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Impacts associated with covered activities were categorized as causing *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 pools, permanent wetlands, 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 any of the following activities or conditions.

- New facilities located in a new ROW (i.e., minor new construction).
- Conversion of the existing land cover type suitable for a covered species to a developed land cover type or to a habitat type that would no longer be available for a covered species.
- Any activity that causes an impact lasting more than 12 months.
- Any activity that disturbs habitat such that the vegetative cover, soils, topography, and hydrological conditions would not recover within one growing season.
- ROW expansion or management that results in land cover type conversion.
- A long-term, substantial increase in the frequency and magnitude of human-related disturbances 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, pole replacements, 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. Permanent impacts for plants are defined as absence of the plant after it is affected.

Temporary habitat loss is 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 can result from equipment staging. While these disturbances may have an impact on habitat values for covered species, impacts on habitat are temporary in nature (no more than 12 months) and allow habitat functions and values to return within that year. Temporary impacts for plants are defined as trimming, pruning, or temporarily removing topsoil and seedbank, where the plants recover.

4.1.2 Calculation of Disturbance Acreages by Activity in the Plan Area

Table 4-1 provides potential annual temporary and permanent disturbances due to the covered activities described in Chapter 3, *Covered Activities*. The calculation of acreages for permanent and temporary disturbance shown in Table 4-1 relies on the size of the covered activity and the frequency with which the covered activity would be implemented in a given year. The calculations derived are considered to be disturbances (as opposed to impacts) as they are assumed to occur uniformly throughout the Plan Area, including in urban areas, on roads or paved areas, or in habitat.

The total annual acres of disturbance were calculated for each covered activity by multiplying the impact (permanent or temporary disturbance) acreage of a single covered activity event by the total number of times that the covered activity would occur each year (frequency). The calculation results in a total annual disturbance for that covered activity in all land cover types throughout the Plan Area. This exercise was carried out for each covered activity. The annual impact was then summed by gas and electric facilities to generate the total annual permanent and temporary disturbance expected from covered activities (Table 4-1).

4.1.3 Calculating Covered Wildlife Impacts

The process of estimating impacts on covered species was a two-step process that was both quantitative and qualitative. The quantitative estimates are based on calculating disturbance estimates by activity (Table 4-1) and calculating amount of modeled habitat within facility corridors (Table 4-2); the qualitative estimates are based on PG&E's assessment of the likeliness of activities occurring within the covered species' habitat and need for take (Table 4-3).

4.1.3.1 Extent of Modeled Habitat in the Plan Area

Covered activities have varying levels of impacts on covered species based on location of impacts in relation to species distribution and life history. Some species are more susceptible to impacts from covered activities, while others are typically less affected. In order to accommodate these variations and better determine how each species might be affected, it was necessary to determine where covered species have the potential to occur within PG&E's Plan Area. First, PG&E incorporated modeled habitat data from the following conservation planning efforts: East Contra Costa HCP/NCCP, Santa Clara County HCP/NCCP, Solano County HCP, Eastern Alameda County Conservation Strategy, and Santa Rosa Plain Conservation Strategy.

Where gaps existed, PG&E created habitat models in conjunction with USFWS and CDFW, using an approach and analysis similar to the one used in the regional conservation planning efforts mentioned above. Species occurrence (i.e., occupancy) was extrapolated using a combination of the California Department of Fish and Wildlife's California Wildlife Habitats Relationship (CWHR) system and/or CNDDDB (see Table 2-3 in Chapter 2, *Environmental Setting*, for the source of each species' range). 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. In general, the models tend to over-estimate habitat because they do not account for species density, barriers to movement, or microhabitat requirements. For example, portions of the habitat model for California red-legged frog includes dispersal habitat across agricultural lands; typically, this land cover is unsuitable, but during wet-weather events may be used for adult frog migration. Similarly, for California tiger salamander, the models include grasslands as suitable dispersal and upland habitat, irrespective of site-specific burrow densities, past ground disturbance, or distance from stock ponds or vernal pools.

Overlaying the modeled habitat of a covered species with the facility corridor (Plan Area) defined the area within which covered activities could affect that species (Table 4-2). To arrive at the extent of modeled habitat within a facility corridor, the acres of modeled habitat within the facility corridor was divided by the acres of facility corridor. This approach provided a quantitative assessment of where covered activities could result in impacts on covered species.

4.1.3.2 Extent of Possible Impacts in the Plan Area

PG&E then multiplied the disturbance estimates (for both gas and electric, permanent and temporary) (Table 4-1) by the percentage of habitat in facility corridors (by species) (Table 4-2), to arrive at an estimate of disturbance by species. For example, gas activities are expected to permanently disturb 30.2 acres, and temporarily disturb 68 acres, annually, and electric activities are expected to permanently disturb 38 acres, and temporarily disturb 261 acres, annually (Table 4-1). Assuming the impacts are distributed uniformly, these numbers are multiplied by the percent of

each species habitat within the associated facility corridor (Table 4-2). The use of these numbers is illustrated for California freshwater shrimp below.

Permanent Impacts on California Freshwater Shrimp

Gas impacts × range	$30.2 \text{ ac} \times 0.01\% = 0.003 \text{ ac}$
Electric impacts × range	$38 \text{ ac} \times 0.05\% = 0.019 \text{ ac}$
Sum of gas and electric	$0.003 \text{ ac} + 0.019 \text{ ac} = 0.022 \text{ ac}$ (rounded to 0.02 ac)

Temporary Impacts on California Freshwater Shrimp

Gas impacts × range	$68 \text{ ac} \times 0.01\% = 0.007 \text{ ac}$
Electric impacts × range	$261 \text{ ac} \times 0.05\% = 0.131 \text{ ac}$
Sum of gas and electric	$0.007 \text{ ac} + 0.131 \text{ ac} = 0.138 \text{ ac}$ (rounded to 0.14 ac)

This was done for each species, as shown in the “Summary of Calculations” columns of Table 4-3.

The quantitative analysis presents a worst-case scenario of what could occur on an annual basis without PG&E’s environmental screening processes to evaluate impacts on species and their habitat and the implementation of AMMs. Because PG&E has not historically recorded or permitted annual disturbances of these magnitudes, PG&E further revised the disturbance estimates as described below.

4.1.3.3 PG&E Revisions to Arrive at 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 estimates in the first two columns 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:

- Past experience regarding annual disturbances of covered species’ habitat
- Past experience obtaining permits for covered species
- Estimated future need based on extent and range of modeled habitat
- Scarcity of habitat and possible avoidance measures
- 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 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, including permanent and temporary impacts by species are shown in the “requested take” columns of Table 4-3. Annual impacts were multiplied by 50 to account for the amount of impact that could occur over the life of the facilities (i.e., over the next 50 years); this number was selected because long-term maintenance activities could be required over this duration even though the permit term is 30 years. These impacts are still likely to represent a worst-case analysis of take authorization as PG&E has typically not needed this amount of annual take.

