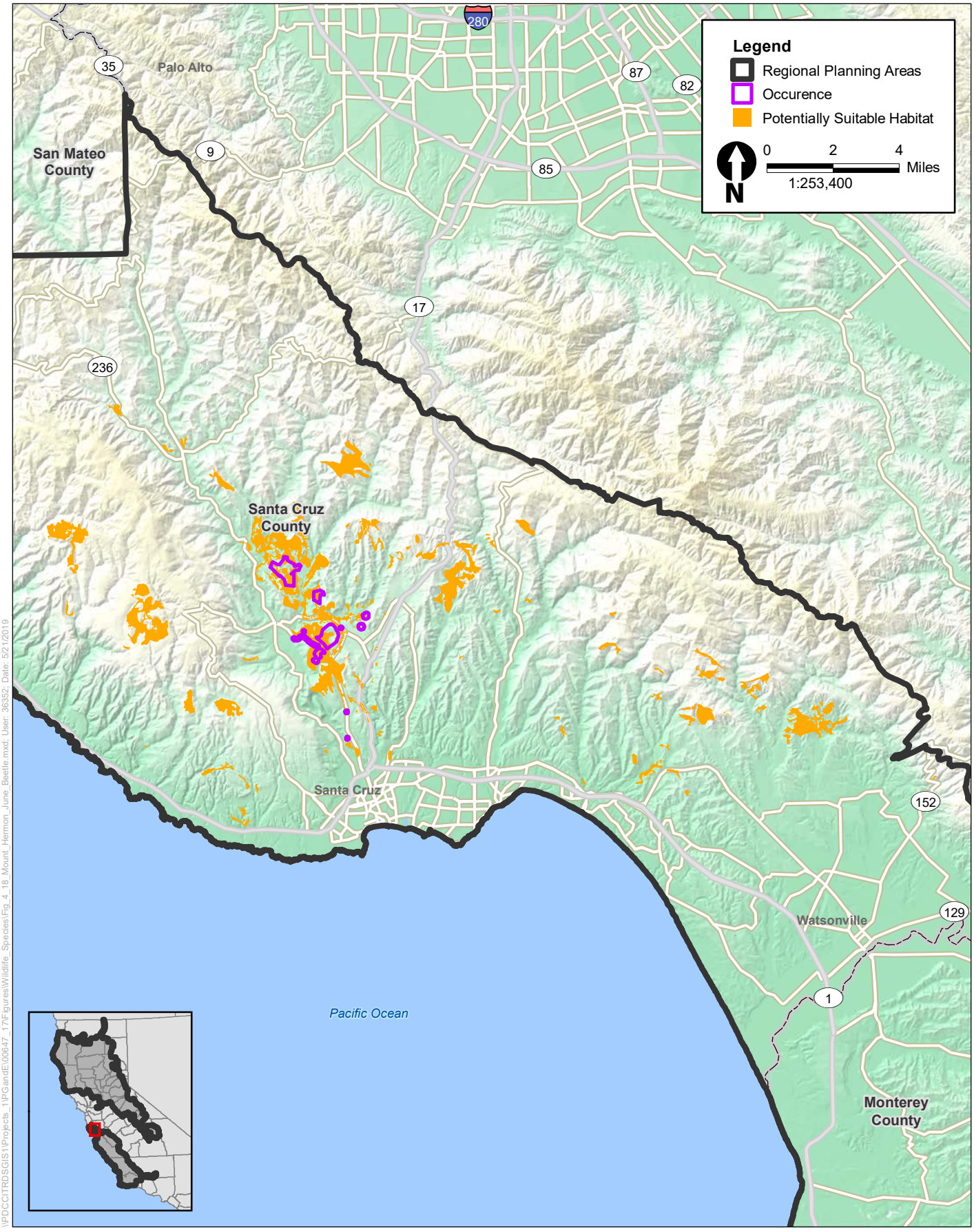
Species Distribution

The Mount Hermon June (MHJB) beetle is restricted to the Zayante sandhills ecosystem in Santa Cruz County (Table 2-7). Detailed life history for the species is included in Appendix B. Approximately 577 acres of MHJB habitat are modeled in the Plan Area within the Central Coast Region (Table 4-4, Figure 4-18).



\\PDCCITRDSGIS1\Projects_1\PGandE\00647_17\Figures\Wildlife_Species\Fig_4_17_Morro_Shoulderband_Snail.mxd; User: 36352; Date: 5/24/2019

Figure 4-17
Morro Shoulderband Snail Modeled Habitat



\\PDCCITRDSGIS11\Projects_1\PGandE\00647_17\Figures\Wildlife_Species\Fig_4_18_Mount_Hermon_June_Beetle.mxd: User: 36352: Date: 5/21/2019

Figure 4-18
Mount Hermon June beetle Modeled Habitat

Direct Impacts

Covered activities could result in direct mortality of MHJB. Vehicles and equipment could crush and kill individual eggs, larvae, pupae, or adults or destroy burrows used by larvae. Under certain conditions, soil compaction or covering of pupation sites could inhibit or prohibit emergence of beetles. In MHJB habitat, implementation of the following measures would ensure that covered activities avoid and minimize impacts on MHJB: FP-02 would restrict vehicles and equipment to designated areas; FP-03 would minimize the development of new roads; FP-04 would minimize access route impacts on vegetation; and Hot Zone-14 would restrict work during the flight season.

Permanent Impacts on Habitat

Permanent impacts on MHJB habitat would consist of affected habitat that does not recover for more than 1 year, or the installation, or expansion, of a permanent facility footprint. Covered activities would permanently impact approximately 0.25 acre of MHJB habitat annually, and approximately 7.50 acres over the 30-year term of the MRHCP (Table 4-25).

Temporary Impacts on Habitat

Temporary impacts on MHJB habitat would consist of affected habitat that recovers within a year and/or does not result in installation, or expansion, of facility footprint. Covered activities would temporarily impact approximately 0.75 acre of MHJB habitat annually and 22.50 acres over 30 years (Table 4-25).

Impacts on Critical Habitat

Critical habitat has not been designated for MHJB.

Indirect Impacts

Indirect impacts on MHJB could result from vegetation removal or introduction of invasive plant species, which may reduce MHJB habitat or productivity by reducing favorable food sources.

Ohlone Tiger Beetle

Species Distribution

Ohlone tiger beetle (OHTB) is endemic to Santa Cruz County, where it is found only in coastal terraces supporting remnant patches of native grassland habitat. Detailed life history for this species is included in Appendix B. There are approximately 720 acres of suitable habitat present in the Plan Area within the Central Coast Region (Table 2-7, Table 4-4, Figure 4-19).

Direct Impacts

Direct impact mechanisms for OHTB are the same as those discussed previously for MHJB. However, because OHTB adults likely spend more time on the ground surface, they may be slightly more likely to be crushed by activities. In OHTB habitat, implementation of the following measures would ensure that covered activities avoid and minimize impacts on OHTB: FP-02 would restrict vehicles and equipment to designated areas; FP-03 would minimize the development of new roads; FP-04 would minimize access route impacts on vegetation; and Hot Zone-11 would minimize ground disturbance and off-road use of vehicles and equipment in sensitive habitat.

Permanent Impacts on Habitat

Permanent impacts on OHTB habitat would consist of impacts on habitat that do not recover for more than 1 year, or the installation, or expansion, of a permanent facility footprint. Covered activities are estimated to permanently impact approximately 0.25 acre of OHTB habitat annually, and no more than 7.50 acres over the 30-year term of the MRHCP (Table 4-25).

Temporary Impacts on Habitat

Temporary impacts on OHTB habitat would consist of impacts on habitat that recover within a year and/or do not result in installation, or expansion, of facility footprint. Covered activities are estimated to temporarily impact approximately 0.75 acre of OHTB habitat annually, and no more than 22.50 acres over the 30-year term of the MRHCP (Table 4-25).

Impacts on Critical Habitat

Critical habitat has not been designated for OHTB.

Indirect Impacts

Indirect impacts on OHTB could result from activity-related erosion of soil into occupied burrows and from spread of invasive plant species leading to a reduction in habitat quality. Potential indirect effects of covered activities would be minimized by using weed-free seed mixes and straw in revegetation and erosion control applications.

Smith's Blue Butterfly

Species Distribution

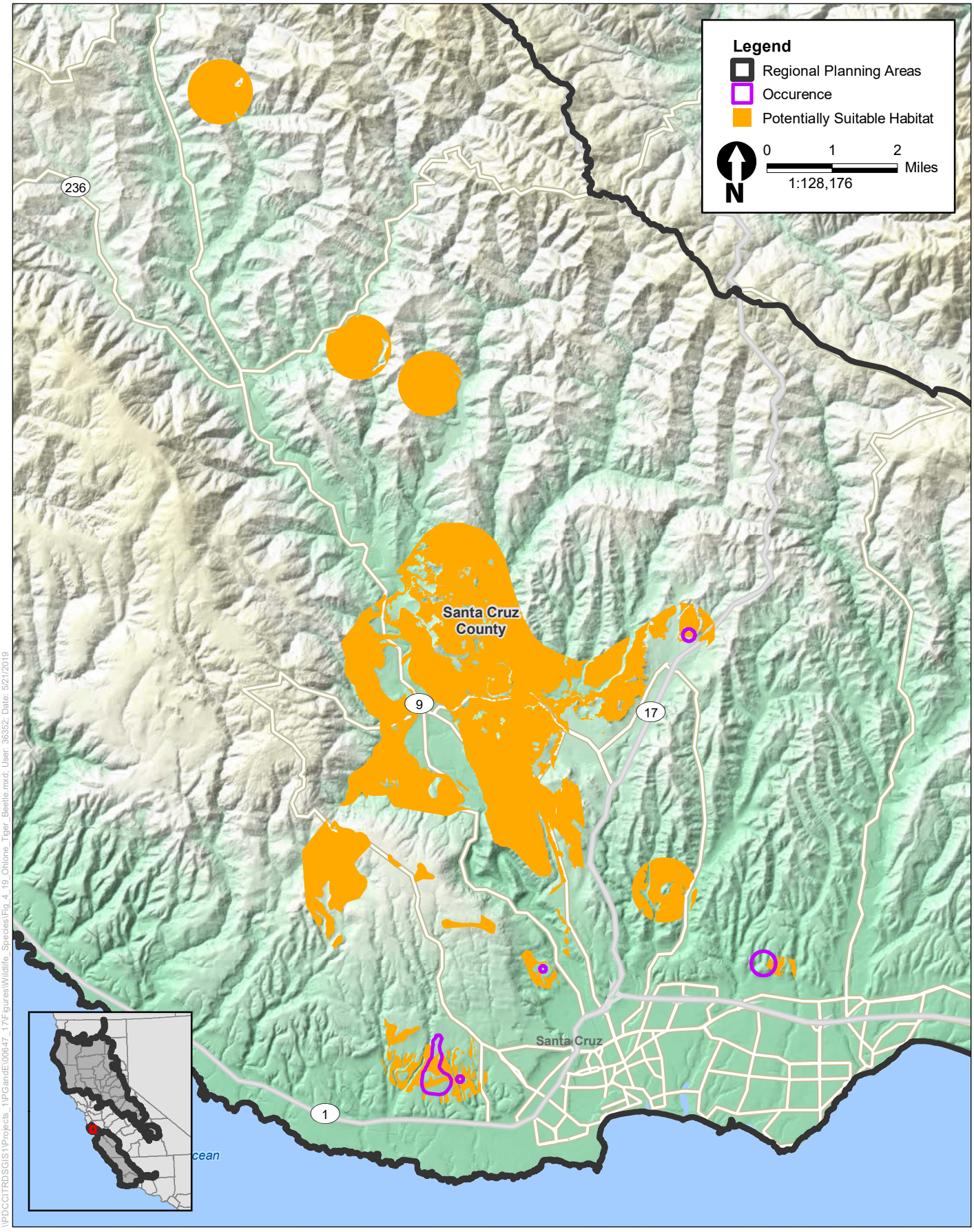
Smith's blue butterfly (SMBB) is restricted to Monterey and San Luis Obispo Counties (Table 2-7). Detailed life history for the species is included in Appendix B. There are approximately 2,890 acres of modeled habitat in the Plan Area within the Central Coast Region (Table 2-7, Figure 4-20).

Direct Impacts

Covered activities could result in direct mortality of SMBB. Eggs, larvae, and pupae could be crushed or buried by vehicles, equipment, and foot traffic. Adults could be struck by vehicles during flight or while nectaring, resting, or basking. In SMBB habitat, implementation of the following measures would ensure that covered activities avoid and minimize impacts on SMBB: FP-02 would restrict vehicles and equipment to designated areas; FP-03 would minimize the development of new roads; FP-04 would minimize access route impacts on vegetation; and for large activities, SMBB-1 would require pre-construction surveys, avoidance of host plants, and seasonal activity restrictions.

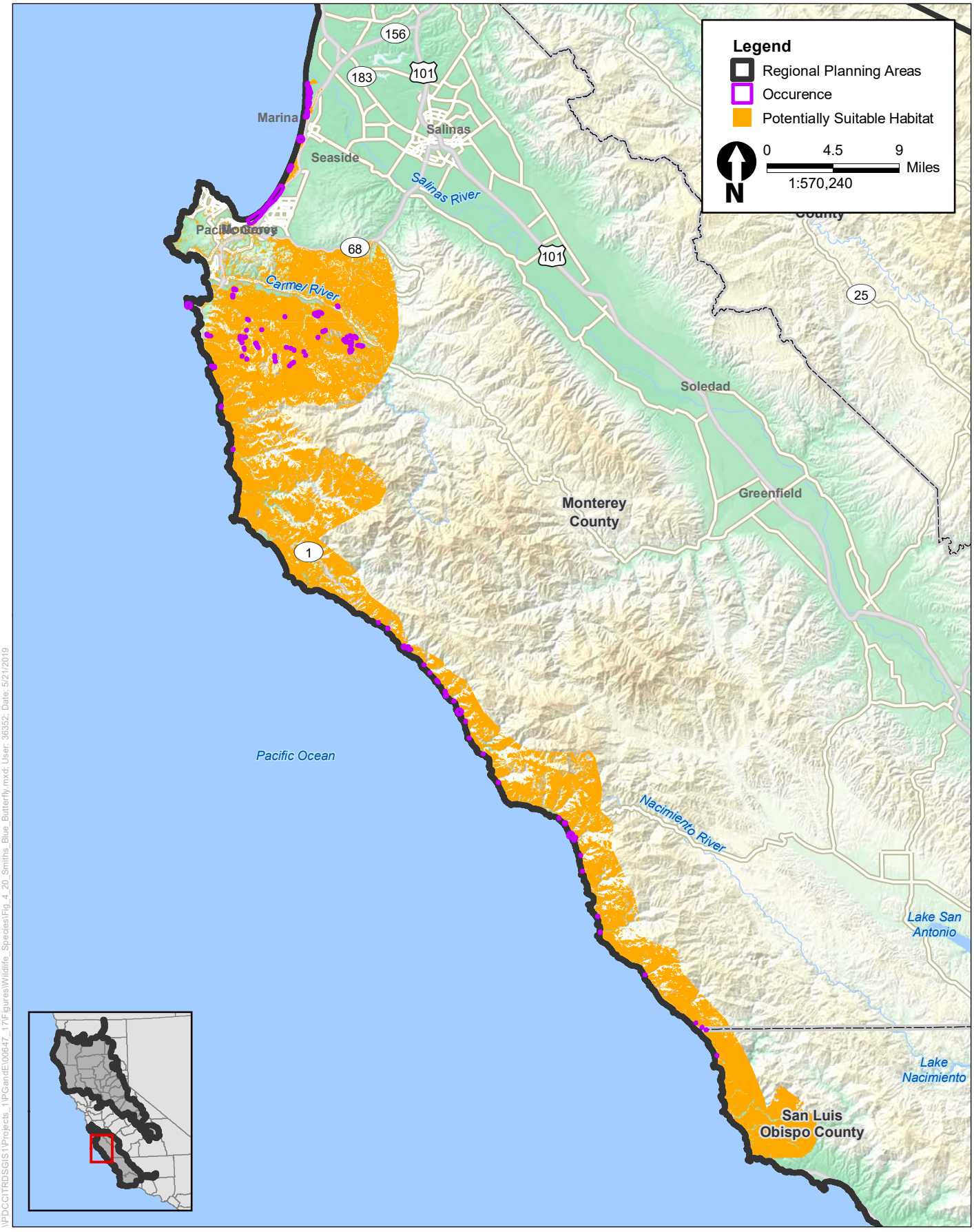
Permanent Impacts on Habitat

Permanent impacts on SMBB habitat would consist of impacts on habitat that do not recover for more than 1 year, or the installation, or expansion, of a permanent facility footprint. Covered activities are estimated to permanently impact approximately 0.51 acre of SMBB habitat annually, and no more than 15.25 acres over the 30-year term of the MRHCP (Table 4-25).



\\PDCCITRDSGIS11\Projects_1\PGandE\00647_17\Figures\Wildlife_Species\Fig_4_19_Ohlone_Tiger_Beetle.mxd: User: 36352: Date: 5/21/2019

Figure 4-19
Ohlone Tiger Beetle Modeled Habitat



\\PDCCITRDSGIS11\Projects_1\PGandE\00647_17\Figures\Wildlife_Species\Fig_4_20_Smiths_Blue_Butterfly.mxd; User: 36352; Date: 5/21/2019

Figure 4-20
Smith's Blue Butterfly Modeled Habitat

Temporary Impacts on Habitat

Temporary impacts on SMBB habitat would consist of impacts on habitat that recover within a year and/or do not result in installation, or expansion, of facility footprint. Covered activities are estimated to temporarily impact approximately 2.42 acre of SMBB habitat annually, and no more than 72.69 acres over the 30-year term of the MRHCP (Table 4-25).

Impacts on Critical Habitat

Critical habitat has not been designated for SMBB.

Indirect Impacts

Indirect impacts on SMBB could result from introduction of invasive plant species that outcompete SMBB host plants. Potential indirect effects of covered activities would be minimized by using weed-free seed mixes and straw in revegetation and erosion control applications.

Zayante Band-Winged Grasshopper

Species Distribution

Zayante band-winged grasshopper (ZBWG) is known to occur only in the Zayante sandhills of Santa Cruz County (Table 2-7, Figure 4-21). Detailed life history for the species is included in Appendix B. There are approximately 577 acres of ZBWG habitat modeled in the Plan Area within the Central Coast Region (Table 4-4).

Direct Impacts

Covered activities could result in direct mortality of ZBWG. Eggs, nymphs, and adults could be crushed or buried by vehicles, equipment, and foot traffic. Adults could be struck by vehicles during flight or while feeding on vegetation. In ZBWG habitat, implementation of the following measures would ensure that covered activities avoid and minimize impacts on ZBWG: FP-02 would restrict vehicles and equipment to designated areas; FP-03 would minimize the development of new roads; FP-04 would minimize access route impacts on vegetation; and Hot Zone-10 would minimize off-road use of vehicles and equipment in habitat, as well as avoid ZBWG host plants.

Permanent Impacts on Habitat

Permanent impacts on ZBWG habitat would consist of impacts on habitat that do not recover for more than 1 year, or the installation, or expansion, of a permanent facility footprint. Covered activities are estimated to permanently impact approximately 0.12 acre of ZBWG habitat annually and approximately 3.59 acres over the 30-year term of the MRHCP (Table 4-25).

Temporary Impacts on Habitat

Temporary impacts on ZBWG habitat would consist of impacts on habitat that recover within a year and/or do not result in installation, or expansion, of facility footprint. Covered activities would temporarily impact approximately 0.51 acre of ZBWG habitat annually and no more than 15.15 acres over 30 years (Table 4-25).

Impacts on Critical Habitat

There are 1,082 acres of ZBWG critical habitat in the Plan Area within the Central Coast Region. All modeled habitat for this species in the region's Plan Area is within critical habitat for this species. It is estimated that covered activities would permanently impact 0.12 acre of critical habitat and temporarily impact 0.51 acre of critical habitat for this species annually. Over the 30-year term of the MRHCP, the estimated permanent (3.6 acres) and temporary (15.3 acres) impact total is 18.9 acres. This represents approximately 0.18% of the entire critical habitat designation for this species (Table 4-10).

Indirect Impacts

Indirect impacts on ZBWG could result from introduction of invasive plant species that outcompete ZBWG host plants. Potential indirect effects of covered activities would be minimized by using weed-free seed mixes and straw in revegetation and erosion control applications.

4.2.10.2 Amphibians

Amphibians in the Central Coast Region—CRLF, CTS, and FYLF—also occur in the Sacramento Valley and Foothills Region. Refer to Section 4.2.8.2 for discussion of direct and indirect impact mechanisms. The extent of habitat and estimated impacts that follow, however, are unique to the Central Coast Region.

California Red-Legged Frog

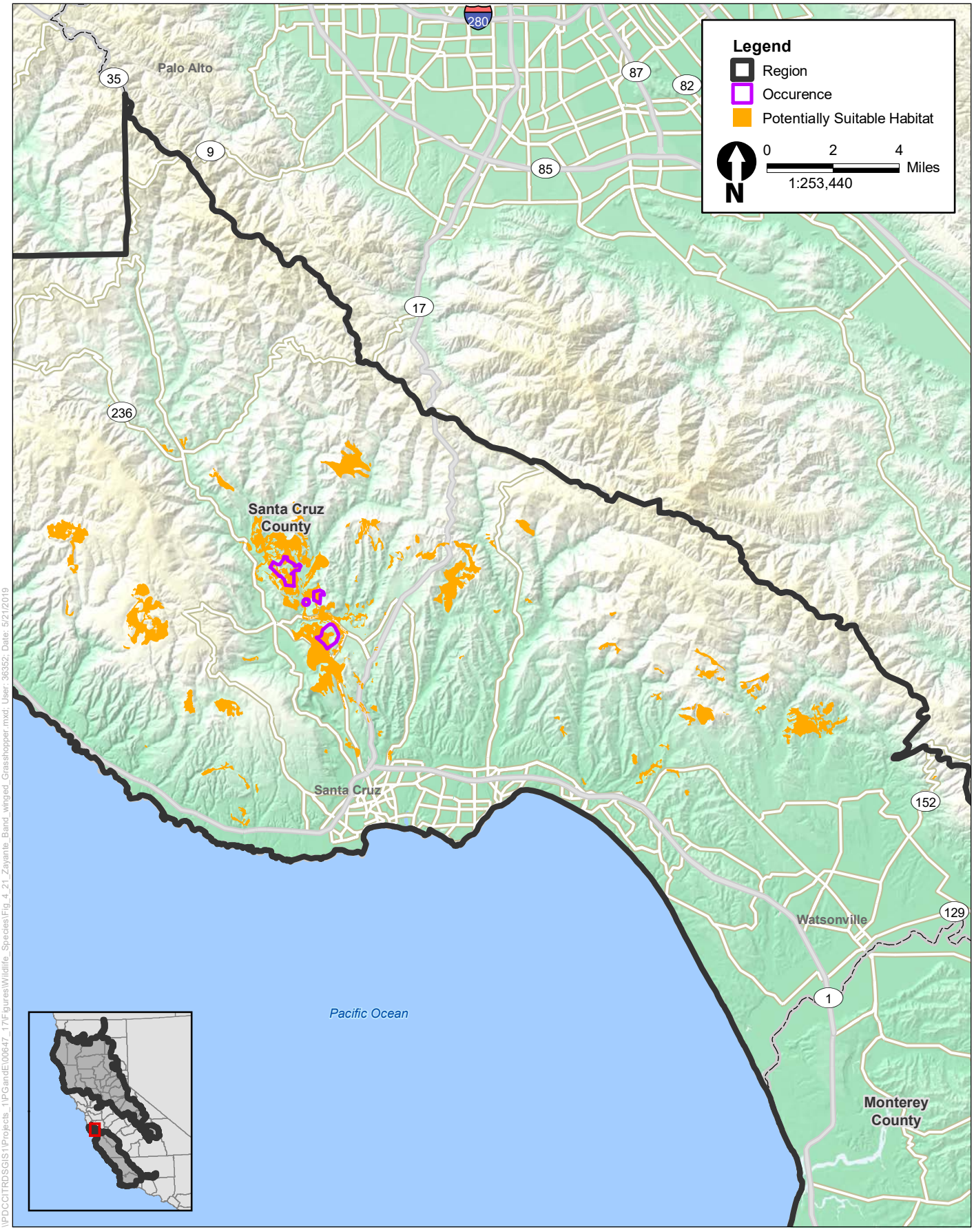
Species Distribution

Detailed life history for this species is included in Appendix B. This species is known to occupy all counties in the Central Coast Region (Table 2-7, Figure 4-7). There are approximately 10,804 acres of modeled habitat within the Plan Area of the Central Coast Region. Within that total, 2,076 acres are aquatic/breeding habitat and 8,728 acres are upland habitat (Table 4-4).

Direct Impacts

Direct impact mechanisms are the same as those described for the species in Section 4.2.8.2. Conservation measures to avoid and minimize impacts on the species would include the following: FP-02 would restrict vehicles and equipment to designated areas; FP-03 would minimize the development of new roads; FP-04 would keep vehicles and equipment out of wet areas and minimize impacts on natural vegetation; FP-11 would avoid soil and sediment runoff into water bodies; FP-12 would limit stockpiles and require covering of spoils; FP-13 would require escape ramps in open trenches and steep-walled holes; FP-15 would prohibit refueling within 250 feet of vernal pools, ponds, and streams; FP-16 would maintain a 250-foot buffer around vernal pools and/or require biological monitoring; and Wetland-2 would maintain a 50-foot buffer around wetlands, ponds, and riparian areas (see Table 5-1).

Additional measures implemented for working near stream-dependent amphibian habitat include FP-06 for inspection of materials and pipes prior to moving materials on-site; FP-08 for prohibition of trash dumping on-site; FP-10 for minimization of footprint and time on site; FP-17 for felling trees away from exclusion zones); and FP-01 for training construction crews on these requirements.



\PDCCITRDSGIS1\Projects_1\PGandE\00647_17\Figures\Wildlife_Species\Fig_4_21_Zayante_Band_winged_Grasshopper.mxd: User: 36352: Date: 5/21/2019

Figure 4-21
Zayante Band-winged Grasshopper Modeled Habitat

Permanent Impacts on Habitat

Permanent impact mechanisms are the same as those described for the species in Section 4.2.8.2. Covered activities would permanently impact 0.50 acre of aquatic breeding habitat (i.e., the wetted area and the adjacent riparian areas) annually, and permanent impacts would not exceed 15 acres over 30 years. Covered activities would permanently impact 2.00 acres of upland habitat annually and 60.00 acres of upland habitat over 30 years (Table 4-25).

Temporary Impacts on Habitat

Temporary impact mechanisms are the same as those described for the species in Section 4.2.8.2. Covered activities would temporarily disturb 3.0 acres of CRLF aquatic habitat (i.e., wetted area and the adjacent riparian areas) annually. Over 30 years, 90.0 acres of aquatic breeding habitat would be temporarily impacted. Covered activities would have temporary impacts on 10 acres of upland CRLF habitat annually, and 300 acres of upland habitat over 30 years (Table 4-25).

Impacts on Critical Habitat

There are 11,854 acres of CRLF critical habitat in the Plan Area within the Central Coast Region. All modeled habitat for this species in the region's Plan Area is within critical habitat for this species (Table 4-10). It is estimated that covered activities would permanently impact 2.50 acres of critical habitat and temporarily impact 13.00 acres annually. Over the 30-year term of the MRHCP, the estimated permanent (75.0 acres) and temporary (390.0 acres) impact total is approximately 465 acres. Combined, this represents 0.028% of the entire critical habitat designation for this species (Table 4-10).

Indirect Impacts

Indirect impacts are the same as those described for the species in Section 4.2.8.2.

California Tiger Salamander (Central California DPS and Santa Barbara DPS)

Species Distribution

Detailed life history for the species is included in Appendix B. There are two distinct population segments for CTS in the Central Coast Region; the Central California DPS occurs in Santa Cruz, San Benito, Monterey, and San Luis Obispo Counties, and the Santa Barbara County DPS occurs only in Santa Barbara County (Table 2-7, Figure 4-8).

In the Plan Area within the Central Coast Region, there are approximately 32,192 acres of modeled habitat consisting of 147 acres of aquatic/breeding habitat and 32,046 acres of upland habitat (Table 4-4). For the Santa Barbara County DPS, there are 3,340 acres of modeled habitat in the Plan Area within the region. The modeled habitat consists of 6 acres of aquatic/breeding habitat and 3,334 acres of upland habitat located in the west-central portion of Santa Barbara County (Table 4-4).

Direct Impacts

Direct impacts are the same as those discussed for the species in Section 4.2.8.2. In CTS habitat for either the Central California or Santa Barbara County DPS, implementation of the following conservation measures would occur: FP-02 would restrict vehicles and equipment to designated areas; FP-03 would minimize the development of new roads; FP-04 would keep vehicles and

equipment out of wet areas and minimize impacts on natural vegetation; FP-11 would avoid soil and sediment runoff into water bodies; FP-12 would limit stockpiles and require covering of spoils; Wetland-1 would maintain a 250-foot buffer around vernal pools; Wetland-2 would maintain a 50-foot buffer around wetlands, ponds, and riparian areas; and Hot Zone-6 would require flagging and avoidance of vernal pools (see Table 5-1). These measures would be implemented in or near aquatic habitat and, accordingly, impacts on breeding areas are expected to be minimal and infrequent.

The same measures would be implemented in upland habitat, with the addition of the following: FP-13 would require escape ramps in open trenches and steep-walled holes; FP-15 would prohibit refueling within 250 feet of vernal pools, ponds, and streams; FP-16 would maintain a 250-foot buffer around vernal pools and/or require biological monitoring (Table 5-1).

Permanent Impacts on Habitat

Permanent impact mechanisms are the same as those discussed previously for CRLF in Section 4.2.8.2. For the Central California DPS, covered activities are estimated to permanently impact approximately 0.03 acre of CTS aquatic breeding habitat annually, and no more than approximately 0.85 acres over the 30-year term of the MRHCP (Table 4-25). Covered activities are estimated to permanently impact approximately 6.02 acres of modeled California tiger salamander upland habitat annually, and no more than approximately 180.59 acres over the 30-year term of the MRHCP (Table 4-25).

For the Santa Barbara County DPS, covered activities are estimated to permanently impact approximately 0.001 acre of aquatic breeding habitat annually, and no more than approximately 0.02 acre over 30 years (Table 4-25). This low number is largely due to the limited number of facilities in close proximity to suitable aquatic habitat. Covered activities are estimated to permanently impact approximately 0.39 acre of modeled upland habitat annually, and no more than approximately 11.77 acres over 30 years (Table 4-25). Although this population segment is sensitive to impacts, the permanent impacts on breeding and upland habitat are expected to be limited and would not reduce the species' long-term survival.

Temporary Impacts on Habitat

Temporary impact mechanisms are the same as those described for CRLF in Section 4.2.8.2. For the Central California DPS, covered activities are estimated to temporarily impact 0.13 acre of modeled CTS breeding habitat annually, and no more than approximately 3.78 acres over the 30-year term of the MRHCP (Table 4-25). Covered activities are estimated to temporarily impact 27.31 acres of modeled CTS upland habitat annually, and no more than 819.4 acres over the 30-year term of the MRHCP (Table 4-25).

For the Santa Barbara County DPS, covered activities are estimated to permanently impact 0.005 acre of modeled breeding habitat annually, and no more than 0.14 acre over 30 years (Table 4-25). Covered activities are estimated to permanently impact 2.57 acres of upland habitat annually, and no more than 77.0 acres over 30 years (Table 4-25). Although this population segment is sensitive to impacts, the temporary impacts on breeding and upland habitat are expected to be limited and would not reduce the species' long-term survival.

Impacts on Critical Habitat

There are 813 acres of critical habitat for CTS (Central California DPS) in the Plan Area within the Central Coast Region, representing approximately 2.5% of modeled habitat in the region's Plan Area

(Table 4-10). It is estimated that covered activities would permanently impact 0.15 acre of critical habitat and temporarily impact 0.69 acre of critical habitat for this species annually. Over the 30-year term of the MRHCP, the estimated permanent (4.6 acres) and temporary (20.8 acres) impact total is 25.4 acres. Combined, this represents 0.013% of the entire critical habitat designation for this species (Table 4-10). The maximum possible 30-year impact on critical habitat would be 181.5 acres for permanent impacts and 823.2 acres for temporary impacts which, when combined, represent 0.51% of the entire critical habitat designation (Table 4-26).

There are 237 acres of critical habitat for CTS (Santa Barbara DPS) in the Plan Area within the Central Coast Region, representing approximately 7.1% of modeled habitat in the region's Plan Area (Table 4-10). It is estimated that covered activities would permanently impact 0.028 acre of critical habitat and temporarily impact 0.18 acre of critical habitat for this species annually. Over the 30-year term of the MRHCP, the estimated permanent (0.83 acre) and temporary (5.5 acres) impact total is 6.33 acres. Combined, this represents 0.057% of the entire critical habitat designation for this species (Table 4-10). The maximum possible 30-year impact on critical habitat would be 11.7 acres for permanent impacts and 77.4 acres for temporary impacts which, when combined, represent 0.80% of the entire critical habitat designation (Table 4-26).

Indirect Impacts

Indirect impacts are the same as those discussed for the species in Section 4.2.8.2.

Foothill Yellow-Legged Frog

Species Distribution

Detailed life history for the species is included in Appendix B. FYLF is known to occur in the coastal mountain ranges of Santa Cruz, San Benito, Monterey, San Luis Obispo, and Santa Barbara Counties in the Central Coast Region (Table 2-7, Figure 4-9). Modeled habitat for FYLF in the Plan Area within the Central Coast Region encompasses approximately 1,275 of acres consisting of 74 acres of potential breeding habitat and 1,201 acres of potential dispersal habitat (Table 4-4).

Direct Impacts

Direct impact mechanisms are the same as those discussed for the species in Section 4.2.8.2. In FYLF habitat, the following measures would be implemented: FP-02 would restrict vehicles and equipment to designated areas; FP-03 would minimize the development of new roads; FP-04 would keep vehicles and equipment out of wet areas and minimize impacts on natural vegetation; FP-11 would avoid soil and sediment runoff into water bodies; FP-12 would limit stockpiles and require covering of spoils; FP-13 would require escape ramps in open trenches and steep-walled holes; FP-15 would prohibit refueling within 250 feet of vernal pools, ponds, and streams; FP-16 would maintain a 250-foot buffer around vernal pools and/or require biological monitoring; and Wetland-2 would maintain a 50-foot buffer around wetlands, ponds, and riparian areas (see Table 5-1). These measures would ensure that the covered activities avoid and minimize potential impacts on FYLF and its habitat.

Additional measures implemented for working near stream-dependent amphibian habitat include FP-06 for inspection of materials and pipes prior to moving materials on-site; FP-08 for prohibition of trash dumping on-site; FP-10 for minimization of footprint and time on site; FP-17 for felling trees away from exclusion zones; and FP-01 for training construction crews on these requirements.

Permanent Impacts on Habitat

Permanent impact mechanisms are the same as those discussed for CRLF in Section 4.2.8.2. Covered activities are estimated to permanently impact 0.01 acre of FYLF breeding habitat annually, and no more than 0.30 acre over the 30-year term of the MRHCP (Table 4-25). Covered activities are estimated to permanently impact 0.17 acre of FYLF upland habitat annually, and no more than 5.15 acres over 30 years (Table 4-25).

Temporary Impacts on Habitat

Temporary impact mechanisms are the same as those discussed for CRLF in Section 4.2.8.2. Covered activities are estimated to temporarily impact 0.06 acre of FYLF breeding habitat annually, and no more than 1.76 acres over the 30-year term of the MRHCP (Table 4-25). Covered activities are estimated to temporarily impact 0.96 acre of FYLF upland habitat annually, and no more than 28.82 acres over 30 years (Table 4-25).

Impacts on Critical Habitat

Critical habitat has not been designated for FYLF.

Indirect Impacts

Indirect impacts on FYLF are similar to those described for CRLF in Section 4.2.8.2 to the extent that they pertain to stream channels, rather than ponds.

Santa Cruz Long-Toed Salamander

Species Distribution

Santa Cruz long-toed salamanders (SCLS) are nocturnal amphibians, inhabiting both aquatic and upland habitats in Santa Cruz and Monterey Counties (Table 2-7, Figure 4-22). Detailed life history for this species is located in Appendix B. There are approximately 1,248 acres of modeled habitat for SCLS in the Plan Area within the Central Coast Region. The modeled habitat consists of 74 acres of breeding habitat and 1,201 acres of upland habitat (Table 4-4).

Direct Impacts

Direct impact mechanisms for SCLS are the same as those discussed previously for CTS in Section 4.2.8.2. In SCLS habitat, implementation of the following measures would occur to reduce and minimize impacts: FP-02 would restrict vehicles and equipment to designated areas; FP-03 would minimize the development of new roads; FP-04 would keep vehicles and equipment out of wet areas and minimize impacts on natural vegetation; FP-11 would avoid soil and sediment runoff into water bodies; FP-12 would limit stockpiles and require covering of spoils; Wetland-2 would maintain a 50-foot buffer around wetlands, ponds and riparian areas; and Hot Zone-9 would require pre-construction surveys and seasonal restrictions (see Table 5-1). These measures would be implemented in or near aquatic habitat and, accordingly, impacts on breeding areas are expected to be minimal and infrequent.

The same measures would be implemented in upland habitat, with the addition of the following: FP-13 would require escape ramps in open trenches and steep-walled holes; FP-15 would prohibit refueling within 250 feet of vernal pools, ponds, and streams; FP-16 would maintain a 250-foot

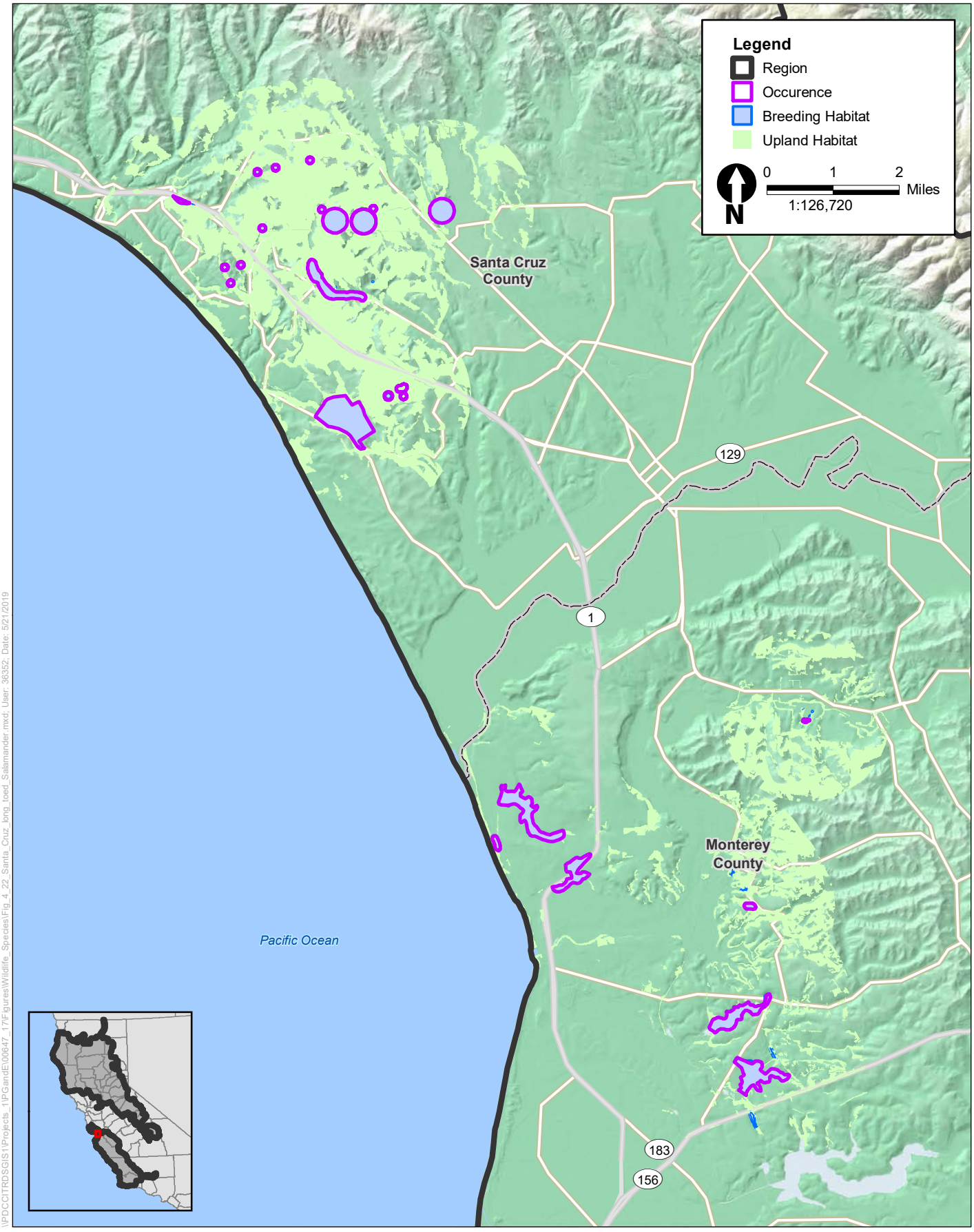


Figure 4-22
Santa Cruz long-toed Salamander Modeled Habitat

buffer around vernal pools, wetlands, ponds, or riparian areas and/or require biological monitoring (Table 5-1).

Permanent Impacts on Habitat

Permanent impact mechanisms are the same as those described for CRLF in Section 4.2.8.2. Covered activities are estimated to permanently impact 0.10 acre of SCLS breeding habitat, annually, and not more than 3.0 acres over the 30-year term of the MRHCP (Table 4-25). Permanent impact on upland habitat is estimated at 0.50 acre annually, and not more than 15.0 acres over the 30-year term.

Temporary Impacts on Habitat

Temporary impact mechanisms are the same as those described for CRLF in Section 4.2.8.2. Covered activities are estimated to temporarily impact 0.10 acre of modeled SCLS breeding habitat, annually, and not more than 3.0 acres over the 30-year term of the MRHCP (Table 4-25). Temporary impact on upland habitat is estimated at 1.50 acres annually, and not more than 45.00 acres over the 30-year term.

Impacts on Critical Habitat

Critical habitat has not been designated for SCLS.

Indirect Impacts

Indirect impacts on SCLS are similar to those described for CRLF in Section 4.2.8.2.

4.2.10.3 Reptiles

Blunt-Nosed Leopard Lizard

Species Distribution

Blunt-nosed leopard lizard (BNLL) inhabits open, sparsely vegetated areas of low relief in non-native grassland and valley sink scrub communities and occurs in the eastern portions of San Benito, San Luis Obispo, and Santa Barbara Counties in the Central Coast Region (Table 2-7, Figure 4-23). Modeled habitat for BNLL in the Plan Area within the Central Coast Region consists of approximately 2,209 acres of suitable habitat and 4,019 acres of core habitat (total of 6,228 acres) (Table 4-4). Suitable habitat is all habitat that can support the species, typically alkali desert scrub, desert wash, desert scrub, annual grassland, perennial grassland, and barren land cover types. Core habitat is suitable habitat with a patch size exceeding 1,236 acres.

Direct Impacts

Covered activities could result in direct impacts on BNLL that include mortality or injury. Individual BNLL (e.g., eggs, juveniles, or adults) could be crushed or buried by vehicles, equipment, or personnel performing covered activities in BNLL habitat, either while lizards are above ground during their active or breeding season or underground during their inactive period.

In BNLL habitat, the following conservation measures would be implemented: FP-02 would restrict vehicles and equipment to designated areas; FP-03 would minimize the development of new roads; FP-04 would minimize impacts on natural vegetation; FP-13 would require escape ramps in open

trenches and steep-walled holes; and BNLL-1 would require surveys, identification and avoidance of burrows, and exclusion zones (see Table 5-1).

Permanent Impacts on Habitat

Permanent impacts on BNLL habitat would result when habitat does not recover for more than 1 year, or where there is installation, or expansion of, a permanent facility footprint. Covered activities are estimated to permanently impact 0.45 acre of BNLL habitat and 0.58 acre of modeled core habitat annually. No more than 13.28 acre of BNLL habitat and 17.52 acres of core habitat would be permanently impacted over the 30-year term of the MRHCP (Table 4-25).

Temporary Impacts on Habitat

Temporary impacts on BNLL habitat would consist of impacts on habitat that recover within a year and/or do not result in installation, or expansion, of a facility footprint. Covered activities are estimated to temporarily impact approximately 1.92 acre of BNLL suitable habitat and 3.22 acres of core habitat annually. No more than 57.56 acre of BNLL habitat and 96.75 acres of core habitat would be temporarily impacted over the 30-year term of the MRHCP (Table 4-25).

Impacts on Critical Habitat

Critical habitat for BNLL has not been designated.

Indirect Impacts

Indirect impacts on BNLL could result from introduction of invasive plant species that reduce BNLL hunting success.

4.2.10.4 Birds

Marbled Murrelet

Species Distribution

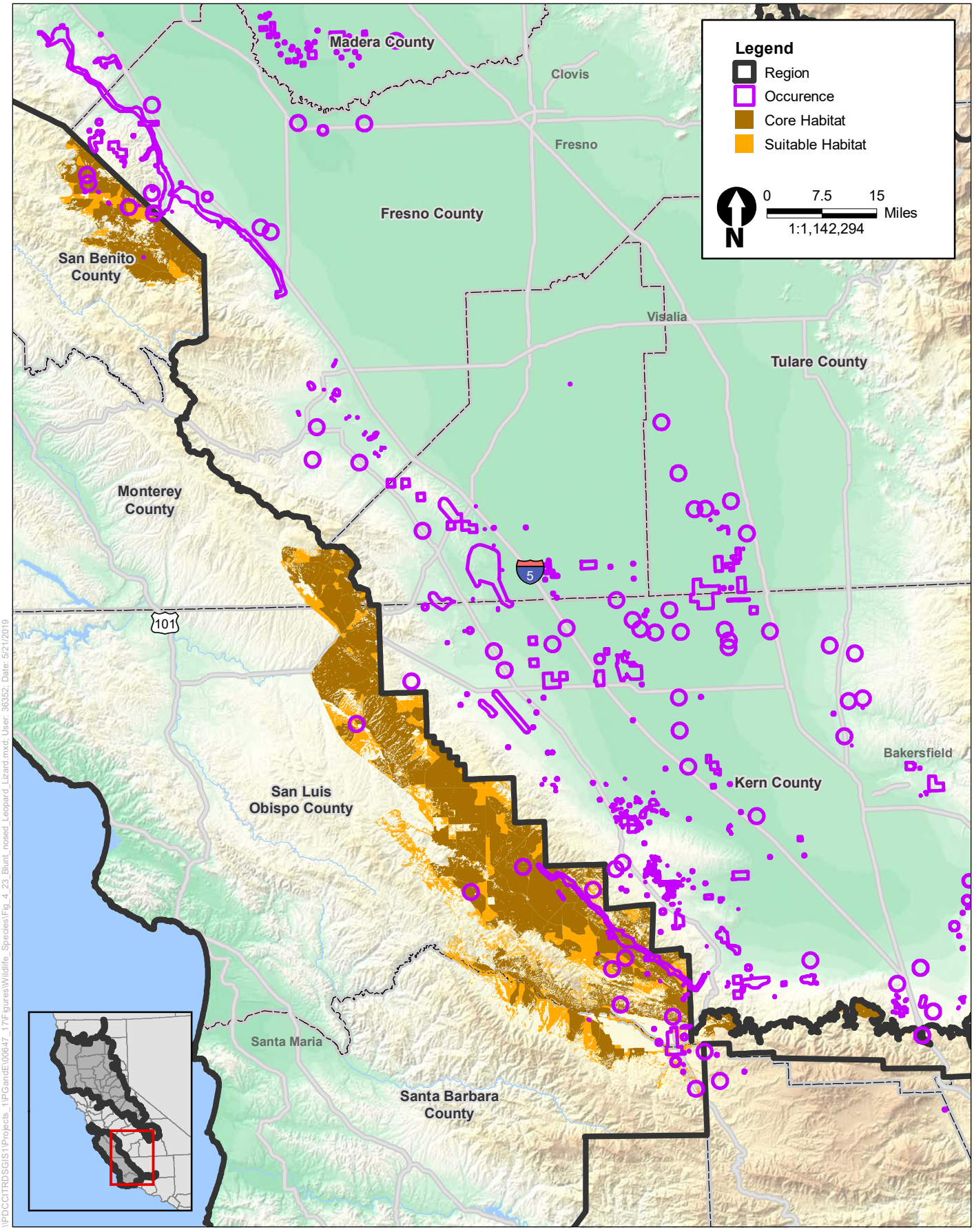
Detailed life history for MAMU is included in Appendix B. The Plan Area within the Central Coast Region contains 607 acres of modeled habitat, which is in northwest Santa Cruz County and along the central coast in Monterey County (Table 2-7, Table 4-4, Figure 4-15).

Direct Impacts

Direct impact mechanisms for MAMU are the same as those described for NSO in Section 4.2.8.4. Measures to ensure that covered activities avoid and minimize impacts on MAMU include: FP- 17, to fall trees away from sensitive areas or exclusion zones; FP-18, for the avoidance of nests with eggs or chicks; and MM-1, which requires surveys and seasonal work restrictions for covered activities in MAMU nesting or critical habitat (Table 5-1).

Permanent Impacts on Habitat

Permanent impacts on MAMU habitat are those activities that would remove a nesting site for 1 year or more. Covered activities are estimated to permanently impact 0.50 acre of MAMU habitat annually, and no more than 15.00 acres over the 30-year term of the MRHCP (Table 4-25).



\\PDCCITRDSGIS1\Projects_1\PGandE\00647_17\Figures\Wildlife_Species\Fig_4_23_Blunt_nosed_Leopard_Lizard.mxd: User: 36352: Date: 5/21/2019

Figure 4-23
Blunt-nosed Leopard Lizard Modeled Habitat

Temporary Impacts on Habitat

Temporary impacts on MAMU habitat are those that would affect MAMU or habitat for only several hours to less than 1 year. Covered activities are estimated to temporarily impact 0.75 acre of MAMU habitat annually, and no more than 22.50 acres over the 30-year term of the MRHCP (Table 4-25).

Impacts on Critical Habitat

There are 166 acres of MAMU critical habitat in the Plan Area within the Central Coast Region, representing approximately 28.4% of modeled habitat in the region's Plan Area (Table 4-10). It is estimated that covered activities would permanently impact 0.14 acre of critical habitat and temporarily impact 0.21 acre of critical habitat for this species annually. Over the 30-year term of the MRHCP, the estimated permanent (4.26 acres) and temporary (6.40 acres) impact total is 10.66 acres. Combined, this represents 0.0003% of the entire critical habitat designation for this species (Table 4-10). The maximum possible 30-year impact on critical habitat would be 15.0 acres for permanent impacts and 22.5 acres for temporary impacts which, when combined, represent 0.001% of the entire critical habitat designation (Table 4-26).

Indirect Impacts

Indirect impacts on MAMU are unlikely to result from covered activities.

4.2.10.5 Mammals

Giant Kangaroo Rat

Species Distribution

The giant kangaroo rat (GIKR) is known to occur in San Benito and San Luis Obispo Counties (Table 2-7, Figure 4-24). Detailed life history for the species is included in Appendix B. There are approximately 5,565 acres of modeled habitat for GIKR in the Plan Area within the Central Coast Region (Table 2-7, Table 4-4).

Direct Impacts

Because GIKR are nocturnal and spend daylight hours in underground burrows, covered activities are most likely to result in direct impacts on GIKR individuals while they are underground. Vehicles or equipment operating over a burrow could collapse the burrow or entrance and entomb an animal and/or young and cause injury or mortality. Conservation measures to avoid and minimize impacts on GIKR include: FP-02, to restrict vehicles and equipment to designated areas; FP-03, to limit access road development; FP-04, to avoid traffic impacts on natural vegetation and mammal burrows; FP-13, to use escape ramps overnight for open excavations; FP-14, for revegetation of areas larger than 0.1 acre; and GKR-1, for pre-construction biological surveys, identification and avoidance of burrow precincts, trapping, and biological monitoring in GIKR habitat.

Permanent Impacts on Habitat

Permanent impacts on GIKR habitat would consist of covered activity impacts on burrow precincts, removal of vegetation that does not recover for more than a year, or installation or expansion of a permanent facility footprint. Covered activities are estimated to permanently impact approximately

1.0 acre of GIKR habitat, annually, and no more than 30.0 acres over the 30-year term of the MRHCP (Table 4-25).

Temporary Impacts on Habitat

Temporary impacts on GIKR habitat would consist of those activities that affect habitat for less than a year, do not impact burrow precincts, or result in installation or expansion of a permanent facility footprint. Covered activities are estimated to temporarily impact approximately 5.0 acres of GIKR habitat annually and no more than 150 acres over the 30-year term of the MRHCP (Table 4-25).

Impacts on Critical Habitat

Critical habitat has not been designated for this species.

Indirect Impacts

Indirect impacts on GIKR could result from ground vibration caused by large activities, which could affect behavior during breeding season. Removal, burial, or destruction of GIKR seed caches could lead to energy loss or starvation of one or more individuals.

San Joaquin Kit Fox

Species Distribution

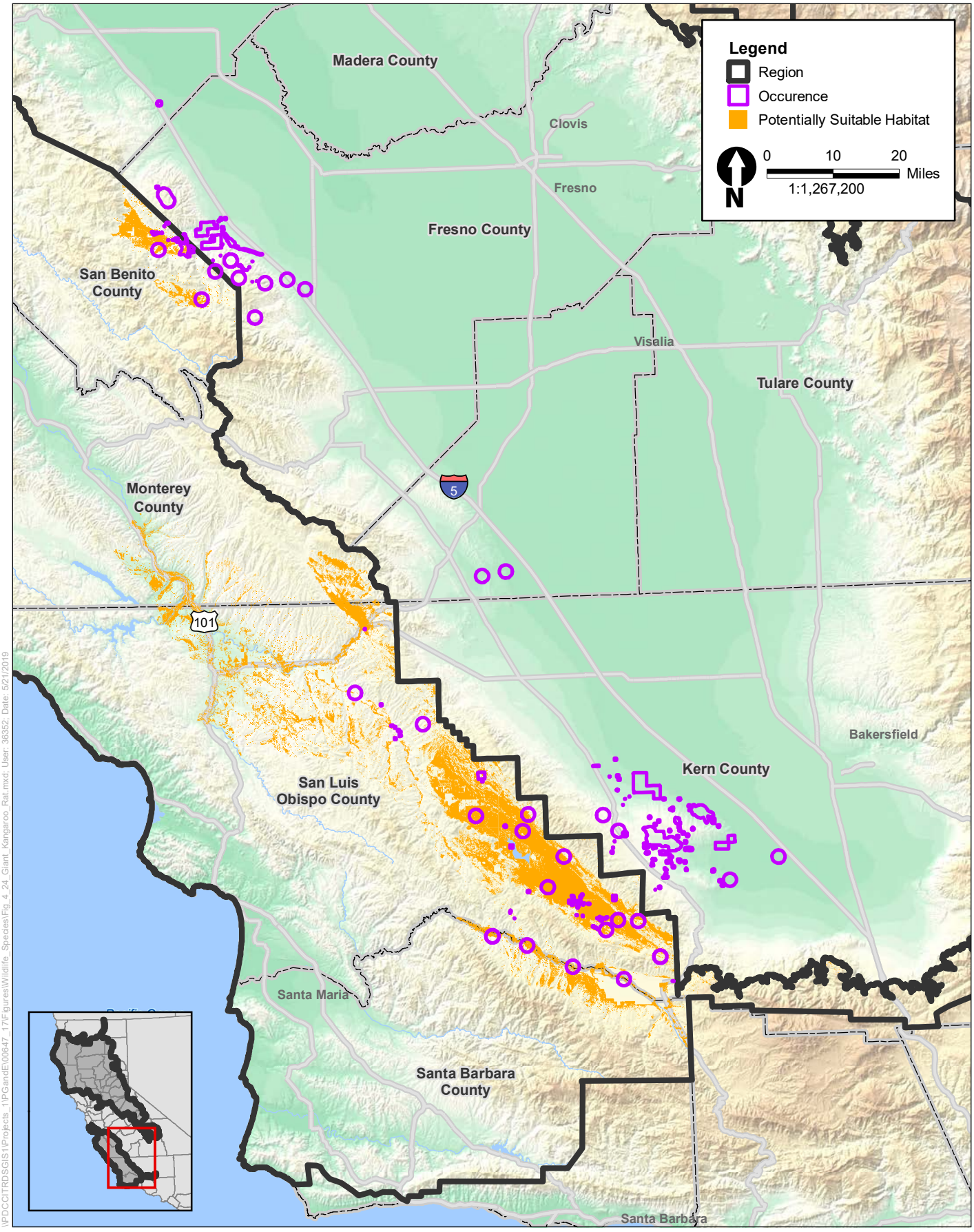
San Joaquin kit fox (SJKF) is known to occur in San Benito, Monterey, San Luis Obispo and Santa Barbara Counties (Table 2-7, Figure 4-25). Detailed life history for the species is included in Appendix B. Within the Plan Area of the Central Coast Region, modeled habitat for SJKF consists of approximately 3,038 acres of high-value suitable habitat; 39,670 acres of low-value suitable habitat; and 5,665 acres of moderate-value suitable habitat (total of 48,373 acres) (Table 2-7, Table 4-4).

Direct Impacts

Covered activities are most likely to result in direct impacts on SJKF while they are in underground dens. Vehicles or equipment operating near a den entrance could collapse the entrance and entomb an individual or its young and lead to injury or mortality. Construction sites may attract SJKF during non-work hours, potentially elevating their risk for injury or death if they become trapped in open trenches or seek cover under equipment or materials (i.e., pipes) that are later moved. Conservation measures to avoid and minimize impacts on SJKF include: FP-02, to restrict vehicles and equipment to designated areas; FP-03, to limit access road development; FP-04, to avoid traffic impacts on natural vegetation and mammal burrows; FP-06, to inspect pipes and materials for wildlife; FP-08, to limit speeds to 15 mph; FP-08, to prohibit trash at work sites; FP-13, to use escape ramps overnight for open excavations; and SJKF-1, for pre-construction biological surveys, identification and avoidance of dens, dusting of den entrances to determine SJKF activity, and establishment of exclusion zones.

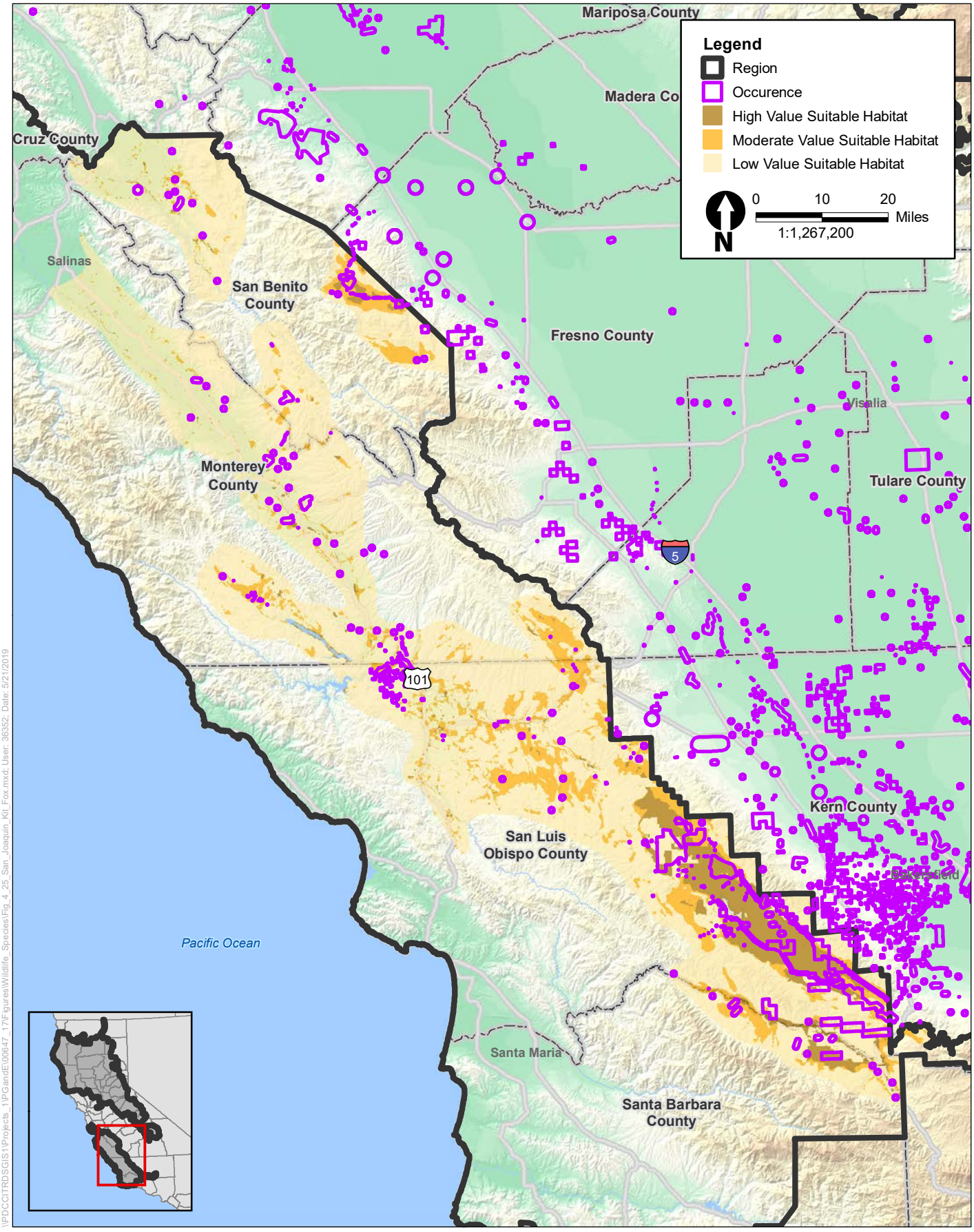
Permanent Impacts on Habitat

Permanent impacts on SJKF habitat would consist of covered activity impact on one or more dens, removal of vegetation that does not recover for more than a year, or installation or expansion of a permanent facility footprint. Covered activities are estimated to permanently impact 0.5 acre of modeled high-value habitat for SJKF, annually, and no more than 15 acres over the 30–year term of



\\PDCCITRDSGIS1\Projects_1\PGandE\00647_17\Figures\Wildlife_Species\Fig_4_24_Giant_Kangaroo_Rat.mxd: User: 36352: Date: 5/21/2019

Figure 4-24
Giant Kangaroo Rat Modeled Habitat



\PDCCITRDSGIS11\Projects_1\PGandE\00647_17\Figures\Wildlife_Species\Fig_4_25_San_Joaquin_Kit_Fox.mxd: User: 36352: Date: 5/21/2019

Figure 4-25
San Joaquin Kit Fox Modeled Habitat

the MRHCP. Permanent impacts on modeled low-value habitat are estimated at 7.13 acres per year, with no more than 213.86 acres impacted over 30 years. Permanent impacts on moderate-value habitat are estimated at 0.97 acre annually, with no more than 29.06 acres impacted over the 30-year term (Table 4-25).