Table 4-1. Estimated Acreages Disturbed by Bay Area O&M HCP Covered Activities in the Plan Area^a

		Potential Permanent		Potential Temporary	
Activity	Annual Frequency ^b	Permanent Disturbance per Activity (acres)	Annual Disturbance (acres)	Temporary Disturbance per Activity (acres)	Annual Temporary Disturbance (acres)
Gas					
G1. Patrols ^c	1	–	–	–	–
G2. Inspections	1	–	–	–	–
G3a. Remedial Maintenance – Fencing	10	0.06	0.57	0.06	0.57
G3a. Remedial Maintenance – Ergon Mats	1	0.11	0.11	–	–
G3b. Internal Pipeline Inspection	50	–	–	0.06	2.98
G4. Compressor Station Upgrades and Maintenance	1	–	–	0.28	0.28
G5. Pipeline ETS Installations	7	–	–	0.06	0.40
G6. Valve Maintenance ^d	5	–	–	–	–
G7. Valve Maintenance – Replacement or Automation ^d	5	–	–	–	–
G8. Pipeline Cathodic Protection	5	–	–	0.02	0.11
G9. Pipeline Lowering	0.33	–	–	2.42	0.80
G10. Pipeline Coating Replacement	0.20	–	–	0.25	0.05
G11. Pipeline Replacement	5	0.06	0.29	2.42	12.12
G12. Telecom Site Maintenance	1	–	–	0.34	0.34
G13a. Pipeline ROW Vegetation Management	10	1.21	12.12	2.42	24.24
G13b. Pipeline Access Road Management	5	–	–	0.01	0.05
G14. Gas Pressure Limiting Station Construction	0.20	0.55	0.11	0.45	0.09
G15. New Customer Pipeline Installation	1	2.42	2.42	0.06	0.06
G16. CPSI—Pipeline Replacement	8	1.82	14.55	2.38	19.00
G17. CPSI—Valve Replacement or Automation	8	0.01	0.06	0.52	4.13
G18. CPSI—Hydrostatic Testing	5	–	–	0.51	2.53
Subtotal Gas			30.2		68
Electric					
E1. Patrols	1	–	–	–	–
E2. Inspections	1	–	–	–	–
E3. Insulator Washing or Replacement	1	–	–	0.002	–
E4. Substation Maintenance	1	–	–	0.46	0.46
E5. Outage Repair	500	–	–	0.01	5.56

Table 4-1. Continued

Activity	Annual Frequency ^b	Potential Permanent		Potential Temporary	
		Permanent Disturbance per Activity (acres)	Annual Disturbance (acres)	Temporary Disturbance per Activity (acres)	Annual Temporary Disturbance (acres)
Electric (continued)					
E6a. Tower Replacement or Repair (including Telecommunication Attachments)	360	0.001	0.41	0.02	8.26
E6b. Boardwalk Repair and Replacement	15	–	–	–	0.03
E7. Facility Installations (Shoo-Fly)	100	–	–	0.06	5.74
E8a. Pole Equipment Repair and Replacement	500	–	–	–	–
E8b. Utility/Wood Pole Replacement	500	–	–	–	0.80
E9a. Line Reconductoring – Transmission	10	0.036	0.36	21.52	215.22
E9b. Line Reconductoring – Distribution	250	–	–	–	0.57
E10a. Veg. Mgmt.—Routine Maintenance	20	0.09	1.84	–	–
E10b. Veg. Mgmt.—Pole Clearing	100	–	0.23	–	–
E10c. Veg. Mgmt.—Removal Activities	25	0.10	2.50	–	–
E10d. Veg. Mgmt.—Transmission Vegetation/ROW Management	10	3.03	30.30	1.88	18.80
E10e. Cage Clearing—Electric Transmission Structures	8	–	–	0.04	0.29
E10f. Fee Strip Maintenance—Electric Transmission Line ROW	1	–	–	3.03	3.03
E11a. Wood Pole Test and Treat—Inspection and Maintenance	6,000	–	–	0.0002	1.24
E11b. Wood Pole Test and Treat—Reinforcement	180	–	–	0.0008	0.15
E12. New Distribution and Transmission Line Construction or Relocation	2	0.23	0.46	0.25	0.49
E13. Elec. Tower Line Construction	2	0.29	0.57	0.26	0.52
E14. Minor Substation Expansion	0.33	3.00	1.00	–	–
E15. Elec. Underground Line Construction	0.10	–	–	0.30	0.03
Subtotal Electric			38		261
Total Gas and Electric			68		329

Table 4-2. Extent of Modeled Habitat by Wildlife Species within Facility Corridors

	Acres of Modeled Habitat in Plan Area					Extent of Modeled Habitat within Facility Corridor ^a (Acres of Modeled Habitat/Acres of Facility Corridor = Percent of Modeled Habitat in Facility Corridor)						
	Elec. Dist.	Elec. Trans.	Gas Dist.	Gas Trans.	Total Plan Area	Elec. Dist.	Elec. Tran.	Elec. Subtotal	Gas Dist.	Gas Trans.	Gas Subtotal	Total
	(A)	(B)	(C)	(D)		(A/154,606)	(B/61,637)		(C/111,361)	(D/49,186)		
Invertebrates												
California freshwater shrimp	59	8	2	3	72	0.04%	0.01%	0.05%	0.00%	0.01%	0.01%	0.06%
Conservancy fairy shrimp	39	99	0	153	292	0.02%	0.16%	0.18%	0.00%	0.31%	0.31%	0.50%
Longhorn fairy shrimp	2	9	0	0	11	0.00%	0.01%	0.01%	0.00%	0.00%	0.00%	0.02%
Vernal pool fairy shrimp	1,381	1,332	615	1,635	4,963	0.89%	2.16%	3.05%	0.55%	3.32%	3.87%	6.93%
Vernal pool tadpole shrimp	1,230	1,123	572	1,457	4,382	0.80%	1.82%	2.62%	0.51%	2.96%	3.47%	6.09%
Delta green ground beetle	23	46	0	54	122	0.01%	0.05%	0.06%	0.00%	0.08%	0.08%	0.13%
Bay checkerspot butterfly	56	475	12	369	912	0.03%	0.74%	0.77%	0.01%	0.68%	0.69%	1.46%
Callippe silverspot butterfly	1,481	3,233	650	1,443	6,807	0.96%	5.25%	6.21%	0.58%	2.93%	3.51%	9.72%
Lange's metalmark butterfly		8	0	5	13	0.00%	0.01%	0.01%	0.00%	0.01%	0.01%	0.02%
Mission blue butterfly	115	335	56	146	652	0.07%	0.54%	0.61%	0.05%	0.30%	0.35%	0.97%
San Bruno elfin butterfly	133	170	7	62	372	0.09%	0.28%	0.37%	0.01%	0.13%	0.14%	0.49%
Amphibians and Reptiles												
California tiger salamander - Central CA DPS												
Potential Breeding Habitat	29	31	7	47	114	0.02%	0.05%	0.07%	0.01%	0.10%	0.11%	0.17%
Potential Upland Habitat	9,783	18,809	2,637	9,809	41,038	6.32%	30.30%	36.62%	2.37%	19.94%	22.31%	58.94%
California tiger salamander - Sonoma County DPS												
California red-legged frog												
Potential Breeding Habitat	4,180	2,979	942	1,162	9,263	2.70%	4.83%	7.53%	0.85%	2.36%	3.21%	10.75%
Potential Upland Habitat	5,610	12,516	561	5,292	23,979	3.63%	20.31%	23.94%	0.50%	10.76%	11.26%	35.20%

Table 4-2. Continued

Acres of Modeled Habitat in Plan Area						Extent of Modeled Habitat within Facility Corridor ^a (Acres of Modeled Habitat/Acres of Facility Corridor = Percent of Modeled Habitat in Facility Corridor)						
						Elec. Dist. (A/154,606)	Elec. Tran. (B/61,637)	Elec. Subtotal	Gas Dist. (C/111,361)	Gas Trans. (D/49,186)	Gas Subtotal	Total
Amphibians and Reptiles (continued)												
Alameda whipsnake												
Core	52	237	17	34	340	0.03%	0.38%	0.41%	0.02%	0.07%	0.09%	0.50%
Perimeter Core	196	738	59	134	1,127	0.13%	1.20%	1.33%	0.05%	0.27%	0.32%	1.65%
Movement	2,346	4,864	1,007	1,119	9,336	1.52%	7.89%	9.41%	0.90%	2.28%	3.18%	12.59%
San Francisco garter snake												
Core	37	117	8	82	244	0.02%	0.19%	0.21%	0.01%	0.17%	0.18%	0.39%
Dispersal	55	147	10	117	329	0.04%	0.24%	0.28%	0.01%	0.24%	0.25%	0.52%
Birds												
Ridgway's rail	678	1,472	64	408	2,622	0.43%	2.36%	2.79%	0.06%	0.83%	0.89%	3.68%
Mammals												
Salt marsh harvest mouse	364	1,430	58	286	2,138	0.24%	2.32%	2.56%	0.05%	0.58%	0.63%	3.19%
San Joaquin kit fox												
Suitable Core	538	2,022	53	1,335	3,948	0.35%	3.28%	3.63%	0.05%	2.71%	2.76%	6.39%
Low-Use/Quality ^b	798	2,734	63	736	4,331	0.52%	4.44%	4.96%	0.06%	1.50%	1.56%	6.50%

Table 4-3. Summary of Estimated Impacts and Requested Take for Covered Wildlife Species

	Summary from Calculations		Adjustment for Take Request		Requested Take				
	Perm. Dist. Est.	Temp. Dist. Est.	Perm.	Temp.	Perm. Loss (acres)	Temp. Loss (acres)	Perm.	Temp.	Total Loss
	Annual	Annual			Annual	Annual	30 Years	30 Years	30 Years
Invertebrates									
California freshwater shrimp	0.02	0.14	Reduce	Reduce	0.01	0.04	0.3	2	2.3
Conservancy fairy shrimp	0.16	0.68	Reduce	Reduce	0.01	0.04	0.5	2	2.5
Longhorn fairy shrimp	0.00	0.03	Reduce	Reduce	0.002	0.02	0.1	1	1.1
Vernal pool fairy shrimp	2.32	10.59	Reduce	Reduce	0.1	0.5	5	25	30
Vernal pool tadpole shrimp	2.04	9.20	Reduce	Reduce	0.1	0.5	5	25	30
Delta green ground beetle	0.05	0.21	Reduce	Reduce	0.02	0.1	1	5	6
Bay checkerspot butterfly	0.50	2.48	Reduce	Reduce	0.08	1.2	4	62	66
Callippe silverspot butterfly	3.40	18.60	Reduce	Reduce	0.6	1.1	30	55	85
Lange's metalmark butterfly	0.01	0.03	Same	Reduce	0.01	0.02	0.3	1	1.3
Mission blue butterfly	0.34	1.83	Reduce	Reduce	0.04	0.4	2	20	22
San Bruno elfin butterfly	0.18	1.06	Reduce	Reduce	0.04	0.4	2	20	22
Amphibians and Reptiles									
California tiger salamander - Central CA DPS									
Potential Breeding Habitat	0.06	0.26	Reduce	Increase	0.04	0.5	2	25	27
Potential Upland Habitat	20.54	110.79	Reduce	Reduce	6	76	298	3,800	4,098
California tiger salamander - Sonoma County DPS	0.98	4.77	Reduce	Reduce	0.3	1.6	13	80	93
California red-legged frog									
Potential Breeding Habitat ^a	3.81	21.85	Reduce	Reduce	1	8	42	377	419
Potential Upland Habitat	12.42	70.17	Reduce	Reduce	4	30	177	1,500	1,677
Alameda whipsnake									
Core	0.18	1.13	Increase	Reduce	0.68	0.3	34	13	47
Perimeter Core	0.60	3.69	Reduce	Reduce	0.5	1.4	25	70	95
Movement	4.51	26.74	Reduce	Reduce	0.5	6.6	27	329	356
San Francisco garter snake									
Core	0.13	0.67	Reduce	Reduce	0.04	0.3	2	16	18
Dispersal	0.18	0.90	Reduce	Reduce	0.04	0.2	2	10	12

Table 4-3. Continued

	Summary from Calculations		Adjustment for Take Request		Requested Take				
	Perm. Dist. Est.	Temp. Dist. Est.	Perm.	Temp.	Perm. Loss (acres)	Temp. Loss (acres)	Perm.	Temp.	Total Loss
	Annual	Annual			Annual	Annual	30 Years	30 Years	30 Years
Birds									
Ridgway's rail	1.32	7.89	Reduce	Reduce	0.1	0.7	3.4	34	37.4
Mammals									
Salt marsh harvest mouse	1.16	7.11	Reduce	Reduce	0.07	0.7	3.7	35	38.7
San Joaquin kit fox									
Core	2.20	11.35	Reduce	Reduce	0.7	8.5	37	426	463
Low-Use/Quality ^b	2.34	14.01	Reduce	Reduce	0.3	5.3	16	264	280

^a 5% is assumed to be actual wetted area based on a 30-foot wide stream with 600 feet of primary dispersal habitat.

^b Habitat terminology adapted from other regional conservation plans and modeled habitat (e.g., East Contra Costa HCP/NCCP uses the term "suitable low use," Santa Clara Valley Habitat Plan uses the terms "secondary habitat" and "secondary habitat low use," and East Alameda Conservation Strategy uses the term "low quality habitat.")

4.1.3.4 Direct Impacts on Individual Species

Historically, most of PG&E's direct impacts have been in the form of temporary loss of habitat. PG&E has done extensive biological monitoring on both large and small projects in the past and the monitoring demonstrated has successfully avoided or reduced taking individuals of the species. This is largely because of the following.

1. PG&E's commitment to avoid and minimize impacts as part of its ongoing commitment to environmental stewardship.
2. PG&E performs environmental reviews of its ground-disturbing activities and assigns measures to avoid and minimize impacts. Such measures include:
 - a. Modified work practices in sensitive habitat areas.
 - b. Limited operating periods for species with temporal sensitivity (e.g., nesting birds).
 - c. Other measures to reduce ground disturbing impacts in sensitive areas (i.e., use of helicopters).
3. Most of PG&E's activities are small (0.1 acre or less) and of a short duration (i.e., hours to days).
4. Large activities (0.5 acres or more) are thoroughly reviewed by a team of environmental planners, biologists, and species experts and when necessary, resource permits are obtained.
5. PG&E strives to locate work areas outside of sensitive locations that may be occupied by listed species and avoid important movement and dispersal corridors.

Despite these standard work practices and the goal to maintain compliance with endangered species regulations, there remains a likelihood that take could result from any given work activity. Consequently, PG&E has determined that incidental take authorization is warranted.

The potential for covered activities to take individuals of a given species is influenced by factors such as the size and duration of activities, timing of activities, and the habitat where covered activities take place. Smaller-scale covered activities focus on maintenance of a specific pole, gas pipeline valve, or other facility that is generally accessible with limited overland travel. For example, routine work around steel or wood electric poles, lattice steel towers, or aboveground gas facilities such as gas pipeline valves generally requires only small work areas around the facility or equipment. Smaller-scale covered activities represent the majority of the covered activities and are typically conducted in a matter of hours or days with few personnel, few and smaller vehicles, fewer vehicle trips, and less ground disturbance than larger-scale activities. Larger-scale covered activities include large maintenance projects that require a great deal of planning and coordination over months or years. Large projects typically involve more habitat disturbance and take longer than small projects. Larger-scale covered activities, such as pipeline replacement projects require a great deal of planning and coordination over months or years and can involve more personnel and more and heavier vehicles. As a result, there is a greater potential for covered activities to have an impact on individuals of a species or their habitat. However, the impact would be minimized through the planning and coordination required to site facilities and to implement permit activities, various BMPs, AMMs and other measures.

4.1.3.5 Designated Critical Habitat

The acreage of impact for species with designated or proposed critical habitat 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. Total covered activity impacts for a given species was multiplied by the proportion of critical habitat to modeled habitat to calculate the overall amount of critical habitat that would be subject to impacts of covered activities over 30 years (Table 4-4). Impacts within specific critical habitat units are expected to be in proportion to the extent of the Plan Area in that critical habitat unit, also shown in Table 4-4.