Temporary Impacts on Habitat

Temporary impacts on SJKF habitat would consist of those activities that affect habitat for less than a year, do not cause loss of dens, or result in installation or expansion of a permanent facility footprint. Covered activities are estimated to temporarily impact approximately 3.0 acres of high-value habitat for SJKF, annually, and no more than 90.0 acres over the 30–year term of the MRHCP. Temporary impacts on low-value habitat are estimated at 33.43 acres per year, with no more than 1,003 acres impacted over the 30-year term. Temporary impacts on moderate-value habitat are estimated at 4.72 acres annually, with no more than 141.49 acres impacted over the 30-year term (Table 4-25).

Impacts on Critical Habitat

Critical habitat has not been designated for SJKF.

Indirect Impacts

Indirect impacts on SJKF could result from ground vibration caused by large activities, which could affect behavior during breeding season. Indirect impacts could also result from a reduction or decrease in SJKF prey base.

4.2.10.6 Plants

This section provides an analysis of each covered plant species, including direct and indirect impacts on habitat, individual plants, seedbank, and impacts on critical habitat. The impacts of implementing the covered activities are described for each of the covered plant species and their respective habitats. Table 4-27 summarizes the acreage of covered plant species' habitat and the number of individual plants potentially subject to impacts over the 30-year term of the MRHCP. Additional species information and full citations for sources considered in the literature review appear in Appendix B, *Species Accounts.* The species accounts in Appendix B supplement this chapter and provide additional information, including habitat requirements and land cover type associations.

Table 4-27. Summary of Estimated Impacts on Covered Plant Species in the Central Coast Region

Species	Percent of Habitat with the Potential to be Directly Affected	Habitat (acres)	Impacted Plants
San Benito evening-primrose	0.19%	0.37	1,888
Monterey spineflower	0.33%	46.60	4,376
Robust spineflower	0.62%	1.30	3,765
Kern mallow	0.19%	10.5	1,226
Monterey gilia	0.18%	6.60	6,266
Yadon's rein orchid	0.1%	2.10	64

Covered activities have the potential to disrupt a covered plant species' seedbank as a result of excavation if seeds are removed from the soil or desiccate from exposure at the ground surface during the dry season. Seedbank disruption could result in reduced regrowth of covered annual plant species once the soil is replaced. Seeds could also be buried by grading or lost where new facilities are constructed. Covered activities at both gas and electric facilities could result in seedbank impacts; however, most impacts associated with electric facilities would be aboveground (e.g., as a result of access, staging equipment, work on overhead wires) and impacts on the seedbank would be restricted to localized areas where existing electric poles are replaced or new electric poles are installed. Covered activities at gas facilities are expected to require grubbing, digging, and grading, which would have greater impacts on covered annual plant species and their seedbank.

San Benito Evening-Primrose (*Camissonia benitensis*)

Habitat Impacts

Habitat for San Benito evening-primrose totals about 197 acres of occupied and potential habitat in the Central Coast Region. Covered activities could impact six occurrences and 0.37 acre of habitat occupied by San Benito evening-primrose (Table 4-28).

Direct Impacts on San Benito Evening-Primrose

Proposed covered activities associated with electric facilities have the potential to result in direct loss of plants. Population sizes reported for these occurrences ranged from fewer than 10 to 18,700 (California Department of Fish and Wildlife 2018) Assuming that plants are uniformly distributed across the occurrences, but recognizing that this may not account for local habitat quality, 1,888 San Benito evening-primrose plants could be lost as a result of covered activities. Most of these impacts would be at EO 16 (Table 4-28). About 10% of the plants at this occurrence could be impacted. The degree of the impact would vary at each EO based on the amount of habitat impacted and habitat quality. The amount of the habitat impacted at the occurrences would range from 0.1% to 10%; habitat quality ranges from fair to good (California Department of Fish and Wildlife 2018). For EO1 and EO15, direct loss of plants will result in only one polygon each, where the polygon is intersected by a distribution line. EO12 is composed of two polygons, and the larger, eastern polygon is intersected by a distribution line. Both polygons are highly disturbed and the eastern polygon contains a building, concrete parking area, and graveled access road. EO13 and EO16 both contain two polygons, all of which are intersected by distribution lines; however, 0.4 acre and 0.17 acres of impacts are associated with vehicle access, respectively. EO35 is not bisected by an electric facility and would be impacted only by vehicle access. Impacts from vehicle access would be short-term and temporary.

Table 4-28. Potential Impacts on San Benito Evening-Primrose in Central Coast Region

Occurrence Number	Number of polygons	Precision	Habitat (acres)	Population Size	Impact Type	Potential Direct Impacts		
						% of Habitat	Habitat (acres)	Plants
1	16	Specific	19	>2,303	Electric Facility	0.1%	0.02	2
12	2	Specific	6	704	Electric Facility	0.5%	0.03	4
13	2	Specific	3	175	Electric Facility and Access	2.0%	0.06	4
15	11	Specific	16	3,768	Electric Facility	0.1%	0.02	5
16	2	Specific	2	18,700	Electric Facility and Access	10.0%	0.20	1,870
35	2	Specific	1	<50	Access	5.0%	0.05	3
Other[a]	–	Specific and non-specific polygons	150	Varies, <100 to 10,000	–	0.0%	0.00	0
Totals	**–**		**197**	**66,941**	**–**	**0.19%**	**0.37**	**1,888**

[a] Occurrences 3, 5, 10, 11, 14, 17, 18, 20, 22, 30 through 34, 36 through 41, and 44 through 67 are not near facility corridors and are unlikely to be directly or indirectly impacted by covered activities.

Impacts on Critical Habitat

Critical habitat has not been designated for San Benito evening-primrose.

Monterey Spineflower (*Chorizanthe pungens* var. *pungens*)

Habitat Impacts

Habitat for Monterey spineflower totals about 14,172 acres in the Central Coast Region. Covered activities could impact 12 occurrences and 46.6 acres of habitat occupied by Monterey spineflower (Table 4-29).

Direct Impacts on Monterey Spineflower

Covered activities associated with both gas and electric facilities have the potential to result in direct loss and reduced habitat quality. Population sizes reported for about half of the Monterey spineflower occurrences vary from about 100 plants to more than 100,000 plants (Table 4-29), with population densities ranging from 2 to 6,667 plants per acre. Using the median density (93.8 plants per acre) and assuming that plants are uniformly distributed across the occurrences, but recognizing that this may not account for local habitat quality, up to 4,376 plants could be lost as a result of covered activities. Most of the plants that could be lost are from EO2, the large occurrence spread across much of the former Fort Ord. Less than 1% of the plants would be impacted at most occurrences, but about 2% of the plants could be impacted at EOs 7, 48, 55, and 57, 4% at EO 58, and 5%–6% at EO 46.

The degree of the impact would vary at each EO based on the amount of the habitat impacted and habitat quality. The amount of the habitat impacted would range from 0.02% to 8%; habitat quality is good to excellent (California Department of Fish and Wildlife 2018). In addition, seven of the Monterey spineflower occurrences have non-specific locations and, thus, may or may not be present where they have been mapped in CNDDB. Suitable habitat at EOs 6, 28, and 54 is highly fragmented by farmland conversion and more than half of the habitat within each occurrence polygon has been

lost. For example, of the 108 acres that compose the single occurrence polygon at EO28, only 46 acres of suitable habitat remain, approximately 13 acres of which are located at the transmission line crossing and 33 of which are located at the eastern end of the occurrence, approximately 0.7 mile east of the transmission line. The other populations listed in Table 4-29 contain suitable habitat throughout most of their mapped occurrence polygons. EOs 2, 6, 8, 46, 48, and 58 are crossed by gas facilities; covered activities associated with gas facilities would require more digging and grading than covered activities for electric facilities and, thus, are more likely to impact Monterey spineflower plants and seedbank.

Table 4-29. Potential Impacts on Monterey Spineflower in Central Coast Region

						Potential Direct Impacts		
Occurrence Number	Number of Polygons	Precision	Habitat (acres)	Population Size	Impact Type	% of Habitat	Habitat (acres)	Plants
2	7	Specific	10,824	>19,700	Facility	0.4%	38.7	3,630
6	1	Non-specific	505	Not reported	Facility	0.2%	1.1	103
7	1	Specific	31	<100	Facility	0.1%	0.02	2
8	3	Specific	16	1,400	Facility	0.1%	0.02	2
26	1	Non-specific	337	Not reported	Facility	0.1%	0.5	47
28	1	Specific	108	>5,000	Facility	0.02%	0.02	2
45	1	Non-specific	268	Not reported	Facility	0.2%	0.6	56
46	23	Non-specific	65	Not reported	Facility	5.8%	3.8	356
48	8	Specific	6	>1,000	Facility	3.3%	0.2	19
54	1	Non-specific	44	Not reported	Facility	0.2%	0.1	9
55	1	Non-specific	41	Not reported	Facility	2.2%	0.9	84
57	1	Non-specific	15	Not reported	Facility	2.0%	0.3	28
58	2	Specific	5	1,000	Facility	8.0%	0.4	38
Other[a]	–	Specific and non-specific polygons	1,907	Varies, <100 to 10,000	Facility	0.0%	0.00	0
Totals	**51**		**14,172**		**–**	**0.33%**	**46.6**	**4,376**

[a] Occurrences 4, 5, 12 through 14, 16 through 18, 20, 21, 27, 29, 30, 32 through 34, 36 through 44, 47, 49 through 53, 56, 59, and 60 are not near facility corridors and are not likely to be directly or indirectly impacted by covered activities.

Impacts on Critical Habitat

Designated critical habitat for Monterey spineflower totals approximately 11,055 acres in the Central Coast Region. Covered activities associated with electric distribution lines and gas distribution would affect about 321 acres of critical habitat for this species.

Robust Spineflower (*Chorizanthe robusta* var. *robusta*)

Habitat Impacts

Habitat for robust spineflower in the Central Coast Region totals about 210 acres of occupied and potential habitat. Covered activities could impact four occurrences and 1.3 acres of habitat occupied by robust spineflower (Table 4-41).

Direct Impacts on Robust Spineflower

Covered activities associated with gas and electric facilities have the potential to result in direct loss and reduced habitat quality. Reported population sizes for other occurrences range from 600 to a million plants. Using the median density (2,000 plants per acre) to estimate the impacts on EO 31, and assuming that plants are uniformly distributed across the occurrences, but recognizing that this may not account for local habitat quality, up to 3,765 robust spineflower plants could be lost as a result of covered activities (Table 4-30). At three of the occurrences, less than 1% of the population would be impacted. At EO 16, about 16% of the population could be impacted.

The degree of the impact would vary at each EO based on the amount of habitat impacted and habitat quality. The amount of the habitat impacted at the occurrences would range from 0.1% to 16%; habitat quality is good to excellent (California Department of Fish and Wildlife 2018). EO10 contains two polygons, both of which are intersected by a transmission line at the extreme southern end of each polygon. EO16 consists of one polygon, which has been highly fragmented by Aptos High School. This EO contains two robust spineflower colonies (California Department of Fish and Wildlife 2018), the larger of which may be intersected by parallel gas and transmission lines. EO30 contains one polygon, which is intersected by one distribution line. The habitat at this EO is intact and the distribution line follows an existing road, which is expected to reduce impacts from covered activities on high-quality habitat and plants. EO31 contains one polygon, which is intersected by multiple transmission lines. This EO is non-specific and the exact location of the population is unknown; plants were seen in 2002 and 2003 but were not observed in 2009. Suitable habitat appears to be present.

Table 4-30. Potential Impacts on Robust Spineflower in Central Coast Region

						Potential Direct Impacts		
Occurrence Number	Number of Polygons	Precision	Habitat (acres)	Population Size	Impact Type	% of Habitat Impacted	Habitat (acres)	Plants
10	1	Non-specific	80	1,000,000	Electric Facility	0.1%	0.1	1,250
16	1	Non-specific	5	>10,000	Electric and Gas Facilities	16.0%	0.8	1,640
30	1	Specific	2	>5,000	Electric Facility	1.5%	0.03	75
31	1	Non-specific	80	Not reported	Electric Facility	0.5%	0.4	800
Other[a]	–	Specific and non-specific polygons	43	Varies, <100 to 10,000	–	0.0%	0.00	0
Totals	**–**		**210**	**1,058,600**	**–**	**0.62%**	**1.3**	**3,765**

[a] Occurrences 5 through 9, 15, 23, 24, and 32 through 34 are not near facility corridors and are not likely to be directly or indirectly impacted by covered activities.

Impacts on Critical Habitat

Designated critical habitat for robust spineflower encompasses 469 acres, all of which is within Santa Cruz County in the Central Coast Region. Covered activities associated with electric and gas distribution lines would impact approximately 21 acres of critical habitat for this species.

Kern Mallow (*Eremalche parryi* subsp. *kernensis*)

Habitat Impacts

Habitat for Kern mallow totals about 5,660 acres of occupied and potential habitat within the Central Coast Region. Covered activities could impact 10.5 acre of potential habitat for Kern mallow (Table 4-31).

Direct Impacts on Kern Mallow

Covered activities associated with electric facilities have the potential to result in direct loss of plants. Reported population sizes for other occurrences outside the study area range from a single plant to 17,500 plants (averaging 117 plants per acre). Assuming that plants are uniformly distributed across the occurrences, but recognizing that this may not account for local habitat quality, up to 1,226 Kern mallow plants could be lost as a result of covered activities (Table 4-31). Less than 1% of the population at each occurrence would be impacted.

The degree of the impact would vary at each EO based on the amount of the habitat impacted and habitat quality. The amount of the habitat impacted across the occurrences would range from 0.03% to 2.8%; the habitat quality ranges from poor to good (California Department of Fish and Wildlife 2018). The occurrences of Kern mallow in the Plan Area are located in areas where there is little development. Most of the habitat is intact and crossed by only one electric facility; however EO181 is crossed by two transmission lines parallel and overlap the occurrence, intersecting most of the length of the occurrence. EOs 161 and 168 are the only two occurrences of Kern mallow in the Plan Area that are rated as containing poor habitat quality, because both occurrences are intersected by roads; vehicles and human disturbance threaten these occurrences (California Department of Fish and Wildlife 2018). EO35 is rated as containing fair habitat quality, although two of its three polygons are intersected by State Route 166. Half of the Kern mallow occurrences in the Plan Area are non-specific, described only vaguely in terms of location; therefore, these populations may or may not be present where covered activities are conducted. Additionally, impacts from vehicle access at EOs 117, 131, and 181 would be short-term and temporary.

Table 4-31. Potential Impacts on Kern Mallow in Central Coast Region

						Potential Direct Impacts		
Occurrence Number	Number of Polygons	Precision	Habitat (acres)	Population Size	Impact Type	% of Habitat	Habitat (acres)	Plants
8	1	Non-specific	67	Not reported	Electric Facility	0.03%	0.02	2
72	3	Specific	15	3,000	Electric Facility	0.2%	0.03	4
117	1	Non-specific	1987	Not reported	Electric Facility and Access	0.3%	6.5	756
133	1	Non-specific	739	Not reported	Electric Facility and Access	0.3%	2.4	280
135	3	Specific	23	78	Electric Facility	0.09%	0.02	2
160	3	Specific	25	5,800	Electric Facility	0.08%	0.02	2
161	1	Specific	5	9	Electric Facility	0.4%	0.02	2
168	1	Specific	5	12	Electric Facility	0.4%	0.02	2
181	1	Non-specific	53	Not reported	Electric Facility and Access	2.8%	1.5	176

Occurrence Number	Number of Polygons	Precision	Habitat (acres)	Population Size	Impact Type	Potential Direct Impacts		
						% of Habitat	Habitat (acres)	Plants
Other[a]	–	Specific and non-specific polygons	2741	Varies, <100 to 10,000	–	0.0%	0.00	0
Totals	**–**		**5,660**	**88,923**	**–**	**0.19%**	**10.5**	**1,226**

[a] Occurrences 9 through 11, 13, 18 through 20, 53 through 57, 61 through 67, 71, 78 through 80, 88 through 101, 103 through 106, 108 through 110, 116, 118 through 128, 130, 137, 151 through 159, 162, 167, 169 through 172, and 182 are not near facility corridors and are not likely to be directly or indirectly impacted by covered activities.

Impacts on Critical Habitat

Critical habitat has not yet been designated for Kern mallow.

Monterey Gilia (*Gilia tenuiflora* subsp. *arenaria*)

Habitat Impacts

Habitat for Monterey gilia totals about 3,628 acres of occupied and potential habitat within the Central Coast Region. Covered activities could impact nine occurrences and 6.64 acres of habitat occupied by Monterey gilia (Table 4-32).

Direct Impacts on Monterey Gilia

Covered activities associated with gas and electric facilities have the potential to result in direct loss of plants. Reported population sizes vary widely, ranging from a few plants to two million plants (median plant density of 270 plants per acre). Assuming that plants are uniformly distributed across the occurrences, but recognizing that this may not account for local habitat quality, about 6,266 plants could be lost as a result of covered activities (Table 4-32). Less than 1% of the population at each occurrence would be impacted.

The degree of the impact would vary at each EO based on the amount of the habitat impacted and habitat quality. The amount of the habitat impacted across the occurrences would range from 0.1% to 1.2%; habitat quality is from fair to good (California Department of Fish and Wildlife 2018). Half of the Monterey gilia occurrences have non-specific locations and most have fragmented or disturbed habitat. EOs 14, 15, and 18 were recorded from fieldwork conducted in 1992 and have not been documented in more 20 years in CNDDB (California Department of Fish and Wildlife 2018). EO14 is composed of five polygons, three of which are intersected by gas and transmission lines. EO15 is composed one polygon, which is bisected by a transmission line. EO18 is composed of six polygons, two of which are intersected by transmission lines. EO2 contains two polygons, the eastern of which is intersected by a transmission line; the transmission line parallels a road through the polygon, which would reduce impacts on high-quality habitat and individual plants from covered activities. EO2O and EO31 both contain numerous polygons that are intersected by a network of gas and electric lines. These occurrences are highly fragmented by urban development and contain heavily disturbed habitat (California Department of Fish and Wildlife 2018). Additionally, impacts from vehicle access at EOs 14, 15, 20, and 31 would be short-term and temporary.

Table 4-32. Potential Impacts on Monterey Gilia in Central Coast Region

Occurrence Number	Number of Polygons	Precision	Habitat (acres)	Population Size	Impact Type	Potential Direct Impacts		
						% of Habitat	Habitat (acres)	Plants
2	2	Specific	8	6,600	Gas Facility	0.3%	0.02	13
14	5	Non-specific	1,185	Not reported	Gas and Electric Facilities, Access	0.2%	2.9	783
15	1	Non-specific	69	Not reported	Electric Facility and Access	1.0%	0.7	189
18	6	Non-specific	1,151	Not reported	Gas and Electric Facilities, Access	0.1%	1.4	378
20	31	Specific	437	45,900–2,000,000	Electric Facility and Access	0.3%	1.2	4,895
31	9	Specific	34	698	Gas and Electric Facilities, Access	1.2%	0.4	8
Other[a]		Specific and non-specific polygons	744	Varies, <100 to 10,000	–	0.0%	0.00	0
Totals			**3,628**			**0.18%**	**6.6**	**6,266**

[a] Occurrences 1, 3 through 6, 10 through 13, 16, 17, 19, 21 through 24, 26, 27, 29, 30, and 32 through 36 are not near facility corridors and are not likely to be directly or indirectly impacted by covered activities.

Impacts on Critical Habitat

Critical habitat has not been designated for Monterey gilia.

Yadon's Rein Orchid (*Piperia yadonii*)

Habitat Impacts

Habitat for Yadon's rein orchid in the Central Coast Region totals about 2,125 acres. Covered activities could impact seven occurrences and 2.1 acres of habitat occupied by Yadon's rein orchid (Table 4-33).

Direct Impacts on Yadon's Rein Orchid

Covered activities associated with gas and electric facilities have the potential to result in direct loss of plants. Population sizes reported for impacted occurrences range from none to 129,000 plants. Based on the population sizes, approximately 64 Yadon's rein orchids could be expected to be lost from covered activities (Table 4-33). This would be less than 1% of any impacted population.

The degree of the impact would vary at each EO based on the amount of the habitat impacted and habitat quality. The amount of the habitat impacted across the occurrences would range from 0.02% to 1.3%; habitat quality is good to excellent (California Department of Fish and Wildlife 2018). Urban encroachment into Monterey pine forest across the range of Yadon's rein orchid has fragmented and disturbed all of these occurrences. EO12 is the only occurrence ranked as containing excellent habitat (California Department of Fish and Wildlife 2018), although the occurrence is non-specific and fragmented by urban and agricultural development. EO12 contains three polygons, one of which is fully bisected by a transmission line. The other two polygons are intersected by transmission lines near the boundary of the polygons. Similarly, EOs 9 and 11 are

intersected by a facility only near the boundary of the occurrences. EO9 is considered to be possibly extirpated because the habitat is not typical for the species and plants were not observed in surveys during 2013, nor in additional four surveys during following years. EO10 encompasses a residential neighborhood and is intersected by the associated network of transmission lines.

Table 4-33. Potential Impacts on Yadon's Rein Orchid in Central Coast Region

						Potential Direct Impacts		
Occurrence Number	Number of Polygons	Precision	Habitat (acres)	Population Size	Impact Type	% of Habitat	Habitat (acres)	Plants
3	>50	Specific	412	53,000–129,000	Electric Facility	0.02%	0.1	31
9	1	Non-specific	15	Possibly extirpated	Gas Facility	1.3%	0.2	0
10	1	Non-specific	29	>10	Electric Facility	0.3%	0.1	0
11	1	Non-specific	325	<100–3,080	Electric Facility	0.1%	0.4	4
12	3	Non-specific	561	0–9,500	Electric Facility	0.04%	0.2	3
19	1	Specific	28	916	Electric Facility	0.4%	0.1	3
22	6	Specific	30	15–3,500+	Electric Facility	0.7%	0.2	23
Other[a]	–	Specific and non-specific polygons	725	Varies, <100 to 10,000	–	0.00%	0.00	0
Totals	**–**		**2,125**	**160,244**	**–**	**0.1%**	**2.1**	**64**

[a] Occurrences 1, 2, 4, 8, 13, 15, 16, 20, 24, 25, 27, 28, and 34 through 37 are not near facility corridors and are not likely to be directly or indirectly impacted by covered activities.

Impacts on Critical Habitat

Designated critical habitat for Yadon's rein orchid encompasses approximately 2,117 acres in the Central Coast Region. The critical habitat found in the region constitutes 100% of this species' total critical habitat in the state. Covered activities could permanently affect 117.7 acres of critical habitat.

4.3 Requested Take Authorization

Table 4-34 provides the covered species' legal status and requested incidental take authorization for wildlife species covered under this plan. The amount of incidental take in Table 4-34 reflects the maximum allowable take under the permit.

Although incidental take of plant species is not prohibited under the ESA and, therefore, cannot be authorized under an incidental take permit, plant species described in this HCP would be included on the permit in recognition of the conservation benefits provided to the species. Table 4-35 addresses the amount of habitat (acres) and estimates of plants that would be impacted over the term of the MRHCP. Impacts on the extremely rare plant species would mostly be avoided because PG&E would implement plant AMMs, implement vegetation management BMPs, and, if necessary, prepare a restoration plan to mitigate for the loss of covered plants.

Table 4-34. Requested Federal Take Authorizations for Wildlife

Common Name	Federal Legal Status[a]	Amount of Permanent Estimated Take over 30 Years (acres of suitable habitat)	Amount of Temporary Estimated Take over 30 Years (acres of suitable habitat)	Total Amount of Take Requested over 30 Years (acres of suitable habitat)
Invertebrates				
Conservancy fairy shrimp	E	7.50	57.92	65.42
Longhorn fairy shrimp	E	3.32	21.06	24.39
Vernal pool fairy shrimp	T	41.97	338.57	380.54
Vernal pool tadpole shrimp	E	41.97	338.57	380.54
Morro shoulderband snail	E	3.00	6.00	9.00
Mount Hermon June beetle	E	7.50	22.50	30.00
Ohlone tiger beetle	E	7.50	22.50	30.00
Smith's blue butterfly	E	15.25	72.69	87.94
Zayante band-winged grasshopper	E	3.59	15.15	18.75
Valley elderberry longhorn beetle	T	78.93	281.67	360.6
Amphibians				
California red-legged frog breeding habitat	T	48.00	186.00	234.00
California red-legged frog upland habitat	T	127.50	640.52	768.00
California tiger salamander (Central California DPS) breeding habitat	T	5.91	29.13	35.04
California tiger salamander (Central California DPS) upland habitat	T	248.81	1,145.71	1,394.51
California tiger salamander (Santa Barbara County DPS) breeding habitat	E	0.02	0.14	0.16
California tiger salamander (Santa Barbara County DPS) upland habitat	E	11.77	77.01	88.78

Common Name	Federal Legal Status[a]	Amount of Permanent Estimated Take over 30 Years (acres of suitable habitat)	Amount of Temporary Estimated Take over 30 Years (acres of suitable habitat)	Total Amount of Take Requested over 30 Years (acres of suitable habitat)
Foothill yellow-legged frog breeding habitat	CT	1.69	9.88	11.57
Foothill yellow-legged frog dispersal habitat	CT	20.23	118.76	139.00
Mountain yellow-legged frog	E	0.60	3.00	3.60
Santa Cruz long-toed salamander breeding habitat	E	3.00	3.00	6.00
Santa Cruz long-toed salamander upland habitat	E	15.00	45.00	60.00
Sierra Nevada yellow-legged frog	E	0.68	4.48	5.16
Yosemite toad	T	0.50	2.00	2.50
Reptiles				
Blunt-nosed leopard lizard suitable habitat	E	13.28	57.56	70.94
Blunt-nosed leopard lizard core habitat	E	17.52	96.75	114.27
Giant garter snake aquatic habitat	T	12.75	90.00	102.75
Giant garter snake upland habitat	T	38.01	300.00	338.01
Giant garter snake potential aquatic habitat (rice)	T	50.48	300.00	350.48
Birds				
Marbled murrelet	T	45.00	82.50	127.50
Northern spotted owl	T	165.00	660.00	825.00
Mammals				
Giant kangaroo rat	E	30.00	150.00	180.00
Point Arena mountain beaver	E	3.00	7.50	10.50
San Joaquin kit fox high value habitat	E	15.00	90.00	105.00
San Joaquin kit fox low value habitat	E	213.86	1,002.99	1,216.85

Common Name	Federal Legal Status[a]	Amount of Permanent Estimated Take over 30 Years (acres of suitable habitat)	Amount of Temporary Estimated Take over 30 Years (acres of suitable habitat)	Total Amount of Take Requested over 30 Years (acres of suitable habitat)
San Joaquin kit fox moderate value habitat	E	29.06	141.49	170.55

[a] Status explanations:

E = listed as endangered under the federal Endangered Species Act.

T = listed as threatened under the federal Endangered Species Act.

CT = candidate threatened under the federal Endangered Species Act.

[b] Estimating the number of individuals affected on an annual basis is challenging given the rarity and low detectability of covered species. These totals are provided as an estimate to support permit issuance. The FPs, AMMs and BMPs in the MRHCP are intended to avoid and minimize direct mortality of individuals, although some incidental take may occur. Capture and relocation is required to avoid direct harm to covered species that may be discovered on project work sites during pre-activity surveys, periods of inactivity at a worksite, or as part of project weatherization where work sites are made ready during periods of covered species activity to allow for work during species of inactivity.

[c] These totals are simply an extrapolation of annual totals multiplied by the permit term of 30-years.

Table 4-35. Estimated Covered Plant Impacts

Common Name	Status under the Endangered Species Act	Amount of Impact on Occupied Habitat (acres) and Plants over 30 years (Total will be capped at whichever number is reached first.)
Ione manzanita	Threatened	12.25 acres; 64 plants
Pine Hill ceanothus	Endangered	3.67 acres; 33 plants
Pine Hill flannelbush	Endangered	1.19 acres; 2 plants
Stebbins' morning-glory	Endangered	2.31 acres; 787 plants
Layne's ragwort	Threatened	2.86 acres; 103 plants
Beach layia	Endangered	0.32 acres; 143 plants
San Benito evening-primrose	Threatened	0.37 acres; 1,888 plants
Monterey spineflower	Threatened	46.6 acres; 4,376 plants
Robust spineflower	Endangered	1.3 acres; 3,765 plants
Kern mallow	Endangered	10.5 acres; 1,226 plants
Monterey gilia	Endangered	6.6 acres; 6,266 plants
Yadon's rein orchid	Endangered	2.1 acres; 64 plants

4.3.1 Cumulative Effects

Most lands in the 565,781-acre Plan Area are privately owned but within a ROW or easements deed with PG&E. Under the terms of these deeds, the landowner may use the ROW lands for any purpose that will not interfere with PG&E's use of the ROW. Buildings or other structures cannot be erected within the boundary of the ROW because they would interfere with PG&E's activities. Consequently, the ROW easement deed provides no protection from land-use change within the ROWs, with the exception that buildings will not be constructed within the ROW boundaries. Other state or private activities are expected to occur within these ROWs, including cattle grazing, extensive agricultural development, timber harvesting, fuel wood cutting, fire suppression, road building, and herbicide use. Although housing development is not expected within the boundary of a ROW, development or other land-use changes may occur on lands directly bordering the ROWs. Although land-cover in a ROW may stay in a natural condition, development or other land-use changes on bordering lands would substantially reduce the habitat value of the ROW lands. These future activities may not be subject to Section 7 consultation and, thus, are considered as part of this cumulative effects analysis. These activities are not associated with the MRHCP.

The MRHCP will not contribute to the local and rangewide trend of urbanization, habitat loss, fragmentation, and degradation, the principal causes of the decline of the species addressed by USFWS. The MRHCP allows the ongoing operation and maintenance of existing natural gas and electric distribution facilities, and minor extensions of gas and electric lines. PG&E would construct the facility extensions in advance or simultaneous to the new energy demand, and the capacity of the new pipelines would not exceed the peak need of the new subdivisions and businesses. Therefore, the new facility extensions would be provided in response to urban development, would not remove an obstacle for future urban development, and are not considered growth-inducing.

Continued human population growth in the study area is expected to drive further development of agriculture, cities, industry, transportation, and water resources in the foreseeable future. This

future development and the associated infrastructure will further contribute to the loss and fragmentation of natural areas, including areas supporting covered species. Ongoing loss and fragmentation of natural land-cover in the study area and anthropogenic factors such as pesticide use and invasion of exotic species are expected to continue for the 30-year term of the MRHCP.

Cumulative effects include the effects of future state, tribal, local, or private actions that are reasonably certain to occur in the study area. Future federal actions that are unrelated to the MRHCP are not considered because they require separate consultation pursuant to Section 7.

4.3.2 Effects of the Taking

This section describes the effects of the taking and provides an overview of PG&E's impacts in relation to total available habitat. For wildlife, the overall context of the taking is summarized in Table 4-36, which shows the total acreage of permanent and temporary impacts on covered species habitat as a percentage of all estimated available habitat in the study area. These percentages show the extent of impacts anticipated in the Plan Area over the 30-year permit term, *relative to the modeled habitat in the study area*. These habitat impacts range from 0.003% of modeled habitat for SYLF up to 0.575% of modeled aquatic breeding habitat for SCLS. Most impacts are less than 0.1% of modeled habitat for any species, with the exception of the following 30-year impacts that exceed 0.1% of modeled habitat: impacts on SCLS upland habitat (0.523%); SJKF moderate-value suitable habitat (0.394%); MHJB habitat (0.388%); MSBS habitat (0.336%); OHTB habitat (0.290%); ZBWG habitat (0.242%); GGS upland habitat (0.201%); and PAMB habitat (0.114%).

On the whole and considering the geographic extent of the Plan Area relative to the covered species' ranges, impacts are projected to be very small. Further, projected impacts do not necessarily represent permanent loss of habitat for covered species because the impacts reflect both permanent and temporary impact totals. Projected impacts would be substantially lower if only permanent impacts were included. Additionally, PG&E's impacts would not be concentrated in time and space. Because covered activities would be conducted intermittently as needed, impacts would be distributed throughout the Plan Area in relation to the specific facilities, and are most frequently temporary in nature. As indicated in Table 4-1, annual permanent impacts are estimated at approximately 100 acres, compared with annual temporary impacts estimated at approximately 465 acres, indicating that approximately 78.5% of impacts in a given year would be temporary.

Table 4-36. Total 30-Year Impacts and Percent of Impacts in Relation to All Habitat in the Study Area

Species Habitat	Modeled Habitat in the Study Area	Total 30-Year Permanent Impact Acreage (from Table 4-9)	Total 30-Year Temporary Impact Acreage (from Table 4-9)	Percent of Permanent Impacts in Relation to All Habitat	Percent of Temporary Impacts in Relation to All Habitat
Aquatic Invertebrates					
Conservancy fairy shrimp suitable habitat	106,581	7.50	57.92	0.01%	0.05%
Longhorn fairy shrimp suitable habitat	57,312	3.32	21.06	0.01%	0.04%
Vernal pool tadpole shrimp suitable habitat	614,581	42.00	338.57	0.01%	0.06%
Vernal pool fairy shrimp suitable habitat	614,581	42.00	338.57	0.01%	0.06%

Species Habitat	Modeled Habitat in the Study Area	Total 30-Year Permanent Impact Acreage (from Table 4-9)	Total 30-Year Temporary Impact Acreage (from Table 4-9)	Percent of Permanent Impacts in Relation to All Habitat	Percent of Temporary Impacts in Relation to All Habitat
Terrestrial Invertebrates					
Morro shoulderband snail suitable habitat	4,899	3.00	6.00	0.06%	0.12%
Mount Hermon (=barbate) June beetle suitable habitat	7,739	7.50	22.50	0.10%	0.29%
Ohlone tiger beetle suitable habitat	10,340	7.50	22.50	0.07%	0.22%
Valley elderberry longhorn beetle suitable habitat	108,640	78.93	281.67	0.07%	0.26%
Smith's blue butterfly suitable habitat	171,473	15.25	72.69	0.01%	0.04%
Zayante band–winged grasshopper suitable habitat	7,739	3.59	15.15	0.05%	0.20%
Amphibians					
California red-legged frog breeding habitat	254,913	48.00	186.00	0.02%	0.07%
California red-legged frog upland habitat	1,014,440	127.50	640.52	0.01%	0.06%
California tiger salamander (Central California DPS) breeding habitat	75,491	5.91	29.13	0.01%	0.04%
California tiger salamander (Central California DPS) upland habitat	2,504,760	248.81	1,145.71	0.01%	0.05%
California tiger salamander (Santa Barbara County DPS) breeding habitat	194	0.02	0.14	0.01%	0.07%
California tiger salamander (Santa Barbara County DPS) upland habitat	212,150	11.77	77.01	0.01%	0.04%
Foothill yellow-legged frog breeding habitat	50,442	1.69	9.88	0.00%	0.02%
Foothill yellow-legged frog dispersal habitat	575,339	20.23	118.76	0.00%	0.02%
Mountain yellow-legged frog suitable habitat	19,444	0.60	3.00	0.00%	0.02%
Santa Cruz long-toed salamander breeding habitat	1,044	3.00	3.00	0.29%	0.29%
Santa Cruz long-toed salamander upland habitat	11,464	15.00	45.00	0.13%	0.39%
Sierra Nevada yellow-legged frog suitable habitat	185,618	0.68	4.48	0.00%	0.00%
Yosemite toad suitable habitat	5,936	0.50	2.00	0.01%	0.03%

Species Habitat	Modeled Habitat in the Study Area	Total 30-Year Permanent Impact Acreage (from Table 4-9)	Total 30-Year Temporary Impact Acreage (from Table 4-9)	Percent of Permanent Impacts in Relation to All Habitat	Percent of Temporary Impacts in Relation to All Habitat
Reptiles					
Blunt-nosed leopard lizard suitable habitat	167,733	13.28	57.56	0.01%	0.03%
Blunt-nosed leopard lizard core habitat	477,623	17.52	96.75	0.00%	0.02%
Giant garter snake potential aquatic habitat—wetland and marsh	137,263	12.75	90.00	0.01%	0.07%
Giant garter snake upland habitat	167,751	38.01	300.00	0.02%	0.18%
Giant garter snake aquatic habitat—rice	444,185	50.48	300.00	0.01%	0.07%
Birds					
Marbled murrelet suitable habitat	358,826	45.00	82.50	0.01%	0.02%
Northern spotted owl suitable habitat	5,525,990	165.00	660.00	0.00%	0.01%
Mammals					
Giant kangaroo rat suitable habitat	324,802	30.00	150.00	0.01%	0.05%
Point Arena mountain beaver suitable habitat	9,210	3.00	7.50	0.03%	0.08%
San Joaquin kit fox high-value suitable habitat	216,417	15.00	90.00	0.01%	0.04%
San Joaquin kit fox moderate-value suitable habitat	308,845	29.06	141.49	0.01%	0.05%
San Joaquin kit fox low-value suitable habitat	1,887,710	213.86	1,003.00	0.01%	0.05%

Although there is some potential that even small activities could result in large impacts on a covered species, the incorporation of BMPs and AMMs and the use of hot zones to screen work would ensure that covered activities do not significantly reduce local populations of covered species. Similarly, although activities could be implemented year-round, PG&E implements seasonal restrictions, where practicable, and designs work to minimize potential effects on breeding and reproducing populations of covered species.

The net effect on covered wildlife species would be negligible from an impacts perspective and beneficial from a long-term conservation perspective (see Chapter 5, *Conservation Strategy*). Therefore, PG&E does not expect the MRHCP to appreciably reduce the likelihood of the survival or recovery of any covered wildlife species population in the wild.

Similarly, although take authorization is not being provided for plants, PG&E created Map Book zones to help avoid known plant populations and would implement BMPs, AMMs, and mitigation to ensure covered plant species persist and continue to survive. Because of PG&E's approach of

avoiding, minimizing, and mitigating its impacts on plants, along with facts that its impacts are small in place and time and distributed over a large area, PG&E does not expect the MRHCP to appreciably reduce the likelihood of the survival and recovery of a plant species in the wild.

Chapter 5
Conservation Strategy

Summary: *PG&E's MRHCP conservation strategy consists of annual HCP training for staff and third-party contractors working under the requirements of the HCP; an environmental review, planning, and screening process for covered activities that will be implemented in species habitat; implementation of AMMs and vegetation management BMPs; biological surveys and monitoring; mitigation for unavoidable impacts; monitoring of compliance; and, in some instances, onsite restoration. The primary objective of the strategy is to avoid and minimize impacts where possible, and to mitigate impacts. Other principles of the strategy include identifying high-value conservation opportunities, acquiring larger mitigation parcels contiguous to protected areas and other nonprotected areas of suitable habitat, and seeking strategic partnerships with local conservation organizations that are actively involved in habitat enhancement and restoration with the goal of species conservation or recovery. PG&E will provide habitat mitigation lands in advance, via jump start and in proportion to activity impacts over the term of the HCP.*

5.1 Conservation Strategy Overview

The MRHCP addresses O&M and minor new construction activities that typically result in small-scale permanent and temporary impacts that are dispersed over a large geographic area (Chapter 4, *Covered Species Impact Analysis*). The purpose of the MRHCP is to enable PG&E to continue to conduct covered activities in the Plan Area while avoiding and minimizing impacts on covered species (see Chapter 1, *Introduction*, Tables 1-2 and 1-3 for identification of covered wildlife and plants, respectively) and mitigating for impacts on covered species and their habitats in compliance with the ESA.

Five key principles guide the conservation strategy:

1. The avoidance and minimization of potential environmental impacts associated with covered activities is ensured by screening covered activities and assigning site-specific conservation measures to the activity, based on activity type, schedule, and location.
2. Avoiding impacts on habitat (i.e., implementing AMMs and BMPs) is preferable to mitigating or preserving habitat offsite.
3. Preserving lands for covered species with high-quality habitat or of high conservation value works in synergy with other local and regional conservation efforts.
4. Preserving large, contiguous areas of habitat is preferable to preserving a larger number of small areas.
5. Habitat mitigation lands will be protected and managed in perpetuity.

Figure 5-1 provides an overview of the key elements of the conservation strategy. These elements consist of training; environmental review, planning and screening; biological surveys and monitoring; avoidance and minimization; and habitat mitigation, all of which are described in this chapter. Recordkeeping and data tracking are described in Chapter 6, *Plan Implementation and Funding*.

5.2 Biological Goals and Objectives

Biological goals and objectives of HCPs establish a framework for conservation and describe the vision and commitments of the conservation strategy. Goals are broad, guiding principles based on the conservation needs of the resources. Biological objectives express specific and measurable conservation targets or actions that should be achieved within a given timeframe. The MRHCP's biological goals and objectives focus on maintaining, preserving, or obtaining high-quality habitat with direct benefits for covered species.

- **Goal 1:** Maintain habitat quality for covered species in the Plan Area by restoring disturbed areas.
  - **Objective 1.1:** Recontour and reseed areas of temporary habitat disturbance that are greater than 0.1 acre with a commercial native grassland seed mix, or a mix otherwise appropriate for the site being restored, within 1 year and prior to the onset of the next rainy season. Validate a set of these activities to ensure these lands recover.
- **Goal 2:** Contribute to the network of permanently protected and managed lands in the study area that support populations of covered species.
  - **Objective 2.1:** Increase the amount of lands protected or managed for covered species adjacent to existing protected areas (e.g., preserves, mitigation banks, and protected watersheds) or within areas identified as having high priority for conservation through mitigation purchases over the permit term. Table 5-4 lists mitigation acreage totals for each covered species.
  - **Objective 2.2:** Protect at least 2,000 acres of habitat for covered species within the first 10 years of the permit.
- **Goal 3:** Pursue conservation actions that result in the creation, restoration or enhancement of habitat that benefits covered species.
  - **Objective 3.1:** Create, restore, and enhance habitat as outlined in Table 5-4.
  - **Objective 3.2:** Contribute to at least 20 acres of habitat enhancement and restoration over the first 10 years of the permit for covered species via in-kind services or monetary contributions.

5.3 Training

5.3.1 Annual Training

PG&E will implement an annual environmental awareness training program for staff who conduct or supervise covered activities performed under the MRHCP. PG&E will provide the training both in person and online so that staff can review it at any time. PG&E will also train contractors, provide "train the trainer" seminars to expand delivery of HCP compliance information, and supply all training materials to these contractors. PG&E holds its contractors responsible for complying with all applicable environmental laws and regulations as well as for implementing PG&E's environmental protection measures.

1. EMPLOYEE AND CONTRACTOR EDUCATION

Prepare and Finalize Training Materials → Distribute Training Materials to Trainers and Contractors → Determine Which Staff Need to Attend and Schedule Training → Conduct Training (Classroom/Computer/ Tailboard) → Record Attendance → Modify and Update Training Materials Based on Implementation and Class Response → Redistribute Training Materials to Trainers and Contractors

2. ENVIRONMENTAL REVIEW , PLANNING, AND SCREENING

Review Covered Activity and Work Areas
Consider: Size, Timing, Access
(See Figure 5-2 for additional detail.)

→ Determine if Biological Resource Impacts can be Avoided or Minimized
Consider: Land-cover Type, CNDDB Records, Species' Ranges, Property Ownership

→ Plan Activity → Release to Construction → Verify Screening is Appropriate

3. BIOLOGICAL SURVEYS AND MONITORING

Conduct Biological Evaluations for Large Activities[1] in Hot Zones and Map Book Zones and Prescribe Surveys or Monitoring as Needed → Prescribe AMMs or Vegetation Management BMPs → Prescribe Biological Monitor, if Necessary → Continue Biologist Training for Consistency

4. AVOIDANCE AND MINIMIZATION MEASURES (AMMs) and VEGETATION MANAGEMENT BEST MANAGEMENT PRACTICES (BMPs)

Implement Field Protocols, AMMs or Vegetation Management BMPs → Conduct Work (with Biological Monitor if Necessary) → Record Temporary and Permanent Impacts → Evaluate Effectiveness of AMMs and BMPs (with Monitor) → Verify Disturbance Estimates (with Monitor or via Audit Study)

5. MITIGATION

Identify Mitigation Opportunities → Agency Review of Mitigation Proposal → Acquire Mitigation → Debit Mitigation to Offset the Impact before the Work Activity Occurs → Monitor Site Conditions → Conduct Enhancement Actions

6. REPORTING AND RECORD KEEPING

Ongoing Recordkeeping and Data Tracking → Prepare Annual Report → Identify Improvements → Implementation: Data Tracking, Reporting, AMMs, Conduct Audit Study, Ongoing Validation Study → Mitigation: Acquisition, Management, Monitoring → Conduct Annual Meeting → Identify and Recommend Improvements

[1] See Section 5.5 for Large Activities

Graphics ... 00647.17 (7-25-18) AB

PG&E

Figure 5-1
Conservation Strategy Overview

Training will include an overview of the MRHCP, an emphasis on the importance of compliance with the HCP and all environmental laws, and a summary of the AMMs and BMPs outlined in the HCP. A qualified professional (e.g., environmental field specialist, land planner, biologist, HCP administrator, forester) will lead the training on covered species and provide specific information regarding sensitive species and their habitats. The trainer will identify measures that apply when covered activities are implemented in sensitive habitat, and AMMs and BMPs to avoid and minimize the potential for disturbance of covered species and other sensitive biological resources. PG&E will record the names of staff members and contractors who attend the annual training to ensure they complete training requirements.

5.3.2 Other Training

PG&E will conduct other training as needed to support the effective implementation of the MRCHP. This will include work crew and contractor tailboard trainings for large activities in the vicinity of sensitive resources, and if necessary, for small activities in hot zone or Map Book zone areas. PG&E may also conduct periodic calibration meetings with biologists and planners working within the MRCHP area to ensure the program is being implemented consistently.

5.4 Environmental Review, Planning, and Screening Process

PG&E conducts planning and review of its ongoing O&M activities, programs, and projects to avoid or minimize impacts on protected species and habitat. To accomplish this, PG&E often redesigns or reconfigures construction plans in consultation with PG&E biologists and land planners by taking the following actions (see Figure 1-2).

- Adjusting or changing access routes.
- Relocating or modifying work sites.
- Minimizing the size of work sites.
- Altering the construction technique.
- Adjusting or changing work periods.

PG&E's environmental review, planning, and screening process varies by the line of business (LOB), with gas and electric distribution activities typically requiring less intensive review and planning than gas or electric transmission projects and activities. Figure 5-2 illustrates the existing environmental review process for various types of covered activities. Currently, there are five work streams for reviewing and assessing environmental impacts from PG&E projects. Under the MRHCP, the environmental screening group for each LOB will maintain compliance with the HCP and will be responsible for the following tasks.

- Screen covered and non-covered activities (i.e., planners and biologists review all types of projects, including new projects that are not covered under this HCP).
- Apply AMMs, field protocols, and other environmental protection measures (e.g., conditions from other state or federal permits).

- Prepare a release-to-construction memorandum, which describes a quality assurance and environmental compliance process, to confirm that environmental screening is complete and all compliance requirements are documented for the work crews to follow.
- Determine whether mitigation of impacts will be based on estimates or on results from an on-the-ground assessment of impacts.
- Track temporary and permanent impacts as well as pertinent project information.
- Report covered activity data to the HCP administrator for inclusion in the *MRHCP Annual Report* (Annual Report).

For most projects presented in Figure 5-2, a team of land planners, biologists, cultural resource specialists, and environmental field specialists will review and plan covered activities. After the review is complete, the appropriate natural resource protection measures (including MRHCP AMMs) will be documented in a release-to-construction memorandum.

PG&E will also use an automated GIS-based environmental assessment (AEA) screening tool to process many of the small electric (e.g., pole replacements with disturbances less than 0.1 acre) and small gas covered activities. Prior to being released to construction, projects undergoing AEA will be automatically screened for overlap with a variety of data layers (e.g., waterways, CNDDB, serpentine soils, conservation easements, critical habitat, kit fox dens, levees, protected lands, anadromous fish streams, and vernal pools). If any AEA data layers are flagged for manual review, the activity will be evaluated further by a land planner or biologist before being released to construction. MRHCP modeled habitat, hot zones, and Map Book zones will be integrated into the AEA screening process and will be flagged for review if a covered activity falls within any of these areas. A team of land planners, biologists, foresters, arborists, and tree inspectors will also conduct environmental review of vegetation management covered activities before work in the field commences.

PG&E's screening and review processes rely on habitat models developed for use in avoiding and minimizing impacts on covered wildlife and plant species. The following sections describe how habitat models for the MRHCP will be integrated into the environmental screening and review process.

5.4.1 Screening for Covered Wildlife

5.4.1.1 Use of Habitat Models

To more effectively perform environmental review of numerous, small (less than 0.1 acre) covered activities, a modeled habitat approach provides an alternative to on-the-ground biological surveys. Habitat models utilize existing commercial data and biological information to assess the likelihood that a covered species or its habitat is present at a particular location. PG&E biologists and land planners will review the modeled habitat information in the company's GIS system to assess whether a covered activity falls within or close to modeled habitat (explained below) that will be impacted. The type and amount of modeled habitat that will be impacted by a covered activity informs the land planner or biologist on prescription of the appropriate AMMs or BMPs.

PG&E used impact estimates from Table 4-1 in Chapter 4 to develop its conservation strategy for activities generally considered "small" (impacting less than 0.1 acre) and those considered medium or large (affecting more than 0.1 acre). Small activities for which PG&E will use estimated impacts for both screening and providing mitigation are G3a (fencing), G3b, G5, G7, G8, and E3, E5, E6a, E6b, E7,

PG&E Environmental Screening Group	Projects/Activities Reviewed for Environmental Compliance[1]	HCP Screening Required?	Work in Modeled Habitat, Map Book Zone, Hot Zone?	Release to Construction (RTC) Process or Notes to Drawings/ "Shop Papers"?	Mitigation for Covered Activities is Based on Pre-Estimated or Actual on-the-ground Impacts?
AEA Tool, Biologist, HCP Team	**1)** G3, G8, E8, E9, E15	**YES:** Apply Field Protocols (FP)s **NO:** Apply Standard Measures[2]	**YES:** Apply FPs, AMMs **NO:** Apply FPs	**YES: RTC Includes List of FPs, AMMs, Permit Conditions, Mitigation Measures, Land Rights Information**	**Pre-Estimate Impacts:** G3 (Fencing), G8, E8, E15
Land Planners, Biologists, Cultural Resource Specialists, Environmental Field Specialists	**1) O&M Projects:** G5–G15 **2) New Capital Improvement Projects[3]**	**YES:** Apply FPs **NO:** Apply Standard Measures	**YES:** Apply FPs, AMMs **NO:** Apply FPs	**YES: RTC Includes List of FPs, AMMs, Permit Conditions, Mitigation Measures, Land Rights Information**	**Pre-Estimate Impacts:** G5, G6, G7, G8, G12 (Staging) **Actual impacts:** G3 (Ercon), G9, G10, G11, G12 (New Cable), G13a, G14, G15
Land Planners, Biologists, Cultural Resource Specialists, Environmental Field Specialists	**1) O&M Projects:** E5–E15 **2) New Capital Improvement Projects[3]**	**YES:** Apply FPs **NO:** Apply Standard Measures	**YES:** Apply FPs, AMMs **NO:** Apply FPs	**YES: RTC Includes List of FPs, AMMs, Permit Conditions, Mitigation Measures, Land Rights Information**	**Pre-Estimate Impacts:** E5, E6, E7, E8b, E9, E10b, E10c, E11b, E15 **Actual impacts:** E9a, E10d, E12, E13, E14
HCP Team (Analysts, Administrator), Land Planners, Biologists	**1) O&M Projects:** G3–G12, E4–E12 **2) New Capital Improvement Projects[3]**	**YES:** Apply FPs **NO:** Apply Standard Measures	**YES:** Apply FPs, AMMs **NO:** Apply FPs	**YES: 1) Cleared through SAP or 2) RTC Includes List of FPs,AMMs , Permit Conditions, Land Rights Information**	**Pre-Estimate Impacts:** G3, G5, G6, G7, G8, G12 (Staging), E4, E5, E6, E7, E8, E9b, E10b, E10c **Actual impacts:** G3a (Ercon), G12 (New Cable), E9a, E12
Land Planners, Biologists, Foresters, Inspectors, Arborists	**1) Routine O&M:** E10a, E10b, E10c, E10e, E10f **2) Reliability Projects (NERC/TROW):** E10d	**YES:** Apply VM BMPs **NO:** Apply VM BMPs	**YES:** Apply VM BMPs, AMMs **NO:** Apply VM BMPs	**TBD: RTC for E10c and E10d only. RTC would Include List of VM BMPs, AMMs , Permit Conditions**	**Pre-Estimate Impacts:** E10b, E10c **Actual impacts:** E10d

Record All Impacts and Debit Appropriate Species Acre Credits

Prepare Annual Report for HCP Compliance

[1] Patrols and inspections are not screened because they do not result in ground disturbance.
[2] Standard measures are measures prescribed by land planners and biologists as the minimum level of environmental protection (i.e . BMPs, avoidance measures, minimization measures) or are agency directed permit conditions or mitigation measures. Standard measures apply to water quality, erosion and sediment prevention, wetland and waters protection measures, ESA compliance measures, MBTA or nesting bird protection measures, and cultural resource protection measures.
[3] Only minor new construction is covered under the HCP.

Graphics ... 0064717 (7-25-18) AB

PG&E

Figure 5-2
Environmental Review Process by Line of Business

E10e, E10c, E11a, E11b. The temporary or permanent impacts from these small activities will not be restored because these impacts will be small and compensatory mitigation will be provided for impacts of these activities based on estimates of impacts on modeled habitat. Additionally, PG&E will periodically validate the restoration progress from a subset of these activities, as described in Chapter 6, *Plan Implementation and Funding*, to ensure that average on-the-ground impacts result as estimated and that habitat impacts do not exceed estimates (e.g., temporary impacts do not become permanent impacts).

For those covered activities impacting more than 0.1 acre, PG&E land planners and biologists will review and utilize the modeled habitat information to plan and prepare projects that require longer lead times, planning, and coordination. For these activities, PG&E will use actual, on-the-ground impacts as measured in the field by biologists and land planners to determine the extent of permanent or temporary impacts on habitat. Activities where actual impacts will be confirmed are G3a (Ercon mats), G9, G10, G11, G12, G13a, G14, G15, and E9a, E10d, E12, E13, E14. Impacts from these activities will then be used to calculate required mitigation. Chapter 6, *Plan Implementation and Funding,* describes how the HCP administrator will work with land planners and biologists to retrieve information on covered activity impacts on modeled habitat for mitigation calculations and Annual Report preparation. Activities G1, G2, G6, E1, E2, and E8a are not expected to result in ground disturbance and, therefore, are unlikely to cause loss of covered species habitat.

Exceptions to the Use of the Models

PG&E's environmental review, planning, and screening processes will evaluate potential habitat impacts based on habitat models and location of the covered activity. In some instances, PG&E may determine that the habitat models are inaccurate when reviewed at higher resolution (either during desktop or field review), possibly resulting in changes to AMM or BMP implementation. These instances would include the following:

1. Habitat models indicate suitable habitat is present, but aerial photo review or field evaluations indicate that no suitable habitat is present. Generally, this would be due to either of two circumstances:

    a. Habitat models were established broadly or imprecisely and included areas that did not represent suitable habitat at the time that models were prepared. Such areas would generally include urban lands, roadways and road shoulders, landscaping, or other development that would not be considered habitat or areas that could support covered species.

    b. Habitat models were established to include appropriate habitat; however, the land use within the mapped boundaries has changed since the time that models were prepared. Habitat models could be inaccurate where agricultural conversion or development projects have removed natural vegetation from a work site, degrading or removing habitat.

2. Habitat models indicate suitable habitat is absent, but desktop or field review indicates suitable habitat is present at, or adjacent to, the site and there is potential for covered species to be present.

PG&E will implement AMMs, BMPs, and provide mitigation when PG&E's land planners and biologists detect suitable habitat near or adjacent to work sites on the border of modeled habitat where the habitat models indicate lack of habitat.

Habitat Model Updates

The habitat models developed for the MRHCP are a coarse representation of habitat likely to be used by covered species in the Plan Area. Because species' land-cover associations are expected to remain relatively unchanged for the next 30 years, it is anticipated that the models will be used for the duration of the permit and will not require updating. However, with concurrence of USFWS, PG&E may update the habitat models under the following circumstances.

- When USFWS data indicates a covered species is using new land-cover types for foraging, breeding or dispersal that were previously not associated with the species.
- When previously unknown biological or life history information becomes available that could substantially change the understanding of covered species presence or distribution.
- When substantially newer or more precise land-cover data becomes available to improve species avoidance and mitigation decisions.

5.4.1.2 Use of Hot Zones

As an augmentation to the model-based approach, PG&E considers modeled habitat the same as a "hot zone" for select covered wildlife species that only occur within specific and localized habitat types. A hot zone is a mapped area containing an extant population of covered wildlife species with a small and well-defined range where the species would occur and may be affected by covered activities. PG&E has hot zones for the following species:

Invertebrate hot zones:

- Longhorn fairy shrimp
- Conservancy fairy shrimp
- Morro shoulderband snail
- Zayante band-winged grasshopper
- Mount Hermon June beetle
- Ohlone tiger beetle

Amphibian hot zones:

- Santa Cruz long-toed salamander

Mammal hot zones:

- Point Arena mountain beaver

Because of their relatively small geographic extent and tendency to support covered species, hot zones represent particularly sensitive locations and require implementation of hot zone AMMs for covered activities. In some instances, habitat assessment surveys are required to ensure that potential impacts associated with even small activities are minimized. All ground-disturbing or off-road travel activities in hot zones, regardless of size, will be required to avoid and minimize take of covered species by implementing appropriate hot zone AMMs (listed in Table 5-1).

5.4.2 Screening for Covered Plants

PG&E's conservation strategy for covered plants is in line with PG&E's current practices for protecting listed plant species and implementing AMMs where practicable. To promote avoidance and minimization of impacts on covered plant individuals and habitat, PG&E created Map Book zones. Map Book zones are defined as areas occupied or potentially occupied by one or more covered plant species and indicate where plant-related AMMs will be applied. Work in these areas may be subject to additional site-specific evaluation, as illustrated in Figure 5-3 and described below.

5.4.2.1 Small Activities within Map Book Zones

For small activities within Map Book zones, PG&E will determine whether appropriate AMMs can be implemented. If the impact is minimized but not avoided, or if it is not feasible to implement an AMM, a post-activity survey may be performed by PG&E (at its discretion) to determine whether plants were permanently impacted by the activity. If a post-activity survey is not performed, PG&E will assume the activity results in a permanent impact and mitigation will be based on the average area of disturbance for the type of small activity that was completed (see Table 4-1 for average area of disturbance). Monitoring would only occur for small activities if PG&E finds that these activities result in disturbances that are larger than calculated, or if surveys and monitoring are needed to protect the habitat of the species.

5.4.2.2 Large Activities within Map Book Zones

For large activities within Map Book zones, additional site-specific review or surveys will be conducted to confirm the location of existing plant populations relative to work sites. Based on Map Book zone (e.g., species, growth form) and results of a site evaluation, PG&E will implement appropriate AMMs. If the impact cannot be avoided, PG&E will prepare a restoration plan for USFWS to review and approve (see Section 5.6.2.5, *Mitigation Summary for Plants*). PG&E will adhere to the restoration plan and subsequent monitoring, which will determine whether the impact is permanent or temporary. PG&E will provide mitigation for large activities based on the number of plants impacted or based on the amount of habitat impacted and will monitor mitigation sites for success. For some large emergency activities, work may be implemented in a Map Book zone without additional evaluation or AMMs. In these instances, PG&E will conduct post-activity surveys to determine if the species has recovered or will mitigate impacts as if they were permanent.

5.4.2.3 Large Activities outside Map Book Zones

For large activities implemented outside of Map Book zones, PG&E may discover additional occurrences or suitable habitat for a covered species during environmental review. New occurrences of covered plants will be added to the Map Book zones and treated as Map Book zones. If a biologist believes that the species is likely present given the range and specific habitat requirements for the covered plant, the biologist will conduct additional analyses and may initiate a survey. If the survey cannot be conducted during the correct seasonal window, the work will be performed in accordance with AMMs to minimize potential impacts. If the survey is conducted during the correct seasonal window, the survey will confirm either the presence or absence of the species. If the species is present, PG&E will select the appropriate AMMs. If the impact cannot be avoided or if an annual plant species (for example) does not recover, PG&E will prepare a restoration plan for USFWS to review and approve (see Section 5.6.2.5, *Mitigation Summary for*

Plants). PG&E will implement the restoration plan, and subsequent monitoring, which will help determine whether the restoration is successful and whether the impact is permanent or temporary. Further mitigation, if any, will be based on the results of the monitoring effort.

5.5 Biological Surveys and Monitoring

Because habitat modeling works in conjunction with covered activity classification (and predefined quantities of permanent and temporary impacts) to determine potential impacts and resulting mitigation requirements, biological surveys and monitoring will be limited for most, if not all, small covered activities. However, for larger gas activities (G4, G7, G9, G10, G11, G12, G13a, G14, G15) and electric activities (E4, E9a, E9b, E10d, E10f, E12, E13, E14, and E15), PG&E will utilize existing work streams within each LOB where biologists conduct site assessments and assist planners in pre-project planning. Such planning includes establishing appropriate locations for laydown areas, access routes, and exclusion zones (see Figure 5-2). For these larger activities, PG&E biologists also evaluate activities in modeled habitat, hot zones, and Map Book zones and determine the need for more focused surveys or monitoring.

When a biological monitor is required for a covered activity, the monitor may prescribe additional site-specific AMMs and is authorized to stop work if a covered species is observed and if work may harm a covered species. Biological monitors will assist with the identification and implementation of exclusion zones, work zones, and access routes. The biological monitor will ensure that all construction employees adhere to the species- and site-specific AMMs and BMPs and that observations of special-status species before, during, or after construction, are documented and submitted to the CNDDB with landowner approval.