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

Covered Species	Critical Habitat in Study Area (ac)	Modeled Habitat in Plan Area (ac)	Critical Habitat in Plan Area (ac)	Proportion Critical Habitat to Modeled Habitat in Plan Area ^a	Annual Permanent Impact ^b (ac)	30-Year Permanent Impact (ac)	Annual Temporary Impact (ac)	30-Year Temporary Impact (ac)	Percent of Critical Habitat with Permanent Impacts	Percent of Critical Habitat with Temporary Impacts	Critical Habitat Units with Possible Impacts (Percent of Plan Area in Critical Habitat Unit)
Invertebrates											
Conservancy fairy shrimp	4,414	292	324	100%	0.01	0.3	0.0	2.0	0.01%	0.05%	Confs 3 (100%)
Longhorn fairy shrimp	791	11	12	100%	0.00	0.1	0.02	1	0.01%	0.13%	Lonfs 1b (100%)
Vernal pool fairy shrimp	21,124	4,963	1,133	23%	0.02	1	0.2	6	0.01%	0.03%	Verfs 16a (80%), Verfs 19b (16%), Others (4%)
Vernal pool tadpole shrimp	12,663	4,382	607	14%	0.01	1	0.1	3	0.01%	0.03%	Verfs 11d (98%), Others (2%)
Delta green ground beetle	969	122	32	26%	0.01	0.3	0.0	1.3	0.03%	0.14%	2 (100%)
Bay checkerspot butterfly	18,292	912	1,731	100%	0.1	4	1.24	62	0.02%	0.34%	Kirby and Metcalf (35% each); Santa Teresa Hills (10%); Edgewood Park, Hale, Tulare Hill (7% each); Calero Reservoir and San Martin (1% each)
Amphibians											
California tiger salamander - Central CA DPS	47,381	41,152	5,438	13%	0.8	39	10	507	0.08%	1.07%	Cv 2 (40%); Eb 6 (19%), Eb 12 (16%); Eb 7; Eb 8 and Eb 9 (6% each); Cv 18 and Eb 10b (3% each); Eb 10a (1%)
California tiger salamander - Sonoma County DPS	47,383	2,404	870	36%	0.1	5	1	29	0.01%	0.06%	Santa Rosa Plain 1 (100%)
California red-legged frog	640,112	33,242	10,348	31%	1.1	55	12	584	0.01%	0.09%	Ala 2 (20%), Ccs 2b (17%), Snm 2 (13%), Snm 1 (12%), Ccs 1 and Stc 1 (7%), Sol 1 (6%), Mrn (3%), 9 Others (<2%)

Table 4-4. Continued

Covered Species	Critical Habitat in Study Area (ac)	Modeled Habitat in Plan Area (ac)	Critical Habitat in Plan Area (ac)	Proportion Critical Habitat to Modeled Habitat in Plan Area ^a	Annual Permanent Impact ^b (ac)	30-Year Permanent Impact (ac)	Annual Temporary Impact (ac)	30-Year Temporary Impact (ac)	Percent of Critical Habitat with Permanent Impacts	Percent of Critical Habitat with Temporary Impacts	Critical Habitat Units with Possible Impacts (Percent of Plan Area in Critical Habitat Unit)
Reptiles											
Alameda whipsnake	154,169	10,803	4,255	39%	0.66	33	3	162	0.02%	0.11%	1 (40%), 2 (16%), 5a (14%), 3 (11%), 4 (9%), 6 (7%), 5b (3%)
Plants											
Contra Costa wallflower	281	NA	41	100%	0.003	0.2	NA	NA	0.06%	NA	100%
Contra Costa goldfields	12,093	NA	1,138	100%	0.110	5.5	NA	NA	0.05%	NA	Contra 4c (33%), Contra 5b and 7 (17%), Contra 3 (9%), Contra 4a, 4b and 6 (7%), and Contra 2, 5a, 8b (1%)
Antioch Dunes evening-primrose	281	NA	41	100%	0.003	0.2	NA	NA	0.06%	NA	1 (100%)

^a Proportions are rounded to 100% if critical habitat is greater than modeled habitat.

^b Impacts are based on permanent and temporary impacts from Table 4-3 multiplied by the proportion of critical habitat in the Plan Area. Totals may not sum due to rounding.

4.1.4 Calculating 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 O&M activity locations and the lack of precise data for some species occurrences. CNDDDB 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 air 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 CNDDDB 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 (707 square feet [sq. ft.] or 0.016 acre per pole), and a similar area would be affected by pole replacement. For electric transmission lines, an impact area of 25 by 40 feet (1,000 sq. ft. or 0.023 acre per tower) was assumed to be needed for tower maintenance. For off-road travel access between poles or towers for 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 encompasses a larger footprint that captures the impact of the pole or tower. Covered plant impacts on habitat and the portion of habitat range potentially affected are described in Section 4.2.6 *Plants*. Indirect impacts are described but

were not quantified because AMMs are expected to reduce these potential impacts as described in the beginning of Section 4.2.6, *Plants*.

The number of individual plants that would be directly affected by covered activities was estimated for CNDDDB occurrences that provided population data. However, population data is not provided for all occurrences. For these populations, the number of individual plants was estimated based on the assumption that individuals are uniformly distributed within the occurrence. The number of individual plants directly affected was calculated from the highest number of plants reported for a site and was assumed to be directly proportional to the amount of habitat affected. Population numbers can vary annually: using the highest count provides an estimate of the maximum number of plants that could be affected.

Covered activity impacts on critical habitat for covered plant species were determined as described above for wildlife species (Table 4-4).

4.2 Impact Analysis

This section provides an analysis of each species, by taxonomic group, that addresses the following topics: life history and distribution, direct impacts (including death, permanent and temporary loss of habitat, and critical habitat impacts), and indirect impacts (impacts that are reasonably certain to occur, are caused by covered activities, but occur later in time [50 CFR 402.02]). Table 4-3 summarizes the calculated acreage of covered wildlife species' habitat that could be affected by the proposed covered activities and for which PG&E is requesting take authorization. These impacts represent a worst-case scenario, because they are assumed to result from PG&E activities in the absence of environmental review and screening, and in the absence of AMMs, BMPs, or other measures to avoid and minimize impacts. In addition to PG&E's current environmental review and screening practices, PG&E would implement measures to avoid and minimize impacts on covered species. These measures include field protocols (FPs), Hot Zone AMMs, species-specific AMMs, and covered plant AMMs.

Annual impacts represent an average, with some years being higher and other years being lower. Thirty-year impacts represent a ceiling of impacts (i.e., a cap) that cannot be exceeded without a major amendment to the permits. Table 4-4 presents the impacts on designated critical habitat. Table 4-5 lists the individual activities and their likelihood to impact covered species' habitat.

This impact analysis uses the following conservative assumptions to present potential impacts from covered activities: (1) modeled habitat is assumed to be occupied (even though the species may not occupy some areas where modeled habitat has been developed); (2) disturbance calculations used for various covered activities are conservative and, therefore, overestimate the amount of ground disturbance that would result from covered activities; and (3) larger-scale covered activities would be infrequent and, thus, calculations may overestimate total annual impacts.

The following sections describe the impacts of implementing the covered activities on each of the covered wildlife species and their respective habitats. Additional species information and full citations for sources considered in the literature review are provided in Appendix B, *Species Accounts*. The species accounts in Appendix B supplement this chapter and provide additional information on the species' listing status, range, ecology, population trends and threats, and management tools.

4.2.1 Invertebrates

Most of the covered invertebrates are narrowly distributed and only a limited number of facilities are located in these species' habitats (Table 4-2). The majority of covered activity impacts would be small (less than 0.1 acre) and temporary. Covered activities may result in take in occupied habitat areas, although the potential depends on the relationship of the facility location to the habitat or species occurrence, the nature of the biological disturbance, and the measures taken to avoid and minimize impacts.