5.5.1 Avoidance and Minimization of Impacts

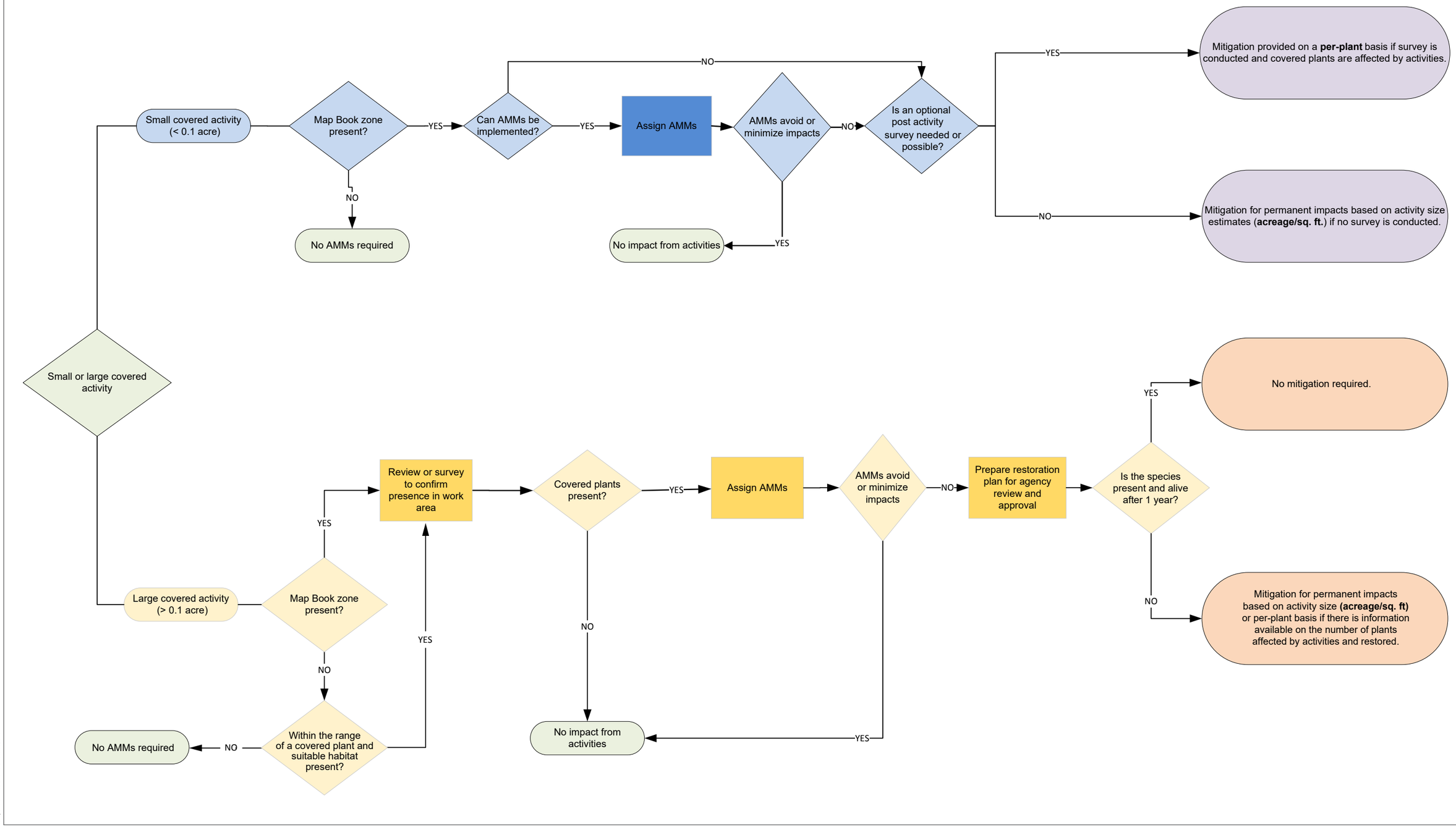
PG&E will avoid and minimize the impacts associated with covered activities through the use of field protocols and AMMs (hot zone AMMs, species-specific AMMs, and covered plant AMMs) (Table 5-1) and vegetation management BMPs (Table 5-2). These protocols and measures are prescribed under various circumstances, which are described below.

5.5.1.1 Field Protocols

Field protocols are PG&E's general measures designed to avoid or minimize impacts on biological resources and covered species during performance of covered activities in field conditions. These measures provide clear and consistent guidance to address a broad range of issues, including work site access and management, erosion control, and natural resource protection (Table 5-1). PG&E will provide training on these field protocols to its crews and contractors for implementation during daily work activities.

5.5.1.2 Avoidance and Minimization Measures

PG&E will employ a suite of AMMs to avoid and minimize the impacts on covered species and habitat resulting from covered activities. These AMMs are specific to hot zones and other sensitive habitat types associated with covered wildlife and plant species (Table 5-1). Hot zone AMMs ensure impacts on narrow endemic species are avoided or minimized; each measure focuses on a particular species or suite of species and will be applied when PG&E undertakes covered activities in a specific area.



Graphics...0064717 (7-25-18) AB

Figure 5-3
Covered Plant Evaluation Process

Table 5-1. Field Protocols and Avoidance and Minimization Measures to Reduce Impacts on Covered Species

Staff Responsible	Code	Description of Measure	Covered Species Benefiting from Measure	Rationale and Benefits of Measure
Field Protocols[a]				
Training				
HCP Team	FP-01	Conduct annual training on habitat conservation plan requirements for employees and contractors performing covered activities in the Plan Area that are applicable to their job duties and work. Tailboard and site-specific training will also be conducted prior to commencing work.	All covered species	Education and awareness aimed at informing workers on HCP and protocols for avoiding and minimizing impacts on covered species and habitats.
Access and Work Site Management				
Field Crew	FP-02	Park vehicles and equipment on pavement, existing roads, or other disturbed or designated areas (barren, gravel, compacted dirt).	All covered species	Avoid direct mortality and disturbance of covered species and temporary disturbance and compaction of habitats.
Field Crew	FP-03	Use existing access and ROW roads. Minimize the development of new access and ROW roads, including clearing and blading for temporary vehicle access in areas of natural vegetation.	All covered species	Avoid direct mortality and disturbance of covered species and temporary disturbance and compaction of habitats.
Field Crew	FP-04	Route off-road access paths and site work sites to minimize impacts on plants, shrubs, and trees, small mammal burrows, and unique natural features (e.g., rock outcrops).	All covered species	Avoid direct mortality and disturbance of covered species and temporary disturbance and compaction of habitats.
HCP Team, Land Planners	FP-05	Notify conservation landowners at least 2 business days prior to conducting covered activities on protected lands (state- or federally owned wildlife areas, ecological reserves, or conservation areas); more notice will be provided if practicable or if required by other permits. If the work is an emergency, as defined in PG&E's Utility Procedure ENV-8003P-01, PG&E will notify the conservation landowner within 48 hours after initiating emergency work. Although this notification is intended only to inform conservation landowner, PG&E will attempt to work with the conservation landowner to address landowner concerns.	All covered species	Courtesy notification to enter lands managed for the benefit of protected species and implementation of any site-specific measures to prevent impacts on species and habitats.

Staff Responsible	Code	Description of Measure	Covered Species Benefiting from Measure	Rationale and Benefits of Measure
Field Crew	FP-06	Minimize potential for covered species to become trapped, injured, or killed in pipes, culverts, or under materials or equipment. Inspect pipes and culverts wide enough to be entered by a covered species that could inhabit the area where pipes are stored for wildlife species prior to moving pipes and culverts. Contact a biologist if a covered species or other federally-listed species is suspected or discovered.	All covered amphibians, reptiles, and mammals	Avoid and minimize potential impacts on covered species that may move into work sites, work equipment, and supplies.
Field Crew	FP-07	Vehicle speeds on unpaved roads will not exceed 15 miles per hour.	All covered wildlife species	Avoid and minimize direct mortality or injury of covered species that may cross unpaved roads in work sites.
Field Crew	FP-08	Prohibit trash dumping, firearms, open fires (such as barbecues), hunting, and pets (except for safety in remote locations) at work sites.	All covered species	Discourage attracting and subsidizing predators such as foxes, coyotes, and raccoons that could prey upon covered species in a work site. Avoid potential species disturbances caused by fires and firearms.
Field Crew	FP-09	In designated State Responsibility Areas, equip all motorized equipment with federally or state-approved spark arrestors. Ensure a backpack pump filled with water and a shovel and fire-resistant mats and/or windscreens is onsite during welding. During fire “red flag” conditions as determined by the California Department of Forestry and Fire Protection, prohibit welding. Each fuel truck will carry a large fire extinguisher with a minimum rating of 40 B:C. Clear parking and storage areas of all flammable materials.	All covered species	Avoid ignition and spread of fire that could lead to mortality of individual species and loss of habitat.
Field Crew	FP-10	Minimize the covered activity footprint and minimize the amount of time spent at a work site to reduce the potential for take of species.	All covered species	Avoid and minimize all potential impacts on covered species and their habitats by reducing work footprint and work duration.

Staff Responsible	Code	Description of Measure	Covered Species Benefiting from Measure	Rationale and Benefits of Measure
Erosion Control				
Field Crew	FP-11	Utilize standard erosion and sediment control BMPs (pursuant to the most current version of PG&E's *Stormwater Field Manual for Construction Best Management Practices*) to prevent construction site runoff into waterways.	All covered aquatic species	Avoid and minimize potential water quality impacts, thereby maintaining water quality for covered aquatic species.
Field Crew	FP-12	Stockpile soil within established work site boundaries and locate stockpiles so as not to enter water bodies, stormwater inlets, other standing bodies of water. Cover stockpiled soil prior to precipitation events.	All covered species	Avoid and minimize potential water quality impacts, thereby maintaining water quality for covered aquatic species.
Natural Resource Protection				
Field Crew	FP-13	Fit open trenches or steep-walled holes with escape ramps of plywood boards or sloped earthen ramps at each end if left open overnight. Field crews will search open trenches or steep-walled holes every morning prior to initiating daily activities to ensure wildlife is not trapped. Field crews will not handle covered species. If any covered wildlife species is found, work will stop and a biologist will be notified. A biologist with appropriate take permits will relocate the species to adjacent habitat or the species will be allowed to naturally disperse, as determined by a biologist.	Covered amphibians, reptiles, and mammals	Avoid and minimize potential for species entrapment or entombment; provide avenue for species escape.
Land Planner or Biologist, and Field Crew	FP-14	If the covered activity disturbs 0.1 acre or more of habitat for a covered species in grasslands, the field crew will revegetate the area with a commercial "weed free" seed mix. (Except in suitable habitat for Mount Hermon June beetle, Ohlone tiger beetle and Zyante band-winged grasshopper.)	All covered grassland species	Avoid and minimize potential erosion and water quality impacts. Reduce the potential for colonization of grassland by invasive or weedy plants and grasses.
Field Crew	FP-15	Prohibit vehicular and equipment refueling within 250 feet of the edge of wetlands, streams, or waterways. If refueling must be conducted closer to wetlands, construct a secondary containment area subject to review by an environmental field specialist and/or biologist. Maintain spill prevention and cleanup equipment in refueling areas.	Vernal pool species, California red-legged frog, mountain yellow-legged frog, Sierra Nevada yellow-legged frog, foothill yellow-legged frog, Yosemite toad, Santa Cruz long-toed salamander, California	Avoid and minimize potential for fuels contamination of aquatic habitats and mortality of aquatic species.

Staff Responsible	Code	Description of Measure	Covered Species Benefiting from Measure	Rationale and Benefits of Measure
			tiger salamander, giant garter snake	
Field Protocols				
Natural Resource Protection (continued)				
Biologist (provide guidance) and Field Crew (follow guidance)	FP-16	Maintain a buffer of 250 feet from the edge of wetlands, ponds, or riparian areas. If maintaining the buffer is not practicable because the covered activity footprint is within the buffered area, other measures as prescribed by the biologist or the HCP administrator to minimize impacts such as flagging access routes or paths, requiring foot access, restricting work until the dry season, or requiring a biological monitor during the activity.	Vernal pool species, California red-legged frog, mountain yellow-legged frog, Sierra Nevada yellow-legged frog, foothill yellow-legged frog, Yosemite toad, California tiger salamander, giant garter snake, Santa Cruz long-toed salamander	Avoid and minimize potential impacts on covered species and habitats by maintaining habitat buffers. Where buffers are not practicable to implement, require crews to minimize impacts in these areas.
Field Crew	FP-17	Directionally fall trees away from an exclusion zone, if an exclusion zone has been defined. If this is not practicable, remove the tree in sections. Avoid damage to adjacent trees to the extent practicable. Avoid removal of snags and conifers with basal hollows, crown deformities, and/or limbs more than 6 inches in diameter.	All covered species	Avoid and minimize potential impacts on covered species that may be seeking refuge in exclusion zones; preserve important tree habitat features for wildlife species.
Biologist and Field Crew	FP-18	Nests with eggs and/or chicks will be avoided: contact a biologist or the Avian Protection Program Manager for further guidance. Work will be stopped until the crew can obtain clarification from a biologist or the Avian Protection Program Manager on how to proceed.	All nesting bird species, including marbled murrelet and northern spotted owl	Avoid and minimize potential impacts and disturbance on nesting birds.
Biologist and Field Crew	FP-19	Inspect and maintain exclusion fencing installed to exclude species from work areas.	California tiger salamander, giant garter snake, Santa Cruz long-toed salamander	Ensure exclusion fencing performs as anticipated and avoids entrapment of species.

Staff Responsible	Code	Description of Measure	Covered Species Benefiting from Measure	Rationale and Benefits of Measure
Hot Zone Avoidance and Minimization Measures[b]				
Biologist/ Field Crew	Hot Zone-2	Ground-disturbing activities will not be implemented from the first significant rain (1 inch) during the wet season (the wet season currently ranges, on average, from October 15 to April 15, and may change significantly as a result of climate change), within 250 feet of the edge of vernal pools unless the field crews conduct the work from an established roadway. Access rock outcrops only on foot during all times of year. Ground-disturbing activities may be implemented during this period if a biologist implements measures to avoid the habitat and the impacts and mitigation are consistent with the HCP. Measures could include, at the direction of the biologist or HCP Administrator, directing crews on access routes or paths, use of erosion/sediment fencing, use of access mats, and other techniques to avoid direct or indirect impacts on vernal pools.	Longhorn fairy shrimp and Conservancy fairy shrimp	Avoid and minimize potential erosion, water quality impacts, and disturbance on vernal pool habitat, thereby maintaining water quality and preventing disturbance of fairy and tadpole shrimp.
Biologist/ Field Crew	Hot Zone-9	Avoid work during the wet season (the wet season currently ranges, on average, from October 15 to April 15, and may change significantly as a result of climate change) to the extent practicable. Due to normal year-to-year fluctuations and the effects of climate change, in a given year the wet season may begin earlier or later and end sooner or later than these dates. This measure will be implemented within 48 hours of a rain event of 0.25 inch or greater within this species' range, even if rainfall occurs before October 15 or after April 15. If work must be conducted during the wet season, then minimize work activities likely to result in injury or mortality when the species is present (e.g., at night and during rain events). A biologist will provide guidance on how the work should be conducted and a summary of potential surveys needed at work, access, and staging areas. Should a Santa Cruz long-toed salamander be observed and in danger of injury or mortality, a biologist, as allowed by state law, will relocate the animal to the nearest appropriate habitat that will not be impacted by the work activity.	Santa Cruz long-toed salamander	Avoid and minimize potential impacts on this covered species and its suitable habitat.
Biologist/ Field Crew	Hot Zone-10	Minimize the off-road use of vehicles and equipment in undisturbed natural habitat (i.e., areas with lupine). Minimize soil disturbing activities. Stage equipment and materials in disturbed areas to the extent practicable. To protect in place silver bush lupine (the species' primary host plant) a biologist will establish an exclusion zone of at least 15 feet from any silver bush lupine plants. Avoid crushing	Zayante band-winged grasshopper	Avoid and minimize take of this species and impacts to its host plants.

Staff Responsible	Code	Description of Measure	Covered Species Benefiting from Measure	Rationale and Benefits of Measure
		individual grasshoppers on work sites if observed (e.g., do not drive trucks in areas with individuals).		
Biologist/ Field Crew	Hot Zone-11	Minimize the off-road use of vehicles and equipment in undisturbed natural habitat (i.e., areas with sandy soils, native grasses, or other undisturbed natural areas). Surplus soil will only be placed on previously disturbed ground. Stage equipment and materials in disturbed areas to the extent practicable. Avoid crushing individual beetles on work sites if observed (e.g., do not drive trucks in areas with individuals).	Ohlone tiger beetle	Avoid and minimize take this species and disturbance and compaction of its habitat.
Biologist/ Field Crew	Hot Zone-12	Avoid impacts on natural and urban habitat by working from paved roads or areas without vegetation to the extent practicable. If Morro shoulderband snail habitat cannot be avoided, then in urban areas a qualified individual shall survey for, capture, and relocate identified individuals to the nearest appropriate location that provides a safe shelter for the snails that will not be impacted by the work activity. In natural habitat, a biologist shall survey for, capture, and relocate individuals to the nearest appropriate location that provides a safe shelter for the snails and that will not be impacted by the work activity.	Morro shoulderband snail	Avoid and take this species and its habitat.
Biologist/ Field Crew	Hot Zone-13	Schedule work with heavy equipment, ground disturbance, or off-road vehicle travel during the non-breeding season (July 1–December 1). If such work must be conducted during the breeding season (December 1–June 30), a biologist will assess habitat within 100 feet of work sites in modeled habitat. If riparian, coastal scrub, and/or dune scrub habitat is present within 100 feet of work sites, then burrows will be evaluated within these areas to determine presence or absence of the species. If occupied burrows are detected, the biologist will determine the following: (1) if work can be conducted with modifications to minimize disturbance, which includes work exclusion zones and/or the presence of a biological monitor, or (2) if work must be delayed until the non-breeding season.	Point Arena mountain beaver	Avoid disturbance during the breeding season, direct mortality of the species, and temporary disturbance and compaction of habitat.
Biologist/ Field Crew	Hot Zone Measure-14	Avoid work during the flight season (May–August) and conduct work September 1–April 30 if practicable. Minimize the off-road use of vehicles and equipment in sensitive habitat. Surplus soil will only be placed on previously disturbed ground. Stage equipment and materials in disturbed areas to the extent practicable. Avoid beetles on work sites if observed.	Mount Hermon June beetle	Avoid and minimize potential impacts from large activities on this species in areas where it is likely to occur and during the time that it is most vulnerable.

Staff Responsible	Code	Description of Measure	Covered Species Benefiting from Measure	Rationale and Benefits of Measure
Species-Specific Avoidance and Minimization Measures for Large Activities				
Biologist and Field Crew	SJKF-1	A biologist will inspect the work site no more than 30 days prior to the start of construction to determine if potential San Joaquin kit fox dens are present. If potential dens are located within the proposed construction footprint and cannot be avoided during construction, a biologist will determine if the dens are occupied. All potential dens within the construction footprint will be dusted with appropriate tracking substrate or monitored with a motion-sensor camera for a minimum of 3 days to determine occupancy unless scat, discarded bones, and/or tracks are observed, at which point the den is presumed occupied. Exit ramps will also be installed in these areas at both ends of the excavated areas. Pipes wide enough to be entered will be inspected and may be capped in areas of potential occurrence. If potential San Joaquin kit fox dens are present within the construction footprint or within 200 feet of the construction boundary, disturbance and destruction will be avoided where practicable. If the potential dens are determined to be unoccupied and cannot be avoided, no further action is needed. If an occupied or natal/pupping den is discovered within the construction area or within 200 feet of the project boundary, USFWS shall be notified to discuss protective measures, such as exclusion zones, visual screens, and construction monitors, to ensure direct mortality is avoided. Work or disturbance within 200 feet of a natal den may not proceed without prior agreement from USFWS.	San Joaquin kit fox	Determine species presence or absence. Avoid and minimize potential impacts from large activities on covered species. Prevent disturbance of active dens.
Biologist/ Field Crew	VELB-1	All personnel, including PG&E employees and contractors, who are likely to encounter elderberry plants or valley elderberry longhorn beetle, especially during vegetation management activities, are required to receive training on valley elderberry longhorn beetle. When covered ground-disturbing activities will be implemented within 20 feet of elderberry, a qualified individual will identify a work exclusion zone (i.e., 5–20 feet of the dripline of all elderberry shrubs), with pin flagging or other appropriate means, within which ground disturbance, tree felling, and equipment and vehicle operation will be avoided or minimized. Except for cut stump treatment of removed trees (non-elderberry), herbicides will not be used within this zone. When performing vegetation maintenance work in compliance with Public Resources Code Sections 4291–	Valley elderberry longhorn beetle	Ensure covered activities near elderberry shrubs are conducted in a way that minimizes disturbance of host plant habitat, as well as direct loss of species.

Staff Responsible	Code	Description of Measure	Covered Species Benefiting from Measure	Rationale and Benefits of Measure
		4293, pruning, rather than removal of elderberry plants, will be performed where feasible.		
Biologist and Field Crew	GGS-1	Conduct work during the active season (May 1–October 1) to the extent practicable. A biologist will conduct a survey and identify where exclusion fencing is needed. If needed, a solid exclusion fence will be installed around the perimeter of work sites and will be inspected weekly. Burrows and other refuge habitat will be avoided to the extent practicable. If work will be conducted during the inactive period (October 2–April 30) then PG&E will conduct preparation work during the snake's active period to make construction areas ready for work during the inactive season. Preparation work includes, at a minimum, adding baserock to access roads and work sites, grading access roads and work sites, and installing work zone exclusion fencing. If giant garter snakes are encountered during construction activities, snakes will be allowed to move away from construction or a biologist will follow USFWS handling protocols and move snakes to the nearest appropriate habitat out of harm's way.	Giant garter snake	Avoid and minimize take of this species by working when the snake can most likely move out of harm's way or can be observed and avoided. Summer season construction preparation work for the species' inactive season further reduces or eliminates potential take of the species when it seeks shelter during its inactive period.
Biologist and Field Crew	SBB-1	Avoid impacts on habitat by working from established roads and in areas clear of vegetation to the extent practicable. Avoid damaging or removing seacliff buckwheat and coast buckwheat (host plants for the species). A biologist will survey the work, access, and staging sites to determine presence of host plants. If host plants are absent, the work can proceed. If host plants are present, then the biologist will flag the plants and crews will avoid the plants by at least 5 feet. If host plants cannot be avoided, then work may proceed under the direction of a biological monitor to minimize disturbance of host plants during the peak summer flight season (August).	Smith's blue butterfly	Avoid and/or minimize take of Smith's blue butterfly and impacts on its host plants.
Biologist and Field Crew	BNLL-1	Work from paved road or cleared shoulder free of burrows, and limit activities in habitat where burrows are present to foot access only. If working off a paved road where burrows are present, then flag a 30 foot exclusion zone around each burrow. If burrows can be avoided, then work can proceed as designed. Should a blunt-nosed leopard lizard be observed and in danger of injury or mortality, a biologist, as allowed by state law, will relocate the animal to the nearest appropriate habitat that will not be impacted by the work activity. A qualified biologist will	Blunt-nosed leopard lizard	Avoid and minimize destruction of burrows, which provide refuge and serve as potential sites for egg laying, to minimize direct impacts on specie and its burrows and to minimize loss of habitat.

Staff Responsible	Code	Description of Measure	Covered Species Benefiting from Measure	Rationale and Benefits of Measure
		conduct periodic spot checks to ensure burrow avoidance. If burrows cannot be avoided, then conduct surveys to determine presence/absence; surveys will be conducted between April 15–June 30 or August 1–September 1 and/or when ambient temperatures are 77–95° and soil temperatures 86–122°. Six separate surveys of the site will occur between 0900 and 1400 hours. If the species is not detected at the work site, then no further action is required. If BNLL is present, then conduct work activity during the active period, clearly flag all access routes and staging areas, and limit the destruction of burrows to the minimum number practicable.		
Biologist and Field Crew	MM-1	If the biologist determines that the project will impact suitable marbled murrelet nesting habitat, then work will not be conducted during the nesting season (March 15–August 31). For activities in known nesting habitat that cannot be scheduled outside of nesting season, nest buffers of 0.25 mile will be implemented or PG&E may implement reduced buffers based on *Estimating the Effects of Auditory and Visual Disturbance to Northern Spotted Owls and Marbled Murrelets in Northwestern California* (U.S. Fish and Wildlife Service 2006)	Marbled murrelet	Avoid and minimize potential impacts from large activities on nesting marbled murrelets.
Biologist and Field Crew	NSO-1	If a biologist determines that a work site is within 0.25 mile of unsurveyed northern spotted owl nesting habitat, activity centers, or critical habitat during nesting season (March 1–July 31), then work will be restricted to August 1–February 28, unless surveys determine the suitable habitat or site is unoccupied or the owls are not nesting. For project work within 0.25 mile of a known nest site or nesting habitat that cannot be scheduled outside of the nesting season and the 0.25 mile buffers cannot be maintained, PG&E may implement reduced buffers based on *Estimating the Effects of Auditory and Visual Disturbance to Northern Spotted Owls and Marbled Murrelets in Northwestern California* (U.S. Fish and Wildlife Service 2006).	Northern spotted owl	Avoid and minimize potential impacts (i.e., noise disturbance) from large activities on nesting northern spotted owls.
Biologist and Field Crew	GKR-1	Avoid occupied or potentially occupied burrows and burrow precincts that were identified by a biologist. If burrows and precincts can be avoided, then work can proceed. If occupied or potentially occupied burrows and precincts cannot be avoided, then a biologist shall stake and flag work exclusion zone(s) of at least 30 feet around each occupied or potentially occupied burrow. The biologist will remain onsite to monitor all ground-disturbing work activities. If occupied or potentially occupied burrows cannot be avoided, then biologists will excavate	Giant kangaroo rat	Avoid and minimize disturbance or destruction of burrows that provide refuge and breeding sites. Avoid and minimize take of the species and minimize loss of micro-habitat.

Staff Responsible	Code	Description of Measure	Covered Species Benefiting from Measure	Rationale and Benefits of Measure
		burrows or trap for any kangaroo rats within the exclusion zones and hold for the shortest duration necessary, or relocate animals to adjacent suitable non-work areas in accordance with holding and release procedures areas. The excavation of burrows and closing of burrows will also be initiated when appropriate (e.g., small activities where multiple nights of surveys are inefficient).		
Biologist/ Field Crew/ HCP Administrator	Wetland-1	Identify vernal pools and other aquatic habitat for covered aquatic invertebrates and amphibians and establish buffers. Maintain a buffer of 250 feet around vernal pools and vernal pool complexes. If maintaining the buffer is not practicable because the areas are either in or adjacent to facilities, the field crew will implement other measures as prescribed by the biologist to minimize impacts. These measures may include flagging access, requiring foot access, restricting work until the dry season, or requiring the presence of a biological monitor during the activity. Activities must maintain the downstream hydrology to the vernal pool or complex.	Vernal pool species, including California tiger salamander (both Central California and Santa Barbara County DPSs)	Avoid and minimize take of these species and impacts on their habitat. Avoid direct mortality of covered species and temporary disturbance and degradation of habitat, water quality, and hydrology.
Biologist/ Field Crew	Wetland-2	Identify wetlands, ponds, and riparian areas and establish and maintain a buffer of 50 feet around wetlands, ponds, and riparian areas. If maintaining the buffer is not practicable because the work sites are within any part of the buffered area, the field crew will implement other measures as prescribed by the biologist to minimize habitat impacts. These measures may include flagging access, requiring foot access, restricting work until the dry season, or requiring a biological monitor during the activity. Activities must maintain the hydrology necessary to support the wetland, pond, or riparian area (inclusive of downstream).	Covered aquatic invertebrates and amphibians	Avoid and minimize take of these species and impacts on their habitat.
Minor New Construction Measure				
HCP Administrator	Minor New-1	For minor new construction activities excluding upgrades and replacements, (G15, E12, E13, and E15), PG&E will notify USFWS of the anticipated project and provide a summary of the activity. The summary will include information on HCP measures to avoid, minimize, and mitigate likely take of covered wildlife species and/or impacts on covered plant species, confirm there is adequate take authorization remaining for the covered species, and confirm that the activity does not have a reasonably certain likelihood of take of listed non-covered species.	All covered species	Avoid and minimize potential impacts on covered species and other sensitive species and their habitats. Notification to the USFWS will ensure all appropriate measures are implemented and that impacts to non-covered listed species are avoided and minimized.

Staff Responsible	Code	Description of Measure	Covered Species Benefiting from Measure	Rationale and Benefits of Measure
Covered Plant Avoidance and Minimization Measures				
Field Crew	Plant-01	No herbicides will be used for vegetation management, pole clearing, or any other purpose within 100 feet of a Map Book zone (except vegetation management's direct application to cut stumps when greater than 25 feet from a Map Book zone and in conformance with applicable pesticide regulations).	All covered plants	Avoid potential for overspray on covered plants that could result in the unnecessary loss of protected plants.
Field Crew	Plant-02	Heavy equipment shall remain on access roads or other previously disturbed areas unless otherwise prescribed by a land planner, biologist, or HCP administrator.	All covered plants	Avoid and minimize potential impacts such as crushing covered species and degrading suitable habitat.
Biologist/ Field Crew	Plant-03	Stockpile separately the upper 4 inches of topsoil during excavations associated with covered activities. Stockpiles of topsoil will be used to restore the disturbed ROW.	All covered annual plants[c]	Preservation of topsoil preserves soil biome and seed bank, allowing for successful restoration once the project is complete.
Biologist	Plant-04	When covered activities greater than 0.1 acre within a Map Book zone will have direct impacts on covered plant species, work with the crew to place flagging, fencing, or other physical exclusion barriers to minimize impacts. If the work will directly impact covered plant species, implement Plant-05, -06, -07, and -08 AMMs.	All covered plants	Avoid and minimize potential impacts such as direct plant loss and ensure plant re-establishment.
Biologist	Plant-05	If a covered plant species is present and it cannot be avoided, then PG&E will salvage plant material (e.g., seeds, cuttings, whole plants) and prepare a restoration plan that details the handling, storage, propagation, or reintroduction to suitable and appropriate habitat subject to USFWS review and approval.	All covered plants	Salvaging plants or plant materials, and implementing a restoration plan facilitates survival and recovery of covered plant species.
Biologist/Field Crew	Plant-06	If a covered annual plant species is present and it cannot be avoided, then conduct covered activities after seeds have matured, to the extent practicable. (See Plant-05 for additional protection and mitigation.)	All covered annual plants	Waiting for an annual plant species to senesce ensures seeds have developed and are ready for dispersal. Annual plants will have maximized their lifespan and their lifecycle will not have been interrupted.
Biologist/Field Crew	Plant-07	If a covered perennial plant species is present and it cannot be physically avoided, then conduct covered activities after seeds have matured to the extent practicable. Minimize disturbance to the below-	All covered perennial plants[d]	Waiting for a plant species' seeds to mature ensures seed development and dispersal. Perennial plants will have not unnecessarily expended

Staff Responsible	Code	Description of Measure	Covered Species Benefiting from Measure	Rationale and Benefits of Measure
		ground portions of the plants (e.g., roots, bulbs, tubers). (See Plant-05 for additional protection and mitigation.)		energy into developing seeds that can be dispersed and the plant lifecycle will not be completely interrupted.
Biologist/Field Crew	Plant-08	PG&E will prune shrubs in a manner that promotes re-sprouting. If permanent impacts are unavoidable (i.e., removal or destruction of shrubs), establish new individuals by planting seedlings or cuttings in adjacent suitable habitat following AMM Plant-05. PG&E will implement BMPs, including vehicle, equipment, and personnel hygiene protocols; procedures for conducting activities in *Phytophthora*-infected areas; and timing restrictions that avoid working when soils are moist and the likelihood of spreading *Phytophthora* is greatest.	Ione manzanita, Pine Hill ceanothus, Pine Hill flannelbush, Lompoc yerba santa	Avoiding excessive pruning prevents plant stress, dehydration, disease, or death. Salvaging plants or plant parts ensures long-term survival and recovery; limiting the spread of plant diseases further ensures plant survival and recovery.

[a] Field Protocols do not apply to vegetation management because BMPs apply to vegetation management activities (Table 5-2).

[b] Hot zone measure 1 and 3–8 are in the Bay Area O&M HCP. Measures in the MRHCP are not numbered sequentially for this reason.

[c] Covered annual plant species are beach layia, San Benito evening-primrose, Monterey spineflower, robust spineflower, Kern mallow, Yadon's rein orchid, and Monterey gilia

[d] Covered perennial plant species are Ione manzanita, Pine Hill ceanothus, Pine Hill flannelbush, Stebbins' morning-glory, Layne's ragwort.

Table 5-2. Best Management Practices[a] to Reduce Environmental Impacts from Vegetation Management Activities

BMP #[b]	Best Management Practice
BMP 1 (FP-01)	Vegetation management (VM) employees and contractors must conduct ongoing training of environmental laws and procedures. VM employees and contractors performing VM activities must comply with these laws and procedures to minimize or avoid impacts on natural resources during work activities.
BMP 2 (FP-05)	On federal, state, local, and tribal agency land the land managers should be notified of pending work as far in advance as possible.
BMP 3	Roads, erosion control measures, fences, and structures damaged as a result of VM operations must be repaired and reported to the work group supervisor and the VM PG&E representative. Gates must be left as they are found.
BMP 4 (FP-02, FP-03, FP-04)	Vehicles and equipment must use pavement, existing roads, and previously disturbed areas to the extent practicable.
BMP 5	Motorized equipment must comply with Air Resources Board permitting requirements.
BMP 6	Vehicle idling, noise, and odor must be minimized to the extent practicable during work near residences, public buildings, or commercial buildings. Within 100 feet of school facilities work vehicle must not stand idling for more than 5 minutes, unless necessary for work purposes. Diesel-fueled work vehicles must not stand idling for more than 5 minutes at any location, unless necessary for work purposes.
BMP 7	Contractors must have the ability to communicate quickly with their supervisor and/or PG&E by having a working cell phone or radio on the job site at all times, or by identifying the closest area of cell phone reception or closest public phone and familiarizing all employees with that location.
BMP 8 (FP-15)	Vehicles and heavy equipment must be refueled at least 100 feet away from riparian areas. Handheld tools must be refueled outside of riparian areas. The fueling operator must stay with the fueling operation at all times. Do not top off tanks.
BMP 9	Petroleum and herbicide spill containment and cleanup materials must be available at the job site. Spills must be immediately cleaned up and contaminated materials disposed of properly. Spills greater than 8 oz. on soil or spills that create sheen on the water must be reported immediately to the supervisor and the VM PG&E Representative for appropriate management.
BMP 10 (FP-11)	If the amount of contiguous, bare soil exposed in one location exceeds 0.1 acre immediately after completion of VM activities, erosion control measures must be implemented. These measures may include lop & scatter, broadcasting chipped material or compliance with other PG&E Erosion control measures.
BMP 11	Vehicle use within riparian areas is limited to existing roads and dry crossings, and they must be checked and maintained daily to prevent leaks of materials that, if introduced to water, could be harmful to aquatic life.
BMP 12	Cleared or pruned vegetation and woody debris (including chips) must be disposed of in a manner to ensure that it does not enter surface water or a watercourse. All cleared vegetation and woody debris (including chips) must be removed from surface water or watercourses, and placed or secured where it cannot re-enter the watercourse.
BMP 13 (FP-07)	Vehicles should not exceed 15 mph on un-surfaced roads such as agricultural field roads and transmission ROW access roads.
BMP 14	Vehicles and heavy Valley Elderberry Longhorn Beetle (VELB)equipment must not be operated off roads within 25 feet of the edge of a vernal pool unless a biologist or natural resource professional evaluates and prescribes site specific AMMs.

BMP #[b]	Best Management Practice
BMP 15	VELB: VM activities in habitat must follow PG&E VELB Utility Standard ENV-7001S and VM VELB Procedures.
BMP 16 (FP-18)	Migratory Birds: VM activities must follow the VM Migratory Bird Flowchart[1].
BMP 17	Sudden Oak Death: VM activities in counties subject to the Sudden Oak Death quarantine must follow VM Sudden Oak Death Protocols.
BMP 18	Environmental screening for mowing locations, fee strip weed abatement, and for electric transmission ROW reclamation work must be conducted by the VM environmental group prior to work.
BMP 19	VM personnel must verify that the environmental screening process for capital and other non-VM work was conducted by the work owner prior to VM starting VM activities. VM personnel and contractors must implement the environmental protection measures prescribed for the work.
BMP 20	Cultural Resources: Items identified through patrols and screenings: When previously identified cultural resources are found (e.g., old bottles, cans, buildings), they must be left in place and undisturbed. If it is necessary to move or disturb them to complete the work, or if human remains are found, stop work and contact the VM PG&E Representative. Unanticipated Discovery: If any new cultural resources (e.g., structure features, bone, shell, artifacts, or architectural remains) are encountered and site disturbance cannot be avoided during work activities, or if human remains are suspected, implement the following measures: • Stop all work within 100 feet of the discovery. • Notify the VM PG&E representative who will contact the Cultural Resource Specialist. • Secure location, but do not touch or remove remains and associated artifacts. • Do not remove associated spoils or pick through them. • Note the location and document all calls and events. • Keep the location confidential.
BMP 21	If a protected wildlife species is killed or injured as a result of VM activities, the incident must be reported immediately to a supervisor and the VM PG&E Representative for appropriate management.
BMP 22	Disturbance or removal of non-target vegetation within a work site should not exceed the minimum necessary to complete operations, subject to other public health and safety directives governing the safe operations and maintenance of electric and gas facilities.
BMP 23 (FP-09)	During designated fire season motorized equipment must have federally or state-approved spark arrestors; all vehicles must be equipped with firefighting tools as appropriate and in accordance with all applicable laws, rules, regulations, orders, and ordinances. When the fire danger rating is Very High or Extreme no vehicular travel is permitted off cleared roads except in case of emergency.
BMP 24 (FP-09)	During designated fire season the contractor must check and follow the requirements of the daily Project Activity Level when working on USFS land (or other properties as required), or follow the requirements of the fire danger rating system in hazardous fire areas and SRAs. These are measures of fire weather conditions and may restrict activities otherwise permitted.

[1] PG&E implements this process to comply with state law.

<table>
<tr><th>BMP #[b]</th><th>Best Management Practice</th></tr>
<tr><td>BMP 25</td><td>The following provisions apply for VM activities during designated fire season in grass and wildland areas:
Smoking is not allowed while walking, working, or operating light or heavy equipment.
Smoking is allowed in a barren area, or within an area cleared to mineral soil at least 3 feet in diameter.
During fire adjective index ratings of Very High or Extreme smoking is not allowed at any time in grass and wildland areas.</td></tr>
<tr><td>BMP 26
(FP-08)</td><td>Hunting, firearms, portable stoves, open fires (such as barbecues) not required by the VM activity, and pets (except for safety in remote locations) are prohibited in VM activity work sites. All trash, food items, and human-generated debris must be properly contained and/or removed from the site.</td></tr>
<tr><td>BMP 27</td><td>Woody debris created by chipping, lop and scatter, or brush mowing operations must be left at an average depth of less than 18 inches from the ground surface unless otherwise specified in an easement or landowner agreement.</td></tr>
<tr><td>BMP 28</td><td>A Licensed Pest Control Advisor must write prescriptions for all herbicide and tree growth regulator applications. Contractors must use a Qualified Applicator when applying herbicides and tree growth regulators for VM.</td></tr>
<tr><td>BMP 29</td><td>Nozzle tip, pressure, and sprayer configuration should be such to produce a coarser droplet to minimize drift.</td></tr>
<tr><td>BMP 30</td><td>Pesticides must not be transported in the same compartment with persons, food, or feed. Pesticide containers must be secured to the vehicle during transportation in a manner that will prevent spilling into or off the vehicle.</td></tr>
<tr><td>BMP 31
(Plant-01)</td><td>Selective application techniques should be used for VM ROW maintenance operations wherever practicable so that desirable vegetation is not adversely impacted.</td></tr>
<tr><td>BMP 32</td><td>The contractor must have a written training program for employees who handle pesticides. The written program must describe the materials and the information that will be provided and used to train the employees.</td></tr>
<tr><td>BMP 33</td><td>Training must be completed before an employee is allowed to handle any pesticide, and must be continually updated to cover any new pesticides that will be handled. Training must be repeated at least annually thereafter.</td></tr>
<tr><td>BMP 34</td><td>These special precautions must be observed during periods of inclement weather:
Applications must not be made in, immediately prior to, or immediately following rain when runoff could be expected.
Applications must not be made when wind and/or fog conditions have the potential to cause drift.
Basal bark applications must not be made when stems are wet with rain, snow, or ice.</td></tr>
<tr><td>BMP 35
(Plant-01)</td><td><table><tr><th>Herbicide Buffer Width from Stream, Wetland, or Other Sensitive Habitat</th><th>Herbicide designation or usage</th></tr><tr><td>No buffer requirement</td><td>Approved for aquatic use</td></tr><tr><td>25 feet</td><td>Not approved for aquatic use</td></tr><tr><td>200 feet</td><td>Mixing, loading, cleaning</td></tr></table></td></tr>
<tr><td>BMP 36</td><td>Mechanical clearing equipment must not be used to clear vegetation within 10 feet of towers, poles or guy wires. Only handheld tools such as chainsaws and weed eaters may be used in these areas.</td></tr>
<tr><td>BMP 37</td><td>Contractor must flag guy wires 200 feet ahead of working an area, using brightly colored flagging, and a minimum of three flags per wire.</td></tr>
</table>

BMP #[b]	Best Management Practice
BMP 38	During fire season contractor must have a water source containing a minimum of 300 gallons of water and 250 feet of 1-inch hose on site at all times during operation. The water source must either be self-propelled or always attached to a vehicle capable of moving it to where it is needed. Where access and terrain allows, contractor's water source must always be within 500 feet of the mowing/cutting operation. Excess water must be disposed of in accordance with all laws and regulations.
BMP 39	Mechanical clearing equipment must have at least one 5 lb. or more Class ABC fire extinguisher with current inspection tag mounted in the cab and accessible by the operator.
BMP 40	During fire season or during high fire danger rating levels contractor must stay on site for a minimum of ½ hour after mechanical clearing operations end for the day to ensure fire safety. During extreme fire levels an additional support person must be dedicated to follow the equipment with a water type back pump and fire line tool. During extreme fire levels mechanical clearing will be limited to the hours of 5:00 a.m. to 12:30 p.m.
BMP 41	Watercourse protection zones must be marked with brightly colored flagging prior to the start of any mechanical clearing or timber operation. Water classes are defined by the California Forest Practice Rules: 14 CCR 916.5. The following watercourse protection zone widths must be maintained at all times, except on existing roadways: • Class I & II watercourses with a slope < 30%: No heavy equipment within 50 feet. • Class I & II watercourses with a slope > 30%: No heavy equipment within 75 feet. • Class III & IV watercourses: No heavy equipment within 25 feet. Protection zones may be increased in areas with steep slopes or highly erodible soils.

[a] Vegetation Management BMPs are equivalent to field protocols in implementation.

[b] Where PG&E distribution and transmission field protocols or AMMs are similar or overlap, they are referenced in parenthesis under the BMP number.

5.5.1.3 Site Restoration Approach

The decision to restore a work site depends on whether covered activities impact less than 0.1 acre or more than 0.1 acre. For the majority of small covered activities that are implemented on a routine, daily basis and that impact less than 0.1 acre, PG&E would provide no site restoration. For larger covered activities impacting more than 0.1 acre, site restoration could include soil compaction or decompaction, recontouring excavated areas to follow natural contours, and reseeding areas where plant cover has been cleared. Although the majority of areas that are impacted by small covered activities would not undergo any site restoration, compensatory mitigation for both temporary and permanent impacts will be provided as part of this HCP. The basis for the approach is supported by years of experience where small impact areas passively restore over brief periods of time or remain in the disturbed or ruderal conditions present prior to the activity. In the San Joaquin Valley portion of PG&E's service territory PG&E has documented passive restoration by annual grasses in areas smaller than 0.25 acre when they were not actively reseeded.

Table 5-3, in Section 5.5.2, *Overview of Approach by Activity*, details those covered activities for which PG&E will implement site restoration. With a few exceptions, covered activities impacting more than 0.1 acre will have some level of restoration to return a site to pre-project conditions. These areas will be restored within 12 months of the completion of construction. Site restoration will not require any plans or approvals unless covered plants have been impacted. If covered plants are impacted, PG&E will be required to prepare a site-specific restoration plan that typically includes a monitoring component.

Infrequently, PG&E will directly impact vernal pools and will need a permit under Section 404 or 401 of the CWA, which typically involves restoration, creation and/or preservation of habitat. Habitat preservation is described in Section 5.6, *Habitat Mitigation*. Habitat restoration and creation plans typically include detailed information on design, implementation, maintenance, monitoring, and performance criteria, as well as contingency planning. The restoration or creation of wetland habitat will be reviewed and approved by USFWS as described in Section 5.6. PG&E will restore directly impacted wetlands and provide mitigation for these impacts.

5.5.1.4 Vegetation Management Best Management Practices to Reduce Environmental Impacts

In concert with PG&E's obligations under CPUC General Order 95, environmental screening practices for vegetation management activities near electric facilities are designed to protect wildlife, groundwater, surface water, and soils, while facilitating safe and reliable electric transmission operations. This screening, similar to what is described in Section 5.4, *Environmental Review, Planning, and Screening Process*, relies on hot zones and Map Books, as well as other pertinent environmental data and vegetation management standard practices to avoid and minimize impacts of activities on natural resources and covered species. Important components of this process are described below.

Hot Zone and Map Book Zone Screening: Vegetation management activities will be screened against hot zones and Map Book zones. When a covered vegetation management activity will be implemented within one of these areas (with the exception of emergency work), hot zone- or Map Book zone-specific AMMs (Table 5-1) will be implemented.

Nesting Bird Management Guidance: To protect birds that nest in areas that could be impacted by vegetation management activities, the vegetation management program follows the process and procedures outlined in PG&E's Avian Protection Plan and associated Nesting Bird Management Plan. These procedures, which supplement the use of vegetation management BMPs (listed in Table 5-2), involve surveys for active nests during pre-activity biological surveys and vegetation management work. If a vegetation management specialist identifies an active nest near a proposed work site, the specialist will prescribe measures to avoid disturbing the nest, which may include performing work at a later time; establishing a setback or buffer consistent with PG&E's policy for managing work activities near nesting birds; or—if vegetation near the line requires emergency pruning—contacting the Avian Protection Program manager for specific guidance.

Riparian Review Standard: When reviewing vegetation management work in the field, PG&E's pre-inspectors utilize a riparian review standard. If vegetation management (pruning or removal) will be implemented within riparian vegetation or within approximately 25 feet of a creek or stream, the pre-inspector will indicate (either on a paper form or in a handheld computer) that the site requires environmental review by a PG&E biologist. The pre-inspector includes the following information on a riparian review form.

- Location (address or latitude/longitude) of the work site.
- Tree work prescribed for the location (pruning or removal).
- Tree species and count to be pruned or removed.
- A description of the location after work is complete.
- Tree work history at the location.

- Percent slope of the location (if on a hill, bank, levee).
- Surrounding vegetation type.
- Description of watercourse (including general information on width and speed, if applicable) and streambed composition.
- Understory tree shade (if the tree shades the water).

The riparian review form will be forwarded to a biologist or land planner for further review and completion of an environmental review of the proposed vegetation management work. Depending on the results of the review, the work location is (1) released for work as described with site-specific BMPs, (2) the work prescription is modified and released for work with site-specific BMPs, or (3) the work is re-scheduled if other notifications or permits are required (e.g. Fish and Game Code 1602 agreement).

Vegetation management BMPs are similar to some field protocols or AMMs listed in Table 5-1. In these instances, field protocols and AMMs are referenced in parenthesis under the BMP number in Table 5-2. Generally, vegetation management BMPs apply in or to the following circumstances.

- BMPs 1–27 are general BMPs implemented for all vegetation management covered activities.
- BMPs 28–35 pertain to the use of herbicides (not a covered activity).
- BMPs 36–41 are implemented during mechanical clearing operations.

5.5.2 Overview of Approach by Activity

Table 5-3 provides a summary of covered activities, sorted by extent of impact (in acres), and PG&E's approach to avoiding, minimizing, and mitigating impacts of covered activities.

Table 5-3. Conservation Strategy Summary for Covered Activities

Activity	Average impact size of covered activity	Annual impacts	Annual covered activities	Approach: In Field: Field Protocols	Approach: In Field: Screening Allows for Review of Hot Zone or Map Book Zone AMMs	Approach: In Field: Flexible Location of Work Site	Approach: In Field: Env. Review Allows Avoidance of Burrows	Approach: In Field: Track and Report if in Modeled Habitat	Approach: In Field: Onsite Rest. of Work Site	Approach: Post Field: Include in Validation Study	Approach: Post Field: Mitigate for Permanent Impacts[a]	Approach: Post Field: Mitigate for Temporary Impacts[b]	Approach: Post Field: Mitigation for Temporary Impacts Based on Estimates or Actuals	Clarifications
Small activities (0.1 acre or less of impact)														
Gas														
G1. Patrols	0	0.00	1	Yes	No	NA	NA	No	No	No	NA	NA	NA	No ground disturbance. Crews will be trained annually on MRHCP compliance requirements.
G2. Inspections	0	0.00	1	Yes	No	NA	NA	No	No	No	NA	NA	NA	No ground disturbance. Crews will be trained annually on MRHCP compliance requirements.
G3a. Pipeline Remedial Maintenance (Fencing)	0.06	1.38	11.5	Yes	Yes	Yes	Yes	Yes	No	No	Yes	NA	Estimate	Some ability to make minor adjustments to work sites.
G3b. Internal Pipeline Inspection	0.06	3.45	57.5	Yes	Yes	Yes	No	Yes	No	No	Yes	Yes	Estimate	Some ability to make minor adjustments to work sites.
G4. Compressor Station Upgrades and Maintenance (Mowing)	0.28	0.322	1.15	Yes	No	No	No	Yes	No	No	NA	NA	NA	Mowing around facility.
G5. Pipeline Electric Test System Installation	0.06	0.483	8.05	Yes	Yes	Yes	Yes	Yes	No	No	Yes	Yes	Estimate	Limited ground disturbance, very small footprint.
G6. Pipeline Valve Maintenance – Recoating	0	0.00	5.75	Yes	Yes	No	No	Yes	No	Yes	NA	Yes	Estimate	Some ability to make minor adjustments to work sites.
G7. Pipeline Valve Maintenance – Replacement or Automation	0.57	16.48	17.83	Yes	Yes	No	No	Yes	No	Yes	NA	Yes	Estimate	Some ability to make minor adjustments to work sites.
G8. Pipeline Cathodic Protection	0.02	2.2	100	Yes	Yes	Yes	Yes	Yes	No	No	Yes	Yes	Estimate	Limited ground disturbance, very small footprint with deep well anodes.

Activity	Average impact size of covered activity	Annual impacts	Annual covered activities	Approach: In Field: Field Protocols	Approach: In Field: Screening Allows for Review of Hot Zone or Map Book Zone AMMs	Approach: In Field: Flexible Location of Work Site	Approach: In Field: Env. Review Allows Avoidance of Burrows	Approach: In Field: Track and Report if in Modeled Habitat	Approach: In Field: Onsite Rest. of Work Site	Approach: Post Field: Include in Validation Study	Approach: Post Field: Mitigate for Permanent Impacts[a]	Approach: Post Field: Mitigate for Temporary Impacts[b]	Approach: Post Field: Mitigation for Temporary Impacts Based on Estimates or Actuals	Clarifications
Small activities (0.1 acre or less of impact) (continued)														
Gas(continued)														
G12. Pipeline Telecommunication Site Maintenance (Staging Area)	0.34	0.391	1.15	Yes	Yes	Yes	Yes	Yes	No	No	NA	Yes	Estimate	Limited ground disturbance.
G13b. Pipeline Right-of-Way Vegetation Management and Access Road Maintenance	0.25	1.43	5.75	Yes	Yes	No	No	No	No	No	NA	NA	NA	Limited ground disturbance.
Electric														
E1. Patrols	0	0.00	1	Yes	No	NA	NA	No	No	No	NA	NA	NA	No ground disturbance. Crews will be trained annually on MRHCP compliance requirements.
E2. Inspections	0	0.00	1	Yes	Yes	NA	NA	No	No	No	NA	NA	NA	No ground disturbance. Crews will be trained annually on MRHCP compliance requirements.
E3. Insulator Washing or Replacement	0.00	0.002	1.2	Yes	Yes	Yes	Yes	No	No	No	NA	NA	NA	No ground disturbance.
E5. System Outage Repair	0.01	6	600	No	No	No	No	No	No	Yes	Yes	Yes	Estimate	Limited ground disturbance.
E6a. Tower Replacement or Repair	0.02	9.83	468	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Estimate	Limited ground disturbance; mostly from foundations of footings.
E6b. Access Boardwalk Replacement or Repair	0.00	0.03	18	Yes	Yes	No	NA	Yes	No	No	Yes	Yes	Estimate	Several square feet of ground disturbance.
E7. Facility Installations (Shoo-Flies)	0.06	7.2	120	Yes	Yes	Yes	Yes	Yes	No	Yes	NA	Yes	Estimate	Limited ground disturbance. These are temporary structures to keep electricity flowing.

Activity	Average impact size of covered activity	Annual impacts	Annual covered activities	Approach: In Field: Field Protocols	Approach: In Field: Screening Allows for Review of Hot Zone or Map Book Zone AMMs	Approach: In Field: Flexible Location of Work Site	Approach: In Field: Env. Review Allows Avoidance of Burrows	Approach: In Field: Track and Report if in Modeled Habitat	Approach: In Field: Onsite Rest. of Work Site	Approach: Post Field: Include in Validation Study	Approach: Post Field: Mitigate for Permanent Impacts[a]	Approach: Post Field: Mitigate for Temporary Impacts[b]	Approach: Post Field: Mitigation for Temporary Impacts Based on Estimates or Actuals	Clarifications
Small activities (0.1 acre or less of impact) (continued)														
Electric (continued)														
E8a. Pole Equipment Repair and Replacement	0	0.00	570	Yes	Yes	Yes	Yes	No	No	No	NA	NA	NA	Several square feet of ground disturbance. Most work is on the pole near the wires and does not impact the ground.
E8b. Utility/Wood Pole Replacement	0.00	0.912	570	Yes	Yes	Yes	Yes	Yes	No	No	NA	Yes	Estimate	Several square feet of ground disturbance.
E9b. Line Reconductoring (Distribution)	0.00	0.65	285	Yes	Yes	Yes	Yes	Yes	No	No	NA	Yes	Estimate	Limited ground disturbance. Most facilities are near roads, on shoulders.
E10a. Vegetation Management Routine Maintenance	0.00	2.16	24	Yes	No	No	No	Yes	No	No	NA	NA	NA	Limited ground disturbance.
E10b. Vegetation Management Pole Clearing	0.00	0.23	114	Yes	No	No	No	Yes	No	No	Yes	NA	Estimate	Limited ground disturbance. Applies to new subject poles.
E10c. Vegetation Management Tree Removal – Small Groups	0.00	3	30	Yes	Yes	No	No	Yes	No	No	NA	Yes	Estimate	Limited ground disturbance.
E10e. Vegetation Management Tower Cage Clearing	0.04	0.38	9.6	Yes	Yes	No	No	Yes	No	No	NA	NA	NA	Limited ground disturbance.
E10f. Vegetation Management Fee Strip Maintenance	3.03	3.64	1.2	Yes	Yes	No	No	Yes	No	No	NA	NA	NA	Mowing of fee lands by regulation.
E11a. Wood Pole Test and Treat – Inspection and Maintenance	0.00	1.37	6840	Yes	Yes	No	No	No	No	No	NA	NA	NA	Several square feet of ground disturbance.
E11b. Wood Pole Test and Treat – Reinforcement	0.00	0.16	205.2	Yes	Yes	No	Yes	No	No	No	NA	Yes	Estimate	Several square feet of ground disturbance.

Activity	Average impact size of covered activity	Annual impacts	Annual covered activities	Approach: In Field: Field Protocols	In Field: Screening Allows for Review of Hot Zone or Map Book Zone AMMs	In Field: Flexible Location of Work Site	In Field: Env. Review Allows Avoidance of Burrows	In Field: Track and Report if in Modeled Habitat	In Field: Onsite Rest. of Work Site	Post Field: Include in Validation Study	Post Field: Mitigate for Permanent Impacts[a]	Post Field: Mitigate for Temporary Impacts[b]	Post Field: Mitigation for Temporary Impacts Based on Estimates or Actuals	Clarifications
Small activities (0.1 acre or less of impact) (continued)														
Electric (continued)														
E15. Underground Line Construction	0.03	0.04	0.24	Yes	Yes	Yes	Yes	Yes	No	No	Yes	Yes	Estimate	Most likely to be in urban areas.
Subtotal		**61.74**	**10,069**											
Medium activities (0.11 acre to 0.5 acre of impact)														
Gas														
G3a. Pipeline Remedial Maintenance (Ercon Mats)	0	0.13	1.5	Yes	Yes	No	No	Yes	Yes	No	Yes	Yes	Actual	Restoration standard as part of additional permit requirements.
G10. Pipeline Coating Replacement	2.42	2.42	1	Yes	Yes	No	No	Yes	Yes	No	NA	Yes	Actual	Some ability to make minor adjustments to work sites.
G12. Pipeline Telecommunication Site Maintenance (New Cable)	0.34	0.40	1.15	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Actual	Minor excavation.
Electric														
E4. Substation Maintenance	0.46	.55	1.2	Yes	Yes	No	No	No	No	No	NA	NA	NA	Mowing around facilities.
E12. New Distribution and Transmission Line Construction or Relocation (New Line and Access Road)	0.25	1.15	2.4	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Actual	Permanent impact from new access; mitigation at permanent impact ratios.
E12. New Distribution and Transmission Line Construction or Relocation (Pull Site)	0.06	0.12	2	Yes	Yes	Yes	Yes	Yes	Yes	No	NA	Yes	Actual	Limited ground disturbance. Use existing disturbed areas where possible.
E12. New Distribution and Transmission Line Construction or Relocation (Staging)	0.13	0.26	2	Yes	Yes	Yes	Yes	Yes	Yes	No	NA	Yes	Actual	Limited ground disturbance.

Activity	Average impact size of covered activity	Annual impacts	Annual covered activities	Approach: In Field: Field Protocols	Approach: In Field: Screening Allows for Review of Hot Zone or Map Book Zone AMMs	Approach: In Field: Flexible Location of Work Site	Approach: In Field: Env. Review Allows Avoidance of Burrows	Approach: In Field: Track and Report if in Modeled Habitat	Approach: In Field: Onsite Rest. of Work Site	Approach: Post Field: Include in Validation Study	Approach: Post Field: Mitigate for Permanent Impacts[a]	Approach: Post Field: Mitigate for Temporary Impacts[b]	Approach: Post Field: Mitigation for Temporary Impacts Based on Estimates or Actuals	Clarifications
Medium activities (0.11 acre to 0.5 acre of impact) (continued)														
Electric (continued)														
E13. Tower Line Construction (Footings and Pull Sites)	0.26	132	2.4	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Actual	Use existing disturbed areas where possible.
Subtotal		**137.0**	**13.65**											
Large activities (0.51 acre or larger)														
Gas														
G9. Pipeline Lowering	4.26	1.62	0.38	Yes	Yes	No	No	Yes	Yes	No	NA	Yes	Actual	Some ability to make minor adjustments to work sites.
G11. Pipeline Replacement	2.42	84.31	17.83	Yes	Yes	No	No	Yes	Yes	No	Yes	Yes	Actual	Less flexibility in making adjustments to work sites.
G13a. Pipeline Right-of-Way Vegetation Management and Access Road Maintenance	2.42	41.75	11.5	Yes	Yes	No	No	Yes	No	No	Yes	Yes	Actual	Impacts in sensitive areas can be minimized.
G14. Gas Pressure Limiting Station Construction (Fencing)	0.00	0.11	0	Yes	Yes	Yes	No	Yes	No	No	Yes	Yes	Actual	Less flexibility in making adjustments to work sites.
G14. Gas Pressure Limiting Station (Laydown Area)	0.23	0.05	0.2	Yes	Yes	Yes	Yes	Yes	Yes	No	NA	Yes	Actual	Some ability to make minor adjustments to work sites.
G14. Gas Pressure Limiting Station (Excavation/Stock)	0.23	0.05	0.2	Yes	Yes	Yes	Yes	Yes	Yes	No	NA	Yes	Actual	Some ability to make minor adjustments to work sites.
G15. New Customer/Business Pipeline Extension	0.06	2.85	1.15	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Actual	Some ability to make minor adjustments to work sites.

Activity	Average impact size of covered activity	Annual impacts	Annual covered activities	Approach: In Field: Field Protocols	In Field: Screening Allows for Review of Hot Zone or Map Book Zone AMMs	In Field: Flexible Location of Work Site	In Field: Env. Review Allows Avoidance of Burrows	In Field: Track and Report if in Modeled Habitat	In Field: Onsite Rest. of Work Site	Post Field: Include in Validation Study	Post Field: Mitigate for Permanent Impacts[a]	Post Field: Mitigate for Temporary Impacts[b]	Post Field: Mitigation for Temporary Impacts Based on Estimates or Actuals	Clarifications
Large activities (0.51 acre or larger) (continued)														
Electric														
E9a. Line Reconductoring (Transmission)	21.5	258.7	12	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Actual	Impacts in sensitive areas can be minimized.
E10d. Vegetation Management Tree Removal – ROW Clearing	1.88	58.92	12	Yes	Yes	Yes	No	Yes	No	No	Yes	Yes	Actual	Must maintain clearance distances. Selective clearing in riparian areas.
E14. Minor Substation Expansion	10.0	3.57	0.4	Yes	Yes	No	No	Yes	Yes	No	Yes	Yes	Actual	Permanent impact from expansion.
Subtotal		**451.9**	**55.7**											
Total[c]		**651**	**10,138**											

[a] Mitigation for permanent impacts indicates "no" if no impacts are expected.

[b] Mitigation for temporary impacts indicates "no" if site is so small it will recovery naturally.

[c] Average impacts multiplied by total activities may not sum to total annual impacts because of rounding and because frequency and size for temporary and permanent impacts have been combined.

5.6 Habitat Mitigation

PG&E will fund the acquisition, enhancement, management, and restoration of habitat by qualified third parties to mitigate effects of covered activities and promote the recovery of covered species in the regional planning areas.

5.6.1 Approach to Mitigation

Impacts on habitat will be mitigated with equivalent or higher-value habitat consistent with the land-cover and habitat data developed for the species that is described in Chapter 2, *Environmental Setting*. PG&E will provide habitat mitigation through the following mechanisms (in order of preference), further described in Section 5.6.3 *Types of Mitigation* and Section 5.6.4, *Mitigation Approval Process*.