4.2.1.1 California Freshwater Shrimp

Life History and Distribution

California freshwater shrimp is an aquatic invertebrate species that requires perennial streams (riparian or open water) that are structurally diverse with undercut banks, exposed roots, overhanging vegetation and woody debris that provide refugia from swift currents and cover from predators. Winter habitat is characterized as submerged undercut banks where fine filamentous roots hang into the water. Summer habitat includes slow-moving water, isolated pools with organic material for cover, undercut banks, and areas with overhanging and emergent vegetation.

In the study area, California freshwater shrimp has been recorded in Marin, Sonoma, and Napa Counties, as shown in Figure 4-1 (California Department of Fish and Wildlife 2013). There are approximately 1,602 acres of modeled habitat in the study area, a small portion (72 acres) of which is in the Plan Area. In the Plan Area, this modeled habitat is sparsely scattered across three counties: 67% in Sonoma County, 18% in Marin County and 15% in Napa County (see Table 2-5 in Chapter 2, *Environmental Setting*). All the modeled habitat in the Plan Area has been identified as hot zones for the species. Approximately 0.06% of all ROWs contain California freshwater shrimp modeled habitat.

Direct Impacts

Covered activities conducted within occupied stream channels or on the channel banks could result in death or injury of California freshwater shrimp. For example, overhanging banks could collapse from heavy equipment.

Generally, PG&E would not conduct work within the channel of a perennial stream so the potential for any death or injury from in-channel work is very low. However, upgrading and replacing electric distribution poles and electric vegetation management activities on or near stream banks occupied by California freshwater shrimp could collapse overhanging banks if vehicles, equipment, and personnel are working too close to the stream bank; adults and larvae could be killed or injured.

Potential for this impact is generally low for gas facilities because it is PG&E's standard practice to avoid and minimize direct impacts on any stream by implementing measures and construction techniques similar to those described in Chapter 5, *Conservation Strategy*. Some construction methods, such as jack and bore and microtunneling, avoid direct disturbance to the channel and banks. However, ground-disturbing activities adjacent to streams that result in sediments entering streams occupied by California freshwater shrimp could impact water quality and result in reduced survivorship and reproductive success for adults and larvae. Also, chemicals, fuels, and lubricants that might be used during covered activities could accidentally enter occupied streams and impact water quality.

Death, reduced survivorship, and reduced reproductive success could result from the impact mechanisms described above, but these are generally unlikely because of existing field practices and AMMs that PG&E already implements. Conservation measures described in Section 5.5.1, *Avoidance and Minimization of Impacts*, (specifically, FP-04, FP-11, FP-12, FP-15, FP-16, Hot Zone-1, and Wetland-2; see Table 5-1) would further reduce the already low potential for direct impacts and ensure that the covered activities avoid and minimize potential adverse effects on the species. For example, FP-11 and FP-12 instruct field crews to avoid soil and sediment runoff into waterways; FP-15 prohibits vehicle refueling within 100 feet from the edge of wetlands, streams, or waterways (Table 5-1).

Covered activities have the potential to permanently impact habitat for California freshwater shrimp. Such activities include the replacement and/or construction of facilities, and construction of access roads near and across occupied drainages. Almost all of the California freshwater shrimp habitat is crossed by at least one electric distribution line; a few are crossed by multiple electric transmission lines. Though these lines span the creeks, vegetation management or removal beneath and adjacent to these lines could impact California freshwater shrimp habitat by removing overhanging vegetation and potentially destabilizing banks by undercutting them. Resulting losses are all considered permanent impacts. Temporary loss of habitat could also result from the pruning of overhanging vegetation. These impacts would be minimized by implementing the field protocols and AMM Hot Zone-1, which requires crews to avoid modifying overhanging streamside vegetation, damaging banks, and working in pools and streams.

PG&E has facilities in several areas of particular concern along creeks identified in the *Recovery Plan for California Freshwater Shrimp* (U.S. Fish and Wildlife 1998). Specifically, two gas transmission pipelines cross Huichica Creek in Napa County south of Highway 12, downstream of a known population of California freshwater shrimp. An electric transmission line and several electric distribution lines span Sonoma Creek and Yulupa Creek near the city of Glen Ellen in Sonoma County; both these streams contain occupied habitat. Additionally, both electric and gas distribution facilities are located near freshwater shrimp populations in Garnett Creek, Atascadero Creek, Redwood Creek, Jonive Creek, and Blucher Creek in Sonoma County, and Stemple Creek and Keys Creek in Marin County. Hot zones have been created in these areas. Covered activities could disturb the channel bed and banks, but PG&E is aware of these locations and would try to avoid impacts in these areas. If they are not avoided, loss or degradation of California freshwater shrimp habitat could result. Table 4-5 identifies specific covered activities that could impact the species' habitat. Conservation measures described in Section 5.5.1, *Avoidance and Minimization of Impacts*, (specifically, FP-04, FP-11, FP-12, FP-15, FP-16, Hot Zone-1, and Wetland-2) would ensure that the covered activities avoid and minimize potential loss of habitat. FP-16 specifies buffers or other measures to minimize impacts on waters. Hot Zone-1 would benefit California freshwater shrimp by ensuring work would avoid pools and streams and crews would prevent damage to banks and streamside vegetation. Wetland-2 prescribes buffer areas of 50 feet around wetland, pond, and riparian areas (see Table 5-1).