- Purchase of high-quality habitat and establishment of a conservation easement and endowment.
- Purchase or placement of conservation easements on high-quality habitat.
- Purchase of credits from approved mitigation or conservation banks.
- Partnerships with and/or contributions to existing conservation planning and recovery efforts.
- Placement of conservation easements on existing PG&E lands.
- Habitat enhancement and restoration on lands already protected to provide increased function and value for covered species.

Mitigation acreage will be based on temporary and permanent habitat impacts. PG&E will acquire mitigation based on the *jump start* and *stay ahead* provisions outlined below. PG&E will actively seek to conserve lands that provide habitat values for multiple species, and in these instances, PG&E will keep track the credit portfolio available to offset its mitigation obligations.

5.6.1.1 Jump Start Provision

To "jump start" conservation and benefit MRHCP covered species, PG&E has made land acquisitions in advance of permit issuance. PG&E will ensure that these interim conservation actions and related land management activities are consistent with the terms of the HCP. Land acquisitions to date consist of approximately 1,616 acres. See Table 5-6 in Section 5.6.8, *Pending Interim Conservation Lands*, for a list of interim conservation lands.

5.6.1.2 Stay Ahead Provision

After the HCP is approved, PG&E will "stay ahead" of impacts, meaning PG&E will provide mitigation in advance of impacts in a given covered species' habitat in a given region, or will mitigate at a slightly higher ratio if advance mitigation is not provided. PG&E will estimate the mitigation credits that are expected to be necessary for future years based on information from the Annual Report for the prior year. This stay ahead provision will enable PG&E to direct its efforts to locations where covered species mitigation should be acquired, restored, enhanced, or created in advance of impacts on such habitat. For example, if 100 acres of modeled habitat for a covered species have been temporarily impacted in the prior year, then PG&E will have already acquired sufficient acres of

species-appropriate habitat to offset the prior year's impacts as well as having enough credits in reserve to offset the next year's impacts. Consideration of pending acquisitions will be taken into account when evaluating the status of the stay ahead provision (i.e., whether or not a purchase and sale agreement has been executed or if outstanding grants have been awarded but no contracts have been approved, see Section 5.6.5, *Mitigation Credit Release*).

PG&E's annual report will indicate where stay ahead provisions goals are being met and where they are not based on both impact and mitigation credit balances. While PG&E may fall behind in its mitigation commitments for covered species, this is not expected for most species because of the advance mitigation acquisition planning done by PG&E staff. PG&E will strive to correct any deficiency prior to the next year's Annual Report. This allowance reasonably accommodates the time it takes for land acquisition and preservation transactions, while providing for continuation of covered activities as well as mitigation pursuits. PG&E may not fall behind for more than two consecutive calendar years. If, at the end of two consecutive calendar years (i.e., after two Annual Reports), PG&E has a mitigation credit deficit of any kind and has not met the stay ahead provision, it will mitigate all outstanding temporary impacts at an additional 0.5:1 ratio and permanent impacts at an additional 1:1 ratio until PG&E has made up the deficit; for simplicity of accounting, PG&E may continue to mitigate at a higher ratio for the remainder of the calendar year in which the deficit is made up. Mitigation shall not be in arrears for more than 2 years. Prior to permit expiration, PG&E will be responsible for any outstanding mitigation requirements in the permit.

5.6.2 Compensatory Mitigation

The mitigation requirements are based on impact totals from Chapter 4, Table 4-9. Over the permit term, PG&E will adjust the amount of habitat mitigation required to reflect the total amount (both estimated and actual) of habitat loss for covered species. The overall intent is to ensure appropriate mitigation for impacts on natural land-cover types is provided in a manner consistent with the stay ahead provision in the HCP.

Temporary and permanent disturbance of urban, barren, ruderal, row crop, orchard, or vineyard lands will not be mitigated because these lands are unsuitable for covered species and undergo regular disturbance comparable in intensity to, or more extensive than, the impacts of covered activities.

5.6.2.1 Mitigation for Permanent Impacts

Permanent impacts typically result from the construction of new facilities, but could also result from activities that cause habitat impacts that do not recover within 1 year of the completion of the activity. PG&E will mitigate permanent impacts on modeled habitat for covered species at a 3:1 ratio (3 acres mitigated for every 1 acre permanently impacted), except for VELB, at a 2:1 ratio, and San Joaquin kit fox moderate-value and low-value habitat, which will be mitigated at 1:1 and 0.5:1, respectively. PG&E will provide mitigation for impacts on a specific location only once during the duration of the HCP, even if subsequent impacts occur in the same location. For permanent impacts, it will be assumed that the impacted location will be permanently lost, and so subsequent impacts within the footprint of those impacts will not require further mitigation.

5.6.2.2 Mitigation for Temporary Impacts

The majority of impacts from O&M activities result from disturbances that are temporary in nature. PG&E will mitigate temporary impacts on habitat within areas of modeled habitat with natural land-cover types for covered species at ratios ranging from 0.1:1 to 1:1 (0.1 to 1.0 acre mitigated for every 1 acre temporarily impacted). Temporary impacts on covered species habitat will be mitigated at the following ratios.

- Temporary impacts on Conservancy fairy shrimp, longhorn fairy shrimp, vernal pool fairy shrimp, vernal pool tadpole shrimp, Zayante broad-banded grasshopper, and Morro shoulder-banded snail will be mitigated at a 0.5:1 ratio.
- Temporary impacts on valley elderberry longhorn beetle will be mitigated at a 0.25:1 ratio.
- Temporary impacts on breeding habitat for California tiger salamander (both Central California and Santa Barbara DPS) will be mitigated at a 1:1 ratio.
- Temporary impacts on upland habitat for California tiger salamander (both Central California and Santa Barbara DPS) will be mitigated at a 0.5:1 ratio.
- Temporary impacts on breeding habitat for California red-legged frog, foothill yellow-legged frog, and Santa Cruz long-toed salamander will be mitigated at a 1:1 ratio.
- Temporary impacts on upland habitat for California red-legged frog and Santa Cruz long-toed salamander will be mitigated at a 0.5:1 ratio.
- Temporary impacts on dispersal habitat for foothill yellow-legged frog will be mitigated at a 0.5:1 ratio based on actual site-specific habitat impacts.
- Temporary impacts on suitable habitat for Sierra Nevada yellow-legged frog, mountain yellow-legged frog, and Yosemite toad will be mitigated at a 0.5:1 ratio.
- Temporary impacts on giant garter snake aquatic habitat will be mitigated at a 1:1 ratio and at a 0.1:1 ratio for upland and rice habitats.
- Temporary impacts on suitable and core habitats for blunt-nosed leopard lizard will be mitigated at a 0.5:1 ratio.
- Temporary impacts on suitable habitat for marbled murrelet and northern spotted owl will be mitigated at a 0.5:1 ratio.
- Temporary impacts on suitable habitat for Point Arena mountain beaver will be mitigated at a 0.5:1 ratio.
- Temporary impacts on suitable habitat for giant kangaroo rat will be mitigated at a 0.5:1 ratio.
- Temporary impacts on San Joaquin kit fox will be mitigated at a ratio of 0.5:1 for high-value habitat and 0.1:1 for low- and moderate-value habitats.

These ratios are based on the types of habitat being impacted and timing of mitigation. PG&E intends to provide jump start mitigation for as many species as possible, as well as adhere to the stay ahead provision described in Section 5.6.1, *Approach to Mitigation*.

5.6.2.3 Exceptions to Use of Models in Determining Mitigation

Habitat models will be used to determine mitigation accounting for most species, except site-specific habitat assessments will determine mitigation for the following species: valley elderberry longhorn beetle, foothill yellow-legged frog, mountain yellow-legged frog, and Yosemite toad. This accounting approach is proposed because of the challenges of modeling these species' habitats and because habitat models greatly overstate where these species occur. The process used to determine mitigation for these species will be as follows.

Valley elderberry longhorn beetle: PG&E will use its existing valley elderberry longhorn beetle database to account for the number of shrubs pruned and removed each year. Mitigation will be calculated annually in association with the number of shrubs subject to permanent or temporary impacts, rather than impacts on modeled habitat. Using the ratios proposed above, PG&E will multiply the number of shrubs pruned and removed by 0.041 acres, the number used by USFWS in *Framework for Assessing Impacts to the Valley Elderberry Longhorn Beetle* (U.S. Fish and Wildlife Service 2017), to calculate annual impacts and mitigation.

Foothill yellow-legged frog, mountain yellow-legged frog and Yosemite toad: PG&E will use the habitat models for these species to inform where site-specific habitat assessments should be conducted. If land cover with suitable aquatic or dispersal habitat will be affected by a covered activity, PG&E will mitigate those impacts. PG&E will conduct site-specific surveys for these species to determine if habitat impacts will result. If, over time, surveys prove ineffective or inefficient (i.e., the cost of surveys exceeds the cost of mitigation), PG&E, with USFWS concurrence, may revert to the use of habitat models to evaluate impacts and determine mitigation.

5.6.2.4 Mitigation Summary for Wildlife

PG&E's annual mitigation for impacts on covered wildlife is described in Table 5-4. Wildlife mitigation is grouped according to the likelihood of species co-occurrence, although site-specific assessments of mitigation lands will provide information on the habitat suitability and suite of species that will benefit from a specific mitigation acquisition. Specific mitigation options are highlighted in the last column of Table 5-4 and will be subject to review and approval by USFWS. Additional or different mitigation approaches may be used and all of PG&E's mitigation options are described in Section 5.6.3, *Types of Mitigation.* The approval of these options is described in Section 5.6.4, *Mitigation Approval Process*. Mitigation totals are not additive because more than one species may occupy a given habitat type; therefore, summing totals without factoring in such overlap leads to inaccurate mitigation requirements. Additional information on mitigation locations and priorities can be found in Section 5.6.6.2, *Location of Mitigation Areas.*

Overall, PG&E's HCP provides a comprehensive mitigation program that offsets PG&E impacts on covered species by contributing to regional conservation or recovery efforts. PG&E will work with USFWS to prioritize mitigation opportunities that meet both conservation priorities and recovery goals for such species. As PG&E evaluates mitigation options, it will consider the regional allocation of mitigation between the Sacramento Valley and Foothills Region, North Coast Region, and Central Coast Region in relation to overall impacts on covered species.

PG&E will focus on acquisitions that foster multiple species conservation and recovery, and will work with other conservation partners to maximize regional conservation efforts. If mitigation compliance for narrow endemic species cannot be combined with larger mitigation acquisitions (i.e., there is no overlap), mitigation will be provided on small-scale sites consistent with PG&E's

mitigation needs and subject to approval by USFWS. A brief summary of the conservation strategy for each group of covered species is provided below.

Sacramento Valley and Foothills

Invertebrates

PG&E intends to acquire fee title or conservation easements, or will partner with regional conservation entities to obtain conservation for most invertebrate species covered in this Region. PG&E will focus on acquisitions in Butte and Placer Counties within the ranges of Conservancy fairy shrimp, Longhorn fairy shrimp, vernal pool fairy shrimp, and vernal pool tadpole shrimp and will focus on combining mitigation, when feasible, to target larger parcels to maximize the conservation benefit to the species. PG&E will acquire vernal pool habitat as well as some of the swale systems and surrounding upland habitat to protect vernal pool species. PG&E will also support valley elderberry longhorn beetle by maintaining elderberry shrubs and enhancing lands to support this species. Mitigation for impacts on VELB is based on elements of the 2017 Framework, advance mitigation provided by PG&E, and the proposed operations and maintenance approach to VELB habitat management (as discussed in Section 4.2.8, *Sacramento Valley and Foothills Region, Valley Elderberry Longhorn Beetle*). For this species, permanent impacts will be mitigated at 2:1 (two credits[2] provided for every shrub permanently impacted), and temporary impacts will be mitigated at 0.25:1 (one-quarter of a credit provided for every shrub temporarily impacted). The mitigation ratio for permanent impacts is comparable to that suggested by the 2017 Framework. Although transplantation of impacted shrubs is not feasible, the same 2:1 ratio will be used for impacted non-riparian shrubs, including those with no evidence of VELB occupancy, ensuring that VELB impacts are mitigated. A lower ratio is proposed for temporary impacts on shrubs because most impacts are near the top of the shrub canopy and above the height of most VELB occupancy (i.e., larval development). Although beetles could be impacted as a result of work higher in the canopy, the likelihood of take is much reduced compared with wholesale removal of an occupied shrub. mitigation is proposed for canopy pruning impacts to account for loss of adult VELB during their flight season because avoidance of this period of VELB lifecycle will not always be possible. Covered activities that result in pruning of stems of any diameter beyond 6 feet above ground level from June 1 through February 30 does not trigger mitigation because of the lower likelihood of adults being present and the totality of the conservation strategy. Overall, the conservation strategy ensures impacts are addressed for the following reasons:

- Pruned shrubs will be mitigated each time they occur; thus PG&E expects to mitigate for impacts to the same habitat repeatedly over the permit term. Since PG&E is providing mitigation in the form habitat conservation and has provided mitigation in the form of individual plantings, it is expected that this will result in an increase in available habitat for the species, and thus more individuals over time relative to the loss of individuals that will result from pruning the shrubs.
- Pruning above 6-feet in height is not expected to result in a significant loss of habitat for VELB because impacted shrubs will remain on the landscape as habitat for VELB.

[2] One credit is 0.041 acre, pursuant to the *Framework for Assessing Impacts to the Valley Elderberry Longhorn Beetle* (U.S. Fish and Wildlife Service 2017).

- PG&E is proposing to mitigate for temporary impacts to any shrub with stems of 1-inch in diameter, or greater, at ground level, regardless of whether or not the impacted shrub has exit holes. As a result both occupied and unoccupied shrubs will be mitigated.
- Because stem diameter decreases with height, most individuals are expected to be present below 6-feet, because stems of large enough diameter to host the species are more abundant below 6-feet. As a result, most individual beetles will remain in the shrub post-pruning. Thus, PG&E does not expect pruning of a shrub above 6-feet in height to preclude the species from occupying the habitat that remains after the pruning (Talley and Holyoak, 2009).
- PG&E has already provided habitat acquisition, preservation, and enhancement activities for this species in Glenn County.

Amphibians

California tiger salamander (Central California and Santa Barbara County DPSs) and California red-legged frog are the primary species on which the HCP conservation strategy is focused. Because their habitat encompasses more area than all other covered species habitat in the Plan Area, these species require more mitigation. PG&E's conservation strategy is to acquire fee title or conservation easements, or partner with other regional conservation entities to obtain conservation for most covered amphibian species.

PG&E will acquire lands for mitigation for covered amphibians across appropriate counties. When acquiring easements or lands, PG&E will prioritize sites that contain habitat for multiple species. PG&E may provide or contribute funding for collaborative conservation projects for California tiger salamander, California red-legged frog and foothill yellow-legged frog throughout the Plan Area to accomplish mitigation requirements. PG&E will prioritize restoration or habitat enhancements as mitigation for impacts on mountain yellow-legged frog, Sierra Nevada yellow-legged frog, and Yosemite toad.

PG&E may partner with a conservation banker or other conservation entity to prepare turn-key mitigation, or PG&E may buy credits from a mitigation bank. To ensure overall habitat connectivity and suitability, PG&E will ensure mitigation lands are located near stock ponds, vernal pools, or other suitable breeding habitat for the species (e.g., riparian areas for listed frogs). Modeled breeding habitat for California red-legged frog includes a buffer around riparian corridors; therefore, PG&E's mitigation for impacts on modeled breeding habitat will include a similar buffer.

Reptiles

PG&E will impact giant garter snake in Sutter, Sacramento, and Yolo Counties; therefore, PG&E will acquire lands or conservation easements in at least one of these counties. PG&E may also collaborate with a regional conservation entity that is working to conserve the species. Mitigation for impacts on giant garter snake may be combined with mitigation for impacts on other species depending on the habitat characteristics of the sites being evaluated.

Birds

PG&E intends to enhance habitat to benefit northern spotted owl. PG&E may also acquire habitat through the mitigation approaches described in section 5.6.4, *Mitigation Approval Process*.

Mammals

No mammal mitigation is expected to be required in the Sacramento Valley and Foothills Region.

North Coast

Invertebrates

PG&E's approach to invertebrates will be the same in this region as in the Sacramento Valley and Foothills Region, with mitigation acquired that is within the species' range.

Amphibians

PG&E's approach to amphibians will be the same in this region as in the Sacramento Valley and Foothills Region.

Birds

PG&E's approach to birds will be similar in this region as in the Sacramento Valley and Foothills Region. In addition, enhancements will be proposed for marbled murrelet.

Mammals

PG&E intends to acquire and enhance habitat to benefit Point Arena mountain beaver. PG&E may also collaborate with a regional conservation entity that is working to conserve the species.

Central Coast

Invertebrates

PG&E intends to acquire fee title or conservation easements, or will partner with regional conservation entities to obtain conservation lands for most invertebrate species covered under this HCP. PG&E will also seek to fund implementation of recovery actions with the approval of USFWS. PG&E will focus on acquisitions in Santa Cruz, Monterey, and San Luis Obispo Counties within the ranges of species in these areas.

PG&E intends to mitigate impacts on longhorn fairy shrimp, vernal pool tadpole shrimp, and vernal pool fairy shrimp by purchasing habitat by fee title, conservation easements, or conservation bank credits. For Morro shoulderband snail, PG&E will mitigate impacts by habitat acquisition and/or enhancement in Morro Bay. PG&E intends to mitigate impacts on Zayante band-winged grasshopper, Mount Hermon June Beetle, and Ohlone tiger beetle by contributing to habitat enhancement (removal of invasive broom) via enhancement partnerships with other conservation entities, purchasing fee title lands that have these species, or purchasing credits at the Zayante Hills Conservation Bank in Santa Cruz County. PG&E intends to mitigate impacts on Smith's blue butterfly by purchasing habitat in Monterey County; a small percent of the species range is included in northwestern San Luis Obispo County, but mitigation would still be consolidated and directed to Monterey County. PG&E may also partner with local land trusts or other conservation entities to secure lands to benefit these species.

Amphibians

PG&E's approach to amphibians will be the same in this region as in the Sacramento Valley and Foothills Region. However, Santa Cruz long-toed salamander mitigation will require additional site evaluations to find appropriate conservation lands; other types of mitigation such as enhancement may be possible for this species.

Reptiles

PG&E intends mitigate for impacts on blunt-nosed leopard lizard by acquiring habitat in San Luis Obispo County. PG&E may also collaborate with a regional conservation entity that is working to conserve the species.

Birds

PG&E intends to mitigate impacts on marbled murrelet through enhancement actions that benefit the species. PG&E may also acquire habitat.

Mammals

PG&E will acquire lands or partner with a regional conservation entity to mitigate impacts on the giant kangaroo rat and San Joaquin kit fox.

Table 5-4. Covered Wildlife Species Mitigation Groupings and 30-Year Mitigation

Covered Species	Permanent Habitat Loss (acres)			Temporary Habitat Loss (acres)			Total Mitigation (acres)[a]	Specific Mitigation Options[b, c]
	Requested Take	Mitigation Ratio	Mitigation	Requested Take	Mitigation Ratio	Mitigation		
Sacramento Valley and Foothills Region								
Conservancy fairy shrimp	7.5	3:1	22.5	57.9	0.5:1	29.0	51.5	1. Habitat acquisition in Butte County.
Longhorn fairy shrimp	1.7	3:1	5.1	10.8	0.5:1	5.4	10.5	1. Habitat acquisition within species range.
Vernal pool fairy shrimp	30.0	3:1	90.0	285.2	0.5:1	142.6	232.6	1. Habitat acquisition in Placer Butte Counties.
Vernal pool tadpole shrimp	30.0	3:1	90.0	285.2	0.5:1	142.6	232.6	1. Habitat acquisition in Butte County.
Valley elderberry longhorn beetle	78.9	2:1	157.9	281.67	0.25:1	70.4	228.2	1. Habitat acquisition within species range.
California red-legged frog								1. Habitat acquisition within species range.
Potential Breeding Habitat	30.0	3:1	90.0	90.0	1:1	90.0	180.0	
Potential Upland Habitat	60.0	3:1	180.0	310.5	0.5:1	155.3	335.3	
California tiger Salamander (Central California DPS)								1. Habitat acquisition in Sacramento Valley foothills.
Potential Breeding Habitat	5.1	3:1	15.3	25.4	1:1	25.4	40.7	
Potential Upland Habitat	68.2	3:1	204.6	326.3	0.5:1	163.2	367.8	
Foothill yellow-legged frog								1. Habitat acquisition in foothills within species range.
Potential Breeding Habitat	0.8	3:1	2.4	4.6	1:1	4.6	7.0	
Potential Dispersal Habitat	8.8	3:1	26.4	54.9	0.5:1	27.5	53.9	

Covered Species	Permanent Habitat Loss (acres)			Temporary Habitat Loss (acres)			Total Mitigation (acres)[a]	Specific Mitigation Options[b, c]
	Requested Take	Mitigation Ratio	Mitigation	Requested Take	Mitigation Ratio	Mitigation		
Mountain yellow-legged frog (northern DPS)	0.6	3:1	1.8	3.0	0.5:1	1.5	3.3	1. Partner with others to enhance or restore habitat. 2. Habitat acquisition in foothills within species range. 3. Partner with others to contribute to habitat acquisition in foothills.
Sierra Nevada yellow-legged frog	0.7	3:1	2.1	4.5	0.5:1	2.3	4.4	1. Partner with others to enhance or restore habitat. 2. Habitat acquisition in foothills within species range. 3. Partner with others to contribute to habitat acquisition in foothills.
Yosemite toad	0.5	3:1	1.5	2.0	0.5:1	1.0	2.5	1. Partner with others to enhance or restore habitat. 2. Habitat acquisition in foothills. 3. Partner with others to contribute to habitat acquisition in foothills.
Giant garter snake								1. Habitat acquisition in Sacramento Valley.
Potential Aquatic Habitat—Wetland and Marsh	12.8	3:1	38.4	90.0	1:1	90.0	128.4	
Potential Upland Habitat	38.0	3:1	114.0	300.0	0.1:1	30.0	144.0	
Potential Aquatic Habitat—Rice	50.5	3:1	151.5	300.0	0.1:1	30.0	181.5	
Northern spotted owl	15.0	3:1	45.0	60.0	0.5:1	30.0	75.0	1. Habitat enhancement within species range. 2. Habitat acquisition and enhancement within species range.

Covered Species	Permanent Habitat Loss (acres)			Temporary Habitat Loss (acres)			Total Mitigation (acres)[a]	Specific Mitigation Options[b, c]
	Requested Take	Mitigation Ratio	Mitigation	Requested Take	Mitigation Ratio	Mitigation		
North Coast Region								
Vernal pool fairy shrimp	0.6	3:1	1.8	3.8	0.5:1	1.9	3.7	1. Habitat acquisition within species range.
Vernal pool tadpole shrimp	0.6	3:1	1.8	3.8	0.5:1	1.9	3.7	2. Habitat acquisition within species range.
California red-legged frog								3. Habitat acquisition within species range.
Potential Breeding Habitat	3.0	3:1	9.0	6.0	1:1	6.0	15.0	
Potential Upland Habitat	7.5	3:1	22.5	30.0	0.5:1	15.0	37.5	
Foothill yellow-legged frog								1. Habitat acquisition in foothills within species range.
Potential Breeding Habitat	0.6	3:1	1.8	3.5	1:1	3.5	5.3	
Potential Dispersal Habitat	6.3	3:1	18.9	35.1	0.5:1	17.6	36.5	
Marbled murrelet	30.0	3:1	90.0	60.0	0.5:1	30.0	120.0	1. Habitat enhancement within species range.
Northern spotted owl	150.0	3:1	450.0	600.0	0.5:1	300.0	750.0	1. Habitat enhancement within species range. 2. Habitat acquisition and enhancement within species range.
Point Arena mountain beaver	3.0	3:1	9.0	7.5	0.5:1	3.25	10.75	1. Habitat acquisition within species range in Mendocino County. 2. Habitat enhancement within species range in Mendocino County. 3. Partner with others to contribute to habitat acquisition and enhancement within species range.

Covered Species	Permanent Habitat Loss (acres)			Temporary Habitat Loss (acres)			Total Mitigation (acres)[a]	Specific Mitigation Options[b, c]
	Requested Take	Mitigation Ratio	Mitigation	Requested Take	Mitigation Ratio	Mitigation		
Central Coast								
Longhorn fairy shrimp	1.7	3:1	5.1	10.3	0.5:1	5.2	10.3	1. Habitat acquisition within species range.
Vernal pool fairy shrimp	11.9	3:1	35.7	53.3	0.5:1	26.7	62.4	1. Habitat acquisition in Placer Butte Counties.
Morro shoulderband snail	3.0	3:1	9.0	6.0	0.5:1	3.0	12.0	1. Habitat enhancement in Morro Bay. 2. Habitat acquisition in Morro Bay.
Mount Hermon June beetle	7.5	3:1	22.5	22.5	0.5:1	11.3	33.8	1. Removal of invasive broom. 2. Enhancement partnership with others. 3. Purchase of credits at Zayante Hills Conservation Bank in Santa Cruz County.
Ohlone tiger beetle	7.5	3:1	22.5	22.5	0.5:1	11.3	33.8	1. Removal of invasive broom. 2. Enhancement partnership with others. 3. Purchase of credits at Zayante Hills Conservation Bank in Santa Cruz County.
Smith's blue butterfly	15.3	3:1	45.9	72.7	0.5:1	36.4	82.3	1. Habitat acquisition in Monterey County. 2. Partner with land trusts to contribute to habitat acquisition in Monterey County.
Zayante band-winged grasshopper	3.6	3:1	10.8	15.2	0.5:1	7.6	18.4	1. Removal of invasive broom. 2. Enhancement partnership with others. 3. Purchase of credits at Zayante Hills Conservation Bank in Santa Cruz County.

Covered Species	Permanent Habitat Loss (acres)			Temporary Habitat Loss (acres)			Total Mitigation (acres)[a]	Specific Mitigation Options[b, c]
	Requested Take	Mitigation Ratio	Mitigation	Requested Take	Mitigation Ratio	Mitigation		
California red-legged frog								1. Habitat acquisition within species range.
Potential Breeding Habitat	15.0	3:1	45.0	90.0	1:1	90.0	135.0	
Potential Upland Habitat	60.0	3:1	180.0	300.0	0.5:1	150.0	330.0	
California tiger salamander (Central California DPS)								1. Habitat acquisition within species range.
Potential Breeding Habitat	0.9	3:1	2.7	3.8	1:1	3.8	6.5	
Potential Upland Habitat	180.6	3:1	541.8	819.4	0.5:1	409.7	951.5	
California tiger salamander (Santa Barbara DPS)								1. Habitat acquisition in Santa Barbara County.
Potential Breeding Habitat	0.02	3:1	0.1	0.14	1:1	0.14	0.24	
Potential Upland Habitat	11.8	3:1	35.4	77.0	0.5:1	38.5	73.9	
Foothill yellow-legged frog								1. Partner with others to enhance or restore habitat. 2. Habitat acquisition in foothills within species range.
Potential Breeding Habitat	0.3	3:1	0.9	1.8	1:1	1.8	2.7	
Potential Dispersal Habitat	5.2	3:1	15.6	28.8	0.5:1	14.4	30.0	

Covered Species	Permanent Habitat Loss (acres)			Temporary Habitat Loss (acres)			Total Mitigation (acres)[a]	Specific Mitigation Options[b, c]
	Requested Take	Mitigation Ratio	Mitigation	Requested Take	Mitigation Ratio	Mitigation		
Santa Cruz long-toed salamander								1. Habitat acquisition within species range in Santa Cruz County. 2. Partner with others to contribute to habitat acquisition in Santa Cruz County. 3. Partner with others to enhance or restore habitat.
Breeding Habitat	3.0	3:1	9.0	3.0	1:1	3.0	12.0	
Upland Habitat	15.0	3:1	45.0	45.0	0.5:1	22.5	67.5	
Blunt-nosed leopard lizard								1. Habitat acquisition within species range in San Luis Obispo County. 2. Partner with others to contribute to habitat acquisition in Santa Cruz County.
Suitable Habitat	13.3	3:1	39.9	57.6	0.5:1	28.8	68.7	
Core Habitat	17.5	3:1	52.5	96.8	0.5:1	48.4	100.9	
Marbled murrelet	15.0	3:1	45.0	22.5	0.5:1	11.3	56.3	1. Habitat enhancement within species range.
Giant kangaroo rat	30.0	3:1	90.0	150.0	0.5:1	75.0	165.0	1. Habitat acquisition in San Luis Obispo County. 2. Habitat enhancement in San Luis Obispo County. 3. Partner with others to contribute to habitat acquisition and enhancement in San Luis Obispo County.

Covered Species	Permanent Habitat Loss (acres)			Temporary Habitat Loss (acres)			Total Mitigation (acres)[a]	Specific Mitigation Options[b, c]
	Requested Take	Mitigation Ratio	Mitigation	Requested Take	Mitigation Ratio	Mitigation		
San Joaquin kit fox								1. Habitat acquisition in San Luis Obispo County. 2. Habitat enhancement in San Luis Obispo County. 3. Partner with others to contribute to habitat acquisition and enhancement in San Luis Obispo County.
High-Value Suitable Habitat	15.0	3:1	45.0	90.0	0.5:1	45.0	90.0	
Moderate-Value Suitable Habitat	29.1	1:1	29.1	141.5	0.1:1	14.2	43.3	
Low-Value[d] Suitable Habitat	213.9	0.5:1	107.0	1003.0	0.1:1	100.3	207.3	

[a] Assumes mitigation is provided via stay ahead provision of this HCP. Totals are not summed as PG&E may acquire parcels that achieve multiple species values. For total mitigation acreages and cost see Chapter 6, *Plan Implementation and Funding*.

[b] Mitigation for impacts on wetlands will also include either a restoration or creation component.

[c] Additional or different options may be used based on opportunities that are available and approved by USFWS.

[d] Low-value modeled habitat was identified based on the low-quality habitat criteria developed under other regional conservation plans. Low-value modeled habitat represents areas with greater slopes and unsuitable movement corridors, and contain habitat that has been otherwise degraded or is marginally suitable for kit fox use.

5.6.2.5 Mitigation Summary for Plants

Mitigation for direct impacts on a covered plant is likely to be determined just prior to the covered activity taking place (usually weeks or months prior to covered activities), and is most likely to be implemented after an activity is completed, based on the success of restored habitat. Impacts on plants may be mitigated through onsite (i.e., within the ROW) habitat restoration or offsite on protected lands. However, because of the limited availability of occupied plant habitat, offsite mitigation for covered plants will be challenging. Although there may be some opportunities in some areas to mitigate simultaneously for impacts on plant and wildlife species (e.g., plants in vernal pool systems), onsite restoration and partnerships that promote plant recovery and conservation may offer greater conservation benefits for covered plant species than land acquisition.

Table 5-5 provides a summary of the conservation strategy for covered plants. Map Book zones and site-specific data on plant locality from the field will determine the acreage of impact and the number of plants that could be impacted. For small activities where additional surveys or monitoring are not conducted, acreages of disturbance area may serve as a surrogate for assessing and mitigating impacts. For larger activities where additional surveys and monitoring are routinely conducted, the number of individual plants or colony size will be the preferred unit of measure for assessing impacts and determining the appropriate mitigation. However, 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 and the density of plants from that element occurrence, or the nearest occurrence with a known plant density, 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 or will measure the post-activity ground disturbances.

Permanent impacts on occupied plant habitat are expected to occur less frequently than temporary impacts because new or replacement facilities and temporary work spaces can be sited outside of these sensitive areas. Table 5-5 provides the estimated number of plants that could be impacted over the permit term. Permanent impacts for plants are defined as absence of the plants subsequent to and as a result of a covered activity. Temporary impacts for plants are defined as pruning or temporarily removing topsoil and seedbank, where the plants recover. PG&E will implement the following mitigation for impacts on covered plant species.

- For permanent impacts, PG&E will provide mitigation in one of the following ways.
    - Planting offsets: For every annual, perennial, or manzanita plant that is permanently impacted, PG&E will provide mitigation at a 3:1 ratio. This ratio is intended to ensure that 1 plant is established and protected for every 1 plant permanently impacted.
    - For every acre or square foot of permanent impact, PG&E will provide mitigation at a 1:1 ratio.
- PG&E will not provide mitigation for temporary impacts on plants.

If impacts on perennial species are unavoidable, PG&E will salvage individual plants in advance of the impact and replant them within the ROW. Similarly, if impacts on annual plant species are unavoidable, PG&E will salvage topsoil and replace it within the ROW. PG&E will monitor the success of the replanting of perennial species and recovery of annual species for 3 years, unless the species is shown to have recovered sooner. If during this time the number of individual plants is not

equal to or within normal variation of the number of individuals originally removed, then PG&E will pursue other mitigation options to ensure that mitigation is implemented at the appropriate ratio. Mitigation options for impacts on perennials may include propagation of replacement stock for planting in suitable habitat within the ROW, where it will not conflict with operation or maintenance of utility facilities. For other plant species, options are dependent on habitat requirements and the availability of mitigation opportunities.

- Wetland plant species: purchase easements or land that benefits plants and consistent with acquisitions made for wildlife species.
- Annual plant species: partner with other organizations that are working to enhance and restore habitat for rare or endangered plants.

For activities impacting more than 0.1 acre in Map Book zones and for which AMMs are ineffective or cannot be implemented, PG&E will submit a restoration plan that includes the following information: an assessment of the impact site; methods for collecting, storing, or propagating plant material from the impact site; information on site preparation and reintroduction of collected plant material; measurable success criteria that can be achieved within a 3-year period (less time may be needed if it is unlikely the plant will recover and a permanent impact has occurred); adaptive management measures to ensure the desired success criteria are achieved; monitoring and reporting methods and schedules; funding source and responsible parties; and the acreage or number of individual plants expected to benefit from implementing the restoration plan. The duration of the restoration plan and restoration effort will depend on additional site-specific discussions with USFWS regarding the tradeoffs of restoration versus mitigation.

Additional measures could include (1) relocating aboveground facilities away from occupied habitat (but still within and subject to existing easements) on a case-by-case basis if feasible and allowable for safe and reliable operations; or (2) removing noxious weeds to expand habitat for annual species. If a conservation easement is not feasible for these lands because private owners are unwilling, PG&E will comply with the success criteria to ensure the population persists. USFWS approval of the plan and success criteria will be required.

Table 5-5. Plant Impacts and Mitigation Approach over 30-Year Permit Term

Plant Species	Impacts within the Plan Area (acres)	Impacts on Plants (individuals)	Mitigation Approach
Sacramento Valley and Foothills Region			
Ione manzanita	12.25	64	1. Salvage and replant as a component of ROW restoration, plus monitor success. 2. Acquire lands or conservation easements.
Pine Hill ceanothus	3.67	38	1. Salvage topsoil, and replace and recontour as a component of ROW restoration, plus monitor success. 2. Partner with conservation entity working to support the species (i.e., Pine Hill Ecological Reserve). 3. Acquire lands or conservation easements.
Pine Hill flannelbush	1.19	2	1. Salvage topsoil, and replace and recontour as a component of ROW restoration, plus monitor success. 2. Partner with conservation entity working to support the species (i.e., Pine Hill Ecological Reserve). 3. Acquire lands or conservation easements.

Plant Species	Impacts within the Plan Area (acres)	Impacts on Plants (individuals)	Mitigation Approach
Stebbins' morning-glory	2.31	787	1. Salvage topsoil, and replace and recontour as a component of ROW restoration, plus monitor success.
Layne's ragwort	2.86	103	1. Salvage topsoil, and replace and recontour as a component of ROW restoration, plus monitor success.
North Coast Region			
Beach layia	0.22	142	1. Salvage topsoil, and replace and recontour as a component of ROW restoration, plus monitor success.
Central Coast Region			
San Benito evening-primrose	0.37	1,888	1. Salvage topsoil, and replace and recontour as a component of ROW restoration, plus monitor success.
Monterey gilia	6.6	6,266	1. Salvage topsoil, and replace and recontour as a component of ROW restoration, plus monitor success.
Monterey spineflower	46.60	4,376	1. Salvage topsoil, and replace and recontour as a component of ROW restoration, plus monitor success.
robust spineflower	1.30	3,765	1. Salvage topsoil, and replace and recontour as a component of ROW restoration, plus monitor success.
Kern mallow	10.5	1,226	1. Salvage topsoil, and replace and recontour as a component of ROW restoration, plus monitor success.
Yadon's rein orchid	2.10	64	1. Salvage and replant as a component of ROW restoration, plus monitor success. 2. Acquire lands or conservation easements.

5.6.3 Types of Mitigation

PG&E may utilize a variety of approaches to fulfill its mitigation obligation. The following subsections describe these approaches. The specific approval process and requirements for each type of mitigation are identified in Section 5.6.4, *Mitigation Approval Process*.

5.6.3.1 Fee Title

PG&E may purchase lands in fee from willing sellers. Lands purchased in fee will be protected through a conservation easement or equivalent site protection mechanism approved by USFWS and will include a management plan and associated endowment. In most cases, PG&E will not own or manage mitigation sites, but will have qualified land conservation organizations hold title or easement and manage the property. Either PG&E or the land conservation organization may also conduct enhancement or restoration activities on these lands to make them more suitable for covered species.

5.6.3.2 Conservation Easements

PG&E may purchase conservation easements from willing sellers to be used as mitigation. A management plan and associated endowment will also be included. In most cases, PG&E will work with a qualified land conservation organization to secure conservation easements on habitat. PG&E also owns several parcels of land that have high conservation values and may be suitable for

mitigation. Either PG&E or the land conservation organization may also conduct enhancement or restoration activities on these lands to make them more suitable for covered species.

5.6.3.3 Conservation Partnerships

PG&E may partner with conservation organizations to further regional conservation efforts. In the study area, many local, state, and federal government organizations and nonprofit organizations (including land trusts and special districts) make species or habitat conservation part of their mission. PG&E funds contributed to land acquisition or management will serve as mitigation. Further, several regional, multiple-species HCPs/NCCPs and conservation strategies have been adopted in the Plan Area, to which PG&E could contribute finances or in-kind services. These types of contributions to regional conservation planning efforts have the advantage of building on or expanding existing species-focused conservation with immediate benefit to covered species.

To achieve the conservation goals of this HCP, PG&E may work with a variety of non-governmental organizations, CDFW ecological reserves, and other agencies or entities representing public HCP/NCCPs. Although the following lists of organizations and entities is not intended to be exhaustive, it represents current and anticipated collaborative opportunities within the Plan Area.

- Existing non-governmental organizations:
  - Big Sur Land Trust
  - California Trout
  - California Rangeland Trust
  - Elkhorn Slough Foundation
  - Mendocino Land Trust
  - San Luis Obispo County Conservancy
  - Santa Barbara County Land Trust
  - Save the Redwoods League
  - Sierra-Cascade Land Trust
- Existing CDFW ecological reserves:
  - Bonny Doon Ecological Reserve
  - Carrizo Plains Ecological Reserve
  - Pine Hill Ecological Reserve
  - Mattole River Ecological Reserve
  - Morro Dunes Ecological Reserve
- Existing public HCP/NCCPs:
  - *Butte Regional Conservation Plan* (in preparation)
  - *Natomas Basin HCP*
  - *Draft Western Placer County Conservation Plan* (in preparation)
  - *South Sacramento HCP*

- *Yolo County HCP/NCCP*

Financial and In-Kind Contribution to Local Land Managers

Many federal, state, and local land managers, park districts, and nonprofit organizations (e.g., The Nature Conservancy), including managers of national wildlife refuges, state parks, wildlife areas and ecological reserves, have missions that include the protection and conservation of endangered species. PG&E may contribute to these efforts through financial or in-kind services if such contributions are shown to have direct benefits to covered species on the public lands where covered species impacts may occur. Such contributions by PG&E would be subject to USFWS review and approval. This type of mitigation will have a discrete timeline for implementation; will result in covered species habitat restoration or enhancement; and will demonstrate a measurable benefit to the species while satisfying a portion of PG&E's mitigation needs.

Financial and In-Kind Contribution to Restoration Efforts

Extensive restoration activities by various entities are under way throughout the Plan Area. PG&E could partner with such organizations and make financial or in-kind contributions to restoration efforts that benefit habitat of one or more covered species. Once an opportunity, including acreage of benefit, is identified financial or in-kind contributions would need the approval of USFWS.

5.6.3.4 Conservation/Mitigation Banks

PG&E may purchase credits from an approved conservation or mitigation bank. Conservation/mitigation bank credits are available to meet some of PG&E's needs. Although there are currently no credits for some species, additional conservation/mitigation banks will likely be created and approved over the next 30 years, expanding the number of covered species for which credits would be available. Upon USFWS approval of the bank, PG&E may purchase credits from these banks to mitigate its impacts. In addition, on a case by case basis subject to USFWS approval, PG&E may obtain mitigation credits created as part of a Regional Conservation Investment Strategy (RCIS). The physical location of any conservation bank must be within the Plan Area or Integrated Plan Area.

5.6.3.5 Habitat Enhancement and Restoration

PG&E may consider enhancement or restoration projects to serve as mitigation. This approach will be implemented in instances where other mitigation approaches are unavailable or may not be reasonably achieved. For example, there may be limited or no opportunity for purchase of fee title lands or easements for narrow endemic species such as Morro shoulderband snail, Zayante band-winged grasshopper, Santa Cruz long-toed salamander, and most covered plants. In these instances, PG&E may fund specific enhancement and restoration projects to benefit those species. Examples of habitat enhancement or restoration efforts to promote recovery include removing invasive species that are inhibiting recovery. In some instances, other restoration enhancement and restoration efforts for more common species may also serve as mitigation; examples include dredging ponds to make them more suitable for California red-legged frog, creating new aquatic habitat, or contributing to bullfrog eradication efforts. PG&E will work closely with the USFWS to gain agreement on the number of mitigation credits that will be generated from an enhancement or restoration activity before fulling committing any financial resources. Enhancement or restoration

would create credits that PG&E would be able to use in the future to offset future impacts on covered species.

5.6.4 Mitigation Approval Process

Once any mitigation proposal has been finalized, PG&E will furnish copies of all final documents to the USFWS Office that has primary responsibility over the geographic area in which the mitigation is to be completed, and to the Sacramento Office for inclusion into the decision record for implementation of the MRHCP. For example, if mitigation is to occur in the geographic area overseen by the Ventura Office, PG&E will furnish final documents to the Ventura Office and the Sacramento Office.

5.6.4.1 Approval Process for Fee Title and Easements

The mitigation approval process is designed to be as efficient and streamlined as possible, while also providing USFWS the information required to make informed decisions. The process includes six steps, discussed below. PG&E and USFWS will work to complete habitat acquisition transactions as quickly as possible.

Step 1. Habitat Acquisition Site Evaluation

PG&E will prepare a mitigation acquisition form to provide USFWS with a summary of the mitigation opportunity. On the form, PG&E will identify the mitigation site size and location, covered species benefitting from the acquisition, and the proposed conservation easement holder. PG&E will also provide a mitigation site map and other site information, including a biological resources survey report and a preliminary title report. PG&E will use existing templates and forms where possible (e.g., acquisition form and checklist), but may also modify these forms to make them appropriate for this HCP. During this initial step, USFWS will review the documents provided and may conduct a site visit with PG&E and its agent. The landowner may accompany USFWS on the site visit or review the documents if desired. If a landowner refuses to provide access to USFWS, and as a result USFWS cannot perform a site evaluation, USFWS may refuse to approve the mitigation until USFWS is able to inspect the site.

Step 2. Conceptual Approval

PG&E will work with USFWS to obtain conceptual approval of the site. If USFWS supports selection of the site, it will provide confirmation that additional investigation of the site is merited.

Step 3. PG&E Submittal of the Habitat Acquisition Package

Based on conceptual approval, PG&E will then prepare additional documentation consisting of a draft conservation easement (using the pre-approved Conservation Easement Deed template in Appendix C) and a draft management plan. If these documents are not included in the acquisition package, PG&E will provide a schedule for when they will be prepared. Such plans will be deemed to meet minimum requirements if they address the topics set forth in the management plan template in Appendix C. PG&E or its agent will also proceed with compiling or preparing additional items as follows:

- Phase I Environmental Site Assessment.

- Preliminary title report (less than 6 months old) and a policy of title insurance.
- Copies of documents supporting any title exceptions or title encumbrances.
- Plat map of the property showing existing easements, structures, and other features.
- County Assessor parcel map(s).
- Copy of the current tax bill for the property.
- Biological resources report.
- Summary of species-acre credits to be generated from the acquisition.
- Summary of transactions.
- A list of individuals who are legally authorized to sign the documents.

PG&E will work with USFWS on the preliminary review of these items as they are being prepared and any known potential issues of concern will be discussed prior to submission of the complete package. PG&E will also work with USFWS on development of easement or grant deed language if there are deviations from the easement template. PG&E will submit a complete set of conservation easement and other supporting documents to USFWS and any other agency involved in mitigation site acquisition approval.

Step 4. Review of the Habitat Acquisition Package

USFWS will review the habitat acquisition package within 30 working days of receipt and provide confirmation that the package is: (1) complete and acceptable, (2) acceptable with modifications, or (3) incomplete. If there is a deviation from the standard easement template or management plan, then this timeline may not be met. USFWS will notify PG&E as soon as possible if USFWS cannot review the acquisition package within 30 days, and will provide PG&E an estimate of how much time in addition to the 30 days it may need to review the acquisition package.

Step 5. Revised Drafts of Documents in the Habitat Acquisition Package

At the end of USFWS's 30-working-day review, PG&E will incorporate revisions and edits to draft documents in the habitat acquisition package. For those revisions received from USFWS after 60 working days in either Step 4 or Step 5, PG&E will accommodate the revisions. If a response is not received after an additional 30 working days, the request will be elevated pursuant to the process set out in Section 6.8.3, *Dispute Resolution Process*.

Step 6. Proceed with Transaction

Once USFWS has approved the documents, PG&E will proceed with the transaction.

5.6.4.2 Approval Process for Conservation Partnerships

The specific mitigation value associated with contribution to an approved HCP or HCP/NCCP will be approved by the permitted entity and USFWS. PG&E will develop a proposal for such contributions, indicating the amount to be contributed, the types of activities on which funds will be spent, and the species expected to benefit from the contribution. The proposal will also discuss future commitments of PG&E and implementing entity with regard to species protection, monitoring, reporting, and additional contributions. For example, PG&E will work with the HCP implementing

entity to fund general actions such as habitat protection within a region, or specific actions such as habitat restoration in a particular area. In each instance, direct benefits to covered species habitat must be demonstrated. USFWS will review the proposal within 30 working days of submittal and indicate whether the proposal is: (1) complete and acceptable, (2) acceptable with modifications, or (3) incomplete. If PG&E does not receive a response from USFWS within 60 working days, then PG&E will contact the appropriate Field Supervisor at USFWS to determine the status and timing of the response. If a response is not received after an additional 30 working days, the request will be elevated following escalation procedures outlined in Chapter 6, *Plan Implementation and Funding*.

5.6.4.3 Approval Process for Purchasing Credits from Conservation/Mitigation Banks

PG&E may purchase available mitigation credits from conservation/mitigation banks with service areas that overlap the Plan Area if the physical location of the conservation banks are also within the Plan Area or the Integrated Plan Area.

5.6.4.4 Approval Process for Offsite Habitat Enhancement and Restoration

PG&E may, on its own or in collaboration with others, pursue habitat enhancement and restoration opportunities in the Plan Area. Where there is a need for specialized offsite habitat enhancement or restoration, PG&E will work with conservation partners to develop options and practical actions that benefit covered species. Proposals for such actions must identify the species expected to benefit, how the actions will benefit the species, how long the improvements are intended to benefit the species, the schedule and cost associated with the enhancement or restoration action, and success criteria. Proposals must be approved by USFWS. USFWS will respond to the proposal within 30 working days. If a response is not received after an additional 30 working days, the request will be elevated pursuant to the process set out in Section 6.8.3, *Dispute Resolution Process*.

5.6.5 Mitigation Credit Release

The approval process describe above is time consuming, but PG&E is providing assurances that these lands will be protected and their management conducted consistent with the species' conservation needs. To this end, a credit release schedule is provided to account for these assurances.

5.6.5.1 Fee Title and Conservation Easement

For fee title land that is purchased for conservation, PG&E will receive 25% of its mitigation value (in acres) when the land is secured by a contract to purchase (i.e., optioned), 50% of its mitigation value upon acquisition, and 25% upon finalizing the management plan, recording the conservation easement and funding the endowment. If the land or easement is not acquired, PG&E will ensure that the 25% of the mitigation value that it had available when the land was intended to be purchased is deducted from PG&E's available mitigation. If covered activities have taken place that required deductions from the available mitigation, and that causes PG&E to owe mitigation for covered activities, the procedures under section 5.6.1.2, *Stay Ahead Provision* will apply.

5.6.5.2 Conservation Partnerships

Conservation partnerships can take the form of land management (i.e., removing invasive species) or restoration and creation efforts. For land management and restoration and creation efforts, 50% of the conservation values approved by USFWS will be released upon PG&E's contribution of funding to the entity. The remaining 50% of the conservation values will be released upon achievement of performance standards for the mitigation land.

For conservation partnership land that is proposed for habitat restoration or creation, PG&E will receive 25% of its mitigation value upon USFWS approval of design drawings, 50% value upon completion of construction, and the remaining 25% upon fulfillment of success criteria. However, if the project fails to meet success criteria, the compliance credit will be reduced to match the extent to which success criteria have been met. If design drawings are approved, but construction of conservation action is not started within 1 year of the approval of those drawings, PG&E will remove all credited mitigation from its mitigation available for debit. PG&E may request from USFWS a single, 1-year time extension to implement the conservation action.

5.6.5.3 Conservation/Mitigation Banks

Conservation values associated with conservation or mitigation banks within the Plan Area will be released in full (100%) upon the purchase of the credits.

5.6.5.4 Habitat Restoration and Enhancement

Conservation values associated with restoration and enhancement projects will be released incrementally. PG&E will receive 25% of its mitigation value upon USFWS approval of design drawings, 50% of value upon completion of construction, and the remaining 25% of mitigation value upon fulfillment of success criteria. However, if the project fails to meet success criteria, the compliance credit will be reduced to match the extent to which success criteria have been met. If design drawings are approved but construction is not started within 1 year of the approval of those drawings, PG&E will remove all credited mitigation from its mitigation available for debit. PG&E may request from USFWS a single, 1-year time extension to implement the land management, creation, or restoration.

5.6.6 Selection, Location, and Management of Habitat Mitigation Lands

5.6.6.1 Mitigation Land Selection

Purchase and preservation of high-quality natural lands, especially those already supporting multiple covered species, are most desirable in the overall mitigation package. Lands that do not require intensive management to maintain existing habitat quality and those that provide opportunities for habitat enhancement also will receive high priority for acquisition as mitigation lands. When mitigation for critical habitat is necessary, lands currently designated or proposed for designation as critical habitat, and which have the appropriate primary constituent elements, will be prioritized for acquisition or preservation. Additionally, PG&E will work with USFWS to identify critical or high-threat areas that could be pursued for mitigation and priority conservation.

Desirable features of conservation lands include the following qualities.

- Demonstrated species use or occupancy.
- Overall habitat suitability and quality.
- Proximity and connectivity to other mitigation lands, mitigation banks, or other protected areas.
- Proximity and connectivity to other important habitats (e.g., wetlands, vernal pools, forests, woodlands, riparian areas) that may not be a target of mitigation efforts.
- Minimum levels of past site disturbance or high potential for restoration from disturbance.
- High conservation priority due to impending threat of development or land conversion.

Candidate sites must meet one of the following two selection criteria to be suitable for mitigation.

1. Species presence.
2. Suitability as determined by one of the following:
    a. Biologist provides qualitative assessment of the presence, suitability for presence, or ability of the site to support species, based on vegetation structure, plant community associations, proximity to CNDDB or other known occurrences, or observations of scat or other signs of covered species' presence or use of a site.
    b. Property contributes to protecting important corridors.

For some species, demonstrating that habitat is occupied may be challenging because of factors such as frequent population fluctuations (e.g., butterflies); difficulty in detecting species (e.g., giant garter snake); or infrequent presence of species in the study area (e.g., San Joaquin kit fox). In these instances, a mitigation site may be selected based on the second criteria: suitability.

5.6.6.2 Location of Mitigation Areas

PG&E will locate mitigation opportunities in accordance with species distribution and the land-selection factors and attributes identified in this section. These opportunities are conceptually described Section 5.6.2, *Determination of Habitat Mitigation Needs* and in Table 5-4, although specific mitigation locations may change based on available mitigation opportunities. PG&E will implement mitigation in the three planning regions: Sacramento Valley and Foothills, North, and Coast Central. This regional framework will ensure that mitigation coincides appropriately with impacts from covered activities.

5.6.6.3 Mitigation Management Plans

Management plans for each conservation parcel will be prepared in consultation with USFWS. Upon completion, all management plans must be approved by USFWS, which will respond to, comment on, or approve a plan within 60 days of submittal. USFWS will notify PG&E as soon as possible if USFWS cannot review the acquisition package within 60 days, and will provide PG&E an estimate of how much additional time may need to review the management plan. Management plans prepared under this HCP will include information as outlined in Appendix C or will adhere to the format of other USFWS-approved management plans. Although the required content may vary with prior approval from USFWS, management plans typically contain the following elements.

- List of covered species to be managed under the plan.

- Management goals.
- Description of management and enhancement activities.
- Maps of existing habitat.
- Acreage table for each habitat type included within conserved land.
- Maps of proposed fence and sign locations.
- Description of anticipated management activities to be performed, including vegetation management.
- Maps of proposed habitat enhancement locations.
- Success criteria for habitat enhancement or restoration and contingency plans if success criteria are unmet.
- Description of applicable monitoring activities.
- Documentation of agreement with a specified conservation easement holder, if any; identification of any deed restrictions on fee-owned land.
- Cost of management and endowment (Property Analysis Record or similar analysis).
- Documentation of agreement with a specified managing entity.
- Description of other activities allowed on the preserve (e.g., education, flood control) and how their impacts on covered species will be minimized.
- Determination of whether public access would be permitted.
- Description of potential revenue-generating activities to be permitted, if applicable.
- Description of how unwanted or illegal activities will be eliminated or reduced in the preserve.
- Description of methods for predator control (e.g., feral cats, coyotes, bullfrogs), if necessary.

5.6.7 Mitigation Debit Process

PG&E will maintain a ledger of mitigation acreage acquired and used to compensate for impacts from covered activities. This ledger will include information on the acres of species habitat that is available for each species from the total credits available from mitigation parcels. These acres will be tracked as species-acre credits, and will be debited as part of each year's annual accounting of species' impact and mitigation needs. PG&E will retain any surplus mitigation credits at the end of the permit duration or upon permit termination for use on future PG&E activities.

5.6.8 Pending Interim Conservation Lands

PG&E has acquired conservation lands during HCP development that will count towards the HCP's compensatory mitigation requirements when the HCP permit is issued (Table 5-6 and Figure 5-4). Evaluating land acquisition and other compensation mechanisms requires a significant amount of time and resources and can take years to complete. Both PG&E and USFWS staff (as well as CDFW, when co-listed species involved) must review and approve these evaluations, as well as conservation easements, management plans, and endowments necessary to provide assurances for perpetual management and protection. Because of this level of effort, key acquisitions were identified during HCP development to ensure that PG&E could provide compensatory mitigation

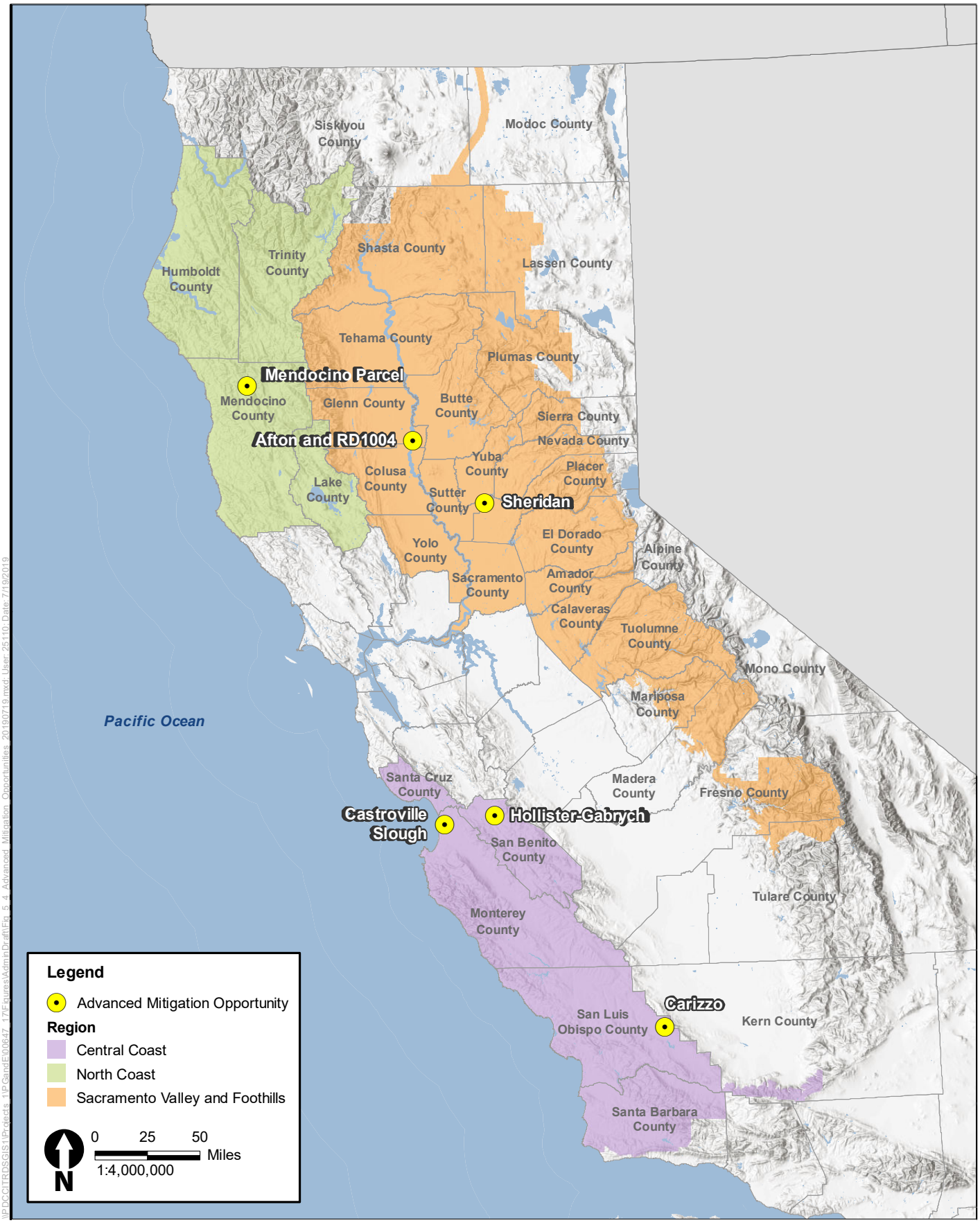


Figure 5-4
Advanced Mitigation Opportunities

ahead of or concurrent with the impacts from covered activities. These acquisitions, presented below, are located in Placer, San Benito, Monterey, and San Luis Obispo Counties.

Sheridan – PG&E purchased a 526-acre parcel in Placer County that is adjacent to existing conservation lands and is a priority conservation area for the Placer County Conservation Plan. The parcel has grassland and vernal pool complex habitat that supports vernal pool tadpole shrimp, vernal pool fairy shrimp, Conservancy fairy shrimp, and giant garter snake (Figure 5-5). 526 acres would be available towards PG&E mitigation needs. A conservation easement, management plan, and endowment are proposed.

Hollister-Gabrych – PG&E has acquired 634 acres in San Benito County. The parcel has grassland and vernal pool complex habitat that supports California red-legged frog, California tiger salamander, and San Joaquin kit fox (Figure 5-6). The parcel is also located in critical habitat for California tiger salamander. A conservation easement, management plan, and endowment are proposed.

Castroville Slough – PG&E has acquired a 233-acre parcel in Monterey County**.** Approximately 86 acres of the parcel are within transmission line ROW. Of the 147 acres outside of the ROW, there are 121 acres of upland habitat and 26 acres of wetted habitat that supports California tiger salamander and California red-legged frog. This parcel is adjacent to Elkhorn Slough State Marine Conservation Area and Moro Cojo Slough State Marine Reserve (Figure 5-7). A conservation easement, management plan, and endowment are proposed.

Carrizo – PG&E has acquired 120 acres in the Carrizo Plain, in San Luis Obispo County. A portion of the parcel has been used for other PG&E activities, leaving 80 acres for HCP mitigation activities. The parcel's grasslands support San Joaquin kit fox, giant kangaroo rat, and blunt-nosed leopard lizard (Figure 5-8). A conservation easement, management plan, and endowment are proposed.

Muzzy Ranch Conservation Bank – PG&E has acquired 400 acre-credits of California tiger salamander upland habitat in the Muzzy Ranch Conservation Bank, in Solano County. The service area of the bank extends north into Yolo County and east into Amador and Calaveras County. A portion of these lands may be used for MRHCP mitigation.

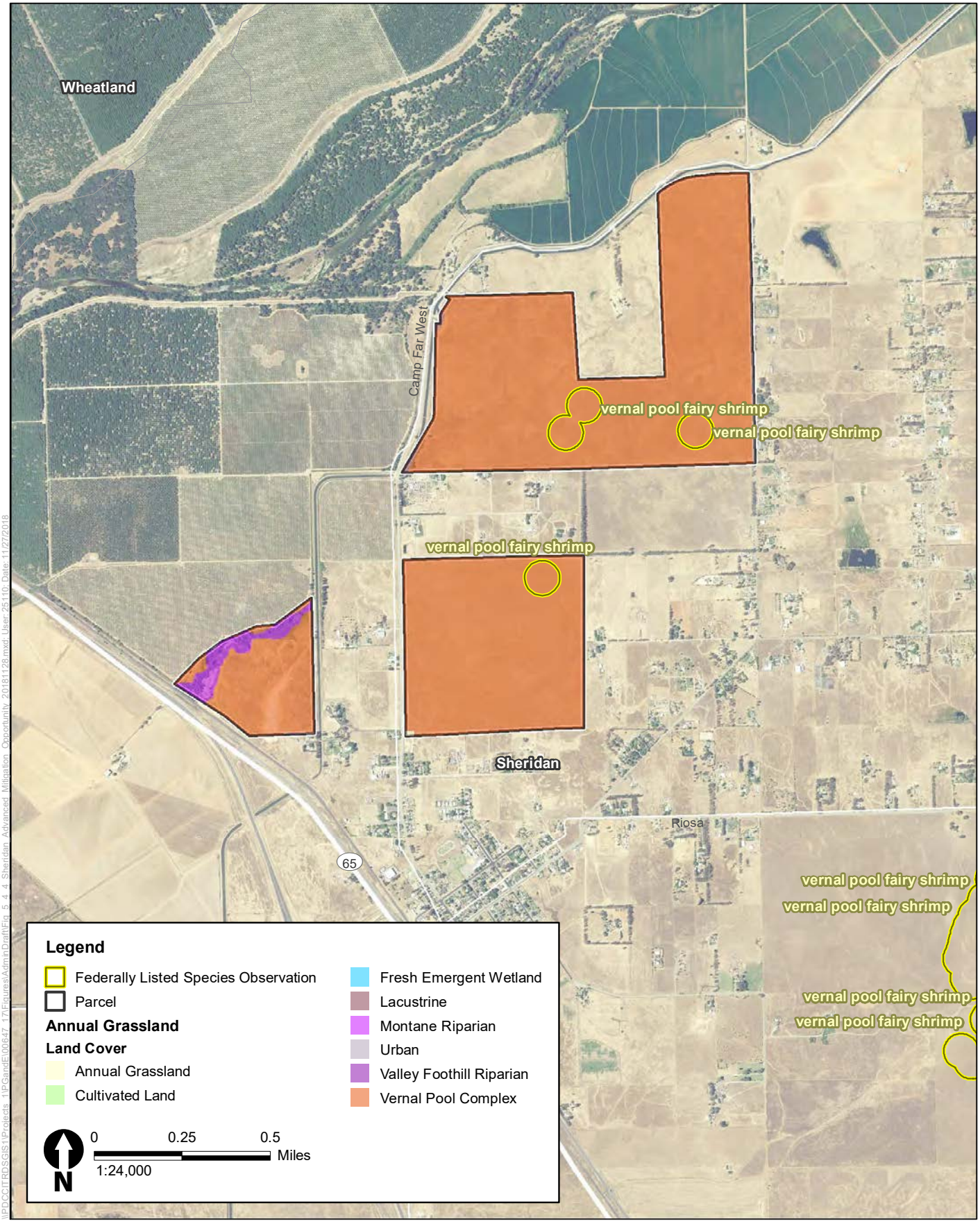
Afton and RD1004 – In 2007, PG&E completed two valley elderberry longhorn beetle mitigation projects in Glenn County for its Systemwide VELB Conservation Program. The projects were referred to as Afton and RD1004. The Afton site consisted of 222.3 acres and 373 original elderberry shrubs, which were supplemented with planting of an additional 2,196 shrubs (2,569 shrubs, total). The second site, RD1004 contained 34.8 acres and 38 elderberry shrubs (Figure 5-9). With deductions made as a result of the Systemwide VELB Conservation Program, it is estimated that 229 acres of Glenn County mitigation remain for impacts on valley elderberry longhorn beetle.

Mendocino Parcel – In partnership with Save the Redwoods League, PG&E is in the process of evaluating and acquiring 523 acres in Mendocino County. The parcel has second growth closed canopy coastal coniferous forest providing high quality northern spotted owl and suitable marbled murrelet habitat. The parcel provides connectivity between two adjacent preservation properties with active northern spotted owl activity centers, and has documented northern spotted owl on the property. In addition, the parcel is directly adjacent to marbled murrelet critical habitat designations. A fee title acquisition, conservation easement, management plan, and endowment are proposed for perpetual management of habitat.

Table 5-6. Pending Interim Conservation Lands

Parcel	Parcel Name Pending Interim Parcels	Parcel Size (acres) / Credits (acres)	County	Approach	Land Cover	Species	Other Notes (Relationship to other Conservation, Critical Habitat, etc.)
Jump Start							
A	Sheridan	526 (504 acres upland habitat and 22 acres wetted habitat)/526	Placer	FT, CE, MP, E	Grassland, Vernal pool complex	Vernal pool tadpole shrimp, vernal pool fairy shrimp, Conservancy fairy shrimp, giant garter snake	Adjacent to existing conservation lands. In priority conservation area for Placer County Conservation Plan.
B	Hollister-Gabrych	634 (613 acres upland habitat and 21 acres wetted)/634	San Benito	FT, CE, MP, E	Grassland, Vernal pool complex	San Joaquin kit fox, California tiger salamander, California red-legged frog	California tiger salamander critical habitat,
C	Castroville Slough	147 (121 acres upland habitat and 26 acres wetted)/147	Monterey	FT, CE, MP, E	Cultivated Land, Annual grassland, Barren, Saline Emergent Wetland	California tiger salamander, California red-legged frog	Adjacent to other protected lands, Elkhorn Slough Ecological Reserve and Moro Cojo Slough State Marine Reserve. Important for conservation.
D	Carrizo	120 (40 acres previously used for other activities/80	San Luis Obispo	FT, CE, MP, E	Annual Grassland	Bluntnose leopard lizard, giant kangaroo rat, San Joaquin kit fox	Adjacent to other protected lands.
E	Muzzy Ranch Conservation Bank	400 (upland dispersal habitat)/TBD	Solano County	CB	Annual Grassland	California tiger salamander	Adjacent to other protected lands.
F	Afton and RD1004	257.1 (valley elderberry longhorn beetle habitat)/229	Glenn County	CE	Riparian Habitat	Valley elderberry longhorn beetle	Along the Sacramento River and near other conservation lands.
G	Mendocino Parcel	523/523	Mendocino County	CE, MP, E	Coastal Coniferous Forest	Northern spotted owl, marbled murrelet	Adjacent to other protected lands.
Total		2,607/2,139					

CE = Conservation Easement, FT = Fee Title Acquisition, MP = Management Plan, E = Endowment, Cr = Credit, CB = Conservation Bank, TBD = To be determined.



\\PGCGTRDSGIS1\Projects_1\PGandE\006447_17\Figures\Admin Draft\Fig_5_4_4_Sheridan_Advanced_Mitigation_Opportunity_20181128.mxd: User: 25110: Date: 11/27/2018

Figure 5-5
Sheridan Advanced Mitigation Opportunity

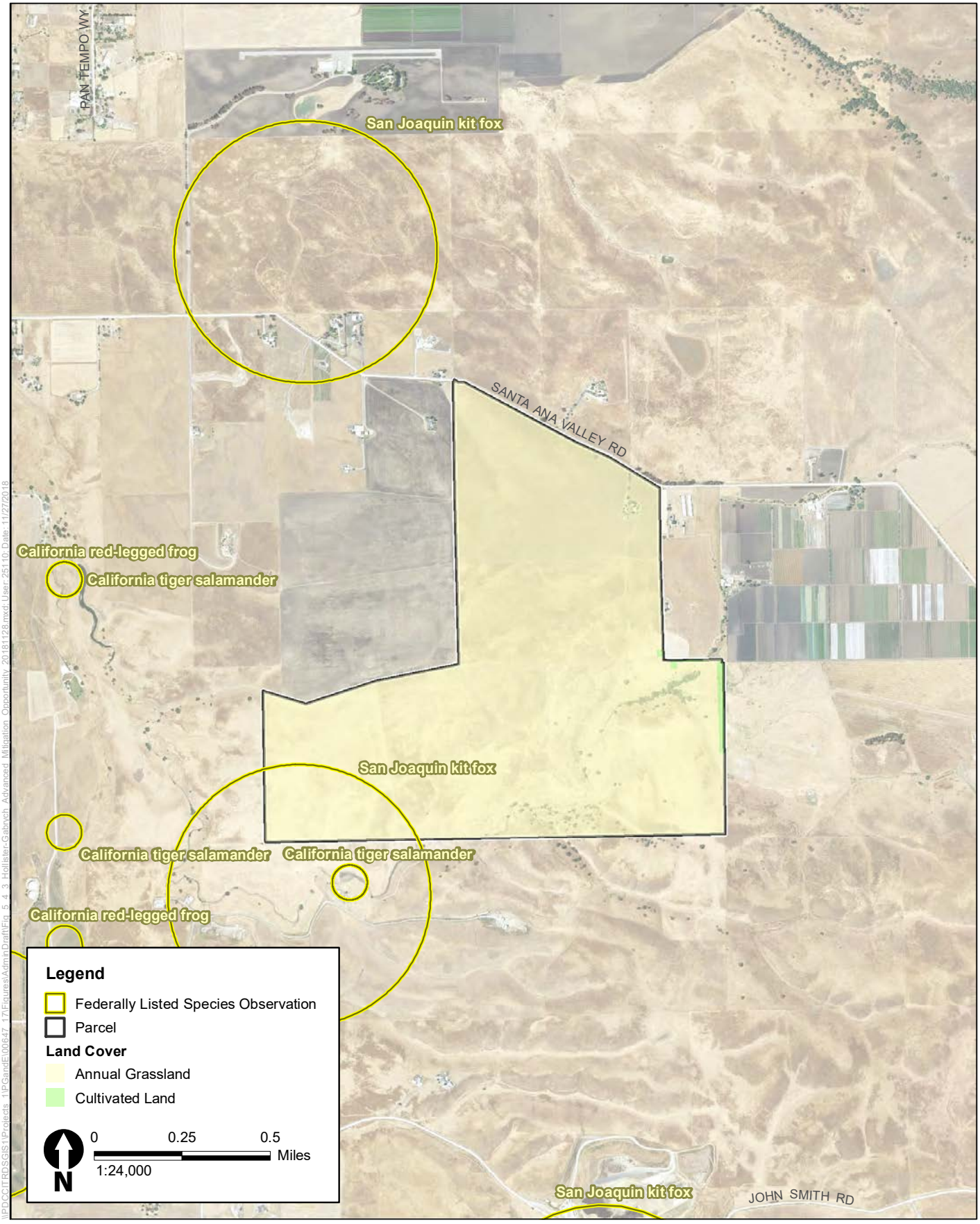
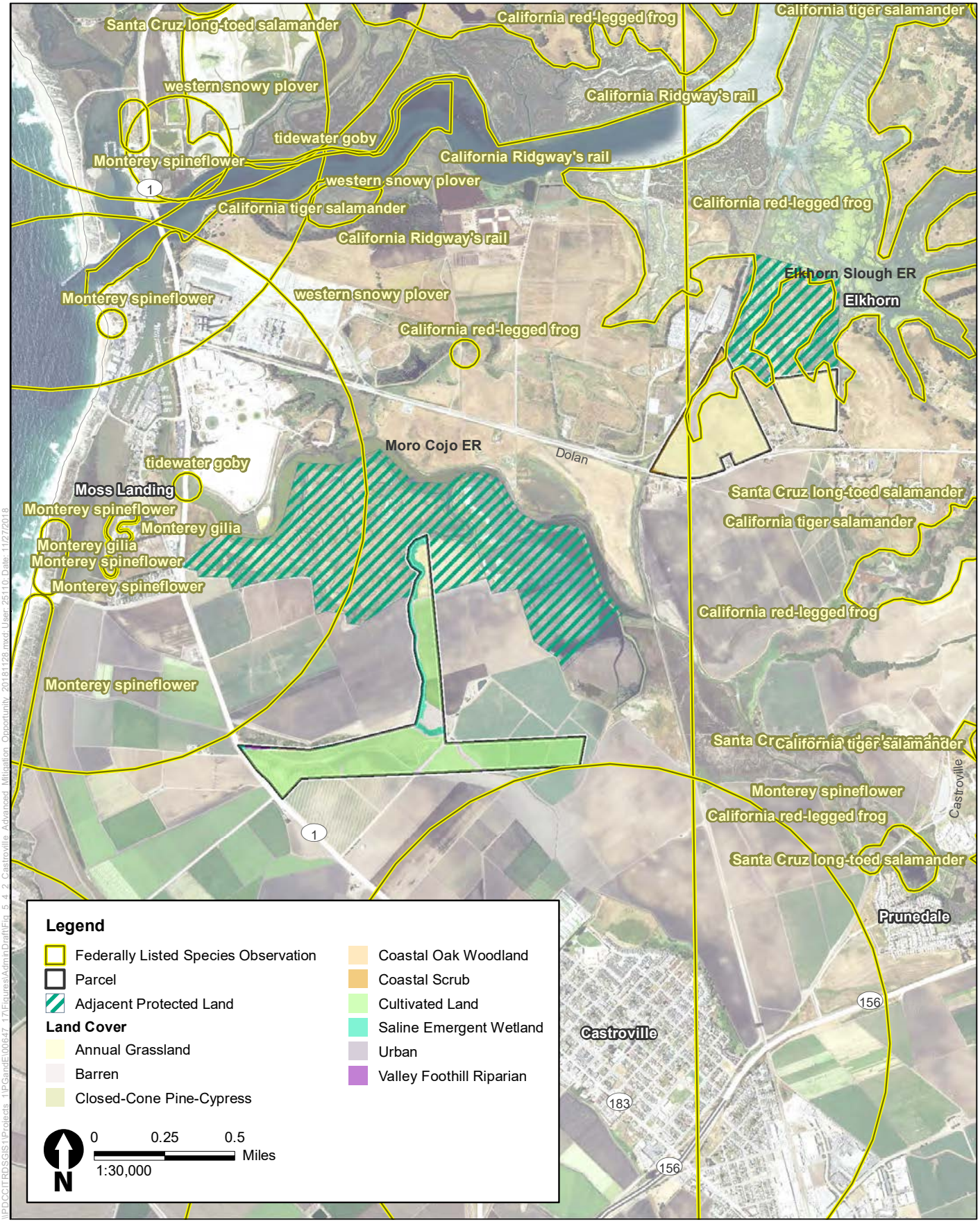
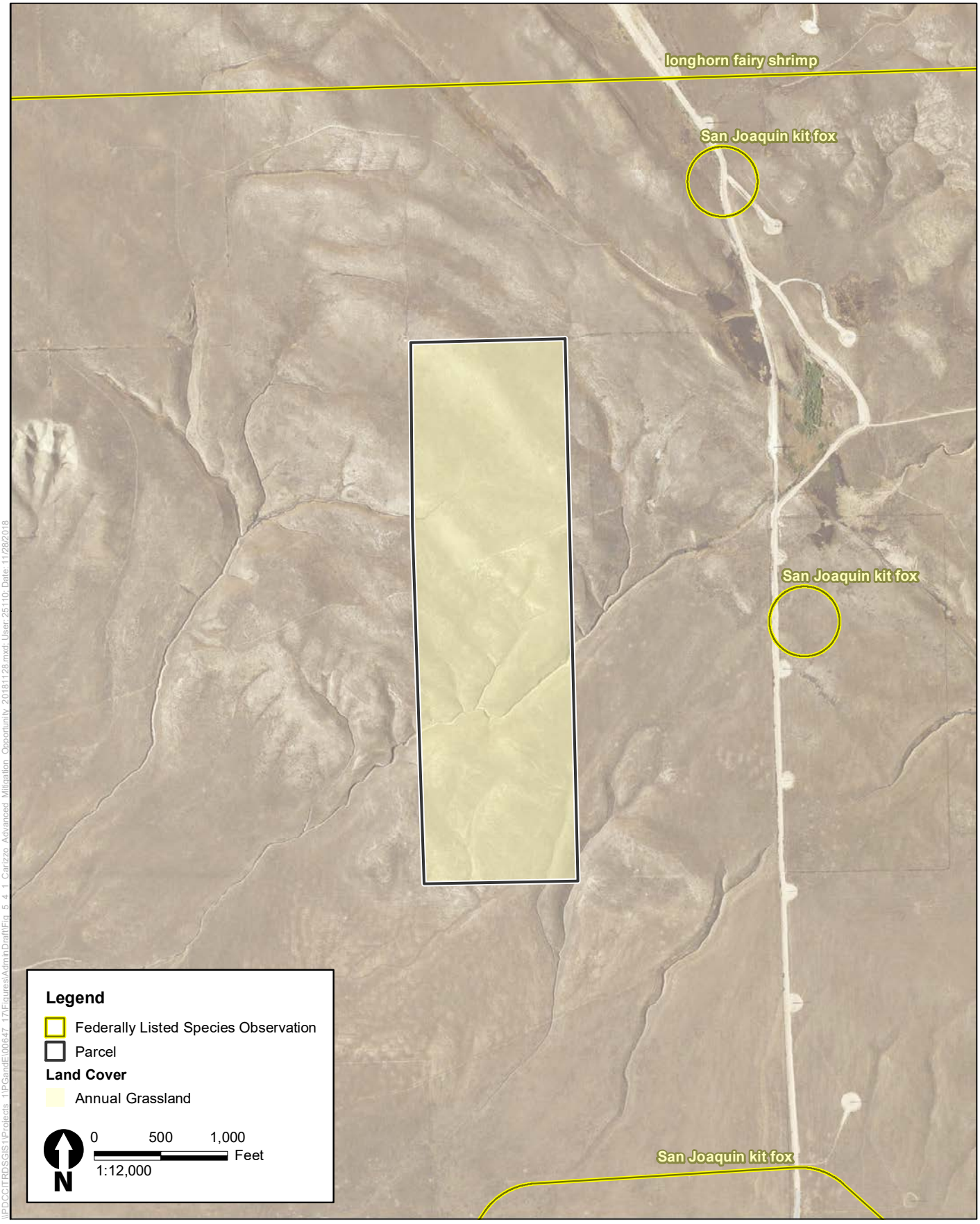


Figure 5-6
Hollister-Gabrych Advanced Mitigation Opportunity



\\PGCGITRDSGIS1\Projects_1\PGandE\000447_47\Figures\Admin Draft\Fig_5_4_2_Castroville_Advanced_Mitigation_Opportunity_20181128.mxd User: 26110 Date: 11/27/2018

Figure 5-7
Castroville Slough Advanced Mitigation Opportunity



\\PDCGITRDSGIS1\Projects_1\PGandE\00647_17\Figures\Admin Draft\Fig_5_4_1_Carizzo_Advanced_Mitigation_Opportunity_20181128.mxd User: 25110 Date: 11/28/2018

Figure 5-8
Carizzo Advanced Mitigation Opportunity

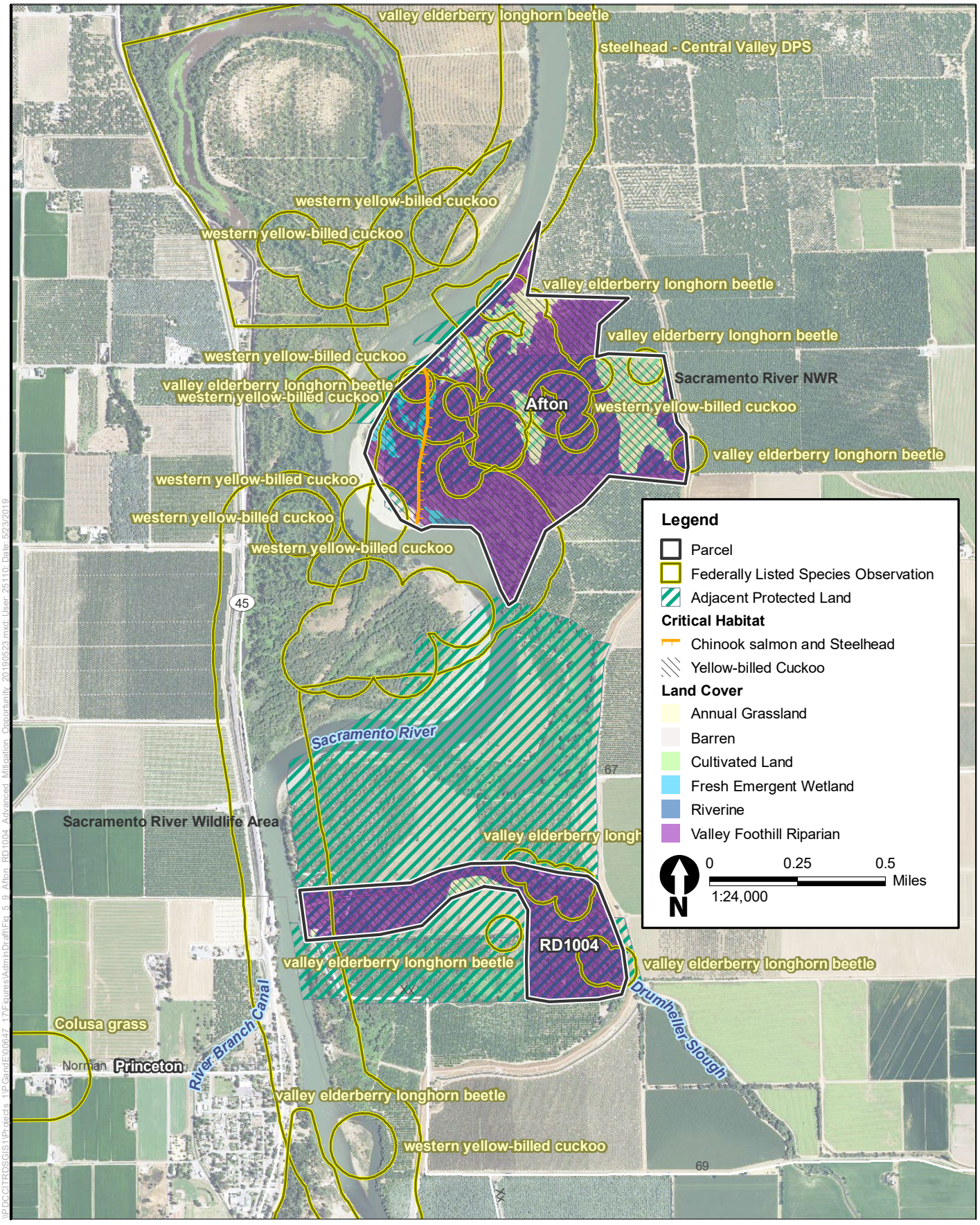


Figure 5-9
Afton and RD1004 Advanced Mitigation

5.7 Conservation Strategy Summary

Table 5-7 provides a species-by-species summary of how implementation of the conservation strategy will avoid, minimize, and mitigate impacts on covered wildlife and plant species.

Table 5-7. Conservation Strategy Summary for Covered Wildlife and Plant Species

Species	Avoidance and Minimization Measures	Mitigation[a]	Conclusion
Sacramento Valley and Foothills Region			
Wildlife			
Conservancy fairy shrimp	FP-01 through FP-05, FP-07 through FP-12, FP-14 through FP-17, Hot Zone-2, Wetland-1, Wetland-2, Minor New-1	Preserve 51.5 acres of habitat.	Direct impacts avoided or minimized with the hot zone AMM and application of large activity AMM and FPs. Mitigation ensures impacts will be mitigated.
Longhorn fairy shrimp	FP-01 through FP-05, FP-07 through FP-12, FP-14 through FP-17, Hot Zone-2, Wetland-1, Wetland-2, Minor New-1	Preserve 10.5 acres of habitat.	Direct impacts avoided or minimized with the hot zone AMM and application of large activity AMM and FPs. Mitigation ensures impacts will be mitigated.
Vernal pool fairy shrimp	FP-01 through FP-05, FP-07 through FP-12, FP-14 through FP-17, Wetland-1, Wetland-2, Minor New-1	Preserve 232.6 acres of habitat.	Direct impacts avoided or minimized with the application of large activity AMM and FPs. Any remaining impacts will be mitigated.
Vernal pool tadpole shrimp	FP-01 through FP-05, FP-07 through FP-12, FP-14 through FP-17, Wetland-1, Wetland-2, Minor New-1	Preserve 232.6 acres of habitat.	Direct impacts avoided or minimized with the application of large activity AMM and FPs. Any remaining impacts will be mitigated.
Valley elderberry longhorn beetle	FP-01 through FP-04, VELB-1, Minor New-1	Preserve 228.3 acres of habitat.	Direct impacts avoided or minimized with the application of large activity AMM and FPs. Any remaining impacts will be mitigated.
California red-legged frog	FP-01 through FP-17, Wetland-2, Minor New-1	Preserve 515.3 acres of habitat.	Direct impacts avoided or minimized with the application of large activity AMM and FPs. Any remaining impacts will be mitigated.
California tiger salamander (Central California DPS)	FP-01 through FP-17, Wetland-1, Wetland-2, Minor New-1	Preserve 408.5 acres of habitat.	Direct impacts avoided or minimized with AMMs and FPs. Mitigation ensures impacts will be mitigated.
Foothill yellow-legged frog	FP-01 through FP-17, Wetland-2, Minor New-1	Preserve 60.9 acres of habitat.	Direct impacts avoided or minimized with the application of large activity AMM and FPs. Any remaining impacts will be mitigated.

Species	Avoidance and Minimization Measures	Mitigation[a]	Conclusion
Mountain yellow-legged frog (northern DPS)	FP-01 through FP-17, Wetland-2, Minor New-1	Preserve 3.3 acres of habitat.	Direct impacts avoided or minimized with the application of large activity AMM and FPs. Any remaining impacts will be mitigated.
Sierra Nevada yellow-legged frog	FP-01 through FP-17, Wetland-2, Minor New-1	Preserve 4.4acres of habitat	Direct impacts avoided or minimized with the application of large activity AMM and FPs. Any remaining impacts will be mitigated.
Yosemite toad	FP-01 through FP-17, Wetland-2, Minor New-1	Preserve 2.5 of habitat	Direct impacts avoided or minimized with the application of large activity AMM and FPs. Any remaining impacts will be mitigated.
Giant garter snake	FP-01 through FP-17, Wetland-2, GGS-1, Minor New-1	Preserve 453.9 acres of habitat.	Direct impacts avoided or minimized with the application of large activity AMM and FPs. Any remaining impacts will be mitigated.
Northern spotted owl	FP-01 thorough FP-18, NSO-1, Minor New-1	Preserve 75.0 acres of habitat.	Direct impacts avoided or minimized with the application of large activity AMM and FPs. Mitigation ensures impacts will be mitigated.
Plants			
Ione manzanita	Plant-01, Plant-02, Plant-04, Plant-05, Plant-07, Plant-08, Plant-09, Minor New-1	Preserve 12.25 acres of habitat.	Direct impacts avoided or minimized with the application of Plant AMMs, FPs, and BMPs. Any remaining impacts will be mitigated.
Pine Hill ceanothus	Plant-01, Plant-02, Plant-04, Plant-05, Plant-07, Plant-08	Preserve 3.67 acres of habitat.	Direct impacts avoided or minimized with the application of Plant AMMs, FPs, and BMPs. Any remaining impacts will be mitigated.
Pine Hill flannelbush	Plant-01, Plant-02, Plant-04, Plant-05, Plant-07, Plant-08, Minor New-1	Preserve 1.19 acres of habitat.	Direct impacts avoided or minimized with the application of Plant AMMs, FPs, and BMPs. Any remaining impacts will be mitigated.
Stebbins' morning-glory	Plant-01, Plant-02, Plant-04, Plant-05, Plant-07, Plant-08, Minor New-1	Preserve 2.31 acres of habitat.	Direct impacts avoided or minimized with the application of Plant AMMs, FPs, and BMPs. Any remaining impacts will be mitigated.
Layne's ragwort	Plant-01, Plant-02, Plant-04, Plant-05, Plant-07, Plant-08, Minor New-1	Preserve 2.86 acres of habitat.	Direct impacts avoided or minimized with the application of Plant AMMs, FPs, and BMPs. Any remaining impacts will be mitigated.
North Coast Region			
Wildlife			
Vernal pool fairy shrimp	FP-01 through FP-05, FP-07 through FP-12, FP-14 through FP-17, Wetland-1, Wetland-2, Minor New-1	Preserve 3.7 acres of habitat.	Direct impacts avoided or minimized with the application of large activity AMM and FPs. Any remaining impacts will be mitigated.

Species	Avoidance and Minimization Measures	Mitigation[a]	Conclusion
Vernal pool tadpole shrimp	FP-01 through FP-05, FP-07 through FP-12, FP-14 through FP-17, Wetland-1, Wetland-2, Minor New-1	Preserve 3.7 acres of habitat.	Direct impacts avoided or minimized with the application of large activity AMM and FPs. Any remaining impacts will be mitigated.
California red-legged frog	FP-01 through FP-17, Wetland-2, Minor New-1	Preserve 52.5 acres of habitat.	Direct impacts avoided or minimized with the application of large activity AMM and FPs. Any remaining impacts will be mitigated.
Foothill yellow-legged frog	FP-01 through FP-17, Wetland-2, Minor New-1	Preserve 41.8 acres of habitat.	Direct impacts avoided or minimized with the application of large activity AMM and FPs. Any remaining impacts will be mitigated.
Marbled murrelet	FP-01 thorough FP-18, MM-1, Minor New-1	Preserve 120.0 acres of habitat.	Direct impacts avoided or minimized with the application of large activity AMM and FPs. Mitigation ensures impacts will be mitigated.
Northern spotted owl	FP-01 thorough FP-18, NSO-1, Minor New-1	Preserve 750.0 acres of habitat.	Direct impacts avoided or minimized with the application of large activity AMM and FPs. Mitigation ensures impacts will be mitigated.
Point Arena mountain beaver	FP-01 through FP-10, FP-12, FP-14, FP-17, Hot Zone-13, Minor New-1	Preserve 16.5 acres of habitat.	Direct impacts avoided or minimized with the hot zone AMM and application of large activity AMM and FPs. Mitigation ensures impacts will be mitigated.
Plants			
beach layia	Plant-01 through Plant-06, Minor New-1	Preserve 0.22 acres of habitat.	Direct impacts avoided or minimized with the application of Plant AMMs, FPs, and BMPs. Any remaining impacts will be mitigated.
Central Coast Region			
Wildlife			
Longhorn fairy shrimp	FP-01 through FP-05, FP-07 through FP-12, FP-14 through FP-17, Hot Zone-2, Wetland-1, Wetland-2, Minor New-1	Preserve 10.3 acres of habitat.	Direct impacts avoided or minimized with the hot zone AMM and application of large activity AMM and FPs. Mitigation ensures impacts will be mitigated.
Vernal pool fairy shrimp	FP-01 through FP-05, FP-07 through FP-12, FP-14 through FP-17, Wetland-1, Wetland-2, Minor New-1	Preserve 62.4 acres of habitat.	Direct impacts avoided or minimized with the application of large activity AMM and FPs. Any remaining impacts will be mitigated.
Morro shoulderband snail	FP-01 through FP-05, FP-07 through FP-10, FP-12, FP-17, Hot Zone-12, Minor New-1	Preserve 12.0 acres of habitat.	Direct impacts avoided or minimized with the hot zone AMM and application of large activity AMM and FPs. Mitigation ensures impacts will be mitigated.
Mount Hermon June beetle	FP-01 through FP-05, FP-07 through FP-10, FP-12, FP-17, Hot Zone-14, Minor New-1	Preserve 33.8 acres of habitat.	Direct impacts avoided or minimized with the application of large activity AMM and FPs. Any remaining impacts will be mitigated.

Species	Avoidance and Minimization Measures	Mitigation[a]	Conclusion
Ohlone tiger beetle	FP-01 through FP-05, FP-07 through FP-10, FP-12, FP-17, Hot Zone-11, Minor New-1	Preserve 33.8 acres of habitat.	Direct impacts avoided or minimized with the hot zone AMM and application of large activity AMM and FPs. Mitigation ensures impacts will be mitigated.
Smith's blue butterfly	FP-01 through FP-05, FP-07 through FP-10, FP-12, FP-17, SBB-1, Minor New-1	Preserve 82.3 acres of habitat.	Direct impacts avoided or minimized with the application of large activity AMM and FPs. Any remaining impacts will be mitigated.
Zayante band-winged grasshopper	FP-01 through FP-05, FP-07 through FP-10, FP-12, FP-17, Hot Zone-10, Minor New-1	Preserve 18.4 acres of habitat.	Direct impacts avoided or minimized with the hot zone AMM and application of large activity AMM and FPs. Mitigation ensures impacts will be mitigated.
California red-legged frog	FP-01 through FP-17, Wetland-2, Minor New-1	Preserve 465.0 acres of habitat.	Direct impacts avoided or minimized with the application of large activity AMM and FPs. Any remaining impacts will be mitigated.
California tiger salamander (Central California DPS)	FP-01 through FP-17, Wetland-1, Wetland-2, Minor New-1	Preserve 958.0 acres of habitat.	Direct impacts avoided or minimized with the AMMs and FPs. Mitigation ensures impacts will be mitigated.
California tiger salamander (Santa Barbara DPS)	FP-01 through FP-17, Wetland-1, Wetland-2, Minor New-1	Preserve 74.1 acres of habitat.	Direct impacts avoided or minimized with the AMMs and FPs. Mitigation ensures impacts will be mitigated.
Foothill yellow-legged frog	FP-01 through FP-17, Wetland-2, Minor New-1	Preserve 32.7 acres of habitat.	Direct impacts avoided or minimized with the application of large activity AMM and FPs. Any remaining impacts will be mitigated.
Santa Cruz long-toed salamander	FP-01 through FP-17, Hot Zone-9, Wetland-2, Minor New-1	Preserve 79.5 acres of habitat.	Direct impacts avoided with the hot zone AMM and application of large activity AMM and FPs. Mitigation ensures impacts will be mitigated.
Blunt-nosed leopard lizard	FP-01 through 10, FP-12, FP-13, FP-14, FP-17, BNLL-1, Minor New-1	Preserve 169.6 acres of habitat.	Direct impacts avoided with the application of large activity AMM and FPs. Any remaining impacts will be mitigated.
Marbled murrelet	FP-01 thorough FP-18, MM-1, Minor New-1	Preserve 56.3 acres of habitat.	Direct impacts avoided or minimized with the application of large activity AMM and FPs. Mitigation ensures impacts will be mitigated.
Giant kangaroo rat	FP-01 through 10, FP-12, FP-13, FP-14, FP-17, GKR-1, Minor New-1	Preserve 165.0 acres of habitat.	Direct impacts avoided or minimized with the application of large activity AMM and FPs. Any remaining impacts will be mitigated.
San Joaquin kit fox	FP-01 through 10, FP-12, FP-13, FP-14, FP-17, SJKF-1, Minor New-1	Preserve 340.6 acres of habitat.	Direct impacts avoided or minimized with the application of large activity AMM and FPs. Any remaining impacts will be mitigated.
Plants			
San Benito evening-primrose	Plant-01 through Plant-06, Minor New-1	Preserve 0.37 acres of habitat.	Direct impacts avoided or minimized with the application of Plant AMMs, FPs,

Species	Avoidance and Minimization Measures	Mitigation[a]	Conclusion
			and BMPs. Any remaining impacts will be mitigated.
California jewel-flower	Plant-01 through Plant-06, Minor New-1	Preserve 0.72 acres of habitat.	Direct impacts avoided or minimized with the application of Plant AMMs, FPs, and BMPs. Any remaining impacts will be mitigated.
Monterey spineflower	Plant-01 through Plant-06, Minor New-1	Preserve 46.6 acres of habitat.	Direct impacts avoided or minimized with the application of Plant AMMs, FPs, and BMPs. Any remaining impacts will be mitigated.
Robust spineflower	Plant-01 through Plant-06, Minor New-1	Preserve 1.3 acres of habitat.	Direct impacts avoided or minimized with the application of Plant AMMs, FPs, and BMPs. Any remaining impacts will be mitigated.
Kern mallow	Plant-01 through Plant-06, Minor New-1	Preserve 10.5 acres of habitat.	Direct impacts avoided or minimized with the application of Plant AMMs, FPs, and BMPs. Any remaining impacts will be mitigated.
Monterey gilia	Plant-01 through Plant-06, Minor New-1	Preserve 6.6 acres of habitat.	Direct impacts avoided or minimized with the application of Plant AMMs, FPs, and BMPs. Any remaining impacts will be mitigated.
Yadon's rein orchid	Plant-01, Plant-02, Plant-04, Plant-05, Plant-07, Plant-08, Minor New-1	Preserve 2.1 acres of habitat.	Direct impacts avoided or minimized with the application of Plant AMMs, FPs, and BMPs. Any remaining impacts will be mitigated.

[a] Mitigation reflects the estimated permanent and temporary impacts to suitable habitat at the proposed mitigation ratios, over a 30-year period as described earlier in the Chapter.

Chapter 6
Plan Implementation and Funding

***Summary**: This chapter describes the implementation structure, implementation tasks, monitoring, reporting, and adaptive management requirements for the MRHCP. It builds on information provided in Chapter 5, and describes how PG&E will staff, implement, monitor, and report on its covered activities. It also describes the regulatory assurances being sought, changed and unforeseen circumstances, and conditions for permit renewal and amendments. Finally, the chapter includes information on program costs, funding, and funding assurances. The cost of implementing the MRHCP could be as high as $96.6 million over the next 30 years, adjusted for inflation. This total includes implementation and training costs, mitigation costs, and program development costs.*

6.1 Implementation Structure

PG&E's Environmental Management group is responsible for environmental planning and permitting of all utility infrastructure and projects. The Environmental Management group will be responsible for the overall management of the MRHCP through a dedicated team of employees that will implement the program. The HCP team will include an HCP administrator and land planning analysts. Direct support to the HCP team will come from company-wide land planners and biologists who will work with the HCP administrator to ensure successful implementation of and compliance with the MRHCP. Biological monitors and field crews will have direct roles for implementing and following AMMs in the field.

6.1.1 Staffing

6.1.1.1 Management Oversight

PG&E will ensure that staffing levels are adequate to fully implement the MRHCP. PG&E's Environmental Management organization has the following responsibilities.

- Ensuring staff resources are available to resolve MRHCP program issues.
- Supervising staff to ensure successful implementation of the MRHCP program.
- Developing performance metrics and reports to illustrate the status of MRHCP implementation.
- Working with the HCP team to identify, document, and resolve noncompliance issues.
- Supporting and leading MRHCP process improvements with the LOBs.

6.1.1.2 HCP Team

HCP Administrator

The HCP administrator will manage the day-to-day implementation and oversee the compliance, monitoring, and reporting aspects of the MRHCP. The HCP administrator's primary responsibilities will be as follows:

- Serving as a point of contact for USFWS for MRHCP implementation issues.
- Overseeing the development and delivery of MRHCP training materials for PG&E staff and contractors.
- Tracking and recording of data to implement the conservation strategy.
- Tracking and recording incidental take information.
- Maintaining records of available mitigation.
- Coordinating validation studies for compliance with the MRHCP.
- Maintaining monitoring and survey data reports.
- Preparing annual reports.
- Evaluating the effectiveness of the program, including the effectiveness of AMMs.
- Making recommendations to ensure that the MRHCP's biological goals and objectives are being met.
- Identifying biological leads to review and approve biological monitors and *authorized* biologists.

Land Planning Analysts

The land planning analysts will organize and manage the data to directly support implementation of and compliance with the MRHCP. The land planning analysts will have the following responsibilities.

- Collecting data on covered activities from land planners, biologists, and automated systems (e.g., AEA).
- Collecting and compiling monitoring reports and survey data from land planners and biologists.
- Preparing monthly and quarterly status reports for the HCP administrator.

6.1.1.3 Land Planners

PG&E's land planners play a significant role in identifying the environmental and permitting requirements for projects and covered activities. The land planners work with biologists, cultural resource specialists, environmental field specialists, and others to identify the environmental and permitting constraints or requirements on projects and covered activities. The land planners will work with the HCP administrator to identify and prescribe AMMs and report on specific activities and their locations. Land planners will have the following responsibilities.

- Reporting on activity impacts and confirm mitigation availability.
- Ensuring covered activities are planned and designed in a way to avoid and minimize impacts consistent with the MRHCP.
- Consulting appropriate resource experts in planning and designing activities.
- Obtaining appropriate permits and authorizations before starting activities.
- Ensuring activities are compliant with permits and authorizations.

6.1.1.4 Biologists

PG&E biologists or contract biologists will work closely with the HCP administrator, land planners, and field crews, and will have the following responsibilities.

- Reporting on activity impacts.
- Conducting environmental training and tailboard meetings with crews.
- Conducting biological surveys as directed by the HCP team or land planner.
- Prescribing AMMs and overseeing their implementation.
- Serving as the biological monitor for covered activities.
- Responding to reports of death or injury of a covered wildlife species.
- Relocating covered species out of harm's way at construction sites when necessary and when authorized by the HCP administrator and USFWS.
- Developing site restoration plans to address impacts on listed plant species.

Biologists will conduct biological surveys when necessary pursuant to the AMMs and will conduct monitoring when needed to minimize take. Biological surveys and site-specific monitoring are periodically necessary for large activities (see Table 5-3 and Figure 5-2 in Chapter 5). Biological evaluations, including possible surveys and monitoring, may be necessary for activities in hot zones and Map Book zones. *Authorized* biologists are those biologists with training and handling experience who can safely handle and relocate or translocate a covered species. To become an authorized biologist, the biologist must be confirmed to have met minimum requirements by the biological lead identified by the HCP administrator and must be approved by USFWS. Only individuals with demonstrated training and handling experience, and without ESA violations, may be deemed authorized. PG&E will report to USFWS positive survey results and monitoring detections as part of its annual report and provide information on the number and location of species it discovers during surveys and monitoring activities.

6.1.1.5 Field Crews

PG&E's field crews, including contract field personnel, will follow the pertinent vegetation management BMPs, field protocols, and AMMs as directed by the land planner, biologist, HCP administrator, or HCP analyst. Field crews at the covered activity site will work closely with biologists to ensure compliance with AMMs during field crews' day-to-day work activities.

6.2 Implementation Tasks

A variety of implementation tasks is associated with the program. These tasks are described in Chapter 5, *Conservation Strategy*, and in the sections below.

6.2.1 Conduct Education and Training

Three types of training will be given to PG&E staff and contractors: annual training, project-specific training, and as-needed training. Annual training is broad and will cover multiple aspects of the MRHCP, including the MRHCP as a program, covered activities, covered species, AMMs, compliance

requirements, and the conservation strategy. The targeted audience that will receive MRHCP education and training include construction crew members, project managers, land planners, land management staff, construction contractors, and environmental management staff. Annual training will be conducted either in-person or as computer-based training.

Project-specific training (e.g., tailboards) will be provided for staff working on covered activities for which AMMs are required, when work is conducted in a hot zone, when species-specific AMMs are required on large projects, and as required when PG&E is working in Map Book zones.

Training will also be provided for staff on an as-needed basis throughout the implementation of the MRHCP. As-needed training could address implementation, use of habitat models, methods for standardizing field work, prescription of FPs and AMMs, and other topics.

6.2.2 Conduct Environmental Review, Planning and Screening

PG&E will continue to conduct its environmental review, planning, and screening processes for ongoing O&M work activities. These standard operating procedures provide the foundation for ensuring work is conducted in a manner that avoids and minimizes impacts on the environment and natural resources. In addition to compliance with MRHCP requirements, land planners and biologists ensure that all environmental, regulatory, and land management requirements are followed.

6.2.2.1 Utilization of the Species Habitat Models

PG&E will integrate the species habitat models into Map Guide, PG&E's system-wide GIS system that contains all facility, environmental, and land use GIS data and information. The Environmental Management group and the HCP team will be trained on the use of the species habitat models and their relationship to the conservation strategy. The Environmental Management group will also be trained on the requirements for working in hot zones and Map Book zones to ensure successful implementation of AMMs and BMPs when covered activities are conducted in those areas.

The HCP team, land planners, and biologists will utilize species habitat models and other data sources in Map Guide during their respective environmental review, planning, and screening processes to determine the use of AMMs for covered activities. Land planners and biologists will work with the HCP team to review, confirm, or identify where covered activities could impact covered species habitat and where mitigation is necessary to compensate for covered activity impacts. Environmental Management staff will be trained on how the models will be used to determine required mitigation for impacts unless additional site review reveals that the site or area is no longer habitat, as described in Chapter 5, Section 5.4.1.1, *Use of Habitat Models.*

6.2.3 Implement AMMs and Vegetation Management BMPs

As part of the initial MRHCP implementation training, Environmental Management staff will be trained on the AMMs and vegetation management BMPs as described in Chapter 5, Section 5.5.1, *Avoidance and Minimization of Impacts.* PG&E will implement field protocols and AMMs described in Table 5-1, the BMPs described in Table 5-2, and the conservation strategy summary approach illustrated in Table 5-3. Table 5-3 provides additional information on screening of hot zone and Map Book zone locations, flexibility of work locations, ability to avoid burrows, PG&E's ability to report and track impacts on modeled habitat, and whether onsite restoration is anticipated. PG&E will

conduct an assessment and review of its AMMs and vegetation management BMPs, as described under Section 6.3.3, *Effectiveness Monitoring*, to determine if they are performing as anticipated.

6.2.3.1 General Restoration Efforts

PG&E land planners and biologists will ensure site restoration efforts are implemented after completion of covered activities affecting more than 0.1 acre (Chapter 5, Section 5.5.1.3, *Site Restoration Approach*) and will report this information to the HCP administrator. Information on the number of restoration sites and the status of the restoration efforts will be aggregated quarterly and summarized for USFWS annually.

6.2.4 Covered Plant Salvage, Restoration, and Monitoring

For activities affecting more than 0.1 acre in Map Book zones for which AMMs are ineffective or cannot be implemented and permanent loss of covered plants will result, a biologist will develop a site-specific plant restoration plan. The plant restoration plan will contain the following information:

- Number of individual plants to be salvaged in advance of covered activities, if plants are in a condition that can be salvaged.
- An assessment of the impact site.
- A description of methods for collecting, storing, or propagating plant material from the impact site.
- Information on site preparation and reintroduction of collected plant material.
- Measurable success criteria for a 3-year period.
- Adaptive management measures to ensure the desired success criteria are achieved.
- Monitoring and reporting methods and schedules.
- Identification of the acreage or number of individual plants expected to benefit from implementing the restoration plan.

For perennials, PG&E biologists will salvage individual plants in advance of the impact and replant them within the ROW, where feasible. For annuals, PG&E biologists will salvage seeds and topsoil and replace it within the ROW. PG&E biologists will monitor the success of the replanting of perennial species and recovery of annual species for up to 3 years. If the success criteria in the site-specific restoration plan are met prior to the 3-year period, monitoring can be discontinued and information regarding successful restoration will be presented in the annual report. If monitoring efforts indicate that restoration is unsuccessful, a permanent impact would be identified in the annual report for the restoration activity, and mitigation would be acquired at the permanent impact ratio.

6.2.5 Maintain Mitigation Requirements

PG&E will secure mitigation for its impacts as described in Chapter 5, Section 5.6, *Habitat Mitigation.* The specific details of the approach; determination of habitat mitigation needs; types of mitigation; approval process; selection, location and management considerations; and debit process are described in Chapter 5. PG&E will keep track of the acres of habitat acquired, its location, and the

species benefiting from the mitigation. PG&E will also account for the acres of habitat debited from mitigation lands. PG&E will track the types of habitat acquired, and identify any issues associated with the habitat acquisitions or management. If there are acquisition or management issues, PG&E will work with USFWS to adjust the acquisition process or clarify management decisions. Additional information on tracking impacts and mitigation is provided in Sections 6.4.1, *Impact Accounting*, and 6.4.2, *Mitigation Accounting*.

6.3 Monitoring

The HCP team will conduct three types of annual, required monitoring.

- **Compliance monitoring** – monitoring that tracks compliance with the requirements of the MRHCP. The HCP administrator and land planning analysts will be responsible for overseeing the compliance monitoring as covered activities are planned and completed.
- **Effects monitoring** – monitoring that tracks and organizes the impacts of the covered activities on the covered species habitat. The HCP administrator will be responsible for ensuring that impact estimates are being evaluated and revised as necessary.
- **Effectiveness monitoring** – monitoring that tracks the effectiveness of the measures in meeting the MRHCP's biological goals and objectives. PG&E management and the HCP administrator will be responsible for reviewing the monitoring data and assessing whether the biological goals and objectives are being met.

The monitoring obligations are described in more detail below.

6.3.1 Compliance Monitoring

PG&E will verify the MRHCP's conservation measures are being implemented as required. Compliance monitoring will include collecting information that:

- Confirms education and training are conducted.
- Demonstrates environmental review, planning, and screening are implemented.
- Shows biological surveys and monitoring are conducted as described and required by the MRHCP.
- Confirms AMMs and vegetation management BMPs are implemented as described and required by the MRHCP.
- Provides an accounting of impacts and mitigation.

Compliance monitoring information will be provided in the annual report as described in Section 6.4, *Reporting.*

6.3.2 Effects Monitoring

PG&E will verify its impacts are in line with the assumptions and impact estimates used in developing the MRHCP. Impacts will vary from year to year. PG&E will use a combination of disturbance estimates for small activities and actual impact data (on the ground measurements) for medium and large activities to track its impacts, as described in Chapter 5, *Conservation Strategy*,

and presented in Table 5-3. To confirm that the estimates for small activities are accurate and have not changed over time, the HCP team will conduct a validation study by reviewing 50 activities in implementation years 5 and 10. This study will assess small activities to verify that impacts were equal to or smaller than those indicated in the MRHCP. The validation study will analyze activities shown in Table 5-3, specifically, activities G3, G5, G8, E5, E6, E7, and E11. A combination of GIS-based desktop and in-the-field measurements will be used to evaluate the impact estimates from covered activities during MRHCP implementation. PG&E will conduct the validation study after USFWS approves the study's design. PG&E will compare these results with the impact estimates used during MRHCP development. The validation study will help ensure the impacts are accounted for correctly. If PG&E determines, and USFWS concurs, that these validation efforts are not valuable (i.e., the surveys continue to demonstrate the activities are small and unchanging, or PG&E is unable to detect impacts), PG&E may reprioritize its staff time to focus on other areas of effects monitoring. Effects monitoring information will be provided in the annual report, as described in Section 6.4, *Reporting*.

6.3.3 Effectiveness Monitoring

The purpose of effectiveness monitoring is to ensure the overall program is being implemented effectively. Effectiveness monitoring will focus on two areas: (1) MRHCP effectiveness as related to the effectiveness of the AMMs, permit compliance, tracking, and reporting, and (2) effectiveness of mitigation to benefit covered species.

6.3.3.1 MRHCP Effectiveness

The HCP team will collect, compile, and summarize data from the land planners and biologists regarding completed covered activities, biological surveys, monitoring reports, release to construction documentation, and other information to evaluate overall effectiveness of the program. Based on this information, the HCP team will answer the following questions.

- Is the program operating as anticipated?
- Is the program effectively avoiding and minimizing take of covered species?
- Are there changes that would make the program more effective?
- Can changes be made within the scope, budget, and staffing available?
- Are changes consistent with the permits?
- Will USFWS support changes?

In addition, the HCP team will complete the following actions.

- Identify when AMMs can be improved.
- Collect and analyze information from land planners and biologists as to why AMMs may have been ineffective or difficult to implement, and solicit ideas for improvement.
- Coordinate with USFWS to determine what is working or not working regarding program implementation.

Information gathered from these actions may identify problems associated with implementation of the hot zone or species-specific AMMs and help the HCP team to develop modifications to existing measures to make them more effective and efficient. Further, additional AMMs may be identified

over time. Changes in AMMs or new AMMs will be implemented only with the concurrence of USFWS.

6.3.3.2 Mitigation Effectiveness

The HCP team will ensure that the mitigation program is effective. The HCP team will ensure mitigation lands contribute to a network of permanently protected and managed lands and ensure mitigation lands benefit covered species as planned in site-specific management plans. Mitigation properties will be subject to regular management, monitoring, and reporting, and the results of these efforts will be summarized in PG&E's annual report from all mitigation property managers overseeing conservation land management (see Section 6.4, *Reporting*). As described in Chapter 5, the MRHCP provides for multiple mitigation approaches. If PG&E purchases credits from a mitigation or conservation bank or regional HCP, PG&E will rely on the effectiveness monitoring associated with those management plans to demonstrate the mitigation is effective. If PG&E purchases habitat through fee title or conservation easement, effectiveness monitoring will be built into the individual management plans. Additional information on maintaining the habitat values on mitigation sites is described in Section 6.5, *Adaptive Management for Mitigation Lands*, and Section 6.6. *Changed Circumstances, Unforeseen Circumstances, and Regulatory Assurances.*

6.4 Reporting

The HCP team will prepare annual reports to document permit compliance and implementation of the conservation strategy. Each annual report will summarize the previous calendar year's activities and will be completed by June 1 following the reporting year. The report delivery date may be changed with mutual agreement of PG&E and USFWS. Annual reports will be submitted to designated representatives of USFWS.

The annual report will meet the following goals.

- Provide the necessary information to demonstrate PG&E is implementing the MRHCP successfully and in compliance with the Section 10 permit.
- Document challenges with plan implementation that occurred during the reporting year and the steps taken to resolve those issues.
- Document foreseeable issues with implementation that may require coordination with USFWS to fix or otherwise address. Such issues could include the infeasibility of implementing AMMs or acquiring mitigation for covered species.
- Make recommendations for improving the success of the conservation strategy, including revisions to AMMs or the implementation process.
- Document mitigation is being secured and benefiting covered species.

The annual report will organize and summarize reporting information in two ways. First, each annual report will summarize the previous calendar year's activities, documenting all compliance requirements for the reporting year. Second, the annual report will compile and summarize all impacts and mitigation account balances from the previous years, starting from the date USFWS issues the permit. At a minimum, each annual report will include the following information to document the previous year's activities.

- A summary of the annual training provided to staff and contractors.
- A summary of the results of the environmental review, planning, and screening processes.
    - Impacts on species habitat.
        - Number of covered activities completed (as shown in Table 5-3).
        - Total of temporary impact acreages by species.
        - Total of permanent impact acreages by species.
        - Total acreages of temporary and permanent impacts on critical habitat.
    - Remaining take authorization.
    - A summary of any injury or mortality-related take that occurred during the year.
- Documentation of compliance with mitigation requirements.
    - Total acreage of mitigation (i.e., approved via land acquisition form).
    - Total acreage purchased.
    - Acreage of mitigation obtained for each covered species during the year.
    - Acreage of mitigation applied to offset covered species impacts during the year.
    - End-of-year acreage balance of mitigation remaining for each covered species.
    - Summary of PG&E-owned mitigation land-area monitoring results.
    - Summary of monitoring reports from the qualified mitigation land managers with responsibility for ensuring habitat quality and suitability is maintained for PG&E habitat acquisitions (Appendix C, includes multiple implementation tools including a *Checklist for Mitigation Site Annual and Monitoring Reports*).
- In addition to the annual compliance reporting, the annual report will compile and summarize the following information from the previous years, starting from the date USFWS approves the MRHCP and issues the permit.
    - Total year over year impacts on species habitat.
        - Total of temporary impact acreages by species.
        - Total of permanent impact acreages by species.
        - Total acreages of temporary and permanent impacts on critical habitat.
        - Total impact acreages combined (temporary and permanent).
        - Overall acreage balance of mitigation remaining for each covered species.
        - Overall remaining take authorization.
        - Confirmation that take is not exceeding approved thresholds or the total cap.
- A summary of the validation study to be conducted in implementation years 5 and 10.
- Summary of all discoveries, encounters, relocations, or takings of covered species, including positive survey results and monitoring detections and information on the number and location of species it discovers during surveys and monitoring activities.

- Summary of pre-activity surveys conducted to evaluate habitat impacts for those species for which impact accounting does not rely solely on use of habitat models.
- Description of any adaptive management measures proposed for the following year for mitigation lands.
- A list of all amendments or other important decisions made to date, starting with the permit issuance.
- The status of the stay ahead provision.
- Additional information as agreed to by PG&E and USFWS.

6.4.1 Impact Accounting

The HCP team will keep a running total of annual covered activity impacts and covered species take, including impacts on critical habitat, over the permit term. As described in Chapter 5, *Conservation Strategy*, and shown in Figure 5-2 and Table 5-3, the determination of impacts resulting from covered activities is based on estimated or actual on-the-ground impacts recorded after the activity is completed. The HCP team is responsible for recording temporary and permanent impacts as reported by the land planners and biologists, as well as the data collected from internal data systems (e.g., AEA). For wildlife habitat impacts, PG&E will record habitat losses in acreage to the nearest hundredth of an acre, or square feet, whichever is necessary to capture the entire impact. For covered plant species, PG&E will record habitat losses as acreage to the nearest hundredth of an acre, or square feet, whichever is necessary to capture the entire impact; as individual plant losses; or both. If planners or biologists determine restoration plans are ineffective and impacts are reclassified as permanent, these impacts will also be tracked and mitigated.

6.4.2 Mitigation Accounting

The HCP team will use the estimated habitat loss acreages in Table 4-1 of Chapter 4 and actual impact determinations for projects reported from land planners and biologists (see Table 5-3 in Chapter 5) to calculate the mitigation that is required to offset the prior years' impacts by species (as described in Section 5.6, *Habitat Mitigation*). Temporary and permanent impacts for the reporting year will be mitigated using: (1) the affected species modeled habitat or the actual habitat disturbed if site-specific assessments or surveys are conducted, and (2) the ratio of compensation for that species based on whether the impacts are temporary, or permanent and whether PG&E is adhering to its stay ahead obligations. The HCP team will use an internal mitigation accounting reporting system (MARS) or similar tool to keep track of all annual impacts and the mitigation required as part of the conservation strategy. MARS will track and deduct "species-acre credits" from approved mitigation acquisitions. If planners find that temporary impacts need to be reclassified as permanent, the data will be updated in MARS.

6.5 Adaptive Management for Mitigation Lands

Adaptive management is a necessary component of habitat conservation plans to ensure the effective management and protection of acquired mitigation lands. Adaptive management is an integrated process for addressing uncertainty in natural resource management. In the context of the MRHCP, natural resource management will focus on managing mitigation lands for the benefit of

covered species. For each management plan a non-wasting endowment is calculated based on a property analysis record- (PAR-) like funding analysis. Each endowment will include 0.5% of the total endowment to allow for adaptive management. Adaptive management actions will likely take place at the following junctures.

1. In response to downward trends in the status of covered species or habitat suitability.
2. When monitoring indicates that the expected or desired result of a management action did not occur.

In these cases, new actions would be implemented to try to improve the outcome for species and their habitat. Such actions could include the following.

- Alter the timing, location, intensity, or type of grazing.
- Reduce, increase, or otherwise change the pattern of management actions.
- Modify the timing, location, or type of restoration.
- Modify the approach to noxious weed control.
- Modify species-specific measures based on monitoring results (e.g., bullfrog eradication technique).

As described in Chapter 5, Section 5.6.6.3, *Mitigation Management Plans*, most land management will focus on simple and proven management and enhancement actions. Adaptive management decisions will be based on the data collected as part of ongoing monitoring and management.

6.6 Changed Circumstances, Unforeseen Circumstances and Regulatory Assurances

Unlike large regional HCPs that have centralized reserve systems, the MRHCP's conservation strategy focuses on providing conservation lands in multiple locations appropriate to mitigate impacts on covered species. To this end, PG&E will work closely with USFWS, county or regional HCP administrators, conservation bankers, land trusts, and other conservation organizations to identify and secure mitigation parcels (see Chapter 5, *Conservation Strategy* for a complete description of the process, including Section 5.6.4, *Mitigtion Approval Process*). Once a parcel is identified for acquisition, PG&E will develop a management plan to address the likely land management issues that could arise on the parcel proposed for mitigation. These site-specific management plans will identify the specific management actions that could arise (e.g., invasive species management) for the individual parcel. The summary of changed and unforseen circumstances below provides an overview of the types of issues and circumstances that could arise during implementation of a management plan.

For each management plan, a non-wasting endowment is calculated based on a PAR-like funding analysis. 4.5% of each endowment PG&E establishes will be reserved for the land manager to address changed circumstances. In all cases, PG&E intends to turn management responsibilities over to a third party (e.g., the fee title holder, land manager, conservation easement holder or endowment holder) who will carry out these responsibilities. Hereafter in this section, PG&E uses *land manager* as the entity that will address changed circumstances, though PG&E will ultimately be responsible. As described above in Section 6.4, *Reporting*, the annual report will also include a summary of

monitoring reports from the qualified mitigation land managers with responsibility for ensuring that habitat quality and suitability is maintained.

6.6.1 Changed and Unforeseen Circumstances

Changed circumstances is defined in 50 CFR 17.3 as changes in circumstances affecting a species or geographic area covered by a conservation plan that can reasonably be anticipated by HCP applicants and USFWS and for which the applicants and USFWS can plan in advance. Specific factors analyzed in the MRHCP include vandalism, fire, floods, landslide and wind/water erosion, drought, climate change, invasive species, and diseases and pathogens.

Changed circumstances will be addressed through the implementation of remedial measures on mitigation lands. *Remedial measures* are specific actions that will be taken in response to changed circumstances and are designed to address the adverse impacts on covered species on mitigation lands resulting from changed circumstances. Remedial measures will generally not include actions beyond those expressly identified in this section, nor for any event not specifically identified as a changed circumstance, although they may include new actions agreed to by PG&E and USFWS. Remedial measures differ from adaptive management in that remedial measures are predetermined and defined actions that must be taken in the event of a changed circumstance. If a changed circumstance, as defined in this section, occurs within mitigation lands, the land manager will notify PG&E and USFWS of this changed circumstance within 30 days of learning that any changed circumstances defined by these sections has occurred. The land manager will implement remedial measures in the manner described below and will report to USFWS on its actions. The land manager will make such modifications without awaiting notice from USFWS.

Changed circumstances do not apply to restoration or enhancement projects on a mitigation property until those projects meet their respective success criteria. If a restoration or enhancement site is repeatedly damaged, PG&E and USFWS will discuss remedies to the situation.

Unforeseen circumstances is defined in 50 CFR 17.3 as changes in circumstances affecting a species or geographic area covered by a conservation plan that could not reasonably have been anticipated by MRHCP developers and USFWS during MRHCP negotiation and development, and that result in a substantial and adverse change in the status of the covered species.

In the event of unforeseen circumstances during the permit term, USFWS and PG&E would work together to identify opportunities to redirect existing resources to address these unforeseen circumstances. However, PG&E requests assurances consistent with the federal No Surprises Regulation that USFWS will not:

- Require the commitment of additional land, water, or financial compensation by PG&E in response to unforeseen circumstances other than those agreed to elsewhere in the MRHCP.
- Impose additional restrictions on the use of land, water, or natural resources otherwise available for use by PG&E under the original terms of the MRHCP to mitigate the effects of the covered activities or in response to unforeseen circumstances.

As described in the No Surprises Regulation, it is USFWS's responsibility to demonstrate the existence of unforeseen circumstances using the best scientific and commercial data available. The No Surprises Regulation does not limit USFWS or any federal, state, local, or tribal government agency or private entity from taking additional actions at its own expense to protect or conserve

covered species. The No Surprises Regulation also does not prevent USFWS from asking PG&E or its land managers to voluntarily undertake additional mitigation on behalf of the affected species.

6.6.1.1 Specific Changed Circumstances

The discussion in this subsection relates to the land manager's responsibility for changed circumstances on mitigation properties acquired as part of MRHCP implementation. The endowment for each mitigation site's management plan will include funds for remedial measures to address appropriate site-specific changed circumstances. Not all conservation lands are likely to be subject to each of these changed circumstances, and the management plan will identify the reasons for excluding some changed circumstances.