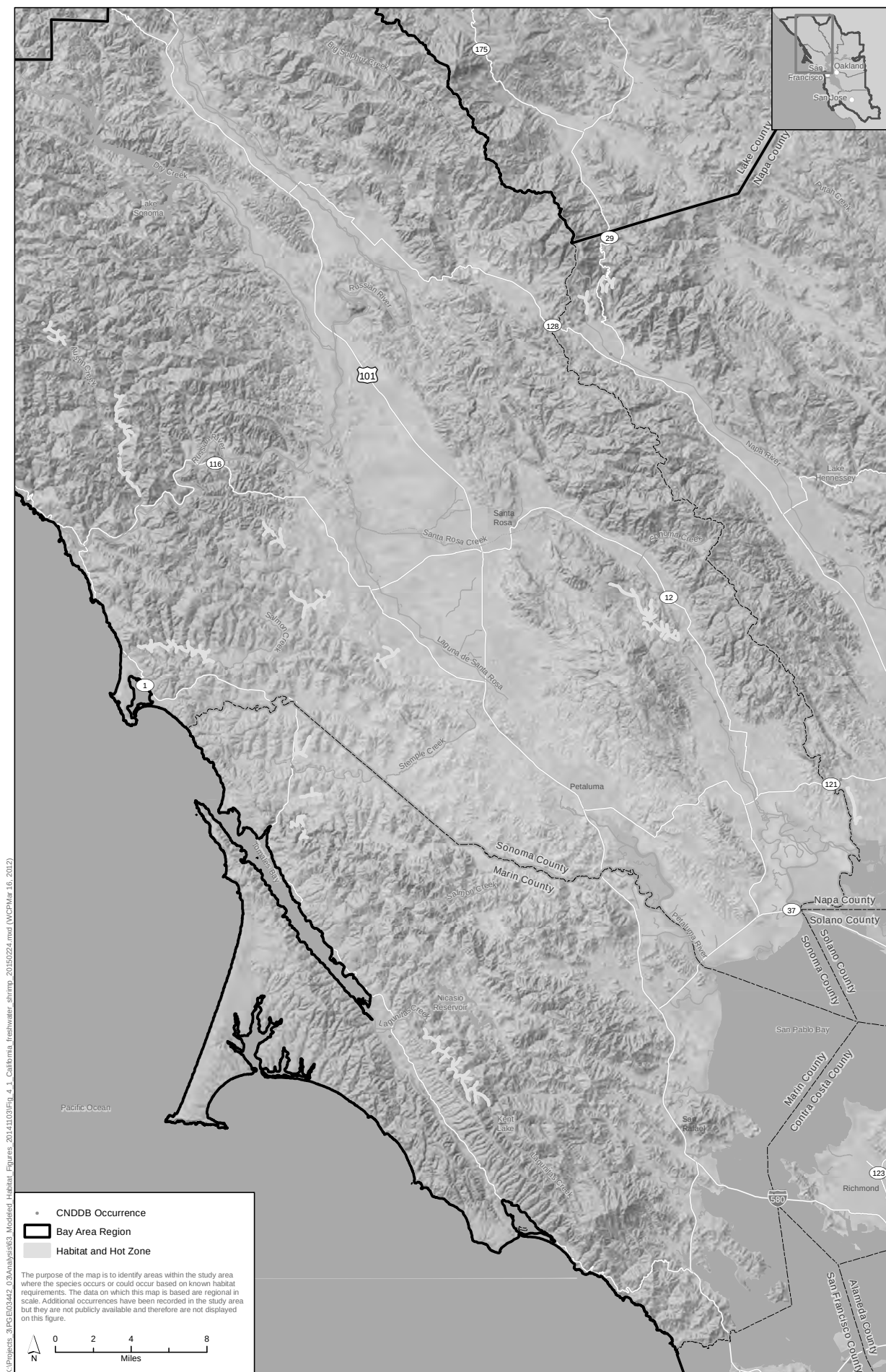


Table 4-5. Likelihood of Specific Activities to Directly Impact Covered Species Habitat

Activity	California Freshwater Shrimp	Conservancy Fairy Shrimp	Longhorn Fairy Shrimp	Vernal Pool Fairy Shrimp	Vernal Pool Tadpole Shrimp	Delta Green Ground Beetle	Bay Checkerspot Butterfly	Callippe Silverspot Butterfly	Lange's Metalmark Butterfly	Mission Blue Butterfly	San Bruno Elfie Butterfly	California tiger Salamander—Central DPS	California Tiger Salamander—Sonoma County DPS	California Red-Legged Frog	Alameda Whipsnake	San Francisco Garter snake	Ridgeway's Rail	Salt Marsh Harvest Mouse	San Joaquin Kit Fox
Natural Gas System Activities																			
G1. Patrols	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
G2. Inspections	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
G3a. Pipeline remedial maintenance	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐
G3b. Internal pipeline inspection	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐
G4. Compressor station upgrades and maintenance	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
G5. Pipeline ETS installation	○	◐	○	○	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐
G6. Pipeline valve maintenance—Recoating	◐	○	○	○	○	○	○	○	○	○	○	◐	○	○	○	○	○	○	○
G7. Pipeline valve maintenance—Replacement or Automation	◐	○	○	○	○	○	○	○	○	○	○	◐	○	○	○	○	○	○	○
G8. Pipeline cathodic protection	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐
G9. Pipeline lowering	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐
G10. Pipeline coating replacement	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐
G11. Pipeline replacement	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐
G12. Pipeline telecommunication site maintenance	○	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐
G13a. Pipeline right-of-way vegetation management	◐	○	○	○	○	○	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	○	○	◐
G13b. Access road maintenance	○	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	○	○	◐
G14. Gas pressure limiting station construction	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	○	○	◐
G15. New customer/business pipeline extension	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	○	○	◐
G16. CPSI—existing pipeline replacement	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐
G17. CPSI—valve replacement or automation	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐
G18. CPSI—hydrostatic testing	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐
Electric System Activities																			
E1. Patrols	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
E2. Inspections	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
E3. Insulator washing or replacement	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
E4. Substation maintenance	○	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	○	○	◐
E5. System outage repair	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐
E6a. Tower replacement or repair	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐
E6b. Boardwalk repair and replacement	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	◐	◐	○
E7. Facility installations	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐
E8a. Pole equipment repair and replacement	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	◐
E8b. Utility/wood pole replacement	◐	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	◐	◐	◐
E9. Line reconductoring	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐

Table 4-5. Continued

Activity	California Freshwater Shrimp	Conservancy Fairy Shrimp	Longhorn Fairy Shrimp	Vernal Pool Fairy Shrimp	Vernal Pool Tadpole Shrimp	Delta Green Ground Beetle	Bay Checkerspot Butterfly	Callippe Silverspot Butterfly	Lang's Metalmark Butterfly	Mission Blue Butterfly	San Bruno Elf In Butterfly	California Tiger Salamander—Central DPS	California Tiger Salamander—Sonoma County DPS	California Red-legged Frog	Alameda Whipsnake	San Francisco Garter snake	Ridge-way's Rail	Salt Marsh Harvest Mouse	San Joaquin Kit Fox
E10. Vegetation management																			
E10a. Routine maintenance	◐	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	◐
E10b. Pole clearing	◐	○	○	○	○	○	○	○	○	○	◐	◐	◐	○	○	○	○	○	◐
E10c. Tree removal—small groups	◐	○	○	○	○	○	○	○	○	○	◐	◐	◐	◐	○	○	○	○	◐
E10d. Tree Removal—ROW Clearing	◐	○	○	○	○	○	○	○	○	○	○	◐	◐	◐	○	○	○	○	◐
E10e. Tower cage clearing	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	◐
E10f. Fee strip maintenance	○	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	○	○	○	◐	◐	○	○	◐
E11. Wood pole test and treat	○	○	○	○	○	○	○	○	○	○	○	◐	○	○	○	○	○	○	◐
E12. New distribution and transmission line construction or relocation	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐
E13. Tower line construction	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐
E14. Minor substation expansion	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	○	○	◐
E15. Underground line construction	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐

◐ = likely impact; ◐ = possible impact; ○ = unlikely impact.

Permanent Impacts on Habitat

Covered activities are anticipated to permanently remove 0.01 acre (436 sq. ft.) of California freshwater shrimp habitat annually in the Plan Area (Table 4-3). Activities in or near California freshwater shrimp habitat are expected to impact the species' habitat only when work within suitable streams cannot be avoided. Typically, facilities span streams perpendicularly; however, some covered activities could impact stream banks and result in the removal of riparian vegetation. Both stream banks and riparian vegetation are important elements of California freshwater shrimp habitat.

There would also likely be some electric transmission line reconductoring within the species' range. These activities would be implemented outside of stream channels; however, any bank disturbance that results in the trampling or collapsing of undercut banks, any ground disturbance in the vicinity that results in the transport of sediment into the channel, or removal of any riparian habitat by either gas or electric vegetation management could permanently alter the suitability of these streams for California freshwater shrimp. Gas transmission and distribution line repair would likely be done with microtunneling and would not impact the species.

PG&E anticipates that covered activities would remove no more than 0.3 acre over the 30-year term of the Bay Area O&M HCP (Table 4-3). Conservation measures described in Section 5.5.1, *Avoidance and Minimization of Impacts*, (specifically, FP-04, FP-11, FP-12, FP-15, FP-16, Hot Zone-1, and Wetland-2) would ensure that the covered activities avoid and minimize potential permanent loss of habitat.

Temporary Impacts on Habitat

O&M and minor new construction activities would temporarily disturb 0.04 acre (1,742 sq. ft.) of habitat annually and no more than 2 acres over the 30-year term of the Bay Area O&M HCP (Table 4-3). These disturbances could include ground disturbance activities that result in the transport of sediment into the channel, a frac-out that results in degraded water quality, or removal of riparian habitat by either gas or electric vegetation management that temporarily alters the suitability of habitat. As described above, field protocols and conservation measures would avoid and minimize such impacts to the extent possible (see Table 5-1).

Critical Habitat Impacts

Critical habitat has neither been proposed nor designated for the California freshwater shrimp.