The nonwasting endowment is intended to address a full suite of management actions, including overall site management and remedial measures when changed circumstances occur. In all changed circumstances categories PG&E has identified a range of conditions that constitute changed circumstances. For conditions below the lowest value, management actions are expected to be included in the management plan. To address conditions within the expected range, remedial measures will be implemented to address the changed circumstances. Conditions above the range are considered an unforeseen circumstance.

Vandalism

Vandalism and other intentional, destructive, illegal human activities are considered changed circumstances. Vandalism can include destruction of fencing and signage, use of off-road vehicles, arson, homeless encampments, and dumping of trash or waste containers. If one of these circumstances results in adverse impacts on the lands managed for covered species, the land manager will determine the extent of damage to the mitigation areas.

One truckload of trash dumping or one abandoned car per year per mitigation site will be addressed as part of ongoing management actions. If more trash dumping than this occurs, this type of vandalism will be considered a changed circumstance. Similarly, annual fence destruction could occur. Small fence repairs of less than 100 feet that are needed two times per year will be addressed as part of ongoing management actions, but more repairs than this will be considered a changed circumstance. Illegal encampments could also occur. These will typically be addressed as part of ongoing management actions, but removal of encampments more than once a year will be considered a changed circumstance.

Remedial Measures for Vandalism

The land manager will use a variety of management options to control vandalism and to repair damage due to vandalism. These measures may include installing an alternate type of fencing, installing large boulders to prevent access, or creating other obstacles to limit access.

Fire

Fires can result in significant adverse consequences for covered species and their habitats. The likelihood of such fires depends on many natural and human factors. The magnitude of the impacts depends on the severity and duration of the event and habitat affected. When a fire occurs, the land manager will assess the specific event and site condition and determine, in coordination with USFWS, whether a response is needed. Fire will occur during the next 30 years and may affect

conservation lands. In general, the fire threat is moderate to high throughout the Plan Area. Urban areas, lowlands, and grasslands typically are classified as areas of moderate threat. More mountainous areas are characterized as having a high or very high fire threat. These classifications were developed by the California Department of Forestry and Fire Protection and are derived from a combination of fire frequency (how often an area burns) and expected fire behavior under severe weather conditions. Fire frequency is derived from 30–50 years of fire history data. Fire behavior is derived from fuels and terrain data (California Department of Forestry and Fire Protection 2007).

A GIS analysis of national wildlife mitigation area lands and Department of Forestry and Fire Protection data indicates that the majority of mitigation lands could experience a moderately severe fire every 1 to 30 years. Fire size and intensity depend on the fuel load, terrain, weather, and fire agency response time. These intermittent fires may or may not cause long-term adverse impacts on species, and, therefore, the need for any additional management will be considered in the context of general management actions. Fires could conceivably burn an entire mitigation site, degrading habitat for covered species. Existing management funds will be used to address management actions for small fires. Changed circumstances funding will be used to address site-specific management issues after a large fire. Unforeseen circumstances are fire-related events that are so catastrophic that they render the area unusable to the covered species without massive rehabilitation. In these instances, PG&E will work with USFWS to determine how to best prioritize the use of the endowment and changed circumstance funding.

Remedial Measures for Fire

Remedial measures for fire may include reseeding, replanting, controlling post-fire runoff to restore covered species habitat, or planning for future strategic fire breaks. The land manager will develop a restoration strategy based on these measures using changed circumstances funding and will have the strategy approved by USFWS.

Floods

Floods can result in significant adverse consequences for covered species and their habitats. The likelihood of floods depends on the mitigation areas' location and history of such events in the region. The magnitude of the impacts depends on the severity and duration of the event and habitat affected.

Floods are not anticipated on most mitigation area lands because most mitigation areas are not expected to be located in floodplains. However, mitigation lands containing giant garter snake or California red-legged frogs may experience flooding by virtue of their location in agricultural and riparian areas, respectively. Floods can also damage stock ponds and result in pond dam failure.

Floods can cause stock ponds to fill with sediment, reducing California red-legged frog breeding success, or result in stock pond dam failure, eliminating breeding habitat. Floods can wash away site vegetation. Existing management funds will be used to address management actions for minor flooding. Changed circumstances funding will be used to address site-specific management issues if major flooding occurs. Unforeseen circumstances are flood-related events that are so catastrophic that they render the area unusable to the covered species without massive rehabilitation. In these instances, PG&E will work with USFWS to determine how to best prioritize the use of the endowment and changed circumstance funding.

Remedial Measures for Floods

The land manager will implement the following remedial measures to help the species recover from a specific event:

- Stock pond dam replacement.
- Repairing and stabilizing eroding banks.
- Redirecting high-energy runoff.
- Installing erosion control devices.

The land manager will use changed circumstances funding to take corrective action to make the habitat suitable again, including repairing and stabilizing eroding banks and replanting vegetation. Regardless of location, remedial measures will be implemented for all flood events that damage or destroy habitat enhancement restoration, or creation projects, or in-stream conservation structures, so that affected habitat continues to support conservation of covered species.

Landslides and Wind/Water Erosion

Landslides and wind/water erosion can result in significant adverse consequences for covered species and their habitats. *Landslide*, also called landslip, is the movement downslope of a mass of rock, debris, earth, or soil. Landslides occur when gravity and other types of shear stresses within a slope exceed the shear strength of the materials that form the slope. The likelihood of landslides and erosion depends on the mitigation areas' location and the history of such events in the region. The magnitude of the impacts depends on the severity and size of the event and habitat affected. A number of processes, including oversteepening of the base of the slope by natural erosion or excavation, can increase a slope's shear stresses. Wind and water could cause erosion in mitigation areas.

Landslides are generally expected to be small and localized should they occur on mitigation lands. Landslides that result in an adverse effect (e.g., fill in a pond or result in the loss of habitat) or damage up to 50% of a mitigation parcel are considered a changed circumstance.

Wind and water erosion that result in an adverse effect on a mitigation parcel (e.g., fill in a pond, result in the loss of habitat, or otherwise inhibit use of the parcel by covered species) or scour up to 50% of a mitigation area is considered a changed circumstance.

When a changed circumstance occurs, the land manager will assess the specific event and site condition and determine, in coordination with USFWS, whether a response is needed.

Unforeseen circumstances are those where 50% or more of a mitigation parcel is damaged by a landslide or wind and water erosion. Irrespective, the land manger will respond to the management needs of the protected species and will use changed circumstances funding when necessary and approved by USFWS to help restore and enhance the species' habitat.

Remedial Measures for Landslides and Water/Wind Erosion

The land manager will use changed circumstances funding to take corrective action to arrest future erosion, stabilize eroding banks and make the habitat suitable again, including through replanting of vegetation.

Earthquake

Earthquakes are reasonably certain to occur within the Plan Area over the next 30 years. Hundreds of earthquakes occur annually on the numerous faults throughout the Plan Area. However, most earthquakes are expected to have little to no effect on covered species or natural communities. The negative effects of a catastrophic earthquake are likely to manifest mostly as damage to infrastructure (e.g., fencing, bridges, buildings, temporary irrigation) rather than to natural communities or species. If the earthquake damages infrastructure essential to maintaining the species or its habitat, the land manager will replace the damaged infrastructure as soon as possible or within 1 year; larger infrastructure repairs may need longer periods of time because of additional design and permitting.

Seismic modeling by the U.S. Geological Survey indicates that catastrophic earthquakes with a magnitude of 6.7 are likely in the next 50 years. Therefore, all earthquakes below a magnitude of 6.8 that damage infrastructure or habitat essential to the species are considered a changed circumstance.

Remedial Measures for Earthquakes

The land manager will use changed circumstances funding to take corrective action to address the infrastructure needs and to restore lost or damaged habitat. Changed circumstances funding will not be used for infrastructure such as ancillary support buildings that are not needed to maintain habitat.

Drought

Drought is an extended period when a region is deficient in its water availability, whether atmospheric, surface, or ground water. Generally, drought occurs when a region receives repeated below average precipitation. California recently experienced one of the worst droughts on record. Overall, the impacts from drought will depend on the duration of the drought, the drought's effect on covered species and their habitat, and the ability of the species to adapt.

Droughts of up to 10 consecutive years when the mean annual rainfall is less than 50% of normal have occurred multiple times in the past 100 years and are considered changed circumstances. Therefore, a drought of 5 consecutive years when the mean annual rainfall is less than 50% of normal is considered a changed circumstance. These events could be expected based on historical and projected conditions. These cyclical droughts may pose long-term adverse impacts on species and, consequently, the need for additional management will be considered in the context of changed circumstances. Droughts of more than 10 consecutive years are considered unforeseen circumstances.

The land manger will respond to the management needs of the species and will use changed circumstances funding when necessary and approved by USFWS to help address drought conditions and enhance the species' habitat.

Remedial Measure for Drought

If habitat conditions become degraded because of drought, the land manager will work with USFWS to identify remedial measures such as augmented irrigation or vegetation planting prior to implementing these measures. The land manager will use changed circumstances funding to take corrective action to improve habitat conditions for covered species.

Climate Change

Climate change is the observed increase in mean global temperature as a result of an increase in greenhouse gas emissions, primarily carbon dioxide, which are a result of human industrialization (Intergovernmental Panel on Climate Change 2018). Climate change also is predicted to include secondary global impacts such as sea level rise and changing weather patterns.

Current global and regional trends suggest that climate change is likely to affect the mitigation lands. Change in temperature over the past century was a global average of 0.6°C (2.2°F), and most global climate models predict temperature increases as high as 6°C (10.8°F) over the coming century (Intergovernmental Panel on Climate Change 2018).

The Sacramento Valley and Sierra Foothills, North Coast, and Central Coast Regions are expected to be affected. Each is expected to experience mean temperature increases of 1.4 to 2.0°C (2.5°F to 3.6°F) by 2070 (PRBO Conservation Science 2011). Recent evidence suggests it is likely that precipitation in these regions will decrease in the future compared with current conditions (PRBO Conservation Science 2011). Consequently, climate in the Plan Area will probably become warmer and drier, but there is a possibility the climate will be warmer and wetter. This warmer/wetter or warmer/drier climate change in the Plan Area is likely to influence the frequency and magnitude of climate-related events such as fires, storms, drought, and flooding.

The possible ecological responses will be influenced by various environmental changes, depending on the location of effects. In the Sacramento Valley and San Joaquin Valley areas, changes in water availability are expected to have the predominant environmental effect on wildlife. In addition to water availability, estuarine habitats in the Delta are at risk from sea level rise and increased salinity, and high temperature events could cause thermal stress.

In the North Coast Region, the predominant environmental stressor on wildlife is expected to result from changes in vegetation communities due to increased temperatures. In addition, sea level rise could degrade coastal estuarine habitats, and it is likely that snow-fed rivers and streams will have less water. In the Central Coast Region, the predominant effect on wildlife populations is likely to result from changes in vegetation communities. Other likely environmental stressors in the Central Coast Region are sea level rise, especially in the Delta but also in coastal estuaries and the coastal strand; thermal stress for species with very narrow temperature tolerance; and increasing fires (PRBO Conservation Science 2011).

Overall, climate change can reasonably be expected to influence the ecological response of covered species over the permit term. The magnitude of these changes and the specific changes remain uncertain. Substantial declines of species populations and occurrences on mitigation lands could occur, especially for covered butterfly species. However, the effects of climate change are being addressed through the closely related remedial responses to changed circumstances of fire, drought, flood, and invasive species.

Invasive Species

Invasive plant or animal species could occur or be introduced into the mitigation areas, (e.g., bullfrogs, hybrid tiger salamanders, fishes, red-eared sliders, noxious weeds) subsequently reducing or affecting the quality of the habitat for covered species. Management plans developed for mitigation lands will include measures to prevent such occurrences or introductions, although additional measures may be needed.

Invasive species spreading throughout the Plan Area within the permit term is a foreseeable event. Noxious weed infestations that are between 5 and 50% of a mitigation parcel are considered a changed circumstances. For invasive animals, a doubling over previous management actions will trigger changed circumstances (e.g., if two bullfrogs are killed in year one and the second year requires four bullfrogs be killed, this would be considered a changed circumstance). The intent of this is to allow changed circumstances funding to be used at the sign of a serious invasive species problem. However, if an invasive species spreads beyond a level that can effectively be controlled, it would be considered an unforeseen circumstance beyond the scope of the MRHCP, and the land manager would not be required to implement remedial actions to address the event.

Remedial Measures for Invasive Species

When an invasive species or nonnative species is detected or begins to spread and adversely impact a covered species or mitigation parcel, the land manager will contact PG&E and USFWS to collaboratively determine the best method of measuring, monitoring, eradicating, or controlling the invasion. Remedial measures that address the invasion of nonnative species follow the steps listed below.

- Determine the best method for measurement and tracking extent within 1 month of detection.
- Prepare a damage-assessment report within 2 months of detection.
- Recommend and plan actions to address the threat within 3 months of detection.
- Respond through management actions in ways consistent with permit obligations and with the consent of USFWS within 6 months of detection.

The land manager will use changed circumstances funding to take appropriate corrective actions.

Diseases and Pathogens

Diseases and pathogens could occur in or be introduced into the mitigation areas, (e.g., amphibian chytrid fungus, sudden oak death syndrome, *Phytophora*) subsequently reducing or affecting the quality of the habitat for covered species. Management plans developed for mitigation lands will include measures to prevent such occurrences or introductions, although additional measures may be needed. The occurrence of new diseases and pathogens spreading throughout the Plan Area within the permit term is a foreseeable event.

At the first sign of a disease or pathogen (e.g., amphibian deaths, or dead and dying trees and shrubs), the land manager will seek to identify the disease or pathogen. Most infestations will be considered changed circumstances. However, if a disease or pathogen spreads beyond a level that can effectively be controlled (e.g., it cannot be controlled on a countywide or region-wide basis), it would be considered an unforeseen circumstance beyond the scope of the MRHCP, and the land manager would not be required to implement remedial actions to address the event.

Remedial Measures for Disease or Pathogens

When a new disease or pathogen is detected or an existing disease or pathogen begins to spread aggressively and adversely impact a covered species or mitigation parcel, the land manager will contact USFWS to collaboratively determine the best method of measuring, monitoring, and eradicating or controlling the disease or pathogen. Remedial measures that address the disease or pathogen follow the steps listed below.

- Determine the best method for measurement and tracking extent within 1 month of detection.
- Prepare a damage-assessment report within 2 months of detection.
- Recommend and plan actions to address the threat within 3 months of detection.
- Respond through management changes in ways consistent with permit obligations and with the consent of USFWS within 6 months of detection.

The land manager will use changed circumstances funding to take appropriate corrective actions.

6.6.2 Other Considerations

6.6.2.1 Listing of Species Not Covered

Over the course of MRHCP implementation, USFWS may list additional species as threatened or endangered that are not covered under the MRHCP. If a non-covered species becomes listed, PG&E will take the following measures.

- The potential impacts of covered activities on the newly listed species will be evaluated, including an assessment of the presence of suitable habitat in impact areas.
- PG&E will develop measures to avoid take (or jeopardy if the species is a plant) of the newly listed species until the MRHCP is amended to cover the species or PG&E complies with the ESA via other means (e.g., take avoidance on projects or through individual Section 7 consultations).

Should a species not covered by the MRHCP be listed, proposed, or petitioned for listing, PG&E may request that USFWS add the species to the permit. In determining whether or not to seek incidental take coverage for the species, PG&E will consider, among other things, where in the Plan Area the species is present and whether covered activities could result in incidental take of the species. If incidental take coverage is necessary, the MRHCP and permit could be amended. Alternatively, PG&E could apply for a new and separate permit. Procedures for amendments to the MRHCP are outlined in Section 6.7, *Permit Renewal, Plan Amendments, Permit Suspension and Revocation*. As part of these processes, PG&E would also work with USFWS to determine the best way to address impacts and conservation of the species; PG&E and USFWS will first consider the conservation benefits already provided under the MRHCP.

6.6.2.2 Delisting of Species Covered

Over the course of MRHCP implementation, USFWS may delist a covered species. If a covered species becomes delisted, PG&E may take the following actions.

- Identify the impacts and mitigation that has been provided for the species to date.
- Discuss with USFWS any potential changes or amendments to the HCP or permit conditions that may be appropriate under this changed condition.

6.6.2.3 Section 7 Consultations

An important goal of the MRHCP is to provide a framework for ESA compliance for all covered activities in the Plan Area, including covered activities that are implemented on federal lands or that require a subsequent federal authorization. The MRHCP does not alter the obligation of federal agencies to consult with USFWS or NMFS pursuant to Section 7 of the ESA for actions related to the

covered activities. Consequently, for some future covered activities, ESA Section 7 consultation will still be required even though the incidental take of covered species has already been authorized by the MRHCP permit (e.g., covered activities requiring CWA Section 404 authorization). Unless otherwise required by law or regulation, USFWS will ensure that any biological opinions issued for projects that are defined as covered activities under the MRHCP are consistent with the biological opinion issued for the MRHCP and the permit. Before completing a Section 7 consultation for a covered activity in which USFWS proposes to require a measure in excess of the requirements of the the MRHCP or the permit for a covered species, USFWS will meet and confer with the PG&E and the agency with jurisdiction over the affected project to discuss alternatives to the imposition of the measures that would meet the applicable legal or regulatory requirements. To help facilitate future Section 7 consultations and other federal agencies' ESA compliance, PG&E has included information on the decision process and template letters in Appendix C. This decision process outlines the information that is necessary to evaluate the potential impacts of the federal agencies action on covered and non-covered listed species, and the AMMs from the MRHCP necessary to reach the appropriate informal or formal Section 7 conclusions. The goal of future consultations will be to strive for streamlining of consultations where feasible and minimizing duplicative analyses of impacts on covered species.

6.6.3 Regulatory Assurances

PG&E has prepared the MRHCP anticipating a standardized, consistent, and cost effective way of complying with the federal ESA. The federal No Surprises Regulation was established by the Secretary of the Interior on March 25, 1998. It provides assurances to Section 10 permit holders that no additional money, commitments, or restrictions of land or water will be required should unforeseen circumstances requiring additional mitigation arise once the permit is in place. The No Surprises Regulation states that if a Permittee is properly implementing an HCP that has been approved by USFWS, no additional commitment of resources, beyond that already specified in the MRHCP, will be required. PG&E requests regulatory assurances (No Surprises) for all covered species in the MRHCP. In accordance with No Surprises, PG&E will be responsible for ensuring the implementation and funding of remedial measures in response to any changed circumstances as described in this chapter. PG&E will not be obligated to address unforeseen circumstances but will work with the wildlife agencies to address them within the funding and other constraints of the MRHCP should unforeseen circumstances arise. PG&E understands that No Surprises assurances are contingent on the proper implementation of the permit and MRHCP.

6.7 Permit Renewal, Plan Amendments, Permit Suspension and Revocation

It may be necessary for USFWS or PG&E to clarify provisions of the MRHCP or the permit to address issues that arise with respect to the administration of the process, or to be more specific regarding the precise meaning and intent of the language contained in those documents. Such clarifications can take two forms: minor modifications and amendments. Any minor modifications or amendment will be in accordance with applicable legal or regulatory requirements. The MRHCP and permit may be amended only with the written consent of PG&E and USFWS.

6.7.1 Clerical and Administrative Actions, Minor Modifications

PG&E or USFWS may propose a minor modification to the permit or the MRHCP by providing written notice to the other party. Such notice will include a statement of the reason for the proposed change and an analysis of its environmental effects, including any effects on covered species, and any other information required by law. The other party will respond in writing to the proposed minor modification within 60 days of receipt of such notice.

Below are examples of minor modifications (i.e., clerical and administrative actions or clarifications) that do not affect the impact assessment or conservation strategy described in the MRHCP and do not affect the ability of PG&E to achieve the MRHCP's biological goals and objectives. These changes do not require an amendment to the permit, but they do require preapproval by USFWS before being implemented. Examples of minor modifications are listed below.

- Correction of typographical, grammatical, and similar editing errors in the MRHCP and the permit that do not change the intended meaning.
- Change to any map or exhibit to correct errors in mapping.
- Minor changes to the AMMs.
- Minor change to monitoring or reporting protocols.
- Correction of any tables or appendices in the MRHCP to reflect previously approved amendments to the MRHCP.

PG&E or USFWS may object to a proposed minor modification for any reason. Where possible, before rejecting a proposed minor modification, USFWS first will consult with PG&E and suggest reasonable conditions or alterations to the proposal. If PG&E agrees, USFWS can approve the proposed minor modification. If USFWS objects to a minor modification, and the objection is not resolved by any conditions or alterations, the proposed modification may be processed as an amendment of the MRHCP and permit as described below.

6.7.2 Amendment

All changes to the permit and the MRHCP that do not qualify as minor modifications may be processed as amendments in accordance with all applicable laws and regulations, including the ESA and NEPA. The party proposing the amendment will provide a statement of the reasons and an analysis of the amendment's environmental effects, particularly its effects on covered species and non-covered listed species.

Examples of changes that would require an amendment are listed below.

- Revision of the permit area boundary that does not qualify as a minor modification.
- Addition of species to the covered species list.
- Removal of a covered species from the covered species list.
- Increasing the allowable take limit of existing covered activities or adding new covered activities to the MRHCP to the extent those activities are substantially different or larger than activities previously analyzed.

- Extending the permit term.

6.7.2.1 Modifying Existing Covered Activities, Field Protocols, Avoidance and Minimization Measures, or Best Management Practices

Advancement in construction techniques and technology during the permit term may result in new methods of performing the MRHCP covered activities or changes in the covered activities themselves that are not described in Chapter 3, *Covered Activities*. Based on the analysis of the impacts of covered activities on covered species in the Plan Area, it is likely that a new construction methods or covered activity that is performing substantially the same function as the described and approved covered activities may result in similar impacts. Therefore, adding such activities to the MRHCP and implementing them pursuant to the MRHCP conservation strategy will not likely result in adverse effects on the covered species different from effects analyzed in connection with the MRHCP.

Similarly, modifications and changes to the FPs, AMMs, or BMPs are expected to be needed over the permit term. PG&E will provide proposed modifications to USFWS in writing and USFWS will respond within 60 days. For more urgent and timely matters, or to further discuss proposed modifications, the PG&E HCP administrator may call the USFWS point of contact to discuss the proposed modification before providing the modification request.

PG&E may seek authorization from USFWS to change the method of performing an approved covered activity or the covered activities themselves pursuant to the modification or amendment process. Any such change for which PG&E successfully obtains approval under the permit through the administrative action or amendment process thereafter will be deemed approved for use under the MRHCP. Also, some covered activities may have to be adjusted slightly. For example, some activities may have to be conducted beyond PG&E ROWs, or a covered activity may slightly deviate from the description of covered activities. If these activities do not exceed the amount of take as provided in the permit, they can be covered with USFWS approval.

6.7.3 Suspension/Revocation of the Permit

USFWS may suspend or revoke permits if PG&E fails to implement the MRHCP in accordance with the terms and conditions of the permits or if suspension or revocation is otherwise required by law. Suspension or revocation of the permit, in whole or in part, by USFWS shall be in accordance with 50 CFR 13.27–29, and 50 CFR 17.32 (b)(8). The permit may be revoked for any of the following reasons.

- PG&E willfully violates any federal or state statute or regulation, or any Indian tribal law or regulation, or any law or regulation of any foreign country, which involves a violation of the conditions of the permit or of the laws or regulations governing the permitted activity.
- PG&E fails within 60 days to correct deficiencies that were the cause of a permit suspension.
- PG&E becomes disqualified to hold the permit.
- The statute or regulation authorizing the permit changes in a way that prohibits the continued implementation of the permit issued by USFWS.
- PG&E's actions are inconsistent with issuance criteria, and the inconsistency has not been rectified.

Typically, USFWS will send a letter to PG&E informing it of the issues of concern and the potential for permit suspension or revocation, and will provide an opportunity to rectify the deficiencies. If the deficiencies are not rectified within the timeframe specified, the permit may be suspended or revoked.

6.7.4 Permit Renewal

The permit may be renewed without the issuance of a new permit, provided that the original permit is renewable, and that biological circumstances and other pertinent factors affecting covered species are not significantly different than those described in the original MRHCP. To renew the permit, PG&E shall submit to USFWS documents that provide the following specifics.

- A request to renew the permit.
- A reference to the original permit number.
- Certification that statements and information provided in the original MRHCP and permit application, together with approved MRHCP amendments, are still true and correct, and a list of changes needed to clarify or revise the MRHCP.
- A description of take that has occurred under the existing permit.
- A description of activities under the original plan that are still to be completed and which the renewal is intended to cover.

If USFWS concurs with the information provided in the request, it shall renew the permit consistent with permit renewal procedures required by federal regulation (50 CFR 13.22). If PG&E files a renewal request and the request is on file with the issuing USFWS office at least 30 days prior to the permit's expiration, the permit shall remain valid while the renewal is being processed, provided the existing permit is renewable. However, PG&E may not take listed species beyond the quantity authorized by the original permit or change the scope of the MRHCP. If PG&E fails to file a renewal request within 30 days prior to permit expiration, the permit shall become invalid upon expiration.

6.8 Role of USFWS in Decisions Regarding Plan Implementation

Successful implementation of the MRHCP relies on the participation and feedback of staff from USFWS. USFWS will participate in discussions and meetings with PG&E to ensure that the MRHCP is being implemented consistent with its terms. USFWS will be responsible to review the annual report, review and approve the acquisition of mitigation lands proposed by PG&E as outlined in Chapter 5, Section 5.6.4, *Mitigation Approval Process*, and assist with other changes or modifications to the MRHCP as described in Section 6.7.1, *Clerical and Administrative Actions*. USFWS will assist with decisions regarding MRHCP implementation as expeditiously as possible.

6.8.1 Role of Field Offices

The Sacrament field office will continue to be the primary point of contact during MRHCP implementation, although each field office has an important role to ensure the conservation strategy is achieved. The Sacramento, Arcata, and Ventura field offices will be involved as follows.

- Each field office will designate a primary point of contact.
- Each field office will be responsible for providing technical assistance and HCP implementation support in a timely manner for species in areas of their jurisdiction.
    - Sacramento field office will facilitate technical assistance discussions for species that cross multiple field office boundaries and will be responsible for providing final recommendations for species whose range is predominantly within their jurisdiction.
- Each field office will be responsible for reviewing and approving restoration plans for restoration proposals within areas of their jurisdiction.
- Each field office will be responsible for reviewing and approving mitigation proposals within areas of their jurisdiction.
- Each field office will review the annual report and impacts within the HCP regions. The Sacramento field office will consolidate any comments on the annual report.
- Each field office will provide recommendations for program improvement. The Sacramento field office will consolidate any recommendations to ensure consistency.

Periodic conference calls with one or more field offices and PG&E may be needed. The Sacramento field office will coordinate and facilitate these calls.

6.8.2 Role of Regional Office

The regional office will resolve any internal or external differences or disputes between the field offices and PG&E that are raised through the dispute resolution process. The regional office will also help provide direction and guidance for ensuring PG&E's permits are consistent and integrated to the greatest degree possible.

6.8.3 Dispute Resolution Process

PG&E will first work with individual field office staff assigned as the point of contact to gain agreement or concurrence on issues related to implementation for each particular regional planning area. In the event that there is a dispute and agreement or concurrence cannot be reached in a timely manner (typically 5 business days for small activities, 10 business days for large activities, 15 business days for restoration plans, and 60 days for mitigation proposals), then PG&E will attempt to resolve disputes with field office management staff. If agreement cannot be reached in a timely manner, PG&E will raise the disputed issue to the Sacramento field office through a written notice. If the Sacramento field office cannot resolve the dispute to the satisfaction on the parties within 30 days of the written notice, the issues in dispute will be raised to the regional office by PG&E through a written notice requesting dispute resolution and a final decision. The parties may consider non-binding mediation and other alternative dispute resolution processes and, if a dispute resolution process is agreed upon, will make good faith efforts to resolve all remaining issues through that process.

6.9 Funding

PG&E developed its implementation cost estimate based on the following steps.

- Reviewing permitting, avoidance, minimization and mitigation expenses from existing projects.
- Evaluating how work is reviewed, planned, and screened by existing staff, and estimating the costs of these efforts.
- Reviewing implementation costs from the San Joaquin Valley and Bay Area O&M HCPs.
- Collecting data from real estate agents/brokers, planners, and mitigation bankers to develop mitigation cost estimates.

PG&E developed a spreadsheet model to calculate the implementation costs over the next 30 years. This information was then used to develop Tables 6-1, 6-2, and 6-3.

6.9.1 Cost to Implement the MRHCP

The cost to implement the MRHCP is estimated to be up to $96.6 million, including a 2.5% inflation rate, assuming all impacts occur as forecasted over the next 30 years. This forecast is a reasonable estimate based on this cost accounting analysis; however, the cost of implementing MRHCP provisions, including required avoidance, minimization, mitigation, endowments, management, monitoring, and reporting, may vary from these estimates. These costs are divided into four categories.

- Staffing, studies, and training materials
- Biological surveys and AMMs
- Mitigation
- Monitoring and reporting.

Description of the methods and costs associated with these program elements appears below.

6.9.1.1 Implementation

Staffing, Validation Study, and Training Materials

Implementation of the MRHCP will largely make use of PG&E's existing environmental review and biological assessment processes. The number of staff members needed to implement the MRHCP is not expected to change from current staffing levels because the current HCP administrator will assume the responsibilities of the management of the MRHCP. PG&E assumes that one additional new full-time equivalent staff person may be needed to support the MRHCP program.

The HCP team will implement the validation study by reviewing activities in implementation years 5 and 10, as described in Section 6.3.2, *Effects Monitoring*, to confirm impact reporting is accurate and to spot-check covered activities to ensure that disturbance estimates are accurate. In addition, PG&E will augment its HCP training program and develop training materials to help PG&E employees and contractors comply with the MRHCP.

These costs are summarized in detail in Table 6-1 and represent approximately 10% of the overall cost to implement the MRHCP. PG&E staff attendance at the environmental training course is included in PG&E's existing staff overhead costs.

Table 6-1. Staffing, Studies, and Training Costs

Program Element	Costs	Assumptions
Staff support	$280,000	1 full-time equivalent employee (fully loaded annual cost)
Validation study	$50,000	Evaluation of activities (years 5 and 10)
Training materials	$15,000	Initial production of training materials

Biological Surveys and Avoidance and Minimization Measures

Biological survey costs and AMM costs will be covered by the project budget for the specific activity being conducted. Therefore, these costs are not included in the MRHCP.

Mitigation

MRHCP implementation includes mitigation for the impacts of PG&E's covered activities on covered species and their habitat. Proposed mitigation costs are summarized in Table 6-2 and Table 6-3. These costs represent the majority, approximately 90%, of the overall cost to implement the MRHCP. As described above, land values and mitigation costs were estimated based on data from real estate agents/brokers, planners, and mitigation bankers. A review of land values from the California Chapter American Association of Farm Managers and Rural Appraisers, 2018 report *Trends in Agricultural Land and Lease Values – California and Nevada* indicate that rangeland values vary from $700 to $11,500 per acre depending on the county and overall supply. The overall trend is stable and prices are increasing. Purchases from regional mitigation banks vary from as low as $15,000 per acre to $39,500 per acre for species such as California tiger salamander and California red-legged frog. The forecasted costs estimated in the MRHCP are based on the average value that PG&E expects to pay to purchase and endow mitigation lands. These costs are generally in the range of $8,000 to $12,000 per acre for rangeland and $20,000 to $125,000 per acre for more specialized acquisitions. Overall, average acquisition and endowment costs over the course of the MRHCP are expected to be approximately $23,000 per acre.

Table 6-2. Mitigation Expenditure Estimate (without inflation)

Approach	Percentage of Total Estimated Mitigation[a]	Amount
Purchase habitat mitigation lands	70%	$55,023,960
Secure conservation easements on PG&E lands	1%	$786,057
Purchase credits from mitigation banks	5%	$3,930,283
Conservation organization donation	17%	$13,362,962
Enhancement as mitigation	1%	$786,057
Recovery plan contribution	1%	$786,057
Contributions to other HCPs/NCCPs	5%	$3,930,283
Total (without inflation)	**100%**	**$78,605,657**

[a] Mix of mitigation likely to vary from these estimates based on specific opportunities and costs.

Table 6-3 indicates that PG&E has included a contingency in the event long-term management costs are more than anticipated. Parcel-specific endowments will be developed to allow land managers to implement adaptive management and respond to changed circumstances associated with a protected parcel.

For some species, the entire amount of mitigation required over the life of the permit may be provided initially. For other species, mitigation amounts may be acquired in 5-year or 10-year increments, depending on the species, the size of the mitigation requirement, the availability of mitigation lands, the potential for covered activities to impact covered species, and other variables. The mitigation requirements are based on the estimate of the type and amount of habitat disturbed (see Table 6-3).

Table 6-3. Estimated Mitigation Cost by Species or Species Grouping

		Region				Cost	
Species Group/ Species	Habitat	Sacramento Valley and Foothills	North Coast	Central Coast	Total Acres	Cost/Acre (Including Endowment)	Estimated Cost (Including Endowment)
Aquatic Invertebrates							
Conservancy fairy shrimp	Potentially suitable habitat	51.5	0	0.0	51.5	$10,000	$514,500
Longhorn fairy shrimp	Potentially suitable habitat	10.5	0	10.3	20.8	$10,000	$207,500
Vernal pool fairy shrimp	Potentially suitable habitat	232.6	3.7	62.4	298.7	$10,000	$2,986,600
Vernal pool tadpole shrimp	Potentially suitable habitat	232.6	3.7	62.4	298.7		$0[a]
Terrestrial Invertebrates							
Mount Hermon (=barbate) June beetle	Potentially suitable habitat	0	0	33.8	33.8	$30,000	$1,012,500
Morro shoulderband snail	Potentially suitable habitat	0	0	15.0	15.0	$60,000	$900,000
Ohlone tiger beetle	Potentially suitable habitat	0	0	33.8	33.8	$30,000	$1,012,500
Valley elderberry longhorn beetle	Potentially suitable habitat	229	0	0	229.0		$0[b]
Smith's blue butterfly	Potentially suitable habitat	0	0	82.3	82.3	$31,000	$2,549,750
Zayante band-winged grasshopper	Potentially suitable habitat	0	0	18.4	18.4	$30,000	$551,250

Species Group/ Species	Habitat	Region				Cost	
		Sacramento Valley and Foothills	North Coast	Central Coast	Total Acres	Cost/Acre (Including Endowment)	Estimated Cost (Including Endowment)
Amphibians							
California red-legged frog	Potential breeding habitat	180	15	135.0	330.0	$10,000	$3,300,000
	Potential upland habitat	335.3	37.5	330.0	702.8	$10,000	$7,027,600
California tiger salamander (Central California DPS)	Potential breeding habitat	40.7	0	6.5	47.1	$15,000	$707,100
	Potential upland habitat	367.8	0	951.5	1319.3	$10,000	$13,192,550
California tiger salamander (Santa Barbara DPS)	Potential breeding habitat	0	0	0.2	0.2	$36,000	$7,200
	Potential upland habitat	0	0	73.9	73.9	$36,000	$2,660,580
Foothill yellow-legged frog	Potential breeding habitat	7.0	5.3	2.7	15.0	$10,000	$149,900
	Potential dispersal habitat	53.9	36.5	30.0	120.4	$10,000	$1,204,100
Mountain yellow-legged frog	Potentially suitable habitat	3.3	0	0.0	3.3	$20,000	$66,000
Santa Cruz long-toed salamander	Breeding habitat	0	0	12.0	12.0	$125,000	$1,500,000
	Upland habitat	0	0	67.5	67.5	$28,000	$1,890,000
Sierra Nevada yellow-legged frog	Potentially suitable habitat	4.4	0	0.0	4.4	$20,000	$87,000
Yosemite toad	Potentially suitable habitat	2.5	0	0.0	2.5	$20,000	$50,000
Reptiles							
Blunt-nosed leopard lizard	Suitable habitat	0	0	68.7	68.7	$10,000	$686,800
	Core habitat	0	0	100.9	100.9	$10,000	$1,008,750
Giant garter snake	Potential aquatic habitat – wetland and marsh	128.4	0	0.0	128.4	$30,000	$3,852,000
	Potential upland habitat	144.0	0	0.0	144.0	$20,000	$2,880,600
	Potential aquatic habitat – rice	181.5	0	0.0	181.5	$15,000	$2,722,500

Species Group/ Species	Habitat	Region				Cost	
		Sacramento Valley and Foothills	North Coast	Central Coast	Total Acres	Cost/Acre (Including Endowment)	Estimated Cost (Including Endowment)
Birds							
Marbled murrelet	Potentially suitable habitat	0	120.0	56.3	176.3	$21,000	$3,701,250
Northern spotted owl	Potentially suitable habitat	75	750.0	0.0	825.0	$10,000	$8,250,000
Mammals							
Point Arena mountain beaver	Potentially suitable habitat	0	16.5	0.0	16.5	$31,000	$511,500
Giant kangaroo rat	Potentially suitable habitat	0	0	165.0	165.0	$10,000	$1,650,000
San Joaquin Kit Fox	High-value suitable habitat	0	0	90.0	90.0	$20,000	$1,800,000
	Moderate-value suitable habitat	0	0	43.3	43.3	$15,000	$649,500
	Low-value suitable habitat	0	0	207.3	207.3	$10,000	$2,073,000
Plants							
Restoration Plans					100	$15,000	$1,500,000
Mitigation					100	$20,000	$2,000,000
Subtotal							$74,862,530
Contingency (5%)							$3,743,127
Grand Total[c]							$78,605,657

[a] Included with other vernal pool species.

[b] Included with acquisitions made to date for this species.

[c] Total is in current dollars. It does not match Table 6-4, which has inflation included.

Monitoring and Reporting

PG&E's monitoring and reporting costs are internalized as part of the responsibilities of the land planners and biologists. The HCP implementation team will be responsible for monitoring the effectiveness of the program and reporting on the impacts associated with covered activities as described in Section 6.4, *Reporting*. Additional costs are not anticipated for monitoring and reporting.

6.9.2 Summary of Total Costs

Total estimated costs for program implementation, including staffing, studies, and training materials, biological surveys and AMMs, habitat mitigation and other costs are shown in Table 6-4.

6.9.3 Funding Sources

PG&E has the financial capacity and commits to fully fund costs of the MRHCP, including associated implementation, avoidance, survey, and mitigation costs[1]. PG&E's costs for implementation of the MRHCP will be fully covered by its gas and electricity rates. Collection of these funds is authorized by CPUC and FERC for the ongoing operation, maintenance, and construction of utility facilities. At the time of preparation of the MRHCP, PG&E has deposited more than $30 million dollars with the National Fish and Wildlife Foundation (NFWF), a national nonprofit organization, one of whose goals is to serve as a manager and trustee for funds arising from legal and regulatory actions involving natural resources and the environment. This money will be used to achieve the conservation objectives outlined in the MRHCP.

PG&E's agreement with NFWF governs the existence and administration of an HCP funding account to receive, manage, and disburse funds to be deposited by PG&E that will be managed and disbursed by NFWF in support of implementation of the HCP. More specifically, funds on deposit within this account will be used for the acquisition of mitigation lands, restoration of mitigation lands (including replanting requirements under the HCP), enhancement of mitigation lands, and other associated activities related to the mitigation lands, including covered species research and the establishment of long-term land management and monitoring funds (i.e., endowments) for such mitigation lands as required by the HCP. Funds in the account will be disbursed in accordance with written direction provided by PG&E consistent with the terms of the HCP. NFWF's participation in the agreement will serve the public purpose of efficient and effective implementation of applicable ESA requirements.

6.9.4 Adequacy of Funding

PG&E is able to meet the conditions and financial obligations of the MRHCP. PG&E will provide adequate resources to fulfill the commitments described in the MRHCP. The HCP administrator will forecast anticipated program needs, ensuring that PG&E implements mitigation roughly proportional to the impacts and budgets accordingly. Because MRHCP funding is rate-based, the funding will be assured to keep pace with program expenditures.

[1] PG&E filed a Chapter 11 case under the U.S. Bankruptcy Code on January 29, 2019. As part of the bankruptcy process, PG&E was granted authority by the Bankruptcy Court to obtain financing for, and to continue to fund and perform, day-to-day operations. PG&E remains committed to delivering safe and reliable electric and natural gas service to its customers and continuing to make critical investments in system safety and maintenance.

Table 6-4. Implementation Costs (with 2.5% Inflation) (in Millions)

Year	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	Total	Percent
Staffing, Studies and Training Materials																																	
Staffing Support	$0.0	$0.3	$0.3	$0.3	$0.3	$0.3	$0.3	$0.3	$0.3	$0.3	$0.3	$0.3	$0.3	$0.3	$0.3	$0.3	$0.3	$0.3	$0.3	$0.3	$0.3	$0.3	$0.3	$0.3	$0.3	$0.3	$0.4	$0.4	$0.4	$0.4	$0.4	$9.6	
Validation Study	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	
Training Costs	$0.0	$0.2	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$.2	
Subtotal	$0.0	$0.4	$0.3	$0.3	$0.3	$0.3	$0.3	$0.3	$0.3	$0.3	$0.3	$0.3	$0.3	$0.3	$0.3	$0.3	$0.3	$0.3	$0.3	$0.3	$0.3	$0.3	$0.3	$0.3	$0.3	$0.4	$0.4	$0.4	$0.4	$0.4	$0.4	**$9.8**	*10.2%*
Surveys and AMMs																																	
Included in project costs	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	
Subtotal	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	*$0.0*	
Mitigation																																	
Aggregated Annual Mitigation	$3.0	$10.0	$10.1	$10.2	$10.3	$5.2	$5.3	$0.0	$0.0	$0.0	$10.9	$11.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$10.8	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$86.8	
Subtotal	$3.0	$10.0	$10.1	$10.2	$10.3	$5.2	$5.3	$0.0	$0.0	$0.0	$10.9	$11.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$10.8	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$86.8	*89.8%*
Estimated HCP Costs	**$3.0**	**$10.4**	**$10.4**	**$10.5**	**$10.6**	**$5.5**	**$5.6**	**$0.3**	**$0.3**	**$0.3**	**$11.2**	**$11.3**	**$0.3**	**$0.3**	**$0.3**	**$0.3**	**$0.3**	**$0.3**	**$0.3**	**$0.3**	**$11.1**	**$0.3**	**$0.3**	**$0.3**	**$0.3**	**$0.4**	**$0.4**	**$0.4**	**$0.4**	**$0.4**	**$0.4**	**$96.6**	*100.0%*
Total 30-Year Costs	**$96.6**																																

This page intentionally left blank.

Chapter 7
Alternatives Analysis

Summary*: This chapter discusses the alternatives to the MRHCP that were considered and the reasons for rejecting each one. Four alternatives to the MRHCP were evaluated and rejected: seeking incidental take authorization on a project-by-project basis through either Section 7 or through low-effect HCPs (the no action alternative); changing work practices to reduce take; reducing the number of covered species; and covering large maintenance projects only.*

7.1 Introduction

The ESA requires that a Section 10 permit applicant specify in its habitat conservation plan what alternatives to take of listed species were considered and the reasons those alternatives were not selected. This chapter discusses alternatives that were considered but, for reasons described below, were not selected.

7.2 Description of Alternatives

The following alternatives were considered in this MRHCP.

1. No action alternative.
2. Changed practices alternative.
3. Reduced number of covered species alternative.
4. Large maintenance projects alternative.

These alternatives and the rationale for rejecting them are discussed below.

7.2.1 No Action Alternative

Under the no action alternative, PG&E would seek to avoid take, but would continue to acquire incidental take authorizations under Section 7 or Section 10 of the ESA for each individual activity for which there is a reasonable likelihood of incidental take. PG&E would continue its environmental planning and screening processes to avoid and minimize impacts, and site-specific AMMs, such as those required under a Biological Opinion. Overall, the total elimination of impacts is not practicable because of the public safety, regulatory, and site-specific requirements related to O&M work. Permitting under Section 7, if a federal nexus is available, or Section 10, if no federal nexus is available, for hundreds of small and routine activities would create a burden for both USFWS and PG&E, and would result in substantial costs and delays of O&M projects. The preparation of dozens of Biological Assessments (BAs) or low-effect HCPs annually would not be practicable because of the sheer volume of activities and projects undertaken each year. In addition, the USFWS often is required to balance competing priorities from multiple applicants to review and process multiple BAs or low-effect HCPs for a broad range of projects beside utility O&M activities.

Moreover, under the no action alternative, the benefits of the proposed conservation program would largely be unrealized. This alternative would preclude the ability to capture the efficiencies associated with both landscape level and advanced mitigation planning. A piecemeal approach to mitigation, the current practice on individual Section 7 consultations, has proved to be expensive, time consuming, and inefficient, and such inefficiencies would be compounded by increasing the number of activities that would follow the project-by-project permitting approach. Because of potential delays involved with permitting such a large volume of work, the no action alternative would be a potential impediment to the efficient and timely maintenance of PG&E facilities, potentially delaying reliability and safety improvements. Additionally, it would move PG&E away from landscape level planning in which mitigation is coordinated and consolidated. Accordingly, this alternative was rejected.

7.2.2 Changed Practices Alternative

PG&E considered a suite of changed practices to avoid the take of covered species when conducting O&M activities. Changed practices considered in this alternative would involve changing maintenance techniques, modifying activities, restricting activities seasonally, and conducting pre-activity biological surveys for a large number of small activities. As described in Chapter 1, *Introduction*, and Chapter 5, *Conservation Strategy*, PG&E already modifies its practices on a project-by-project basis through its existing environmental review and screening processes. A total elimination of impacts is often impracticable because of the public safety, regulatory, and site-specific requirements that are related to O&M work. Changed practices may be ineffective at reducing take and could introduce new and inconsistent work practices into PG&E's operations.

PG&E's approach to maintenance has evolved based on the regulatory requirements for public safety and environmental compliance. PG&E eliminated the prospect of changing its maintenance activities because PG&E has a legal and public safety obligation to maintain its facilities and because AMMs are already implemented on a project-by-project basis. PG&E's environmental management group of land planners and biologists work closely with maintenance and project staff to coordinate construction activities to avoid and minimize impacts associated with all aspects of maintenance.

Modifying activities to completely avoid impacts is also infeasible because O&M activities are needed to maintain, repair, or upgrade existing facilities to maintain public safety and comply with CPUC regulations. As an example, pipeline replacement and recoating are necessary to ensure that facilities continue to operate safely and reliably. Regulatory, legal, and logistical considerations such as NERC's standards and requirements to maintain conductor clearances and reliability also limit PG&E's ability to modify some activities. NERC reliability standards and requirements, as an example, limit PG&E's ability to restrict some covered activities seasonally because some repairs must be conducted within 12 months from the time a deficiency is reported; additionally, scheduling work around line clearance schedules often requires months of additional planning. As part of NERC, PG&E must remove vegetation around lines year-round to maintain access to facilities and reduce fire risk.

Seasonally restricting covered activities beyond what is proposed in the AMMs (see Chapter 5, Table 5-1) would be logistically and economically prohibitive because it would require that PG&E forego maintenance when the maintenance activity is needed, which would compromise PG&E's abilities to make necessary inspections, repairs, and upgrades, potentially leading to emergency repairs and unnecessary outages. By restricting covered activities beyond what is proposed in the AMMs to a few months per year, typically outside of the rainy/wet and nesting bird seasons, would

limit PG&E's ability to operate and maintain its infrastructure, leading to interruptions in service and potentially reduced public safety.

PG&E also evaluated the possibility of conducting pre-activity biological surveys for most O&M covered activities. Conducting such surveys for a majority of covered activities would be cost-prohibitive and would not appreciably reduce impacts on species because most of PG&E's impacts are temporary disturbances to habitat. Furthermore, PG&E performs tens of thousands of activities per year, and the effort required to schedule, monitor, and report on so many biological surveys would be extraordinary given the number of staff members and budget available. The costs would increase substantially and would not result in tangible benefits for covered species. Accordingly, this alternative was rejected.

7.2.3 Reduced Number of Covered Species Alternative

PG&E considered an alternative that would focus the analysis on those species most likely to be affected and to cover fewer species in the Plan Area. Under this alternative, PG&E would only cover species for which covered activities would have at least 0.5 acre of temporary habitat disturbance per year (see Chapter 4, Table 4-8). A 0.5-acre threshold was established because most small impacts are dispersed, decentralized, and difficult to monitor, and because these small impacts are unlikely to result in take of species. Application of these criteria would result in a list of 14 covered wildlife species (Table 7-1). The species that are covered under the MRHCP but which would not be covered under this alternative are Conservancy fairy shrimp, longhorn fairy shrimp, Morro shoulderband snail, Mount Hermon June beetle, Ohlone tiger beetle, Zyante band-winged grasshopper, Mountain yellow-legged frog, Sierra Nevada yellow-legged frog, and Yosemite toad. Additionally, no plant species would be covered under this alternative.

Table 7-1. Wildlife Species Listed Under the ESA with an Estimated 0.5-Acre Habitat or More Affected per Year by Covered Activities

Invertebrates	Vernal pool fairy shrimp
	Vernal pool tadpole shrimp
	Valley elderberry longhorn beetle
	Smith's blue butterfly
Amphibians	California red-legged frog
	California tiger salamander (Central California DPS)
	California tiger salamander (Santa Barbara DPS)
	Foothill yellow-legged frog
	Santa Cruz long-toed salamander
Reptiles	Blunt-nosed leopard lizard
	Giant garter snake
Birds	Marbled murrelet
	Northern spotted owl
Mammals	Giant kangaroo rat
	San Joaquin kit fox

Under a reduced species alternative, fewer AMMs would be implemented and several hot zones would be removed. These reductions would likely result in some cost savings to PG&E because fewer AMMs would be followed and mitigation would not be required for these activities. However, PG&E would continue to screen its work, and, if PG&E determined that one of its activities could be expected to reasonably result in incidental take, a project-specific Section 7 consultation or a project-specific Section 10 permit would be sought. These project-by-project requirements would likely result in project delays and would undermine the intent of the HCP to provide a regional approach to complying with the ESA in a timely manner to support reliable and safe utility operations. Accordingly, this alternative was rejected.

7.2.4 Large Maintenance Projects Alternative

This alternative would include only PG&E's larger maintenance projects that have historically needed take coverage, coordination with multiple stakeholders and considered the equivalent of new construction projects. These activities consist of most large gas transmission work (i.e., G9, G11, G13a, G14, and G15), and large electric transmission work (i.e., E9a, and E12 through E14) (see discussion of work activities in Sections 3.2 and 3.3 of Chapter 3, *Covered Activities*). By covering fewer activities, PG&E's take request would be reduced. However, there may still be instances when PG&E would need take coverage for smaller projects. PG&E would continue to screen its work, and, if PG&E determined that one of these species could be affected, a project-specific Section 7 consultation or a project-specific Section 10 permit would be needed. These project-by-project requirements would likely result in project delays and would undermine the intent of the HCP to provide a regional approach to complying with the ESA in a timely manner to support reliable and safe utility infrastructure. Therefore, this alternative was rejected.

Chapter 8
References Cited

8.1 Printed References

Atwater, T. and J. Stock. 1998. Pacific-North American Plate Tectonics of the Neogene Southwestern United States: An Update. *International Geology Review* 40:375–402.

Baldwin, B. G., D. H. Goldman, D. J. Keil, R. Patterson, T. J. Rosatti, and D. H. Wilken (eds.). 2012. *The Jepson Manual: Vascular Plants of California*. Second edition. Berkeley, CA: University of California Press.

Buising, A. V. and J. P. Walker. 1995. Preliminary Palinspastic Paleogeographic Reconstructions for the Greater San Francisco Bay Area, 15 Ma–5 Ma. Pages 141–160 in E. M. Sanginés, D. W. Andersen, and A. V. Buising (eds.), *Recent Geologic Studies in the San Francisco Bay Area*. Fullerton, CA: Pacific Section, The Society for Sedimentary Geology.

California Department of Fish and Game. 2003. *Atlas of the Biodiversity of California*. Sacramento, CA.

———. 2010. California Wildlife Habitat Relationships (CWHR), System Description and Species Distribution Maps. California Interagency Wildlife Task Group.

California Department of Fish and Wildlife. 2014. CWHR version 9.0 personal computer program. California Interagency Wildlife Task Group. Sacramento, CA.

———. 2017. Vegetation Classification and Mapping Program.
Vegetation: Carrizo Plain National Monument, Ecological Reserve and Adjacent Elk Range [ds1094], 2015-01-16.
Vegetation: Cow Creek, 2013 [ds1345], 2016-01-07.
Vegetation: Mill Creek, 2013 [ds1346], 2016-01-07.
Vegetation: Napa County and Blue Ridge Berryessa [ds201], 2004-01-01.
Vegetation: Great Valley Ecoregion [ds2632], 2016-11-07.
Vegetation and Land Use [ds292], 2011-12-05.
Vegetation: Carrizo Plain Ecological Reserve, 2005–2008 [ds561], 2009-09-10.
Vegetation: Lassen Foothills [ds564], 2008-03-01.
Vegetation: Northern Sierra Nevada Foothills [ds566], 2011-06-07.
Vegetation: Gabilan Ranch, 2006 [ds614], 2006-10-01.
Vegetation: San Benito River, 2007 [ds616], 2007-06-09.
Vegetation: Garcia River, Mendocino County, 2005 [ds722], 2007-01-01.
Vegetation: Clear Creek Monocline Ridge [ds995], 2006-01-01.
Vegetation: Mid-Peninsula Open Space [ds997], 2014.
Vegetation: San Benito River, 2007 [ds616], 2007-06-09.
Vegetation: Garcia River, Mendocino County, 2005 [ds722], 2007-01-01.
Vegetation: Clear Creek Monocline Ridge [ds995], 2006-01-01. Vegetation: Mid-Peninsula Open Space [ds997], 2014.

———. 2018. California Natural Diversity Database, RareFind 5, Version 5.2.7. Available: https://www.wildlife.ca.gov/Data/CNDDB/Maps-and-Data. Accessed: February 2018.

California Department of Forestry and Fire Protection. 2007. California fire hazard severity zone map update project. Sacramento, CA. Available: http://www.fire.ca.gov/fire_prevention/fire_prevention_wildland_zones_maps.php. Accessed: January 7, 2015.

California Department of Water Resources. 2005*. California Water Plan Update 2005, A Framewok for Action*. Volume 3: Regional Reports. Bulletin 160-05. December. Available: https://water.ca.gov/-/media/DWR-Website/Web-Pages/Programs/California-Water-Plan/Docs/Update2005/California-Water-Plan-Update-2005---Volume-3.pdf.

California Native Plant Society. 2012. Inventory of Rare and Endangered Plants. Online edition, v7. Last revised: May 15, 2012. Available: http://cnps.site.aplus.net/cgi-bin/inv/inventory.cgi. Accessed: June 28, 2012.

California Stormwater Quality Association. 2014. *California Stormwater Best Management Practices Handbook.* Available: http://www.casqa.org.

Central Valley Regional Water Quality Control Board. 2018. *The Water Quality Control Plan (Basin Plan) for the California Regional Water Quality Control Board Central Valley Region*. Fifth Edition. May. Available: https://www.waterboards.ca.gov/centralvalley/water_issues/basin_plans/sacsjr_201805.pdf

City of Sacramento, Sutter County, Natomas Basin Conservation, Reclamation District No. 1000, and Natomas Central Mutual Water Company. 2003. *Natomas Basin Habitat Conservation Plan*. Final Draft. Prepared for U.S. Fish and Wildlife Service and California Department of Fish and Game. April.

Davis, F. W. and M. Borchert. 2006. Central Coast Bioregion. Pages 321–349 in N. G. Sugihara, J. W. Van Wagtendtonk, K. E. Shaffer, J. Fites-Kaufman, and A. E. Thode, (eds.), *Fire in California's Ecosystems*. University of California, Berkeley.

Earth System Science Center, Pennsylvania State University. 1998. *Soil Information for Environmental Modeling and Ecosystem Management*. Last Posted or Revised: December 15, 1998. Available: http://www.essc.psu.edu/soil_info/soil_lrr/. Accessed: March 9, 2004.

GreenInfo Network. 2018. California Protected Areas Database (CPAD). Available: http://www.calands.org/data. Accessed: May 3, 2018.

Griffin, J. R. 1975. *Plants of the Highest Santa Lucia and Diablo Range Peaks, California*. USDA Forest Serv. Res. Paper PSW-110, 50 Pacific Southwest Forest and Range Exp. Stn., Berkeley, CA.

Hackel, O. 1966. Summary of the Geology of the Great Valley. Pages 217–238 in E. G. Bailey, (ed.), *Geology of Northern California*. Bulletin 190. Sacramento, CA: California Division of Mines and Geology.

Harden, D. R. 1998. *California Geology*. Prentice-Hall: Upper Saddle River, NJ.

Hill, D. P., P. Mowinckel, and L. G. Peake. 1975. Earthquakes, Active Faults, and Geothermal Areas in the Imperial Valley, California. *Science* 188:4195, 1306-1308.

Intergovernmental Panel on Climate Change. 2007. *Climate Change 2007: The Physical Science Basis. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change.* Solomon, S., D. Qin, M. Manning, Z. Chen, M. Marquis, K. B. Avery, M. Tignor,

and H. L. Miller (eds.). Cambridge, U.K. and New York, NY: Cambridge University Press. Available: http://www.ipcc.ch/ipccreports/ar4-wg1.htm.

Linsley, E. G. and J. A. Chemsak. 1972. Cerambycidae of North America, Part VI, No. 1. Taxonomy and classification of the subfamily Lepturinae. *University of California Publications in Entomology* 36:1-13. University of California Press, Berkeley and Los Angeles, California.

Norris, R. M. and R. W. Webb. 1990. *Geology of California* (2nd edition). John Wiley & Sons: New York.

Null, J. 1995. *Climate of San Francisco*. Monterey, CA, National Oceanic and Atmospheric Agency, National Weather Service.

Placer County Conservation Program. 2018. *Draft Western Placer County Habitat Conservation Plan/Natural Community Conservation Plan*. Prepared by ICF and MIG, Inc. December.

Planert, M. and J. S. Williams. 1995. *Ground Water Atlas of the United States*: Segment 1 California, Nevada. U.S. Geological Survey. Reston, VA.

PRBO Conservation Science. 2011. *Projected Effects of Climate Change in California: Ecoregional Summaries Emphasizing Consequences for Wildlife.* Version 1.0. February 10. Petaluma, CA.

Ramsay, J. G. and M. I. Huber. 1987. *The Techniques of Modern Structural Geology*. Vol. 2: Folds and Fractures. Pergamon Press: London.

Schweickert, R. A. 1981. Tectonic Evolution of the Sierra Nevada Range. Pages 87–131 in W. G. Ernst (ed.), *The Geotectonic Development of California*. Prentice-Hall: Englewood Cliffs, NJ.

Talley, T. S. and M. Holyoak. 2009. *Effects of Highways and Highway Construction Activities on Valley Elderberry Longhorn Beetle Habitat*. Final Report FHWA/CA09-0925. Submitted to California Department of Transportation, Contract Number 65A0222. University of California, Davis, CA. March 31.

U.S. Fish and Wildlife Service. 2005. *Revised Guidance on Site Assessments and Field Surveys for the California Red-Legged Frog*. August.

———. 2006. *Estimating the Effects of Auditory and Visual Disturbance to Northern Spotted Owls and Marbled Murrelets in Northwestern California*. Arcata Fish and Wildlife Office, Arcata CA. July.

———. 2017. *Framework for Assessing Impacts to the Valley Elderberry Longhorn Beetle (*Desmocerus californicus dimorphus*)*. May. Sacramento, CA.

U.S. Fish and Wildlife Service and California Department of Fish and Game. 2003. Interim Guidance on Site Assessments and Field Surveys for Determining Presence or a Negative Find of the California Tiger Salamander. October. U.S. Fish and Wildlife Service, Sacramento Field Office, Sacramento, CA.

U.S. Forest Service. 2017. CALVEG—Existing Vegetation [ESRI personal geodatabase]. ExistingVegR5_CentralValley1998_2016_v1. ExistingVegR5_NorCoastEast1998_2015_v1. ExistingVegR5_NorCoastMid1998_2014_v1. ExistingVegR5_NorCoastWest2000_2014_v1. ExistingVegR5_CentralCoast1997_2013_v1. ExistingVegR5_CentralValley1998_2016_v1. ExistingVegR5_SouCoast2002_2010_v2. ExistingVegR5_SouthSierra1995_2016_v1. ExistingVegR5_NorCoastEast1998_2015_v1. ExistingVegR5_SouthSierra1995_2016_v1.

ExistingVegR5_NorthSierra2000_2014_v1. ExistingVegR5_NorthInterior1999_2009_v1. ExistingVegR5_GreatBasin1999_2009_v1. ExistingVegR5_CentralValley1998_2016_v1. ExistingVegR5_NorCoastMid1998_2014_v1. ExistingVegR5_NorCoastEast1998_2015_v1. ExistingVegR5_NorthSierra2000_2014_v1. ExistingVegR5_NorthInterior1999_2009_v1. ExistingVegR5_CentralValley1998_2016_v1.

Van Dyke, E., K. D. Holl, and J. R. Griffin. 2001. Maritime Chaparral Community Transition in the Absence of Fire. *Madrono* 48:4. 221–229.

Van Wagtendonk, J. W. and J. Fites-Kaufman. 2006. Sierra Nevada Bioregion. Pages 264–294 in N. G. Sugihara (ed.), *Fire in California's Ecosystem*. University of California Press.

Witham, C. W., R. F. Holland, and J. Vollmar. 2014. C*hanges in the Distribution of Great Valley Vernal Pool Habitats from 2005 to 2012*. Sacramento, CA. GIS data prepared for CVPIA Habitat Restoration Program, U.S. Fish and Wildlife Service. Grant Agreement No. F11AP00169 with the USFWS. GIS Data and metadata available at: http://www.vernalpools.org/. Accessed: December 2016.

Yolo Habitat Conservancy. 2018. *Yolo Habitat Conservation Plan/Natural Community Conservation Plan*. Final. Woodland, CA. Prepared by ICF, Sacramento CA. April.

Chapter 9
Preparers

9.1 PG&E Preparers

Jon Wilcox	Supervising Program Manager

9.2 PG&E Reviewers

Kathleen Jones	Attorney, PG&E Law Department
Tim Armstrong	Wildlife Biologist, HCP Administrator
Sean Skaggs	Ebbins Moser + Skaggs LLP

9.3 ICF

Brad Norton	Project Manager
Danielle Wilson	Deputy Project Manager
Kelsey Cowin	Project Coordinator
Robert Knutson	Wildlife Biologist
Shannon Crossen	Wildlife Biologist
John Howe	Wildlife Biologist
Steve Yonge	Wildlife Biologist
Rob Preston	Senior Botanist
Torrey Edell	Botanist
Devin Jokerst	Botanist
Kasey Allen	GIS Specialist
Greg Nichols	GIS Specialist
Teresa Giffen	Graphics Specialist
Alan Barnard	Graphics Specialist
Paul Shigley	Technical Editor
Corrine Ortega	Publications Specialist

Chapter 10
Glossary

ampere. Unit of electric current. One volt applied across one ohm of resistance will produce one ampere of current.

anadromous fish. Fish that spend most of their time in saltwater and return to freshwater to spawn. Anadromous fish include Chinook salmon, white and green sturgeon, Pacific and river lamprey, steelhead rainbow trout, delta smelt, and threespine stickleback.

anode bed sites. Anode bed sites are located approximately every 10–20 miles along the pipeline and are composed of a number of anodes that are installed in a 200- to more than 300-foot-deep, 10-inch-diameter vertical hole and backfilled with conductive coke (a material that improves the performance and life of the anodes).

anode beds. Anode beds are a number of anodes, placed together, to function together as a single anode, or terminal, where current is able to flow in from the ground. Anode beds are part of the cathodic protection system that controls corrosion by making the pipeline the cathode of an electrochemical cell.

area transmission. Facilities whose primary purpose is to supply bulk power to the distribution system.

auger. A drilling device, or drill bit, that usually includes a rotating helical screw blade which acts as a screw conveyor to remove the drilled-out material.

automatic recloser. Pole-mounted, oil-filled switch that will open an electric circuit automatically if faulted and then may close automatically to try to complete the circuit again. An automatic recloser issued on electric distribution lines.

backbone transmission. Facilities that integrate major system resources directly or through generation ties and system interconnections.

backfill. Earth or other material which has been used to refill a ditch or trench. Also, the act of refilling a ditch or trench.

biologist. A person who has the educational background, training, work experience (handling experience or permits), required to perform a specific biological task. For the purposes of this HCP, the use of *biologist* also applies to a botanist, where applicable, for specific plant-related tasks. An *authorized* biologist, is a PG&E biologist or PG&E biological contractor, who is authorized to handle, relocate or translocate a covered species after being approved by USFWS. Approval will be granted by USFWS as appropriate, as part of the take authority in the Section 7 Biological Opinion on the HCP.

blading. The act of scraping the ground with a blade attached to a vehicle for the purpose of flattening ground and clearing it of debris and/or vegetation, usually for maintaining unpaved access roads.

blasting mats. A blanket usually composed of woven cable or interlocked rings that is placed over a blast to reduce flyrock.

blasting. The practice of using controlled explosives to excavate, break down, or remove rock.

blown down. Gas is evacuated to the atmosphere from the affected section of pipe through a blowdown stack.

bonding. A piece of equipment installed on the pole prior to installation.

boring. The act or process of making or enlarging a hole.

British Thermal Units (BTU) per cubic foot. A measure of the heat available or released when one cubic foot of gas is burned.

brush hog. A type of rotary mower with hinged blades that can bounce backward and inward when contact with stumps or rocks is made.

cage. Transmission tower lines can be made of steel profiles that are put together to form a lattice or reinforcing metal cage. The freestanding framework is anchored on concrete footings.

California Public Utilities Code. The primary set of laws governing public utilities in California. The code establishes, among other things, the organization of the California Public Utilities Commission, rights and obligations of public utilities, procedures for public utility regulation, and processes for utility-related hearings and judicial review.

California Public Utilities Commission (CPUC). The independent state agency that oversees, monitors and approves pricing and policies of regulated utilities.

capacitor bank. Pole-mounted device for neutralizing inductive electric load to correct the power factor.

capacity. A measure of the quantity of instantaneous energy use. The term is applied to the amount of electric power delivered for which a generator, turbine, transformer, transmission circuit, station or system is rated by the manufacturer. See “demand.”

capital improvement project. A classification of projects that typically require extensive planning, permitting and coordination with multiple stakeholders and are often considered as construction projects. Under the PG&E Bay Area HCP this includes covered activities such as electric reconductoring or gas pipeline replacement projects.

cathodic protection. A technique to prevent the corrosion of a metal surface by making that surface the cathode of an electrochemical cell.

circuit breakers. Substation circuit breakers disconnect major feeder lines from the power system in the event of an overload that could cause damage.

circuit. Completed path for electric current from source to point of use and back.

clamshells. A type of digging bucket, with two cutting edges, opened and closed by a manual, electric, or hydraulic mechanism, and usually extended from an arm or crane.

clearance. Radial distance around overhead open conductors which must be kept free of vegetation; distance varies from 4 feet (less than 72 kilovolt [kV]) to 10 feet (110 kV and greater).

coffer dam. A temporary, watertight enclosure that is pumped dry to expose the bottom of a body of water so that construction may be undertaken.

compressor stations. Locations located along natural gas pipeline and consisting of compressors that maintain a steady flow with pressures of up to 1,000 pounds per square inch gauge (psig), averaging 700 psig in the main pipelines.

condensate. Condensate is formed when "heavy" hydrocarbons, such as ethane, propane, butane, and pentane, condense as pressure suddenly drops at the surface.

conductor reel trailers. A trailer specifically designed to carry conductor reels. Trailers often have the ability to automatically turn the reel in order to properly tension the conductors.

conductor sag. The purposefully created slack or sag in the conductor line between electric towers or poles to allow the conductor line some freedom of movement during high winds or high temperatures.

conductor. Metal wire or cable through which an electric current flows continuously.

connector. Mechanical device used to join two conductors. An automatic connector is a sleeve-type connector requiring tension on the conductors to maintain connection; a bolted connector is a device used for fastening two or more conductors together; a compression connector is a metal sleeve that is mechanically or hydraulically pressed to secure tension; a parallel groove connector uses bolts to compress the sides of the connector against conductors placed in preformed grooves; a plate connector joins conductors by bolting two flat plates together.

controlled backfill. Backfill (intended as a bearing for a structural load) that is placed in layers, compacted, and tested to ensure that it meets specified compaction standards as determined by laboratory tests on a series of soil samples from the fill material.

corner pole (tower). Any pole (tower) where the conductors make an angle of 60 degrees or more from their previous alignment.

CPUC. See California Public Utilities Commission.

cross arm. A horizontal conductor support attached to poles or structures generally at right angles to the conductors.

current. The flow of electricity measured in amperes. Alternating current electricity flows in alternating directions because of the effect of a rotating magnetic field on the electrons in a conductor. Almost all electric utilities generate alternating current. Direct current electricity flows in a single direction and at a constant voltage.

cut and fill. The process of constructing a railway, road or canal whereby the amount of material from cuts roughly matches the amount of fill needed to make nearby embankments, thereby minimizing the amount of construction labor.

cutout. A disconnect with a fuse designed to open the circuit in case of a short or overload.

dead end. Point where the conductors end. Other conductors in many cases will continue and be connected to the preceding conductors by jumper wires and various forms of connectors.

de-energized. Disconnected from electric energy (dead circuit).

demand. The amount of power required to meet the customer's load at a given instant, or averaged over any designated interval of time, and expressed in kilowatts, or megawatts. See also "capacity."

designated work area. The area within which the work crews, vehicles, and materials are to be confined until work activities are completed.

diameter breast height (dbh). The diameter of a tree trunk at a distance measured 4.5 feet above grade.

direct impact. Defined as activities or projects that remove or alter land cover types, or covered species habitat, populations, or occurrences (or portions of thereof). Direct impacts are caused by the project and occur at the time and place of project implementation (e.g., ground disturbance, inundation). Direct impacts can be either permanent or temporary (see definitions of permanent and temporary impacts).

disconnect. Type of switch mounted on a pole. Blades are opened and closed manually, one at a time.

distribution line. A term used by most utilities that refer to low-voltage electric lines. These lines usually serve small businesses and feed residential areas. Primary distribution consists of medium-voltage (2–50 kV) circuits between switchyard and service transformer; secondary distribution consists of a low-voltage (usually 120, 240, or 480 v) circuit between transformer and point of use.

ductility. A solid material's ability to deform under tensile stress; this is often characterized by the material's ability to be stretched into a wire.

electric transmission. The process of moving bulk electric energy from generating sources to load centers or other principal parts of an electric system. A transmission system includes all high-voltage lines, both overhead and underground, that carry electric energy ranging from 50 kV to 765 kV.

emergency work. As defined in PG&E's Utility Procedure ENV-8003P-01: "A project or activity which includes but is not limited to emergency repairs to facilities necessary to maintain service essential to the public health, safety or welfare. Emergency repairs include those that require a reasonable amount of planning where delay of project or activity would result in significant safety or environmental impacts. Furthermore, emergency projects include specific actions necessary to prevent or mitigate an emergency."

energized. Connected to a source of electrical energy (live circuit).

exclusion zone. An area marked with fencing, signage, stakes, or flagging. Exclusion zones are "do not enter" areas, except as instructed by a biologist or the Bay Area Operations and Maintenance (O&M) HCP Administrator. This exclusion zone distance is a guideline that may be modified by a biologist, based on site-specific conditions (including, but not limited to, habituation by the species or background disturbance levels).

existing access road. Roads used by PG&E to access its infrastructure that does not require the creation of new roads.

extant. Currently or still existing not destroyed or lost.

fault. A break in the circuit, an unwanted path for electric current.

fiber optic communications cable. Communications cable that is typically included with the electric transmission system.

fiber wrapping. Wrapping an electric pole with material impregnated with preservatives to retard external deterioration of the pole.

flexi-float or **portable bridges.** Temporary crossings for vehicles that prevent impacts on streams and that are installed for the time of the activity and then removed.

frac-out. A potential concern when drilling, this condition occurs when the pressure of the drilling lubricant escalates, fractures the soil, and allows the drilling fluids to escape the bore.

franchise. Electric transmission and distribution lines and natural gas transportation and distribution lines are located within rights-of-way or franchises. Franchises are the rights granted by cities or counties to PG&E to use public streets and roads, subject to certain requirements, to install and maintain electric and gas lines.

fuse. A device designed to open the circuit in case of short or overload.

generation ties. Facilities whose primary purpose is to provide electrical paths between generating facilities and the integrated transmission network at either backbone or area levels.

grading. The act of leveling or smoothing the ground to a desired or horizontal gradient.

grit blasting. The cleaning of metal or other material with a pressurized stream of sand or other "gritty" material.

ground. To connect a line or piece of equipment to the earth.

ground-disturbing. An activity that uses motorized equipment to break the ground surface. Use of backhoes, scrapers, bulldozers, or graders to alter natural terrain constitutes ground-disturbing activities. Use of hand tools, such as shovels and pick axes, does not constitute a ground-disturbing activity for the Bay Area O&M HCP.

guy. A tension member (a solid wire or stranded wires) used to withstand an otherwise unbalanced force on a pole, crossarm or other overhead line structure.

hazard tree. A tree with structural weakness that poses a direct safety risk to infrastructure (e.g., dead or dying trees, dead parts of live trees, or unstable live trees [due to structural defects or other factors] that are within striking distance of overhead or aboveground electric transmission and distribution lines).

heavy equipment. Backhoes, front-end loaders, bulldozers, excavators, and other heavy, mechanized equipment used to grade, trench, prune, and/or remove vegetation; remove sediment and large woody debris; and place riprap and rock.

hot zone. Area containing a known localized population of covered species with a small and well-defined range, and where the species would be most likely to be affected should covered activities occur there.

hydro-axe. A hydro-axe is a powerful mulching attachment that trims unwanted vegetation, including trees up to 6 inches in diameter, and transforms the debris into mulch in a very short time.

Independent System Operator (ISO). Independent System Operator. A neutral party responsible for the management and control of the electric transmission grid in a state or a region.

indirect impact. Impacts that are caused by the proposed action and are later in time, but are still reasonably certain to occur (50 CFR 402.02). Indirect impacts in the context of this HCP include those impacts that occur at the time of the project or activity, but are beyond the footprint of a project or activity (i.e., beyond the area of land cover disturbance). While more difficult to detect and track, indirect impacts can undermine species viability or habitat quality, especially if multiple indirect or direct impacts work cumulatively to impair the species or to degrade the habitat.

insulated cables. Either carried aboveground or underground. For higher distribution voltages, power cables are made of twisted copper conductors surrounded by insulation; the whole cable is enclosed in a protective sheath. Simpler cables, with fewer conductors and thinner insulation are adequate for lower voltages.

insulation. Protective covering, around a conductor or other piece of equipment, that is a non-conductor of electricity.

insulator. Porcelain, glass, or non-ceramic unit used to support and separate conductors from each other and the ground.

interstate pipeline. A natural gas transmission line that crosses state boundaries and is owned and operated by independent companies that deliver gas from the well heads (source) to the local utility and other wholesale customers.

investor-owned utility. Those utilities organized as tax-paying businesses usually financed by the sale of securities in the free market, and whose properties are managed by representatives regularly elected by their shareholders. IOUs' stock normally is sold on an exchange such as the New York Stock Exchange or NASDAQ.

jack and bore. Process by which the pipeline is installed at the same time as the drilling.

jetting head. Technical term for adhesive application guns which controls the way and place adhesive is applied.

kilovolt (kV). One thousand volts.

kilowatt (kW). A unit of electrical power equal to 1,000 watts.

kilowatt-hour (kWh). A common unit of electric energy consumption, and the basic unit of electric energy. It equals the total energy developed by the power of 1 kilowatt (kW) supplied to or taken from an electric current steadily for 1 hour.

landslide. The movement downslope of a mass of rock, debris, earth, or soil; also called a landslip.

lattice. An open framework made of strips of metal, wood, or similar material overlapped or overlaid in a regular, usually crisscross, pattern.

line clearance. Pruning of branches or trees growing toward conductors on high-voltage electric lines.

Lines of business (LOB). A specific operating group responsible for a common set of projects or activities. PG&E has multiple LOBs typically oriented around electric transmission and distribution, gas transmission and distribution, and vegetation management.

liquid weld. An epoxy product used to glue or "weld" two surfaces or objects together.

local responsibility areas. Wildland fire protection in California is the responsibility of either the State, local government, or the federal government. Local responsibility areas include incorporated cities, cultivated agriculture lands, and portions of the desert. Local responsibility area fire protection is typically provided by city fire departments, fire protection districts, counties, and by CAL FIRE under contract to local government.

maintenance activities. Maintenance activities include repairing and replacing facilities, structures, and access roads. They also include emergency repair and replacement and vegetation management, including tree pruning and removal.

maintenance classes. The Federal Safety Standards define four maintenance classes or "class location units." A class location unit is an onshore area that extends 220 yards (200 meters) on either side of the centerline of any continuous 1-mile (1.6 kilometers) length of pipeline. These classes are used to determine the frequency of patrols and corrective actions needed to repair gas pipeline. The maintenance classes are defined as follows.

- **Class 1**: an offshore area; or any class location unit that has 10 or fewer buildings intended for human occupancy.
- **Class 2**: a class location unit in any location unit that has more than10 but fewer than 46 buildings intended for human occupancy.
- **Class 3**: Any class location unit that has 46 or more buildings intended for human occupancy; or an area where the pipeline lies within 100 yards (91 meters) of either a building or a small, well-defined outside area (such as a playground, recreation area, outdoor theater, or other place of public assembly) that is occupied by 20 or more persons on at least 5 days a week for 10 weeks in any 12-month period (the days and weeks need not be consecutive).
- **Class 4**: any class location unit where buildings with four or more stories above ground are prevalent.

The length of Class locations 2, 3, and 4 may be adjusted as follows: 1) A Class 4 location ends 220 yards (200 meters) from the nearest building with four or more stories above ground. 2) When a cluster of buildings intended for human occupancy requires a Class 2 or 3 location, the class location ends 220 yards (200 meters) from the nearest building in the cluster.

Map Book zone. Area of occupied or potentially occupied plant habitat as determined by PG&E botanical surveys.

mastic. A paste-like cement used in highway construction, especially one made with powdered lime or brick and tar.

meter. A device for measuring levels and volumes of a customer's gas and electricity use.

minor new construction. These activities involve installing new structures to extend service to new residential or commercial customers. When conducted in natural vegetation or agricultural lands that contain suitable habitat for covered species, new electric or gas line extensions are limited to 2 miles from an existing line. End-to-end extensions exceeding 2 miles are not covered under the MRHCP. Multiple 2-mile extensions in different geographic areas are covered, but each will be treated as a separate activity. The size of a minor new construction project is estimated as the total footprint, expressed in acres. Consistent with the requirements of NEPA, the MRHCP does not allow segmentation of proposed construction to obtain coverage under the MRHCP. New

facilities are limited to 1.0 acre of new gas pressure limiting stations (PLS) and 3.0 acres per electric substation expansion; though up to 10 acres may be allowable if take authorization is available.

modernization and replacement activities. Activities that are required by CPUC to enhance the operation and safety of PG&E's natural gas transmission system in heavily populated areas and that are scheduled to be performed throughout PG&E's service area. The gas pipeline system will be inspected and field tested and damaged pipeline segments will be replaced in areas characterized as high-consequence areas, or densely populated locations.

native fish. Fishes endemic to lakes, streams, and rivers in California.

natural gas distribution. The process of using a gas line carrying less than 60 pounds per square inch gauge (psig) pressure.

natural gas transmission. The transport of natural gas from California and out of state sources into the PG&E system to ensure maximum reliability of gas service to customers.

natural gas. A hydrocarbon gas found in the earth, composed of methane, ethane, butane, propane, nitrogen, carbon dioxide, hexane, heptanes, and pentane. PG&E adds a mercaptan sulfur odor to all natural gas as a safety measure to allow detection if a leak occurs.

natural land cover type. Areas with natural vegetation and non-specific vegetation community. In California there are many natural land cover types, and there are many subcategories of vegetation communities. A definitive source for these communities is Swayer and Keeler-Wolfe's *A Manual of California Vegetation*.

network. A system of transmission or distribution lines so cross-connected and operated as to permit multiple power supplies to any principal point on it.

North American Electric Reliability Corporation (NERC). Formed by the electric utility industry in 1968 to promote the reliability of its generation and transmission systems. NERC develops and enforces reliability standards; assesses adequacy annually through a 10-year forecast and winter and summer forecasts; monitors the bulk power system; and educates, trains, and certifies industry personnel. NERC is a self-regulatory organization, subject to oversight by the U.S. Federal Energy Regulatory Commission and governmental authorities in Canada.

noxious weed. A noxious weed is a weed that has been designated by an agricultural authority as one that is injurious to agricultural or horticultural crops, natural habitats or ecosystems, or humans or livestock.

off-road travel. Travel by vehicle or foot off existing paved or gravel roads.

ohm. Unit of resistance to flow of electric current. One ohm of resistance requires 1 volt of energy to push 1 ampere of current across it. Roughly analogous to friction loss in a water hose.

open crossings. Openings in the ground, such as a ravine, where an otherwise below-ground pipe may be exposed or day lighted.

open trenching. Method of installing underground equipment, such as pipeline, that involves digging a trench, laying the pipe, and then filling the trench back in once finished.

operation activities. Operation activities typically include inspecting, monitoring, testing, and operating valves, enclosures, switches, and other components. These covered activities involve utility personnel working at facilities; personnel typically use existing access roads.

peak load. The maximum demand for electric power that determines the generating capacity required by a utility. More generally, it is the maximum load consumed or produced over a stated period of time.

permanent impact. Effects that result in permanent changes in land cover or disturbance to habitat such that the vegetative cover, soils, topography, and hydrological conditions would not recover within one growing season. Permanent impacts on plants are defined as absence of the plant after the restoration period has ended or for more than 1 year after it is impacted..

permanent impact on VELB habitat. Any covered activity that results in removal of an entire elderberry shrub with at least one stem greater than 1-inch diameter at ground level will be counted as a permanent impact on one shrub.

Permit Area. Also known as the Plan Area. The area in which activities are authorized.

phase. One wire or conductor of a circuit. All electric energy generated by PG&E is three-phase alternating current (AC) electricity. During each 360-degree cycle of the rotor in a generator, electric voltage is induced successively in three coils, each located 120 degrees apart. The succession of voltages induced corresponds to three phases, each one-third of a cycle apart. Electricity is generated and transmitted (by a set of three power lines) in these three phases.

pig. A pipeline inspection gauge, or pig, is used to inspect various pipeline operations remotely without stopping the flow of the pipeline product.

Plan Area. The portion of the 34-county study area that consists of PG&E gas and electric transmission and distribution facilities plus right of ways (ROWs), the lands owned by PG&E and/or subject to PG&E easements to maintain these facilities, private access routes associated with PG&E's routine maintenance, a buffer around the ROWs, and mitigation areas acquired to mitigate for impacts resulting from covered activities.

plug. A plug is a commonly used method for erosion control on streambeds. The contractor creates an area/plug that can be opened if a rain event occurs so that the water can flow into the stream mirroring natural conditions.

pole switch (air switch). Switch mounted on a pole. All blades open and close together with one handle.

pounds per square inch gauge (psig). Pipeline pressure is measured by a gauge as psig and does not include the force of the atmosphere at any location. Atmospheric pressure decreases with increasing elevation; at sea level it is 14.7 pounds per square inch (psi).

pre-activity survey. Biological survey required to be conducted within 30 days of the start of Bay Area O&M HCP covered activities located within natural vegetation (and certain agricultural lands that provide key habitat for covered species) that are sized 0.01 acre or more, or smaller activities that are within species Map Book zones or hot zones.

pressure-limiting station. Equipment installed for the purpose of preventing the pressure on a pipeline or distribution system from exceeding the maximum pressure as determined by one or

more regulating codes by controlling or restricting the flow of gas when abnormal conditions develop.

primary distribution lines. Electric lines that carry three-phase AC power in the 2 kV–50 kV range to street rail and bus systems, as well as to industrial and commercial customers.

public utility. Public utilities can be divided into two major service groups. One group consists of businesses that supply continuous services through fixed physical connections between suppliers and consumers; these include electric, gas, telephone, water, and sewage companies. The second group consists of public transportation companies such as railroads, trucking companies, gas and oil pipelines, airlines, and water carriers. Public utilities can also be divided into three ownership categories; investor-owned utilities (such as PG&E), government-owned utilities (such as municipal utilities), and cooperatively owned utilities (such as rural electric cooperatives).

pull site. Temporary construction areas that are used during the removal of existing conductors and the placement of new conductors along the transmission line; these are also used to help tension the lines.

qualified individual. Staff or contractors who have undergone specific training to address their work needs. PG&E may conduct specialized Valley elderberry longhorn beetle and Morro shoulderband snail training to allow field crews to become qualified individuals who can identify habitat, and, in the case of the snails in urban areas, safely move them.

rate case. A proceeding, usually before a regulatory committee, involving the rates to be charged for a public utility service.

regulator (gas). A device used to reduce gas pressure.

reliability. The guarantee of system performance at all times and under all reasonable conditions to assure constancy, quality, adequacy and economy of electricity. It is also the assurance of the continuous supply of electricity for customers at the proper voltage and frequency.

right-of-way (ROW). Electric and gas transmission and distribution lines are located within corridors or franchises that PG&E purchases, or more commonly leases, from landowners to install and maintain electric or gas lines. PG&E owns less than 1% of its rights-of-way in fee; the remainder is easements.

riparian vegetation. Terrestrial vegetation that grows beside rivers, streams, and other freshwater bodies, and depends on these water sources for soil moisture greater than would be available from local precipitation.

ripping. Method of loosening rock during excavation using steel tynes attached to the rear of bulldozers.

riprap. Rock or other material used to armor shorelines, streambeds, bridge abutments, piling, and other shoreline structures against scour, water, or ice erosion.

ruderal/barren. Areas in which the natural vegetation cover has been disturbed and is either comprised of invasive and/or non-native, colonial species or no vegetation is present. This is generally considered low quality habitat.

secondary distribution lines. Electric distribution lines that carry 120/240-volt, single-phase, three-wire service, which provides electric power for most appliances in residential areas.

service area. The area where a utility has the right or is required to provide utility service to retail customers, as well as specified areas adjacent to the utility's electric distribution lines or natural gas pipelines in cities and counties where the utility holds franchises. PG&E's 94,000-square-mile combined electric and gas service territory covers much of northern and central California and includes all or portions of 48 of the state's 58 counties.

service drop. Portion of the power line from the secondary distribution line to the point of use (usually between the pole and the house).

shoo-fly. A temporary support system that involves adding poles or structures around existing permanent facilities to limit service interruptions until permanent repairs can be made.

shot blasting. The cleaning of metal or other material by a stream of shot (water, sand, etc.)

side boom. An arm or crane-type attachment to a tractor or bulldozer used for lifting and moving large, heavy pieces of equipment, especially pipe.

slurry. A suspension of insoluble particles in a liquid, as in a mixture of cement, clay, coal dust, manure, meat, etc. with water.

soil matting. Installation of protective fiber mulches or bonded fiber materials to control soil erosion.

spoil. Refuse material removed from an excavation.

State Responsibility Area. A legal term defining the area where the state has financial responsibility for wildland fire protection.

stubbing. A reinforcement method for existing wood poles that entails driving or setting a short steel truss or wood pole into the ground and attaching it to the existing pole.

study area. All or portions of 34 counties: Amador, Butte, Calaveras, Colusa, El Dorado, Fresno, Glenn, Humboldt, Kern, Lake, Lassen, Madera, Mariposa, Mendocino, Modoc, Monterey, Nevada, Placer, Plumas, Sacramento, San Benito, San Luis Obispo, Santa Barbara, Santa Cruz, Shasta, Sierra, Siskiyou, Sutter, Tehama, Trinity, Tulare, Tuolumne, Yolo, and Yuba.

substation. An assemblage of equipment for purposes of switching and/or changing or regulating the voltage of electricity. Substations that simply connect two or more transmission circuits without transforming the voltage are called switching stations.

Supervisory Control and Data Acquisition system (SCADA). Monitors pipeline functions remotely and then transmits that information to operational offices.

switchyard. Switchyards are located adjacent to electric power generation sources, and consist of step up transformers that increase the voltage at which power is generated to the voltage at which power is transmitted and thereby connect generators to PG&E's electric transmission system.

tailboards. Meetings, held prior to initiation of work activity, wherein crew members are given important information relating to completing their tasks.

tap lines. Tapping a circuit can refer either to running a line or cable from a point in a circuit, or to the drawing of electricity from that circuit. Just as a water tap allows one to draw a certain amount of water from the total supply, an electric tap serves the same function for drawing electricity from a source of supply.

temporary impact. Effects that result in temporary alteration of existing vegetation, soils, topography, and hydrology for a period of days, weeks, or months, but no longer than 12 months. Temporary impacts for plants are defined as trimming, pruning, or temporarily removing topsoil and seedbank, where the plants recover.

temporary impact on VELB habitat. Any covered activity that results in pruning of one or more elderberry shrub stems greater than 1-inch diameter at ground level, where pruning is at 6-feet or below in height, when the plant is left in place will be counted as a temporary impact. Any covered activity that results in pruning of elderberry shrub stems, regardless of stem diameter, beyond 6 feet above ground level during the months of March through May, when adult VELB is most likely to be present (Lindsey et al. 1972) will also be counted as a temporary.

tensioners. A small piece of powered equipment mounted to a truck and used to tension conductors.

therm. A standard measurement used for natural gas volumes. One therm equals 100 cubic feet of gas and contains approximately 100,000 BTU of energy (varies with gas quality).

thermal select backfill. A fill product that resists thermal expansion or contraction.

third-party construction dig-ins. Result of a contractor, or third party, causing damage to a gas pipeline.

transformer. A device that is used to reduce ("step down") voltage on electric lines (i.e., from primary to secondary voltage).

transmission. The act or process of transporting electric energy in bulk from a source or sources of supply to other principal parts of the system or to other utility systems.

travelers. Pulleys.

trussing. A pole reinforcement method that entails driving or setting a short steel truss or wood pole into the ground and attaching it to the existing pole.

two-toning. Grading at two elevations, performed on steep terrain to access the ROW.

urban land cover type. Areas that contain residential, commercial, industrial or other developed land uses.

valve. A movable part that controls the flow of a liquid or gas through a pipe or other channel.

vaults. A pre-fabricated, steel-reinforced concrete structure used to provide access to underground cables for maintenance inspections and repairs.

volt (v). The unit of measurement of electrical force or pressure. The volt is analogous to water pressure in pounds per square inch. One volt equals the electrical force that, if steadily applied to a circuit with a resistance of 1 ohm, will produce a current of 1 ampere.

watt. The basic unit of electric power. It is equal to the rate of energy transfer equivalent to 1 ampere flowing under 1 volt of pressure with a power factor of 100%.

well-pointing. Sub-ground dewatering method for controlling or lowering the level of sub-ground water within an aquifer.

windrow. A row of cut and stacked vegetation or soil, or to temporarily store vegetation or soil on an activity site.

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 B1
Species Accounts—Wildlife

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)

GIS Sources

Barry, S. 1995. *Rangeland Oasis*. University of California Cooperative Extension. Leaflet No. 21531. Available: https://ucanr.edu/repository/fileaccess.cfm?article=157404&p=XXWGMW. Accessed: November 18, 2016.

California Department of Fish and Wildlife. 2018. California Natural Diversity Database, RareFind 5, Version 5.2.7. Available: https://www.wildlife.ca.gov/Data/CNDDB/Maps-and-Data. Accessed: February 2018.

U.S. Fish and Wildlife Service. 2005. *Recovery Plan for Vernal Pool Ecosystems of California and Southern Oregon*. Portland, OR: Region 1. Available: https://www.fws.gov/oregonfwo/documents/RecoveryPlans/Vernal_Pool_Fairy_Shrimp_RP.pdf. Accessed: February 2018.

U.S. Geological Survey. 2013, National Hydrography Geodatabase: The National Map viewer available: https://viewer.nationalmap.gov/viewer/nhd.html?p=nhd. Accessed: February 2018.

Witham, C. W., R. F. Holland, and J. Vollmar. 2014. *Changes in the Distribution of Great Valley Vernal Pool Habitats from 2005 to 2012*. Sacramento, CA. GIS data prepared for CVPIA Habitat Restoration Program, U.S. Fish and Wildlife Service. Grant Agreement No. F11AP00169 with the USFWS. GIS data and metadata available: http://www.vernalpools.org/. Accessed: December 2016.

References

California Department of Fish and Wildlife. 2018. California Natural Diversity Database, RareFind 5, Version 5.2.7. Available: https://www.wildlife.ca.gov/Data/CNDDB/Maps-and-Data. Accessed: June 2018.

Eng, L., L. Belk, and C. H. Eriksen. 1990. California Anostraca: Distribution, Habitat and Status. *Journal of Crustacean Biology*. 10(2):247–277.

Eriksen, C. and D. Belk. 1999. *Fairy Shrimps of California's Puddles, Pools, and Playas*. Eureka, CA: Mad River Press, Inc.

Helm, B. 1998. Biogeography of Eight Large Branchiopods Endemic to California. Pages 124–139 in C. W. Witham, E. T. Bauder, D. Belk, W. R. Ferren, Jr., and R. Ornduff (eds.), *Ecology, Conservation, and Management of Vernal Pool Ecosystems—Proceedings from a 1996 Conference*. Sacramento, CA: California Native Plant Society.

U.S. Fish and Wildlife Service. 2005. *Recovery Plan for Vernal Pool Ecosystems of California and Southern Oregon*. Portland, OR. xxvi + 606 pages.

———. 2007. *Conservancy Fairy Shrimp* (*Branchinecta conservatio*) *5-Year Review: Summary and Evaluation*. Sacramento, CA: U.S. Fish and Wildlife Service, Sacramento Fish and Wildlife Office.

———. 2012. *Conservancy Fairy Shrimp (*Branchinecta conservatio*) 5-Year Review: Summary and Evaluation*. Sacramento, CA: U.S. Fish and Wildlife Service, Sacramento Fish and Wildlife Office.

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.

References

California Department of Fish and Wildlife. 2018. California Natural Diversity Database, RareFind 5, Version 5.2.7. Available: https://www.wildlife.ca.gov/Data/CNDDB/Maps-and-Data. Accessed: June 2018.

Eng, L., L. Belk and C. H. Eriksen. 1990. California Anostraca: Distribution, Habitat and Status. *Journal of Crustacean Biology.* 10:247–277.

Eriksen, C. and D. Belk. 1999. *Fairy Shrimps of California's Puddles, Pools, and Playas*. Eureka, CA: Mad River Press, Inc.

Helm, B. 1998. Biogeography of Eight Large Branchiopods Endemic to California. Pages 124–139 in C. W. Witham, E. T. Bauder, D. Belk, W. R. Ferren, Jr., and R. Ornduff (eds.), *Ecology, Conservation, and Management of Vernal Pool Ecosystems—Proceedings from a 1996 Conference*. Sacramento, CA: California Native Plant Society. 285 pp.

Holland, R. F. 1978. *The Geographic and Edaphic Distribution of Vernal Pools in the Great Central Valley, California*. California Native Plant Society Special Publication. 4:1–12.

U.S. Fish and Wildlife Service. 2005. *Recovery Plan for Vernal Pool Ecosystems of California and Southern Oregon*. Portland, OR. xxvi + 606 pages.———. 2007. *Vernal Pool Fairy Shrimp* (Branchinecta lynchi)*. 5-Year Review: Summary and Evaluation*. Sacramento, CA: U.S. Fish and Wildlife Service, Sacramento Fish and Wildlife Office.

Vollmar, J. E. 2002. Chapter 2: Landscape Setting. In J. E. Vollmar (ed.), *Wildlife and Rare Plant Ecology of Eastern Merced County's Vernal Pool Grasslands.* Vollmar Consulting. Berkeley, CA.

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.

References

Literature Cited

Goodman, D. 1987. How Do Species Persist? Lessons for Conservation. *Conservation Biology* 1:59–62.

Helm, B. 1998. Biogeography of Eight Large Branchiopods Endemic to California. Pages 124–139 in C. W. Witham, E. T. Bauder, D. Belk, W.R. Ferren, Jr., and R. Ornduff (eds.), *Ecology, Conservation, and Management of Vernal Pool Ecosystems—Proceedings from a 1996 Conference*. Sacramento, CA: California Native Plant Society.

U.S. Fish and Wildlife Service. 2005. *Recovery Plan for Vernal Pool Ecosystems of California and Southern Oregon*. Portland, OR. Available: <http://ecos.fws.gov/docs/recovery_plan/060614.pdf>. Accessed: January 28, 2010.

———. 2006. Final rule; administrative revisions - Designation of Critical Habitat for Four Vernal Pool Crustaceans and Eleven Vernal Pool Plants. 71 FR 7118-7316.

———. 2007. *Vernal Pool Tadpole Shrimp (Lepidurus packardi), 5-Year Review: Summary and Evaluation*. Sacramento, CA: U.S. Fish and Wildlife Service, Sacramento Fish and Wildlife Office.

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.

References

California Department of Fish and Wildlife. 2018. California Natural Diversity Database, RareFind 5, Version 5.2.7. Available: https://www.wildlife.ca.gov/Data/CNDDB/Maps-and-Data. Accessed: June 2018.

Eng, L., L. Belk, and C. H. Eriksen. 1990. California Anostraca: Distribution, Habitat and Status. *Journal of Crustacean Biology*. 10(2):247–277.

Eriksen, C. and D. Belk. 1999. *Fairy Shrimps of California's Puddles, Pools, and Playas*. Eureka, CA: Mad River Press, Inc.

Helm, B. 1998. Biogeography of Eight Large Branchiopods Endemic to California. Pages 124–139 in C. W. Witham, E. T. Bauder, D. Belk, W. R. Ferren, Jr., and R. Ornduff (eds.), *Ecology, Conservation, and Management of Vernal Pool Ecosystems—Proceedings from a 1996 Conference*. Sacramento, CA: California Native Plant Society.

U.S. Fish and Wildlife Service. 2005. *Recovery Plan for Vernal Pool Ecosystems of California and Southern Oregon*. Portland, OR. xxvi + 606 pages.

———. 2007. *Longhorn Fairy Shrimp* (*Branchinecta conservatio*)*, 5-Year Review: Summary and Evaluation*. Sacramento, CA: U.S. Fish and Wildlife Service, Sacramento Fish and Wildlife Office.

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.

———. 2006. *Smith's Blue Butterfly (Euphilotes enoptes smithi), 5-Year Review: Summary and Evaluation*. U.S. Fish and Wildlife Service, Ventura Fish and Wildlife Office, Ventura, California.

References

California Department of Fish and Wildlife. 2018. California Natural Diversity Database, RareFind 5, Version 5.2.7. Available: https://www.wildlife.ca.gov/Data/CNDDB/Maps-and-Data. Accessed June 2018.

U.S. Fish and Wildlife Service. 1977. Proposed Determination of Critical Habitat for Six Butterflies and Two Plants. 42 FR 7972-7976

———. 1984. *Recovery Plan for Smith's Blue Butterfly (Euphilotes enoptes smithi)*. Portland, OR. 87 pp.

———. 2006. *Smith's Blue Butterfly, (Euphilotes enoptes smithi*), *5-Year Review: Summary and Evaluation*. Ventura, CA: U.S. Fish and Wildlife Service. 28 pp.

———. 2018. Species Profile for Smith's Blue butterfly (*Euphilotes enoptes smithi*). Available at: https://ecos.fws.gov/ecp0/profile/speciesProfile?spcode=I00R. Accessed June 2028

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

California Department of Fish and Wildlife. 2018. California Natural Diversity Database, RareFind 5, Version 5.2.7. Available: https://www.wildlife.ca.gov/Data/CNDDB/Maps-and-Data. Accessed February 2018.

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

———. 2006. *Banded Dune Snail (Helminthoglypta walkeriana) [=Morro shoulderband snail (Helminthoglypta walkeriana) and Chorro shoulderband snail (Helminthoglypta morroensis)], 5-Year Review: Summary and Evaluation*. U.S. Fish and Wildlife Service, Ventura Fish and Wildlife Office, Ventura, CA.

References

California Department of Fish and Wildlife. 2018. California Natural Diversity Database, RareFind 5, Version 5.2.7. Available: https://www.wildlife.ca.gov/Data/CNDDB/Maps-and-Data. Accessed: June 2018.

NatureServe. 2012. NatureServe Explorer: An Online Encyclopedia of Life-Morro Shoulderband (*Helminthoglypta walkeriana*). Available: <http://www.natureserve.org/explorer>.

Roth, B. 1985. *Status Survey of the Banded Dune Snail Helminthoglypta walkeriana*. Prepared for the U.S. Fish and Wildlife Service, Sacramento Endangered Species Office, Sacramento, CA.

U.S. Fish and Wildlife Service. 1998. *Recovery Plan for the Morro Shoulderband Snail and Four Plants from Western San Luis Obispo County, California*. Ventura, CA. 83 pp.

———. 2006. *Banded Dune Snail* (*Helminthoglypta walkeriana*) *[=Morro shoulderband snail* (*Helminthoglypta walkeriana*) *and Chorro Shoulderband Snail* (*Helminthoglypta morrensis*)*]. 5-Year Review: Summary and Evaluation*. Ventura, CA: U.S. Fish and Wildlife Service, Ventura Fish and Wildlife Office. Available: <http://ecos.fws.gov/docs/five_year_review/doc772.pdf>. Accessed: June 2018.

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

California Department of Fish and Wildlife. 2018. California Natural Diversity Database, RareFind 5, Version 5.2.7. Available: https://www.wildlife.ca.gov/Data/CNDDB/Maps-and-Data. Accessed February 2018.

GreenInfo Network. 2017. *California Protected Areas Database*. Oakland, California.

Soil Survey Staff, Natural Resources Conservation Service, United States Department of Agriculture. Web Soil Survey. Available online at https://websoilsurvey.nrcs.usda.gov/. Accessed February 2018

U.S. Geological Survey. 2018. Biodiversity Information Serving Our Nation (BISON). Available at: https://bison.usgs.gov. Accessed February 2018.

U.S. Fish and Wildlife Service. 1998. *Recovery Plan for Insect and Plant Taxa from the Santa Cruz Mountains in California*. Portland, Oregon.

———. 2009. *Zayante band-winged grasshopper (Trimerotropis infantilis) and Mount Herman June Beetle (Polyphylla barbata). 5-Year Review: Summary and Evaluation*. U.S. Fish and Wildlife Service, Ventura Fish and Wildlife Office, Ventura California.

References

Hazeltine, W. 1993. *Distribution of the Scarab Beetle*, *Polyphylla barbath Cazier*. Unpublished report. July 13. Oroville, CA. 5 pages and 4 figures.

U.S. Fish and Wildlife Service. 1998. *Recovery Plan for Insect and Plant Taxa from the Santa Cruz Mountains in California*. Portland, OR. 83 pp.

———. 2009. *Zayante Band-Winged Grasshopper (Trimeropteris infantilis) and Mount Hermon June beetle (Polyphylla barbata)*. *5-Year Review: Summary and Evaluation*. Ventura, CA: U.S. Fish and Wildlife Service, Ventura Fish and Wildlife Office.

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.

GIS Sources

California Department of Fish and Wildlife. 2018. California Natural Diversity Database, RareFind 5, Version 5.2.7. Available: https://www.wildlife.ca.gov/Data/CNDDB/Maps-and-Data. Accessed February 2018.

U.S. Fish and Wildlife Service. 2009. *Ohlone tiger beetle (Cicindela ohlone), 5-Year Review: Summary and Evaluation*. Ventura Fish and Wildlife Office, Ventura, California.

U.S. Geological Survey. 2018. Biodiversity Information Serving Our Nation (BISON). Available at: https://bison.usgs.gov. Accessed February 2018.

References

California Department of Fish and Wildlife. 2018. California Natural Diversity Database, RareFind 5, Version 5.2.7. Available: https://www.wildlife.ca.gov/Data/CNDDB/Maps-and-Data. Accessed June 2018.

Freitag, R., D.H. Kavanaugh, and R. Morgan. 1993. A New Species of *Cicindela* (*Cicindela*) *(Coleoptera: Carabidae: Cicindelini)* from Remnant Native Grassland in Santa Cruz County, California. *The Coleopterists Bulletin* 47:113–120.

Jones & Stokes. 2005. Habitat Conservation Plan for Ranch View Terrace. Prepared for the University of California at Santa Cruz. U.S. Fish and Wildlife Service. 1998. *Recovery Plan for Insect and Plant Taxa from the Santa Cruz Mountains in California*. Portland, OR. 83 pp.

U.S. Fish and Wildlife Service. 2001. Endangered and threatened wildlife and plants: endangered status of the Ohlone tiger beetle (Cicindela ohlone). Federal Register 66: 50340-50350

———. 2009. *Ohlone tiger beetle (Cicindela ohlone), 5-Year Review: Summary and Evaluation*. Ventura Fish and Wildlife Office, Ventura, California.

In Litteris

Arnold, Richard A. 2006. Biologist and Principal, Entomological Consulting Services, Ltd. Letter to Mr. Ron Powers from Richard A. Arnold, Ph.D., dated August 28, 2006. Subject: Poliski-Gross Property at Meder Street in Santa Cruz, CA, Summary of Ohlone Tiger Beetle Situation

Personal Communications

Arnold, Richard A. 2009. Biologist and Principal, Entomological Consulting Services, Ltd. Telephone conversation between R. Arnold and Douglass Cooper, Biologist, U.S. Fish and Wildlife Service, on August 27, 2009. Subject: history of occupancy and extirpation of Ohlone tiger beetles at various sites throughout Santa Cruz County; threats to currently occupied sites; threats that may have been cause of extirpation at historic sites; suggestions for habitat management techniques to maintain, restore, or improve Ohlone tiger beetle habitat.

Hayes, Grey. 1995. Biologist, Natural Reserves Steward, University of California at Santa Cruz. Telephone conversation between Mr. Hayes and Jon Hoekstra, U.S. Fish and Wildlife Service, on April 28, 1995. Subject: information regarding Ohlone tiger beetle surveys and habitat assessments

Personal Observations

Cooper, Douglass. 2009. Biologist, U.S. Fish and Wildlife Service. Site visits to many of the currently and historically occupied Ohlone tiger beetle occurrences. Observed management activities at Glenwood Open Space Preserve, Wilder Ranch State Park, and UC Santa Cruz – Marshall Fields.

Also observed extirpated sites, including Gross Poliski, Santa Cruz Gardens, Pogonip, and Jade's Ranch.

Sculley, Colleen. 1999. Biologist, U.S. Fish and Wildlife Service. Site visits conducted at Ohlone tiger beetle occurrences through the species' range. Observations included documentation of adults, larval burrows, thermoregulatory behavior, and foraging behavior.

———. 2000. Biologist, U.S. Fish and Wildlife Service. Site visits conducted at Ohlone tiger beetle occurrences through the species' range. Observations included documentation of adults, larval burrows, thermoregulatory behavior, and foraging behavior.

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.

References

Barr, C. B. 1991. *The Distribution, Habitat and Status of the Valley Elderberry Longhorn Beetle,* Desmocerus californicus dimorphus. U. S. Fish and Wildlife Service, Sacramento, CA.

Thelander, C. G. (ed.). 1994. *Life on the Edge, A Guide to California's Endangered Natural Resources*. Vol. 1, Wildlife. BioSystems Books. Santa Cruz, CA.

U.S. Fish and Wildlife Service. 1984. *Valley Elderberry Longhorn Beetle Recovery Plan*. U.S. Fish and Wildlife Service. Portland, OR. Available: http://www.fws.gov/sacramento/es/recovery_plans/velb_recovery_plan.pdf. Accessed: January 29, 2010.

U.S. Fish and Wildlife Service. 2006. *Valley Elderberry Longhorn Beetle (*Desmocerus californicus dimorphus*) 5-Year review: summary and evaluation*. Sacramento Fish and Wildlife Office. Sacramento, CA.

———. 2014. Endangered and Threatened Wildlife and Plants; Withdrawal of the Proposed Rule To Remove the Valley Elderberry Longhorn Beetle From the Federal List of Endangered and Threatened Wildlife. U.S. Department of Interior, Fish and Wildlife Service. 50 CFR, Part 17. Federal Register, Vol. 79, No. 180. September 17, 2014.

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 private open sand parkland habitat at 57 acres (23 hectares) (U.S. Fish and Wildlife Service 2009) though over 10,560 acres has been designated as critical habitat and habitat models built for this HCP, based on Zayante soils, indicate the range could include 7,739 acres of habitat.

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.

References

Borror, D. J., D. M. DeLongs and C. A. Triplehorn. 1976. *An Introduction to the Study of Insects*. NY: Holt, Reinhart & Winston.

McGraw, J. M. 2004. *Sandhills Conservation and Management Plan: A Strategy for Preserving Native Biodiversity in the Santa Cruz Sandhills*. Report submitted to the Land Trust of Santa Cruz County, Santa Cruz, CA. 310 pp.

U.S. Fish and Wildlife Service. 1998. *Recovery Plan for Insect and Plant Taxa from the Santa Cruz Mountains in California*. Portland, OR. 83 pp.

———. 2009. *Zayante Band-Winged Grasshopper and Mount Hermon Grasshopper 5-Year Review: Summary and Evaluation*. U.S. Fish and Wildlife Service, Ventura, CA: Ventura Fish and Wildlife Office. August.

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

GIS Sources

Bulger, J. B., N. J. Scott and R. B. Seymour. 2003. Terrestrial activity and conservation of adult California red-legged frogs *Rana aurora draytonii* in coastal forests and grasslands. Biological Conservation. 110: 85-95.

California Department of Fish and Wildlife and California Interagency Wildlife Task Group. 2014. Standards and Guidelines for CWHR Species Models. Technical Report No. 31. California Wildlife Habitat Relationships System, California Department of Fish and Game. Sacramento, CA.

———. 2018. California Natural Diversity Database, RareFind 5, Version 5.2.7. Available: https://www.wildlife.ca.gov/Data/CNDDB/Maps-and-Data. Accessed February 2018.

Shaffer, H. B., G. M. Fellers, S. R. Voss, J. C. Oliver and G. B. Pauly. 2004. Species boundaries, phylogeography and conservation genetics of the red-legged frog (*Rana aurora*/*draytonii*) complex. Molecular Ecology 13:2667-2677

Thomson, R. C., A. N. Wright, and H. B. Shaffer. 2016. California amphibians and reptile species of special concern. California Department of Fish and Wildlife, University of California Press.

U.S. Fish and Wildlife Service. 2002*. Recovery Plan for the California Red-legged Frog (Rana aurora draytonii)*. U.S. Fish and Wildlife Service, Portland, Oregon.

———. 2010. Endangered and Threatened Wildlife and Plants: Revised Designation of Critical Habitat for California Red-Legged Frog; Final Rule. U.S. Department of Interior, Fish and Wildlife Service. 50 CFR, Part 17. Federal Register, Vol. 75, No. 50. March 17, 2010.

———. 2016. *National Wetlands Inventory;* Division of Habitat and Resource Conservation. Arlington, Virginia. Accessed February, 2018.U.S. Geological Survey. 2013, National Hydrography Geodatabase: The National Map viewer available on the World Wide Web (https://viewer.nationalmap.gov/viewer/nhd.html?p=nhd), accessed: February 2018

References

California Department of Fish and Wildlife. 2018. California Natural Diversity Database, RareFind 5, Version 5.2.7. Available: https://www.wildlife.ca.gov/Data/CNDDB/Maps-and-Data. Accessed June 2018.

CaliforniaHerps.com. 2012. *Rana draytonii*—California Red-Legged Frog. Available: <http://www.californiaherps.com/frogs/pages/r.draytonii.html>. Accessed: August 27, 2012.

Fellers, G. M. and P. M. Kleeman. 2007. California Red-Legged Frog (*Rana draytonii*) Movement and Habitat Use: Implications for Conservation. *Journal of Herpetology* 41(2):276–286.

U.S. Fish and Wildlife Service. 2002. *Recovery Plan for the California Red-Legged Frog* (Rana aurora draytonii). Portland, OR. viii + 173 pages.

———. 2005. *Revised Guidance on Site Assessments and Field Surveys for the California Red-Legged Frog*. Available: http:<www.fws.gov>. Accessed: March 23, 2006.

———. 2010. *Sacramento Fish and Wildlife Office Species Account for California Red-legged Frog* (Rana aurora draytonii). Available: < http://www.fws.gov/sacramento/ES_Kids/SF-Garter-Snake/Documents/ca_red-legged_frog.pdf >. Accessed: August 15, 2012.

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

GIS Sources

U.S. Fish and Wildlife Service and California Department of Fish and Game. 2003. Interim guidance of conducting site assessment sand field surveys for determining presence or a negative finding of the California tiger salamander. October 2003

———. 2016. Recovery plan for the Santa Barbara County Distinct Population Segment of the California tiger salamander (*Ambystoma californiense*). U.S. Fish and Wildlife Service, Pacific Southwest Region, Ventura, California.

———. 2017. Recovery Plan for the Central California Distinct Population Segment of the California Tiger Salamander (*Ambystoma californiense*). U.S. Fish and Wildlife Service, Pacific Southwest Region, Sacramento, California.

U.S. Geological Survey, 2013. National Hydrography Geodatabase: The National Map viewer available on the World Wide Web (https://viewer.nationalmap.gov/viewer/nhd.html?p=nhd), accessed: February 2018

Witham, C. W., R. F. Holland, and J. Vollmar. 2014. Changes in the Distribution of Great Valley Vernal Pool Habitats from 2005 to 2012. Sacramento, CA. GIS data prepared for CVPIA Habitat Restoration Program, U.S. Fish and Wildlife Service. Grant Agreement No. F11AP00169 with the USFWS. GIS Data and metadata available at: http://www.vernalpools.org/. Accessed: December 2016.

References

Barry, S. J., and H. B. Shaffer. 1994. The Status of the California Tiger Salamander (*Ambystoma californiense*) at Lagunita: A 50-Year Update. *Journal of Herpetology* 28:159–164.

California Department of Fish and Game. 2005. *California Tiger Salamander.* California Wildlife Habitat Relationships System. California Interagency Wildlife Task Group. Available: < http://www.dfg.ca.gov/biogeodata/cwhr/cawildlife.aspx> Accessed: November 2012.

———. 2010. *A Status Review of the California Tiger Salamander* (*Ambystoma californiense*). January 11. Report Prepared for the Fish and Game Commission.

———. 2012. *California Natural Diversity Database* (CNDDB). RareFind 4. Available < http://www.dfg.ca.gov/biogeodata/cnddb/mapsanddata.asp>. Accessed November 16, 2012

Holland, D. C., M. P. Hayes, and E. McMillan. 1990. Late Summer Movement and Mass Mortality in the California Tiger Salamander (*Ambystoma californiense*). *Southwestern Naturalist* 35:217–220.

Jennings, M. R., and M. P. Hayes. 1994. *Amphibian and Reptile Species of Special Concern in California.* Prepared for the California Department of Fish and Game, Inland Fisheries Division, Rancho Cordova, CA.

Loredo, I., D. Van Vuren, and M. L. Morrison. 1996. Habitat Use and Migration Behavior of the California Tiger Salamander. *Journal of Herpetology* 30:282–285.

Shaffer, H. B., and P. C. Trenham. 2005. *Ambystoma californiense*. Pages 1093–1102 in M. J. Lannoo (ed.), *Status and Conservation of U.S.*

Stebbins, R.C. and S. M. McGinnis. 2012. Field Guide to Amphibians and Reptiles of California. Revised Edition. University of California Press. Pages 71- 75.

Trenham, P. C. 2001. Terrestrial Habitat Use by Adult California Tiger Salamanders. *Journal of Herpetology* 35:343–346.

Trenham, P.C., and D. G. Cook. 2008. Distribution of Migrating Adults Related to the Location of Remnant Grassland Around an Urban California Tiger Salamander *(Ambystoma californiense)* Breeding Pool. Pages 9–16 in J.C. Mitchell, R. E. Jung Brown, and B. Bartholomew (eds.), *Urban Herpetology*.

Trenham, P.C., and H. B. Schaffer. 2005. Amphibian Upland Habitat Use and its Consequences for Population Viability. *Ecological Applications* 15(4):1158–1168.

U.S. Fish and Wildlife Service. 2009a. *Sacramento Fish and Wildlife Office Species Account for California Tiger Salamander* (*Ambystoma californiense*). Available: http://www.fws.gov/sacramento/es_species/Accounts/Amphibians-Reptiles/Documents/california_tiger_salamander.pdf>. Accessed: November 16, 2012.

———. 2009b. *Arroyo Toad* (*Bufo californicus* (=*microscaphus*) *5-Year Review: Summary and Evaluation.* August. Ventura Fish and Wildlife Office. Ventura, CA.

———. 2016a. Recovery plan for the Santa Barbara County Distinct Population Segment of the California tiger salamander (*Ambystoma californiense*). U.S. Fish and Wildlife Service, Pacific Southwest Region, Ventura, California. vi + 87 pp.

———. 2016b. 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, Pacific Southwest Region, Sacramento, California. vi + 128 pp.

———. 2017. Recovery Plan for the Central California Distinct Population Segment of the California Tiger Salamander (*Ambystoma californiense*). U.S. Fish and Wildlife Service, Pacific Southwest Region, Sacramento, California. v + 69p

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.

GIS Sources

California Department of Fish and Wildlife and California Interagency Wildlife Task Group. 2014. Standards and Guidelines for CWHR Species Models. Technical Report No. 31. California Wildlife Habitat Relationships System, California Department of Fish and Game. Sacramento, CA.

Gesch, D., M. Oimoen, S. Greenlee, C. Nelson, M. Steuck, and D. Tyler (2002), The National Elevation Dataset, Photogramm. Eng. Remote Sens., 68,5–1

Nussbaum, R. A., E. D. Brodie, Jr., and R. M. Storm. 1983. Amphibians and reptiles of the Pacific Northwest. Univ. Press of Idaho. 332pp.

Thomson, R. C., A. N. Wright, and H. B. Shaffer. 2016. California amphibians and reptile species of special concern. California Department of Fish and Wildlife, University of California Press.

U.S. Geological Survey. 2013, National Hydrography Geodatabase (NHD): The National Map viewer available on the World Wide Web (https://viewer.nationalmap.gov/viewer/nhd.html?p=nhd), accessed: December 2016.

Hayes, Marc P.; Wheeler, Clara A.; Lind, Amy J.; Green, Gregory A.; Macfarlane, Diane C., tech. coords. 2016. Foothill yellow-legged frog conservation assessment in California. Gen. Tech. Rep. PSW-GTR-248. Albany, CA: U.S. Department of Agriculture, Forest Service, Pacific Southwest Research Station.

References

Ashton, Don T., Amy J. Lind, and Kary E. Schlick. 1997. Foothill Yellow-Legged Frog (*Rana boylii*). *Natural History* Available: < http://www.krisweb.com/biblio/gen_usfs_ashtonetal_1997_frog.pdf>. Accessed: February 15, 2010.

California Department of Fish and Game. 2000. *Foothill Yellow-Legged Frog.* California Wildlife Habitat Relationships System. California Interagency Wildlife Task Group. Available: < http://www.dfg.ca.gov/biogeodata/cwhr/cawildlife.aspx> Accessed: November 2012.

California Department of Fish and Wildlife. 2018. California Natural Diversity Database, RareFind 5, Version 5.2.7. Available: https://www.wildlife.ca.gov/Data/CNDDB/Maps-and-Data. Accessed June 2018.

Feller, Gary M. 2005. *Amphibian Decline: The Conservation Status of United States Species.* Pages 534–536. ed. Michael Cannoo. University of California Press. London. Available: < http://books.google.com/books?id=1Muuqiga2Y8C&pg=PA534&lpg=PA534&dq=Loomis+1965+foothill+yellow-legged+frog&source=bl&ots=WjT2HR6Ssf&sig=CUtPGqn-HhbyUx-7ZBYILYxl1nI&hl=en&ei=ich5S8LjGMmUtgf0s_G1Cg&sa=X&oi=book_result&ct=result&resnum=10&ved=0CDUQ6AEwCQ#v=onepage&q=Loomis%201965%20foothill%20yellow-legged%20frog&f=false>. Accessed: February 15, 2010.

Jennings, M. R., and M. P. Hayes. 1994. *Amphibian and Reptile Species of Special Concern in California*. Final Report. Contract 8023. Prepared for the California Department of Fish and Game, Inland Fisheries Division. Rancho Cordova, CA.

Kupferberg, S., A. Lind, J. Mount, and S. Yarnell. 2008. *Pulsed-Flow Effects on the Foothill Yellow-Legged Frog (Rana boylii): Integration of Empirical, Experimental and Hydrodynamic Modeling Approaches.* First Year Interim Report. CEC-500-2007-119. California Energy Commission, PEIR Energy-Related Environmental Research Program.

Olson, D.H. and Davis, R.J., 2009. Conservation Assessment for the Foothill Yellow-legged Frog (*Rana boylii*) in Oregon. USDA Forest Service Region 6 and USDI Bureau of Land Management Interagency Special Status Species Program.

Stebbins, R.C. and S. M. McGinnis. 2012. Field Guide to Amphibians and Reptiles of California. Revised Edition. University of California Press. Pages 196-199.

Thomson, R. C., Wright, A. N., and Shaffer, H. B. 2016. California Amphibian and Reptile Species of California Concern. California Department of Fish and Wildlife. University of California Press.U.S. Fish and Wildlife Service. 2009. Arroyo Toad (*Bufo californicus* (=*microscaphus*) 5-Year Review: Summary and Evaluation. August. Ventura Fish and Wildlife Office. Ventura, CA.

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

GIS Sources

California Department of Fish and Wildlife. 2018. California Natural Diversity Database, RareFind 5, Version 5.2.7. Available: https://www.wildlife.ca.gov/Data/CNDDB/Maps-and-Data. Accessed February 2018.

City of Santa Cruz. 2012. *City of Santa Cruz 2030 General Plan*. Available: http://www.cityofsantacruz.com/home/showdocument?id=33418. Accessed February 2018.

U.S. Fish and Wildlife Service. 2009. Santa Cruz long-toed salamander (Ambystoma macrodactylum croceum), 5-Year Review: Summary and Evaluation. U.S. Fish and Wildlife Service, Ventura Fish and Wildlife Office. Ventura, California, May, 2009.

U.S. Fish and Wildlife Service and California Department of Fish and Wildlife. 2012. *Guidance on site assessment and field studies to determine presence or report a negative finding of the Santa Cruz long-toed salamander*. Unpublished Report. Ventura and Sacramento, California. December 2012.

Laabs, Dave and Allaback, Mark. Biosearch Associates. Personal communications: unpublished survey data provided to ICF 2018.

References

Biosearch Associates. 2008. Santa Cruz Long-toed Salamander Study, Valencia Lagoon and Adjacent Drainage Channel, Santa Cruz County, California. California Department of Fish and Game. 2004. *Species Accounts – Amphibians: Santa Cruz Long-Toed Salamander*. Available. <http://www.dfg.ca.gov/wildlife/nongame/t_e_spp/docs/2004/t_eamphibians.pdf>. Accessed. January 28, 2010.

———. 2018. California Natural Diversity Database, RareFind 5, Version 5.2.7. Available: https://www.wildlife.ca.gov/Data/CNDDB/Maps-and-Data. Accessed June 2018.

Biosearch Wildlife Surveys. 2001. Santa Cruz long-toed salamander study, Millsap Pond, Santa Cruz County, California. Report (30 June 2001) submitted to U.S. Fish and Wildlife Service, Ventura, California. Biosearch Wildlife Surveys, Santa Cruz, California.

———. 2002. Santa Cruz long-toed salamander study, Willow Canyon, Santa Cruz County, California. Report (24 June 2002) submitted to U.S. Fish and Wildlife Service, Ventura, California. Biosearch Wildlife Surveys, Santa Cruz, California.

———. 2003. Surveys for the Santa Cruz long-toed salamander at McClusky Slough and Zmudowski State Beach, Monterey County, California. Report (29 April 2003) submitted to U.S. Fish and Wildlife Service, Ventura, California. Biosearch Wildlife Surveys, Santa Cruz, California.

Dana Bland and Associates. 2002. Results of pitfall trapping study for Santa Cruz long-toed salamander at Tucker-Madigan property, Aptos, CA. Dana Bland & Associates, Aptos, California.

John Gilchrist and Associates. 2007. Biotic Report – North Monterey County School Facility, Proposed Site at 13990 Castroville Blvd., Castroville, California. Prepared for North Monterey County School District, Moss Landing, California

Laabs, D. 2003. Seascape Uplands 2002 annual monitoring reports for Federal Fish and Wildlife permit (PRT-749374), Aptos, Santa Cruz County, California. Report (21 July 2003) submitted to

U.S. Fish and Wildlife Service, Ventura, California. Center for Natural Lands Management, Santa Cruz, California.

National Archives And Records Administration. (1979) *Federal Register: 44 Fed. Reg. 1 Mar. 6, 1979*. March 6, Tuesday. [Periodical] Retrieved from the Library of Congress, https://www.loc.gov/item/fr044045/.

Reed, R. J. 1979. Population study of the Santa Cruz long-toed salamander (*Ambystoma macrodactylum croceum*) at Valencia Lagoon 1977-78, with notes on habitat and occurrence in Santa Cruz and Monterey Counties. Final report to CDFG, Sacramento, under contract (S-1180). vi+115 pp.