Indirect Impacts

Facilities exist within the species' habitat range so the potential for indirect impacts on the species arises from work site runoff associated with O&M and minor new construction activities. All life stages could be affected by degraded water quality. The magnitude of potential impacts would depend on the proximity of individuals or populations to the activity, the type of activity, the size and type of discharge, existing water quality conditions, and impacts on other instream habitat characteristics. Changes to slopes near stream banks or vegetation cover in nearby areas could result in erosion that could impact water quality in occupied streams. However, PG&E would implement FP-11 and FP-12 to avoid these types of impacts.

4.2.1.2 Conservancy Fairy Shrimp

Life History and Distribution

Conservancy fairy shrimp inhabits rather large, cool-water vernal pools with moderately turbid water (Eriksen and Belk 1999).

The Conservancy fairy shrimp lifecycle occurs entirely within vernal pools, requiring pools that fill and hold water for long periods. Females produce eggs that rest on the pool bottom, drying out as the pool dries after the rainy season. These resting shrimp eggs, called cysts, can withstand heat, cold, and prolonged dry periods; they may persist in the soil bank for several years. Cysts hatch when water temperatures of 50°F or lower are achieved. Adults range in size from about 0.5 inch to 1 inch long, emerging as the pools fill with rainwater. They are passively dispersed when a pool overflows and becomes connected with adjacent pools. Cysts can be carried on the wind and on the bodies or in the intestines of larger animals, resulting in long distance dispersal. Cysts can also be transported in mud carried on the feet and feathers of birds and the hooves and hair of livestock that may wade through the habitat (U.S. Fish and Wildlife Service 2007; Eriksen and Belk 1999). This species may co-occur with other covered fairy shrimp species.

The species is known from Butte, Tehama, Glenn, Yolo, Solano, Stanislaus, Merced, and Ventura Counties but in the study area is known to occur only in Solano County, as shown in Figure 4-2 (California Department of Fish and Game 2011). Conservancy fairy shrimp has an estimated range of 4,782 acres within the study area, of which only a small portion (292 acres) is within the Plan Area (Table 4-2). Modeled habitat for Conservancy fairy shrimp can be found mainly in the eastern portion of Solano County east of Fairfield with a few areas in southern Solano County along the edge of the Delta. The most contiguous, well connected habitat patches are those located east of Travis Air Force Base. There is also habitat in the vicinity of Jepson Prairie.

Direct Impacts

Covered activities could result in death but the probability of take is low because PG&E does not typically conduct work in vernal pools. Take of Conservancy fairy shrimp could occur at any life history stage, from cyst or eggs to adults. General mechanisms for death or injury are grading and excavation activities and general vehicle movement, which could crush or bury shrimp cysts in vernal pools. Shrimp cysts could be buried by the inadvertent deposition of soil into or near vernal pools or swales during ground-disturbing activities, such as augering or trenching, thus possibly preventing these cysts from hatching the following wet season(s). Adult shrimp could also be buried and water quality could be altered by sediment transport into vernal pools or swales during ground-disturbing activities such that they die or have reduced survivorship or reproductive output. Also, dust and chemicals inadvertently released (e.g., fuel, lubricants, degreasers) during construction and subsequently deposited in vernal pools near or adjacent to work areas could impact water quality and result in mortality, injury, or reduced reproductive success. These impacts are generally unlikely because of existing practices, such as FP-11, erosion and sediment control BMPs to prevent construction-site runoff into waterways to preserve water quality; FP-15, which prohibits vehicle refueling within 250 feet from the edge of vernal pools; and Wetland-1, which require avoiding vernal pools and other standing bodies of water and establishing buffers and other protective measures (Table 5-1). Conservation measures described in Section 5.5.1, *Avoidance and Minimization of Impacts*, (including FP-04, FP-11, FP-15 (prohibit refueling within 250 or 100 feet of water bodies), FP-16 (maintain buffers), and Wetland-1 (establish and maintain buffers) would

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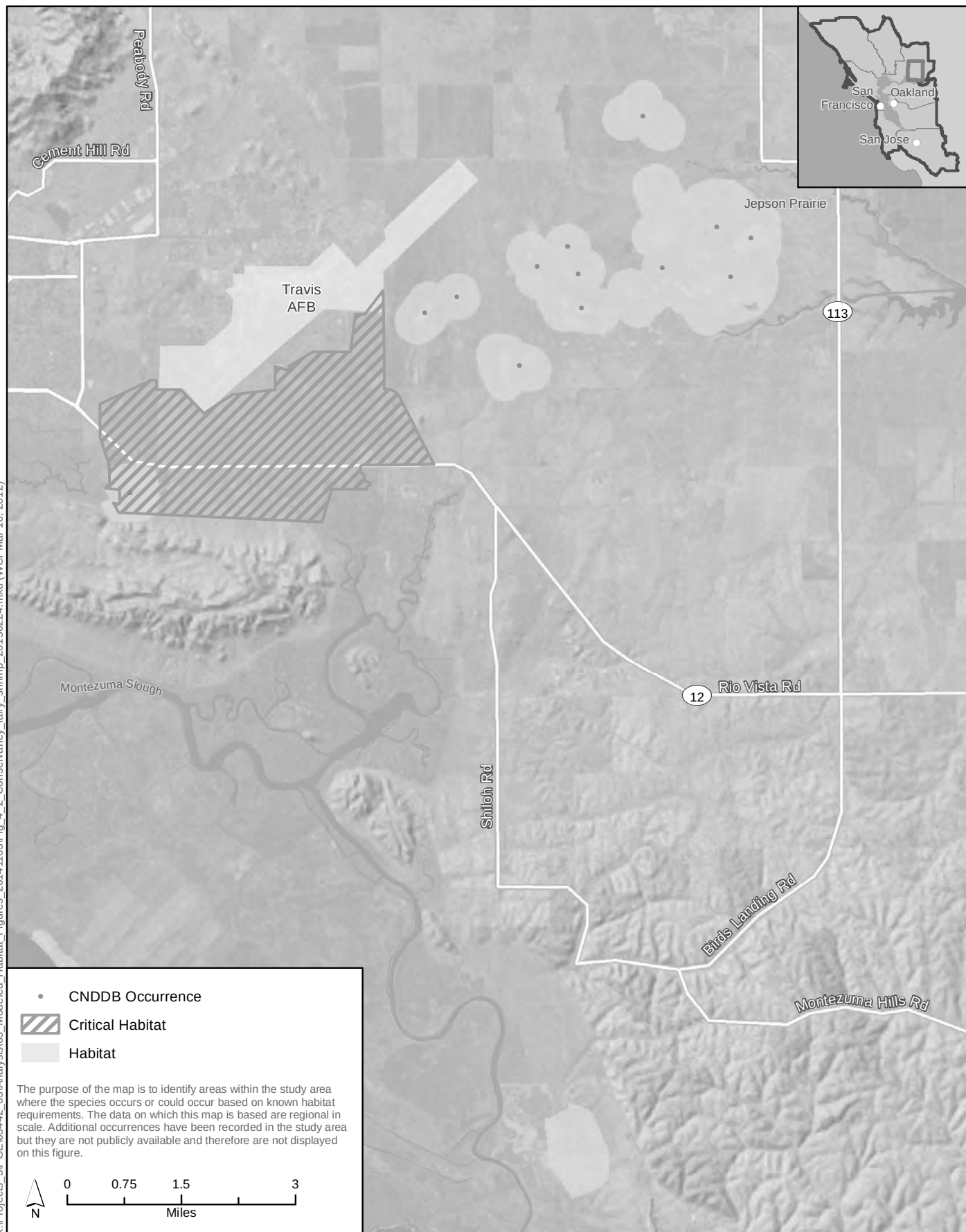


Figure 4-2
Conservancy fairy shrimp modeled habitat

reduce the already-low potential for direct impacts and ensure that the covered activities avoid and minimize death or injury of individuals.