———. 1999. *Draft Revised Recovery Plan for the Santa Cruz Long-Toed Salamander.* 2nd revision. Available. <http://ecos.fws.gov/docs/recovery_plan/990702.pdf >. Accessed: January 28, 2010.

———. 2009a. *Santa Cruz Long-Toed Salamander. 5-Year Review: Summary and Evaluation.* Available. <http://www.fws.gov/cno/es/five_year_review_lists.html >. Accessed: January 28, 2010.

———. 2009b. *Arroyo Toad* (*Bufo californicus* (=*microscaphus*) *5-Year Review: Summary and Evaluation.* August. Ventura Fish and Wildlife Office. Ventura, CA.

Personal Communications

Bland, D. 2009. Phone record correspondence, dated January 9, 2009. Dana Bland, Dana Bland and Associates, with Chad Mitcham, biologist, Ventura Fish and Wildlife Office.

Kodama, D. 2009. Phone record correspondence, dated January 6, 2009. Diane Kodama, Refuge Manager, Ellicott Slough National Wildlife Refuge, with Chad Mitcham, biologist, Ventura Fish and Wildlife Office.

Savage, W. 2009. Phone record correspondence, dated February 10, 2009, W. Savage, PhD., Lehigh University, with Chad Mitcham, biologist, Ventura Fish and Wildlife Office.

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

GIS Sources

California Department of Fish and Wildlife. 2018. California Natural Diversity Database, RareFind 5, Version 5.2.7. Available: https://www.wildlife.ca.gov/Data/CNDDB/Maps-and-Data. Accessed February 2018.

Gesch, D., M. Oimoen, S. Greenlee, C. Nelson, M. Steuck, and D. Tyler (2002), The National Elevation Dataset, Photogramm. Eng. Remote Sens., 68,5–1

U.S. Geological Survey. 2013, National Hydrography Geodatabase (NHD): The National Map viewer available on the World Wide Web (https://viewer.nationalmap.gov/viewer/nhd.html?p=nhd), accessed: December 2016.

U.S. Fish and Wildlife Service. 2012. Mountain yellow-legged frog (*Rana muscosa*) Southern California Distinct Population Segment 5-year Review: Summary and Evaluation. U.S. Fish and Wildlife Service, Carlsbad Fish and Wildlife Office, Carlsbad, California, July 2012.

———. 2014. Endangered and Threatened Wildlife and Plants; Endangered Species Status for Sierra Nevada Yellow-Legged Frog and Northern Distinct Population Segment of the Mountain Yellow-Legged Frog, and Threatened Species Status for Yosemite Toad; Final Rule. U.S. Department of Interior, Fish and Wildlife Service. 50 CFR, Part 17. Federal Register, Vol 79, No. 82. April 29, 2014

———. 2016. Endangered and Threatened Wildlife and Plants; Designation of Critical Habitat for the Sierra Nevada Yellow-Legged Frog, the Northern DPS of the Mountain Yellow-Legged Frog, and the Yosemite Toad; Final Rule. U.S. Department of Interior, Fish and Wildlife Service. 50 CFR, Part 17. Federal Register, Vol. 81, No. 166. August 26, 2016.

U.S. Forest Service. 2014. Mountain yellow-legged frog conservation assessment for the Sierra Nevada Mountains of California, USA. A Collaborative Inter-Agency Project by: USDA Forest Service, California Department of Fish and Wildlife, National Park Service, and U.S. Fish and Wildlife Service. U.S. Forest Service, Pacific Southwest Region, R5-TP-038, July 2014.

U.S. Geological Survey. 2018. Biodiversity Information Serving Our Nation (BISON). Available at: https://bison.usgs.gov. Accessed February 2018.

References

California Department of Fish and Game. 2008. *Sierra Nevada Yellow-Legged Frog.* California Wildlife Habitat Relationships System. California Interagency Wildlife Task Group. Available: < http://www.dfg.ca.gov/biogeodata/cwhr/cawildlife.aspx> Accessed: November 2012.

———. 2011. A status review of the mountain yellow-legged frog (*Rana sierra* and *Rana muscosa*. Report to the Fish and Game Commission. California Department of Fish and Game. 186 pages.

Matthews, K. R., and K. L. Pope. 1999. A Telemetric Study of the Movement Patterns and Habitat Use of *Rana Muscosa*, the Mountain Yellow-Legged Frog, in a High-Elevation Basin in Kings Canyon National Park, California. *Journal of Herpetology* 33:615–623.

Roland A. Knapp, Gary M. Fellers, Patrick M. Kleeman, David A. W. Miller, Vance T. Vredenburg, Erica BreeRosenblum, Cheryl J. Briggs. Amphibian recovery despite ongoing stressors. Proceedings of the National Academy of Sciences Oct 2016, 113 (42) 11889-11894; DOI: 10.1073/pnas.1600983113

Stebbins, R.C. and S. M. McGinnis. 2012. Field Guide to Amphibians and Reptiles of California. Revised Edition. University of California Press. Pages 199-202.

U.S. Fish and Wildlife Service. 2009. *Arroyo Toad* (*Bufo californicus* (=*microscaphus*) *5-Year Review: Summary and Evaluation.* August. Ventura Fish and Wildlife Office. Ventura, CA.

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

California Department of Fish and Wildlife and California Interagency Wildlife Task Group. 2014. Standards and Guidelines for CWHR Species Models. Technical Report No. 31. California Wildlife Habitat Relationships System, California Department of Fish and Game. Sacramento, CA.

References

California Department of Fish and Game. 2008. *Southern Mountain Yellow-Legged Frog.* California Wildlife Habitat Relationships System. California Interagency Wildlife Task Group. Available: < http://www.dfg.ca.gov/biogeodata/cwhr/cawildlife.aspx> Accessed: November 2011.

———. 2011. A status review of the mountain yellow-legged frog (*Rana sierra* and *Rana muscosa*. Report to the Fish and Game Commission. California Department of Fish and Game. 186 pages.

Jennings, M. R., and M. P. Hayes. 1994. *Amphibian and Reptile Species of Special Concern in California.* Rancho Cordova, CA: California Department of Fish and Game, Inland Fisheries Division.

Stebbins, R.C. and S. M. McGinnis. 2012. Field Guide to Amphibians and Reptiles of California. Revised Edition. University of California Press. Pages 199-202.

———. 2009. Arroyo Toad (*Bufo californicus* (=*microscaphus*) 5-Year Review: Summary and Evaluation. August. Ventura Fish and Wildlife Office. Ventura, CA.

———. 2012. Mountain yellow-legged frog (*Rana muscosa*), Southern California Distinct Population Segment, 5-year Review. U.S Fish and Wildlife Service, Carlsbad Fish and Wildlife Office, Carlsbad, CA. July 13, 2012.

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.

GIS Sources

California Department of Fish and Wildlife. 2018. California Natural Diversity Database, RareFind 5, Version 5.2.7. Available: https://www.wildlife.ca.gov/Data/CNDDB/Maps-and-Data. Accessed February 2018.

U.S. Forest Service. 2015. Yosemite toad conservation assessment, a collaborative Inter-Agency Project by: USDA Forest Service, California Department of Fish and Wildlife, National Park Service, U.S. Fish and Wildlife Service. U.S. Forest Service, Pacific Southwest Region, R5-TP-040, January 2015.

U.S. Geological Survey. 2018. Biodiversity Information Serving Our Nation (BISON). Available at: https://bison.usgs.gov. Accessed February 2018.

References

Brown, C. Hayes, M. Green, G. Macfarlane, D. Lind, A. 2015. Yosemite Toad Conservation Assessment. A Collaborative Inter-Agency Project by: USDA Forest Service California Department of Fish and Wildlife National Park Service U.S. Fish and Wildlife Service. R5-TP-040.

California Department of Fish and Game. 2012. California Natural Diversity Database, RareFind 3, Version 3.1.0, Updated November 2, 2012. Yosemite toad records. Sacramento, CA

California Department of Fish and Game. 2000. Yosemite Toad. California Wildlife Habitat Relationships System. California Interagency Wildlife Task Group. Available: <http://www.dfg.ca.gov/biogeodata/cwhr/cawildlife.aspx>. Accessed November 27. 2012.

Jennings, M. R., and M. Hayes. 1994. *Amphibian and Reptile Species of Special Concern in California.* Sacramento, CA. California Department of Fish and Game. Pages 50–53.

Kagarise, Sherman, C. and M. L. Morton. 1993. Population Declines of Yosemite Toads in the Eastern Sierra Nevada of California. *Journal of Herpetology* 27:186–198.

Liang, C.T. 2012. Habitat modeling and movements of the Yosemite Toad (*Anaxyrus (=Bufo) canorus*) in the Sierra Nevada, California. Ph.D. Dissertation, University of California, Davis, California, USA. 126 p.

U.S. Fish and Wildlife Service. 2009. *Arroyo Toad* (Bufo californicus (=microscaphus) *5-Year Review: Summary and Evaluation.* August. Ventura Fish and Wildlife Office. Ventura, CA.

———. 2010. Species Assessment and Listing Priority Assignment Form. Yosemite Toad. April 14, 2012. Available: http://ecos.fws.gov/docs/candidate/assessments/2010/r8/D02K_V01.pdf. Accessed: November 17, 2011.

———. 2014. Amendment of the Programmatic Biological Opinion on Nine Forest Programs on Nine National Forests in the Sierra Nevada of California for the Endangered Sierra Nevada Yellow-legged Frog, Endangered Northern Distinct Population Segment of the Mountain Yellow-legged Frog, and Threatened Yosemite Toad. FF0SESMF00-2014-F-0557-1

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

Bailey, Robert G. 2016. Bailey's ecoregions and subregions of the United States, Puerto Rico, and the U.S. Virgin Islands. Fort Collins, CO: Forest Service Research Data Archive. Available at: https://doi.org/10.2737/RDS-2016-0003; Accessed February 2018.

California Department of Fish and Wildlife and California Interagency Wildlife Task Group. 2014. Standards and Guidelines for CWHR Species Models. Technical Report No. 31. California Wildlife Habitat Relationships System, California Department of Fish and Game. Sacramento, Ca

Gesch, D., M. Oimoen, S. Greenlee, C. Nelson, M. Steuck, and D. Tyler (2002), The National Elevation Dataset, Photogramm. Eng. Remote Sens., 68,5–1

U.S. Census Bureau. 2016. TIGER/Line Shapefiles (machine readable data files)

U.S. Environmental Protection Agency, 2013, Level III ecoregions of the continental United States: Corvallis, Oregon, U.S. EPA – National Health and Environmental Effects Research Laboratory, map scale 1:7,500,000, http://www.epa.gov/wed/pages/ecoregions/level_iii_iv.htm.

U.S. Fish and Wildlife Service. 2010. *Blunt-nosed leopard lizard (Gambelia sila) 5-Year Review: Summary and Evaluation*. U.S. Fish and Wildlife Service, Sacramento Fish and Wildlife Office, Sacramento, California. February.

U.S. Forest Service 2007. ECOMAP Team. Ecological Subregions: Sections and Subsections for the Conterminous United States. Washington, D.C.

References

California Department of Fish and Game. 2000. *Blunt-Nosed Leopard Lizard.* California Wildlife Habitat Relationships System. California Interagency Wildlife Task Group. Available: < http://www.dfg.ca.gov/biogeodata/cwhr/cawildlife.aspx> Accessed: November 17, 2011.

CaliforniaHerps.com. 2012. *Gambelia sila*– Blunt-nosed Leopard Lizard. Available: <http://www.californiaherps.com/lizards/pages/g.sila.html>. Accessed: September 25, 2012.

Germano, D. J., and D. F. Williams. 2005. Population ecology of blunt-nosed leopard lizards (Gambelia sila) in high elevation habitats. Journal of Herpetology 39:1-18.

Quad Knopf, Inc. 2005. Coles Levee Ecosystem Preserve: 2004 Annual Report. Quad Knopf, Inc., Bakersfield, California.

U.S. Fish and Wildlife Service. 1980. Blunt-nosed leopard lizard recovery plan. U.S. Fish and Wildlife Service, Portland, Oregon, 62 pp.

———. 1998. *Recovery Plan for the Upland Species of the San Joaquin Valley, California*. September 30, 1998. Portland, OR. Available: <http://ecos.fws.gov/docs/recovery_plans/1998/980930a.pdf>. Accessed: February 23, 2010.

———. 2007. *Species Account. Blunt-Nosed Leopard Lizard* Gambelia sila. Sacramento Fish and Wildlife Office. Last updated: May 28, 2010. Sacramento, CA.

Williams, D.F. 1990. Assessment of potential habitat for the blunt-nosed leopard lizard and San Joaquin kit fox in western Madera County, California. U.S. Fish and Wildlife Service, Endangered Species Office, Sacramento, CA, 31 pp.

Williams, D.F., and D.J. Germano, W Tordoff III. 1993. Population studies of endangered kangaroo rats and blunt-nosed leopard lizards in the Carrizo Plain Natural Area, California. State of California, Department of Fish and Game, Wildlife Management Division, Nongame Bird and Mammal Section Report. 93-01, 114 pp.

Zeiner, D. C., W. F. Laudenslayer, Jr., and K. E. Mayer. 1988. *California's Wildlife.* Volume I: *Amphibians and Reptiles*. California Department of Fish and Game, Sacramento, CA. 272 pages.

In litteris

Germano, David. 2006. Electronic mail from Professor, Department of Biology, California State University, Bakersfield, California, to Joseph Terry, Biologist, San Joaquin Valley Branch, Endangered Species Division, Sacramento Fish and Wildlife Office, U.S. Fish and Wildlife Service, Sacramento, California.

Williams, Pam. 2006. Electronic mail from Refuge Biologist, Kern National Wildlife Refuge Complex, Delano, California to Joseph Terry, Biologist, San Joaquin Valley Branch, Endangered Species Division, Sacramento Fish and Wildlife Office, U.S. Fish and Wildlife Service, Sacramento, California.

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

GIS Sources

California Department of Fish and Wildlife. 2018. California Natural Diversity Database, RareFind 5, Version 5.2.7. Available: https://www.wildlife.ca.gov/Data/CNDDB/Maps-and-Data. Accessed February 2018

U.S. Fish and Wildlife Service. 2017. *Recovery Plan for the Giant Garter Snake (Thamnophis gigas)*. U.S. Fish and Wildlife Service, Pacific Southwest Region, Sacramento, California.

U.S. Geological Survey. 2013, National Hydrography Geodatabase: The National Map viewer available on the World Wide Web (https://viewer.nationalmap.gov/viewer/nhd.html?p=nhd), accessed: Accessed February 2018

———. 2018. Biodiversity Information Serving Our Nation (BISON). Available at: https://bison.usgs.gov. Accessed February 2018

References

California Department of Fish and Game. 2000. *The Status of Rare, Threatened, and Endangered Animals and Plants of California: Giant Garter Snake*. Habitat Conservation Planning Branch.

———. California Interagency Wildlife Task Group. 2008. CWHR Version 8.2 personal computer program. Sacramento, CA.

California Department of Water Resources. 2010. 2009 Annual report for permit TE-835365-5, provided to the Sacramento Fish and Wildlife Office by Laura Patterson, DWR

California Natural Diversity Database. 2011. RareFind 3, Version 3.1.0 (July 2011). Sacramento, CA: California Department of Fish and Game.

Dickert, C. 2002. San Joaquin Valley Giant Garter Snake Project—2001. California Department of Fish and Game, Los Banos, California. January 11, 2002

Engstrom, T. 2010. Genetic analysis of giant garter snake (*Thamnophis gigas*) populations in the San Joaquin and Sacramento Valleys. Prepared for the Central Valley Project Conservation Program/Habitat Restoration Program

Hansen, R. W. 1980. Western aquatic garter snakes in central California: an ecological and evolutionary perspective. Master's thesis, Department of Biology, California State University, Fresno. 78 pp.

Hansen, E. 2003. Year 2002 investigations of the giant garter snake (*Thamnophis gigas*) at the Cosumnes River preserve. Prepared for the Nature Conservancy by Eric Hansen. March 15, 2003.

Hansen, E. 2008. Implementation of priority 1, priority 2, and priority 3 recovery tasks for giant garter snake (*Thamnophis gigas*) – continuing surveys in Merced County, California, with an extension to northern Fresno County. Prepared for the U.S. Fish and Wildlife Service by Eric Hansen. April 15, 2008.

Hansen, E. 2011. Status and distribution of giant garter snakes at the eastern Delta's White Slough Wildlife Area, San Joaquin County, CA. Report prepared for the U.S. Fish and Wildlife Service

Paquin, M. M., G. D. Wylie, and E. J. Routman. 2006. Population structure of the giant garter snake Thamnophis gigas. Conservation Genetics. 7:25-36.

U.S. Fish and Wildlife Service. 1999. *Draft Recovery Plan for the Giant Garter Snake* (*Thamnophsis gigas*). Portland, OR. ix + 192 pages.

———. 2006. *Giant Garter Snake* (*Thamnophis gigas*) *5-Year Review: Summary and Evaluation.* Sacramento, CA. ii + 46 pages.

———. 2012. *Giant Garter Snake* (*Thamnophis* gigas) *5-Year Review: Summary and Evaluation.* Sacramento, CA. ii + 63 pages.

———. 2017. Recovery Plan for the Giant Garter Snake (*Thamnophis gigas*). U.S. Fish and Wildlife Service, Pacific Southwest Region, Sacramento, California. vii + 71 pp.

Western Ecological Resource Center, Dixon Field Station. 2011. Distribution of the giant garter snake in Butte County, California. Report to the U.S. Bureau of Reclamation, Habitat Restoration Program. R09PG20049. 43 pp.

Westervelt Ecological Services. 2010. Sutter Basin Conservation Bank 2009 Annual Report. Submitted February 15, 2010 to the Sacramento Fish and Wildlife Off

Wylie, G. D., M. Cassaza, and J. K. Daugherty. 1997. 1996 Progress Report for the Giant Garter Snake Study. Preliminary Report. U.S. Geological Survey, Biological Resources Division. Wylie, G. D., M. L. Casazza, and L. L. Martin. 2002. The distribution of giant garter snakes and their habitat in the Natomas Basin: a report for the U.S. Fish and Wildlife Service. U.S. Geological Survey, Western Ecological Research Center, Dixon Field Station, Dixon, California.

Wylie, G. D. and M. Amarello. 2007. Surveys for the current distribution and abundance of giant garter snakes (*Thamnophis gigas*) in the southern San Joaquin Valley. Prepared for the Bureau of Reclamation by the U. S. Geological Survey, Biological Resources Division, Dixon Field Station, Dixon, California.

Wylie, G.D., M.L. Casazza, C.J. Gregory, and B.J. Halstead. 2010. Abundance and sexual size dimorphism of the giant garter snake (*Thamnophis gigas*) in the Sacramento Valley of California. Journal of Herpetology 44(1): 94-103.

In. Litt.

Gallaway Consulting, Inc. 2008. Letter and report from Jody Gallaway to Gateway Pacific Contractors, Inc. dated May 6, 2008.

Halstead, B. 2011. Unpublished annual report to USFWS for permit activities completed in 2010 (Permit TE-157216).

Martin, R. 2012. Ryan Martin, California Department of Water Resources, E-mail message to Ben Watson of the U.S. Fish and Wildlife Service staff, Sacramento Fish and Wildlife Office, Sacramento, California. February 7, 2012

Personal Communications

Silveira, Joe. 2009. USFWS. Sacramento National Wildlife Refuge Complex.

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.

GIS Sources

California Department of Fish and Wildlife (CDFW). 2018. California Natural Diversity Database, RareFind 5, Version 5.2.7. Available: https://www.wildlife.ca.gov/Data/CNDDB/Maps-and-Data. Accessed February 2018.

U.S. Geological Survey. 2018. Biodiversity Information Serving Our Nation (BISON). Available at: https://bison.usgs.gov. Accessed February 2018.

References

Ainley, D.G., Allen, S.G., Spear, L.B., 1995. Offshore occurrence patterns of marbled murrelets in central California. Marbled Murrelet Conservation Assessment. In: Ralph, C.J., Hunt, G.L., Raphael, M.G., Piatt, J.F. (Eds.), Ecology and Conservation of the Marbled Murrelet. Gen. Tech. Rept. PSW-GTR-152. U. S. Dept. Agriculture, Forest Service, Pacific Southwest Res. Station, Albany, California 2005, pp. 361–370.

Burger, A. E., I. A. Manley, M. P. Silvergieter, D. B. Lank, K. M. Jordan, T. D. Bloxton, and M. G. Raphael. 2009. Re-use of Nest Sites by Marbled Murrelets (*Brachyramphus marmoratus*) in British Columbia. *Northwestern Naturalist* 90:217–226.

Burger, A. E., and F. L. Waterhouse. 2009. Relationships Between Habitat Area, Habitat Quality, and Populations of Nesting Marbled Murrelets. *BC Journal of Ecosystems and Management* 10:101–112.

California Department of Fish and Game. 2008. California Interagency Wildlife Task Group, California Wildlife Habitat Relationships System (CWHR), version 8.2 personal computer program. Sacramento, California.

Gutowsky, S., M. H. Janssen, P. Arcese, T. K. Kyser, D. Ethier, M. B. Wunder, D. F. Bertram, L. McFarlane Tranquilla, C. Lougheed, D. R. Norris. 2009. Concurrent Declines in Nestling Diet Quality and Reproductive Success of a Threatened Seabird over 150 Years. *Endangered Species Research* 9:247-254.

Hall, L. A., P. J. Palsboll, S. R. Beissinger, J. T. Harvey, M. Berube, M. G. Raphael, S. K. Nelson, R. T. Golightly, L. McFarlane-Tranquilla, S. H. Newman, and M. Z. Peery. 2009. Characterizing Dispersal Patterns in a Threatened Seabird with Limited Genetic Structure. *Molecular Ecology* 18:5074-5085.

Hébert, P. N. and R. T. Golightly. 2006. *Movements, Nesting, and Response to Anthropogenic Disturbance of Marbled Murrelets (*Brachyramphus Marmoratus*) in Redwood National and State Parks, California*. Unpublished report, Department of Wildlife, Humboldt State University, Arcata, CA and California Department of Fish and Game Report 2006-02. Sacramento, CA.

Hébert, P. N., and R. T. Golightly. 2008. At-Sea Distribution and Movements of Nesting and Non-Nesting Marbled Murrelets *Brachyramphus Marmoratus* in Northern California. *Marine Ornithology* 36:99-105.

Janssen, M. H., P. Arcese, T. K. Kyser, D. F. Bertram, L. Mcfarlane Tranquilla, T. D. Williams, and D. R. Norris. 2009. Pre-Breeding Diet, Condition, and Timing of Breeding in a Threatened Seabird, the Marbled Murrelet *Brachyramphus marmoratus*. *Marine Ornithology* 37:33-40.

Nelson, S. K. 1997. Marbled Murrelet (*Brachyramphus marmoratus*). In A. Poole and F. Gill (eds.), *The Birds of North America, No. 276*. Philadelphia, PA: the Academy of Natural Sciences and Washington, DC: the American Ornithologists' Union.

Norris, D. R., P. Arcese, D. Preikshot, D. F. Bertram, and T.K. Kyser. 2007. Diet Reconstruction and Historic Population Dynamics in a Threatened Seabird. *Journal of Applied Ecology* 44:875-884.

O'Donnell, B. P., N. L. Naslund and C. J. Ralph. 1995. "Patterns of seasonal variation of activity of Marbled Murrelets in forested stands." In Ecology and conservation of the Marbled Murrelet., edited by C. J. Ralph, Jr G. L. Hunt, M. G. Raphael and J. F. Piatt, 117-128. Albany, CA: USDA For. Serv. Gen. Tech. Rep. PSW-152.

Ralph C.J., G.L. Hunt, Jr., M.G. Raphael, and J.F. Piatt (Tech. eds.). 1995. Ecology and conservation of the marbled murrelet. Gen. Tech. Rep. PSWGTR-152. Albany, CA: Pacific Southwest Research Station, Forest Service, U.S. Dept. of Agriculture. 420 p.

Tesky, Julie L. 1994. Brachyramphus marmoratus. In: Fire Effects Information System, [Online]. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory (Producer). Available: www.fs.fed.us/database/feis/animals/bird/brma/all.html [2018, June 19].

U.S. Department of Agriculture. 1999. *Southern California Mountains and Foothills Assessment: Habitat and Species Conservation Issues.* General Technical Report GTR-PSW-172. Albany, CA: Pacific Southwest Research Station, USDA Forest Service.

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

———. 2004. Marbled Murrelet 5-Year Review. Oregon Fish and Wildlife Office.

———. 2009. *Marbled Murrelet (*Brachyramphus marmoratus*) 5-Year Review*. Report. June 12. Lacey, WA: Washington Fish and Wildlife Office.

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

GIS Sources

California Department of Fish and Wildlife. 2018. California Natural Diversity Database, RareFind 5, Version 5.2.7. Available: https://www.wildlife.ca.gov/Data/CNDDB/Maps-and-Data. Accessed February 2018.

California Department of Fish and Wildlife. 2018. California Natural Diversity Database & Spotted Owl Data Viewer, RareFind 5, Version 5.2.7. Available: https://www.wildlife.ca.gov/Data/CNDDB/Maps-and-Data. Accessed February 2018.

U.S. Fish and Wildlife Service. 2012. *Endangered and Threatened Wildlife and Plants; Designation of Revised Critical Habitat for the Northern Spotted Owl*. U.S. Department of the Interior, Fish and Wildlife Service. 50 CFR Part 17. Federal Register, Vol. 77, No. 233. December 4, 2012

References

Literature Cited

Franklin, A. B., D. R. Anderson, R. J. Gutiérrez, and K. P. Burnham. 2000. Climate, Habitat Quality, and Fitness in Northern Spotted Owl Populations in Northwestern California. *Ecological Monographs* 70:539-590.

Forsman, E.D., R.G. Anthony, J.A. Reid, P.J. Loschl, S.G. Sovern, M. Taylor, B.L. Biswell, A. Ellingson, E.C. Meslow, G.S. Miller, K.A. Swindle, J.A. Thrailkill, F.F. Wagner and D.E. Seaman. 2002. Natal and breeding dispersal of northern spotted owls. Wildlife Monographs 149:1–35.

Forsman, E.D., R.G. Anthony, K.M. Dugger, E.M. Glenn, A.B. Franklin, G.C. White, C.J. Schwarz, K.P. Burnham, D.R. Anderson, J.D. Nichols, J.E. Hines, J.B. Lint, R.J. Davis, S.H. Ackers, L.S. Andrews, B.L. Biswell, P.C. Carlson, L.V. Diller, S.A. Gremel, D.R. Herter, J.M. Higley, R.B. Horn, J.A. Reid, J. Rockweit, J. Schaberl, T.J. Snetsinger and S.G. Sovern. 2011. Population demography of northern spotted owls: 1985–2008. Studies in Avian Biology. Cooper Ornithological Society.

Gutiérrez, R. J., M. Cody, S. Courtney, and A. B. Franklin. 2007. The Invasion of Barred Owls and its Potential Effect on the Spotted Owl: A Conservation Conundrum. *Biological Invasions* 9:181-196.

Gutiérrez, R. J., A. B. Franklin and W. S. Lahaye. 1995. Spotted Owl *(Strix occidentalis*). In A. Poole, (ed.), *The Birds of North America Online.* Ithaca, NY: Cornell Lab of Ornithology. Available: <http://bna.birds.cornell.edu/bna/species/179 doi:10.2173/bna.179>. Accessed: February, 2018

Miller, G. S., R. J. Small, and E. C. Meslow. 1997. Habitat Selection by Spotted Owls during Natal Dispersal in Western Oregon. *Journal of Wildlife Management* 61:140-150.

Thomas, J. W., E. D. Forsman, J. V. Lint, E. C. Meslow, B. R. Noon, and J. Verner. 1990. *A Conservation Strategy for the Northern Spotted Owl: A Report to the Interagency Scientific Committee to Address the Conservation of the Northern Spotted Owl.* 79 1-171/20026*.* U.S. Forest Service, U.S. Fish and Wildlife Service, and National Park Service. Washington, DC: U.S. Government Printing Office.

Thome, D. M., C. J. Zabel, and L. V. Diller. 2000. Spotted Owl Turnover and Reproduction in Managed Forests of North-Coastal California. *Journal of Field Ornithology* 71(1):140-146.

U.S. Fish and Wildlife Service. 2008. *Final Recovery Plan for the Northern Spotted Owl,* Strix occidentalis caurina. Portland, OR. xii + 142 pages.

———. 2008. *Endangered and Threatened Wildlife and Plants; Revised Designation of Critical Habitat for the Northern Spotted Owl; Final Rule*. Federal Register 73: 47325-47522.

———. 2011. Revised Recovery Plan for the Northern Spotted Owl (Strix occidentalis caurina). U.S. Fish and Wildlife Service, Portland, Oregon. xvi + 258 pp

———. 1992. *Determination of Critical Habitat for the Northern Spotted Owl; Final Rule*. Federal Register 57: 1796-1838.

Ward Jr., J. P., R. T. Gutierrez, and B. R. Noon. 1998. Habitat Selection by Northern Spotted Owls: The Consequences of Prey Selection and Distribution. *Condor* 100:79

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.

GIS Sources

California Department of Fish and Wildlife and California Interagency Wildlife Task Group. 2014. Standards and Guidelines for CWHR Species Models. Technical Report No. 31. California Wildlife Habitat Relationships System, California Department of Fish and Game. Sacramento, Ca

———. 2018. California Natural Diversity Database, RareFind 5, Version 5.2.7. Available at: https://www.wildlife.ca.gov/Data/CNDDB/Maps-and-Data. Accessed February 2018

References

Germano, D.J., G.B. Rathbun, and L.R. Saslaw. 2001. Managing Exotic Grasses and Conserving Declining Species. Wildlife Society Bulletin 29: 551-559.

Loew, S. S., D. F. Williams, K. Ralls, K. Pilgrim, and R. C. Fleischer. 2005. Population Structure and Genetic Variation in the Endangered Giant Kangaroo Rat (*Dipodomys ingens*). *Conservation Genetics* 6: 495-510.

U.S. Fish and Wildlife Service. 1998. *Recovery plan for upland species of the San Joaquin Valley, California*. Region 1, Portland, OR. 319 pp.

———. 2010*. Giant Kangaroo Rat (*Dipodomys ingens*). 5-Year Review: Summary and Evaluation.* Sacramento, CA. February.

———. 2018. Species Profile for Giant kangaroo rat (Dipodomys ingens). Accessed June 2018. Available at: https://ecos.fws.gov/ecp0/profile/speciesProfile?spcode=A08P#crithab

Williams, D. F. and K. S Kilburn. 1991. *Dipodomys ingens*. Mammalian Species 377: 1-7.

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

California Department of Fish and Wildlife and California Interagency Wildlife Task Group. 2014. Standards and Guidelines for CWHR Species Models. Technical Report No. 31. California Wildlife Habitat Relationships System, California Department of Fish and Game. Sacramento, CA.

U.S. Fish and Wildlife Service. 1998. Point Arena Mountain Beaver Recovery Plan. Portland Oregon

References

BioConsultants LLC. 2006. Point Arena mountain beaver survey on the Stornetta Public Lands. Prepared for Mendocino County Resource Conservation District. Bureau of Land Management, Ukiah, California.

California Department of Fish and Wildlife. 2018. California Natural Diversity Database, RareFind 5, Version 5.2.7. Available: https://www.wildlife.ca.gov/Data/CNDDB/Maps-and-Data. Accessed June 2018.

Fitts, K., S. Flowers, R. Jackson, D. Marshall, R. Meentemeyer, and P. Northern. 2002. Point Arena mountain beaver Aplodontia rufa nigra (Rafinesque) habitat protection and restoration plan for Manchester State Park. Prepared for R. Pasquinelli, California Department of Parks and Recreation, Mendocino District, Manchester State Park, Manchester, California.

Johnson, S.R. 1971. Thermal regulation, microclimate, and distribution of the mountain beaver, Aplodontia rufa pacifica Merriam. Ph.D. Dissertation. Oregon State University, Corvallis, OR.

Kinney, J. 1971. Environmental physiology of a primitive rodent (Aplodontia rufa). PhD Dissertation, University of Oregon, Eugene, OR.

Neal, F. and J. Borrecco. 1981. Distribution and Relationship of Mountain Beaver to Openings in Sapling Stands. *Northwest Science* 55(2):79–82.

Nungesser, W.C. and E.W. Pfeiffer. 1965. Water balance and maximum concentrating capacity in the primitive rodent, Aplodontia rufa. Comparative Physiology and Biochemistry 14:289-297.

Pfeiffer, E.W. 1958. The reproductive cycle of the female mountain beaver. Journal of Mammalogy 39:223-235.

Schmidt-Nelson, B. and E.W. Pfeiffer. 1970. Urea and urinary concentrating ability in the mountain beaver, Aplodontia rufa. American Journal of Physiology and Biochemistry 14:289-297.

U.S. Fish and Wildlife Service. 1998. *Point Arena Mountain Beaver (*Aplodontia rufa nigra *[Rafinesque]) Recovery Plan*. Region 1, Portland, OR. 71 pages.

———. 2009. *Point Arena Mountain Beaver*. Aplodontia rufa nigra 5-Year Review: Summary and Evaluation. Arcata Fish and Wildlife Office, Arcata, CA. Updated February 17, 2009.

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.

GIS Sources

California Department of Fish and Wildlife and California Interagency Wildlife Task Group. 2014. Standards and Guidelines for CWHR Species Models. Technical Report No. 31. California Wildlife Habitat Relationships System, California Department of Fish and Game. Sacramento, Ca

California Department of Fish and Wildlife. 2018. California Natural Diversity Database, RareFind 5, Version 5.2.7. Available: https://www.wildlife.ca.gov/Data/CNDDB/Maps-and-Data. Accessed June 2018.

Cypher, B. L., S. E. Phillips, and P. A. Kelly. 2013. Quantity and distribution of suitable habitat for endangered San Joaquin kit foxes: conservation implications. Canid Biology and Conservation 16:25-31.

U.S. Geological Survey. 2013, National Hydrography Geodatabase: The National Map viewer available on the World Wide Web (https://viewer.nationalmap.gov/viewer/nhd.html?p=nhd), accessed: Accessed February 2018

References

Anderson, R. L., L. K. Spiegel, and K. M. Kakiba-Russell. 1991. *Southern San Joaquin Valley Ecosystems Protection Program: Natural Lands Inventory and Maps*. California Energy Commission. Sacramento, CA.

Berry, W. H., J. H. Scrivner, T. P. O'Farrell, C. E. Harris, T. T. Kato, and P. M. McCue. 1987. *Sources and Rates of Mortality of the San Joaquin Kit Fox, Naval Petroleum Reserve #1, Kern County, CA, 1980 – 1986*. Report No. EGG 10282-2154. EG&G Energy Measurements. Goleta, CA.

California Department of Fish and Game. 1987. *Los Banos Grandes Project – 1986 Annual Progress Report.* Unpublished Report. Sacramento, CA.

———. 2018. California Natural Diversity Database, RareFind 5, Version 5.2.7. Available: https://www.wildlife.ca.gov/Data/CNDDB/Maps-and-Data. Accessed June 2018.

California Department of Fish and Game. California Interagency Wildlife Task Group. 2008. CWHR Version 8.2 personal computer program. Sacramento, California.

Constable, J. L., B. L. Cypher, S. E. Phillips and P. A. Kelly. *Conservation of San Joaquin Kit Foxes in Western Merced County, California*. Prepared for the U. S. Bureau of Reclamation, Fresno, CA. Available: <http://esrp.csustan.edu/publications/reports/usbr/esrp_2009_wmercedkitfox_e.pdf>. Accessed: December 16, 2009.

Egoscue, H. J. 1956. Preliminary Studies of the Kit Fox in Utah. *Journal of Mammalogy* 37:351–357.

———. 1962. Ecology and Life History of the Kit Fox in Tooele County, Utah. *Ecology* 43:481–497.

———. 1975. Population Dynamics of the Kit Fox in Western Utah. *Bulletin of the Southern California Academy of Sciences* 74:122–127.

Grinnell, J., J. S. Dixon, and J. M. Linsdale. 1937. *Fur-bearing Mammals of California.* Volume II. Berkeley, CA: University of California Press.

Hall, F. A. 1983. *Status of the Kit Fox (*Vulpes macrotis mutica*) at the Bethany Wind Turbine Generating (WTG) Project Site, Alameda, CA.* The Resources Agency, California Department of Fish and Game. Sacramento, CA.

Jensen, C. C. 1972. *San Joaquin Kit Fox Distribution.* Unpublished Report. Sacramento, CA: U.S. Fish and Wildlife Service.

Kakiba-Russell, K., E. Hubert, and L. K. Spiegel. 1991. *Carrizo Plain Natural Area Biological Resources Inventory: Sensitive Species Accounts*. California Energy Commission and The Nature Conservancy. Sacramento, CA.

Kato, T. T., and T. P. O'Farrell. 1986. *Biological Assessment of the Effects Of Petroleum Production at Maximum Efficient Rate, Naval Petroleum Reserve #1 (Elk Hills), Kern County, California, on the Endangered Blunt-Nosed Leopard Lizard,* Gambelia silus. U.S. Department of Energy Topical Report No. EGG 10282-2108. Santa Barbara Operations. EG&G Energy Measurements. Goleta, CA.

Knapp, D. K. 1978. *Effects of Agricultural Development in Kern County, California, on the San Joaquin Kit Fox in 1977*. Final Report. Project E-1-1, Job V-1.21, Non-Game Wildlife Investigations. California Department of Fish and Game. Sacramento, CA.

McCue, P. M., T. Kato, M. L. Sauls, and T. P. O'Farrell. 1981. Inventory of San Joaquin Kit Fox On Land Proposed as Phase II, Kesterson Reservoir, Merced County, California*. Inventory of San Joaquin Kit Fox On Land Proposed as Phase II, Kesterson Reservoir, Merced County, California*. Report No. EGG 1183-2426. EG&G Energy Measurements. Goleta, CA.

McGrew, J. C. 1979. *Vulpes macrotis*. *Mammalian Species* 123:1–6.

Morrell, S.H. 1971. Life history of the San Joaquin kitfox. California Dept. Fish and Game, Sacramento, Spec. Wildl. Invest., Unpubl. Rep., 25 pp. Morrell, S. H. 1972. Life History of the San Joaquin Kit Fox. *California Fish and Game* 58(3):162–174.

O'Farrell, T. P. 1980. *Elk Hills Endangered and Threatened Species Program, Phase 1 Progress Summary.* U.S. Department of Energy Topical Report No. EGG 1183-2403. Santa Barbara Operations. EG&G Energy Measurements. Goleta, CA.

O'Farrell, T. P., W. H. Berry, and G. D. Warrick. 1987. *Distribution and Status of the Endangered San Joaquin Kit Fox,* Vulpes macrotis mutica*, on Fort Hunter Liggett and Camp Roberts, California*. Report No. EGG-10282-2194. EG&G Energy Measurements. Goleta, CA. Prepared for the U.S. Department of the Army, Corps of Engineers, through the U.S. Department of Energy, Nevada Operations Office. Reno, NV.

O'Farrell, T. P., and L. Gilbertson. 1979. Ecology of the Desert Kit Fox, *Vulpes macrotis arsipus*, in the Mojave Desert of Southern California. *Bulletin of the Southern California Academy of Sciences* 85:1–15.

O'Farrell, T. P., T. T. Kato, P. M. McCue, and M. L. Sauls. 1980. *Inventory of San Joaquin Kit Fox on USBLM Lands in Southern and Southwestern San Joaquin Valley – Final Report*. Report. No. EGG 1183-2400. EG&G Energy Measurements. Goleta, CA.

Orloff, S., F. Hall, and L. Spiegel. 1986. Distribution and Habitat Requirements of the San Joaquin Kit Fox in the Northern Extreme of their Range. *Transactions of the Western Section of the Wildlife Society* 22:60–70.

Ralls, K., and P. J. White. 1991. *Kit Fox–Coyote Relationships in the Carrizo Plain Natural Area*. Annual Report. U.S. Fish and Wildlife Service. Sacramento, CA.

Ralls, K., and P. J. White. 1995. Predation on Endangered San Joaquin Kit Foxes by Larger Canids. *Journal of Mammalogy* 276:723–729.

Reese, E. A., T. T. Kato, W. H. Berry, and T. P. O'Farrell. 1992. *Ground Penetrating Radar and Thermal Images Applied to San Joaquin Kit Fox* (Vulpes macrotis mutica) *at Camp Roberts Army National Guard Training Site, CA*. U.S. Department of Energy Topical Report No. EGG 10617-2162. EG&G Energy Measurements, Santa Barbara Operations, National Technical Service. Springfield, VA.

Scrivner, J. H., T. P. O'Farrell, and T. T. Kato. 1987. *Dispersal of San Joaquin Kit Foxes,* Vulpes macrotis mutica*, on Naval Petroleum Reserve #1, Kern County, California*. Report No. EGG 10282-2190. EG&G Energy Measurements. Goleta, CA.

Spiegel, L. K., and M. Bradbury. 1992. Home Range Characteristics of the San Joaquin Kit Fox in Western Kern County, California. *Transactions of the Western Section of the Wildlife Society 2*8:83–92.

Standley, W. G., W. J. Berry, T. P. O'Farrell, and T. T. Kato. 1992. *Mortality of San Joaquin Kit Fox (*Vulpes macrotis mutica*) at Camp Roberts Army National Guard Training Site, California*. Report No. EGG 10617-2157. EG&G Energy Measurements. Goleta, CA.

U.S. Fish and Wildlife Service. 1983. *The San Joaquin Kit Fox Recovery Plan*. Portland, OR.

———. 1998. *Recovery Plan for Upland Species of the San Joaquin Valley, California*. Region 1, Portland, OR.

———. 2010. *San Joaquin Kit Fox 5-Year Review: Summary and Evaluation*. Sacramento, CA.

White, P. J., and K. Ralls. 1993. Reproduction and Spacing Patterns of Kit Foxes Relative to Changing Prey Availability. *Journal of Wildlife Management* 57:861–867.

White, P. J., K. Ralls, and R. A. Garrott. 1994. Coyote–Kit Fox Spatial Interactions Based on Radio-Telemetry. *Canadian Journal of Zoology* 72:1831–1836.

White, P. J., C. A. Vanderbilt-White, and K. Ralls. 1996. Functional and Numerical Responses of Kit Foxes to a Short-Term Decline in Mammalian Prey. *Journal of Mammalogy* 77(2):370–376.

Zoellick, B. W., T. P. O'Farrell, and T. T. Kato. 1987. Movements and Home Ranges of San Joaquin Kit Foxes on the Naval Petroleum Reserves, Kern County, California. Report No. EG&G 10282-2184, DE88 05188. EG&G Energy Measurements. Goleta, CA.

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).

References

California Department of Fish and Wildlife. 2018. California Natural Diversity Database, RareFind, Version 5.2.14. (March 26, 2018). Occurrence records for *Arctostaphylos myrtifolia*. Sacramento CA.

Creely, S. and E.R. Force. 2007. Type region of the Ione formation (Eocene), central California: stratigraphy, paleogeography, and relation to auriferous Gravels. Open file report submitted to USGS. 65 pp.

Force, E.R. and S. Creely. 2000. Titanium mineral resources of the western U.S.—an update. Unpublished USGS report. 37 pp.

U.S. Fish and Wildlife Service. 2010. *Eriogonum apricum* (inclusive of vars. *apricum* and *prostratum*) (Ione Buckwheat = Irish Hill Buckwheat) *Arctostaphylos myrtifolia* (Ione manzanita), 5-Year Review: Summary and Evaluation. Sacramento Fish and Wildlife Office, Sacramento, CA. July.

Wells, P. V. 1969. The relation between mode of repro-duction and extent of speciation in woody genera of the California chaparral. Evolution 23:264-267.

Vander Wall, S. B. 2010. How plants manipulate the scatter-hoarding behavior of seed-dispersing animals. Philos. Trans. R. Soc. B 365:989 –997.

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.

References

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 March 27, 2018

James, S.C. 1996. A demographic study of *Ceanothus roderickii* (the Pine Hill ceanothus) El Dorado County, California. Unpublished Master's Thesis, California State University, Sacramento, 150 pp.

Vasey, M.C. and V.T. Parker. 2014. Drivers of diversity in woody plant lineages experiencing canopy fire regimes in Mediterranean type climates, pp. 179-200. In: Rajakaruna, N., R.S. Boyd, and T.B. Harris (eds.) Plant ecology and evolution in harsh environments. Nova Science Publishers, Hauppauge, NY. 475 pp

U.S. Fish and Wildlife Service. 2002 *Recovery Plan for Gabbro Soil Plants of the Central Sierra Nevada Foothills*. Portland U.S. Fish and Wildlife Office, Portland, Or. August.

Wilson, J. L. 1986. A study of plant species diversity and vegetation pattern associated with the Pine Hill gabbro formation and adjacent substrata, El Dorado County, California. California State University, Sacramento. Thesis. 249 pp.

Wells, P. V. 1969. The relation between mode of repro-duction and extent of speciation in woody genera of the California chaparral. Evolution 23:264-267.

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.

References

Baldwin, B. G., D. H. Goldman, D. J. Keil, R. Patterson, T. J. Rosatti, and D. H. Wilken (eds.). 2012. *The Jepson Manual: Vascular Plants of California*. 2nd edition. Berkeley, CA: University of California Press.

Boyd, R. 1987. The effects of controlled burning on three rare plants. Pages 513-517, In: Conservation and management of rare and endangered plants, Elias, T.S. (ed.).

———.1996. Ant-mediated seed dispersal of the rare chaparral shrub Fremontodendron decumbens (Sterculiaceae). Madrono 43:299-315.

Boyd, R.S. and L. L. Serafini. 1992. Reproductive attrition in the rare chaparral shrub Fremontodendron decumbens Lloyd (Sterculiaceae). American Journal of Botany 79(11):1264-1272.

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 March 28, 2018.

Kelman, W.M. 1991. A Revision of Fremontodendron (Sterculiaceae). Systematic Botany 16:3-20.

U.S. Fish and Wildlife Service. 2002 Recovery Plan for Gabbro Soil Plants of the Central Sierra Nevada Foothills. Portland U.S. Fish and Wildlife Office, Portland, Or. August.

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.

References

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 March 27, 2018.

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.California Native Plant Society.org [accessed 26 March 2018].

Eng, L. 1999. Letter to Wayne White, U.S. Fish and Wildlife Service, Sacramento, California, 6 pp.+.

Holland, R.F. 1986. Preliminary descriptions of the terrestrial natural communities of California. California Department of Fish and Game, Sacramento. 146 pp. + appendices.

Nosal, T. 1997. A demographic study of Stebbins' morning-glory, (*Calystegia stebbinsii*, Brummit, Convolvulaceae), a California state listed and Federal listed endangered plant species. Unpublished Masters thesis, California State University, Sacramento. 44 pp.

U.S. Fish and Wildlife Service. 2002 *Recovery Plan for Gabbro Soil Plants of the Central Sierra Nevada Foothills*. Portland U.S. Fish and Wildlife Office, Portland, Or. August.

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.

References

Baad, M.F. and G.D. Hanna. 1987. Pine Hill Ecological Reserve operations and maintenance schedule. Prepared for the California Department of Fish and Game. Unpublished report. 52 pp. + appendices.

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 March 28, 2018.

Marsh, G. 2000. Genetic structure of Layne's butterweed (Senecio layneae) using random amplified polymorphic DNA (RAPD) and inter simple sequence repeat (ISSR) markers. Unpublished Master's thesis. California State University, Sacramento. 64 pp.

U.S. Fish and Wildlife Service. 2002 *Recovery Plan for Gabbro Soil Plants of the Central Sierra Nevada Foothills*. Portland U.S. Fish and Wildlife Office, Portland, Or. August.

Williams, S. 2014. *The ecology and distribution patterns of a rare serpentine endemic, Packera layneae.* Master's Thesis, Chico State University.

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.

References

Botanica Northwest Associates. 1992. Monitoring Plan for Menzies' Wallflower (Erysimum nienziesii) in the Humboldt County Beach and Dunes Planning Area. Unpublished draft report, August, 1992.

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.

Johns, Michael. 2009. Assessment of endangered beach layia (Layia carnosa) on the Monterey Peninusula. California State University, Monterey Bay.

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

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).

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.

Dick, C.A; Herman, J.A.; O'Dell, R; Lopez-Villalobos, A; Eckert, C; Whittall, J. 2014. Cryptic genetic subdivision in the San Benito evening primrose (*Camissonia benitensis*)Conserv Genet. 2014. 15: 165. https://doi.org/10.1007/s10592-013-0533-4.

Taylor, D., R. Palmer, and W. Davilla. 1989. *Camissonia benitensis* life history studies, 1988 progress report. BioSystems Analysis, Inc. May 1989. 37 pp.

Taylor, D. 1990. Ecology and life history of the San Benito evening-primrose (*Camissonia benitensis*). Prepared by BioSystems Analysis, Inc. Bureau of Land Management Contract Number CA950-RFP7-13 J-325. 87 pp.

U.S. Bureau of Land Management. 2006. Record of Decision for the resource management plan amendment for the Clear Creek Management Area. Hollister Field Office, Hollister, California.

U.S. Bureau of Land Management. 2008. Closure Order. Hollister Field Office, Hollister, California. May 1, 2008.

U.S. Fish and Wildlife Service. 2006. Recovery Plan for Camissonia benitensis (San Benito evening primrose). 71 FR 54837-54838. Ventura, California.

———. 2009. Camissonia benitensis (San Benito evening-primrose) 5-Year Review. Ventura, California.

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

County	Total Existing Occurrences	Extant Occurrences	Public	Private	Unknown
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.

References

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

———. 2008. Endangered and Threatened Wildlife and Plants; Designation of Critical Habitat for the Monterey Spineflower (Chorizanthe pungens var. pungens). 73 FR 1525, January 9, 2008.

Zoger, A. and B. Pavlik. 1987. Marina Dunes rare plant survey. Report prepared for Marina Coastal Zone Planning Task Force.

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.

References

Baron, S. 1998. A demographic study of four annual plants of maritime chaparral. Senior thesis, University of California, Santa Cruz. 28 pages.

Brinegar, C. and S. Baron. 2008. Molecular phylogeny of the *Pungentes* subsection of *Chorizanthe* with emphasis on the *C. pungens/C. robusta* complex. Unpublished report submitted to the U.S. Fish and Wildlife Service, Region 8, Ventura, California.

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.

Murphy, A. 2003. Endangered plant conservation: do pollinators matter to the robust spineflower? Masters Thesis, Department of Environmental Studies, San Jose State University, San Jose, California.

Reveal, J. L., and C. B. Hardham. 1989. A revision of the annual species of the *Chorizanthe* (Polygonaceae: Eriogonoideae). Phytologia 66: 98-198.

Reveal, J. L. 2001. Scientific review questions on *Chorizanthe parryi* S. Watson var. *fernandina* (S. Watson) Jepson (San Fernando Valley spineflower). University of Maryland, College Park, Maryland.

U.S. Fish and Wildlife Service. 1994. Endangered and threatened wildlife and plants: Endangered status for three plants and threatened status for one plant from sandy and sedimentary soils of central and coastal California. Federal Register 59:5499-5511. February 4, 1994.

———. 2002. Critical Habitat Designation for Chorizanthe robusta var. robusta (Robust Spineflower). 67 FR 36822-36845.

———. 2004. Recovery Plan for Chorizanthe robusta var. robusta (Robust Spineflower). U.S. Fish and Wildlife Service, Portland, Oregon. vii + 71 pages.

———. 2010. *Chorizanthe robusta* var. *robusta* (Robust Spineflower) 5-Year Review: Summary and Evaluation. Ventura California.

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.

References

Andreasen, K., E.A. Cypher, and B.G. Baldwin. 2002. Sympatry between desert mallow, *Eremalche exilis* and Kern mallow, *E. kernensis* (Malvaceae): molecular and morphological perspectives. Madroño 49(1): 22-24.

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.

Cypher, EA. 1994. Progress report on 1994 grazing studies for Kern mallow and San Joaquin woolly-threads. U.S. Bureau Land Management, Bakersfield, CA, Unpubl. Rep., 22 pp.

Cypher, E.A. 2002. Occurrence of desert mallow (*Eremalche exilis*) in the Lokern area of Kern County: Implications for conservation of the endangered Kern mallow (*Eremalche kernensis*). 2002 Annual Meeting of the Western Section of The Wildlife Society. Session Managed Lands and Botanical Issues. March 7 – 9, 2002, Visalia, California.

Cypher, E.A. and B.L. Cypher. 2004. Endangered giant kangaroo rats benefit the endangered plant Kern mallow. 2004 Annual Meeting of the Western Section of The Wildlife Society. February 26 – 28, 2004, Rohnert Park, California.

De Vries, P. 2011. Results of the 2011 Kern mallow surveys on the Carrizo Plain. Unpublished report, with appendices, prepared for the Bureau of Land Management, Bakersfield, California.

Mazer, S.J., G. LeBuhn, and D.E. Meade. 1993. Demography and reproductive biology of Kern mallow *(Eremaiche kernensis:Malvaceae).* California Dept. Fish and Game, Sacramento, Unpubl. Rep., 300 pp. + Appendices.

Taylor, D.W., and W.B. Davilla. 1986. Status survey of three plants endemic to the San Joaquin Valley and adjacent areas, California. U.S. Fish and Wildlife Service, Sacramento, CA, Unpubl. Rep., 131 pp.

U.S. Fish and Wildlife Service.1990. Endangered and threatened wildlife and plants; determination of endangered or threatened status for five plants from the southern San Joaquin Valley. Fed. Register 55:29361-29370.

———. 1998. Recovery plan for upland species of the San Joaquin Valley, California. Region 1, Portland, OR. 319 pp.

———. 2013. *Eremalche kernensis* (Kern mallow) 5-Year Review: Summary and Evaluation. Sacramento, California.

Wolf, C.B. 1938. California plant notes: II. Occas. Papers Rancho Santa Ana Bot. Garden Series 1(2):44-90.

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—Contents

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: Nearest City: Total Acres of Credit:	Sectional cords (MDBM):

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

Attachment 1

Attachment 2

Appendix C2
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

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. Summary of Parcel Development Plan (if applicable)

[*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

Objective: Monitor sources of trash and trespass.

Objective: Collect and remove trash, repair vandalized structures, and rectify trespass impacts.

Task: During each site visit, record occurrences of trash and/or trespass. Record type, location, and management mitigation recommendations to avoid, minimize, or rectify a trash and/or trespass impact.

Task: At least once yearly collect and remove as much trash and repair and rectify vandalism and trespass impacts.

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

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.

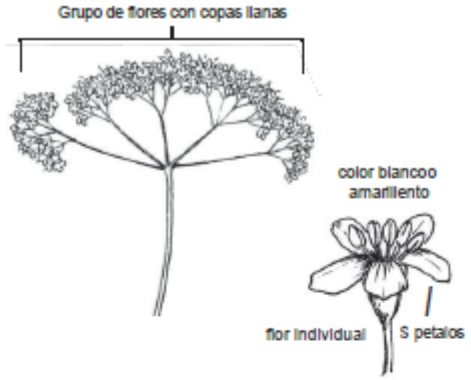
To achieve compliance with federal law, Pacific Gas and Electric Company has obtained a permit that allows the company to conduct necessary routine maintenance and operations activities that may impact VELB habitat.

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)

Gul"a ambiental para proteger el habitat del escarabajo *Desmocerus californicus dimorphus* (Valley Elderberry Longhron Beetle, VELB)

Pacific Gas and Electric Company

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.

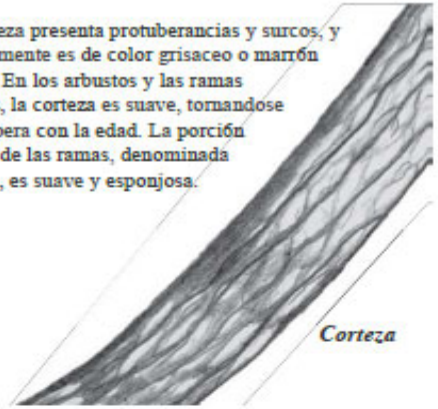
Descripci6n del sauce

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

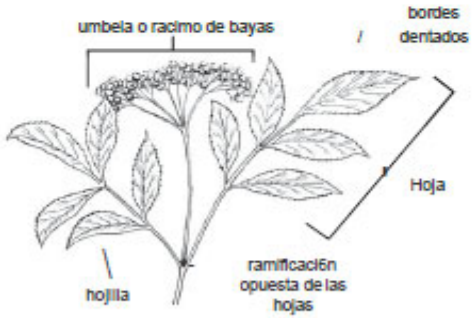
Grupo de arbustos de sauco

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 C8-1. 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.

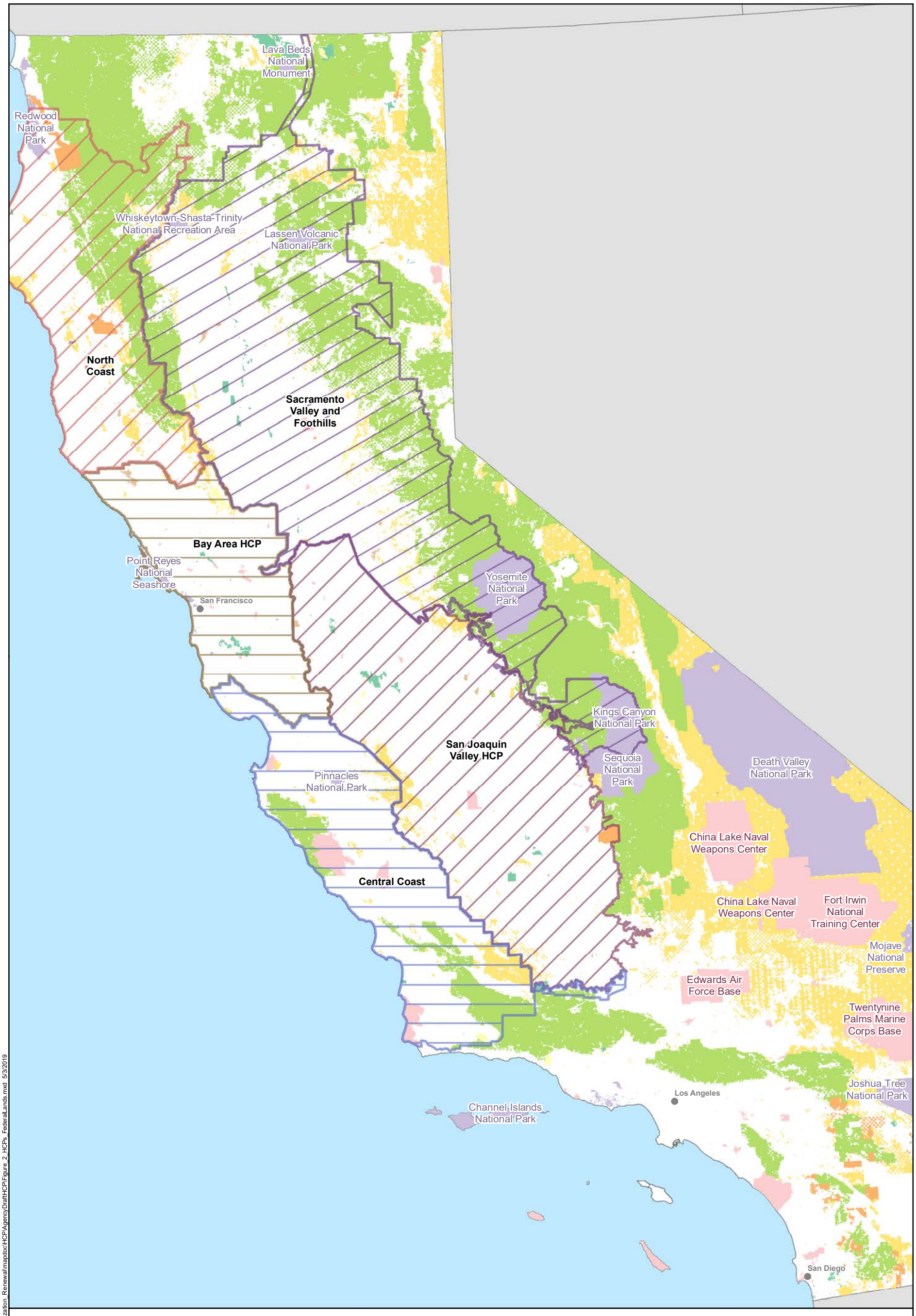


Figure C8-1. PG&E Operation and Maintenance Habitat Conservation Plans and Overlapping Federal Lands

\\PDCCITRDSGIS2\Projects_3\PGE\00434_16_USFS_Authorization_Renewal\mapdoc\HCPAgencyDraftHCP\Figure_2_HCPs_FederalLands.mxd 5/3/2019

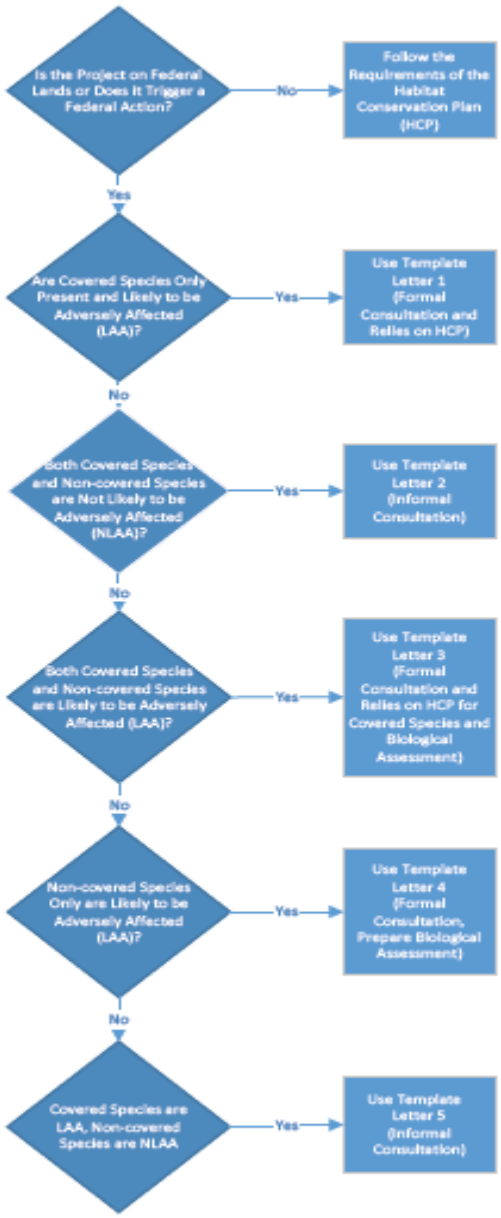


Figure C8-2
Flowchart Illustrating When Template Letters Should be Used

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

Attachment C8-2
Draft Template Letters

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].