Covered activities associated with gas transmission and electric transmission and distribution could impact Conservancy fairy shrimp in the vicinity of Travis Air Force Base and Jepson Prairie, though there are relatively few facility corridors in these areas. In addition, activities associated with electric distribution and transmission could impact modeled habitat on the edge of the Delta. Table 4-5 identifies specific covered activities that could impact Conservancy fairy shrimp habitat. However, conservation measures described in Section 5.5.1, *Avoidance and Minimization of Impacts* (including FP-04, FP-11, FP-12, FP-15, FP-16, and Wetland-1) would ensure that the covered activities avoid and minimize habitat impacts.

Permanent Impacts on Habitat

Covered activities are anticipated to permanently remove 0.01 acre (436 sq. ft.) of Conservancy fairy shrimp habitat in the Plan Area annually and no more than 0.5 acre over 30 years (Table 4-3). Covered activities that have the greatest potential for permanent impacts on habitat for Conservancy fairy shrimp generally include trenching and excavations to replace a gas transmission pipeline, augering for electric pole removals/replacements, and blading and maintenance of access roads. These activities could result in the fill of Conservancy fairy shrimp habitat or changes to the soil profile (i.e., breaking through restrictive soil layers) or in the topography such that the hydrology of the habitat is changed and no longer pools to sufficient depths or durations to support vernal pool invertebrates. The small areas of impacts (i.e., 436 sq. ft.), existing practices, and field protocols and AMMs described in Section 5.5.1, *Avoidance and Minimization of Impacts*, would minimize and avoid adverse impacts on Conservancy fairy shrimp.

Temporary Impacts on Habitat

Covered activities would temporarily impact 0.04 acre (1,742 sq. ft.) of Conservancy fairy shrimp habitat annually and no more than 2 acres over 30 years (Table 4-3). Covered activities that involve trenching or excavation and could have temporary impacts on Conservancy fairy shrimp habitat are those that would impact a portion of the wetland habitat (i.e., swale) and would not alter the hydrology to the extent that the habitat would be permanently affected. Some temporary impacts could become permanent if habitat conditions cannot be completely restored. The small area of habitat potentially affected, existing practices, and field protocols and AMMs described in Section 5.5.1, *Avoidance and Minimization of Impacts*, make it unlikely that habitat impacts would impair the Conservancy fairy shrimp life cycle.

Critical Habitat Impacts

Critical habitat designated for the Conservancy fairy shrimp includes 4,414 acres in the study area and 324 acres in the Plan Area. It is anticipated that 0.01 acre (436 sq. ft.) of critical habitat would be affected by covered activities annually and 0.3 acre over 30 years (Table 4-4). Considering the small areas potentially affected and implementation of practices to avoid and minimize impacts on individuals and habitat, impacts on critical habitat are likely to be negligible.

Indirect Impacts

The inadvertent introduction of an invasive plant species by construction equipment, personnel, or contaminated seed or straw is an indirect impact that could have serious implications for vernal

pool invertebrate species. Invasive plants can displace native vernal pool/swale plant species by outcompeting them for space, sun, and water.

USFWS considers that construction activities within 250 feet of vernal pools could indirectly impact vernal pool invertebrates by altering the hydrology that supports this habitat (e.g., altering surface runoff patterns, breaking through hardpan or claypan restrictive layers), increasing human intrusion, introducing invasive species (discussed above), and causing pollution (U.S. Fish and Wildlife Service 1996). These impacts may not be apparent until sometime after the activity has been completed. However, PG&E would implement FP-11, FP-12, and Wetland-1 to avoid these types of impacts.

4.2.1.3 Longhorn Fairy Shrimp

Life History and Distribution

Longhorn fairy shrimp occurs mostly in vernal pools and swales in grassland habitat but also is known to occur in grass-bottomed or claypan pools that pond for time sufficient to enable the shrimp to complete its life cycle, which is similar to that of Conservancy fairy shrimp. Longhorn fairy shrimp can potentially live in vernal pools that exist for a fairly short time (6–7 weeks in winter and 3 weeks in spring) (Eriksen and Belk 1999). In Alameda and Contra Costa Counties the species occurs within water that is pooled in sandstone depressions. The species is known from San Luis Obispo, Merced, Alameda, and Contra Costa Counties but in the study area is known to occur only in eastern Contra Costa and Alameda Counties (California Department of Fish and Game 2011). Longhorn fairy shrimp has an estimated range consisting of 791 acres within the study area and 11 acres within the Plan Area (Table 4-2).

Direct Impacts

The mechanisms for permanent and temporary direct impacts on longhorn fairy shrimp are the same as those described above for Conservancy fairy shrimp. Modeled habitat for longhorn fairy shrimp can be found in eastern Contra Costa and Alameda Counties, as shown in Figure 4-3. The majority of this habitat is relatively open, contiguous, and well-connected and contains relatively low numbers of gas and electric facility corridors and roads. Modeled habitat for this species consists of two habitat patches near Los Vaqueros Reservoir separated by North Vasco Road in eastern Contra Costa County. This area has been identified as a hot zone for longhorn fairy shrimp and includes all modeled habitat for the species in the study area. Covered activities associated with a single electric distribution line and electric transmission in a section of modeled habitat south of North Vasco Road could impact longhorn fairy shrimp. Table 4-5 identifies specific covered activities that could impact longhorn fairy shrimp habitat.

Conservation measures described in Section 5.5.1, *Avoidance and Minimization of Impacts*, (specifically, FP-04, FP-11, FP-12, FP-15, FP-16, Hot Zone-2, and Wetland-1) would ensure that the covered activities avoid and minimize impacts. Hot Zone-2, for example, protects longhorn fairy shrimp by prohibiting ground-disturbing activities during the wet season within 250 feet of the edge of vernal pools, unless conducted from an existing roadway (Table 5-1).

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Figure 4-3
Longhorn fairy shrimp modeled habitat

Permanent Impacts on Habitat

O&M and minor new construction are anticipated to permanently remove 0.002 acre (approximately 87 sq. ft.) of longhorn fairy shrimp habitat in the Plan Area annually, and no more than 0.1 acre (a 66-ft. × 66-ft. area) over 30 years (Table 4-3).

Temporary Impacts on Habitat

O&M and minor new construction activities would temporarily impact 0.02 acre (871 sq. ft.) of longhorn fairy shrimp habitat annually and no more than 1 acre over 30 years (Table 4-3). The small area of habitat potentially affected, existing practices, and field protocols and AMMs described in Section 5.5.1, *Avoidance and Minimization of Impacts*, make it unlikely that habitat impacts would impair the longhorn fairy shrimp life cycle.

Critical Habitat Impacts

PG&E's permanent and temporary impacts are anticipated to be the same as above (0.002 acre of permanent impact and 0.02 acre of temporary impact) and entirely within critical habitat because of the limited range and distribution of this species (Table 4-4). Considering the small areas potentially affected and implementation of practices to avoid and minimize impacts on individuals and habitat, impacts on critical habitat are likely to be negligible.

Indirect Impacts

The mechanisms for indirect impacts on longhorn fairy shrimp are the same as those described above for Conservancy fairy shrimp.

4.2.1.4 Vernal Pool Fairy Shrimp

Life History and Distribution

This species occurs mainly in vernal pools and swales in grassland habitats that pond for time sufficient to enable the shrimp to complete their life cycle (20–45 days) (Eriksen and Belk 1999). In the study area this species is generally found in portions of Solano County, eastern Contra Costa County, and eastern Alameda County and is known from one occurrence in Napa County at the south end of the Napa Airport, as shown in Figure 4-4 (California Department of Fish and Game 2011). This species may co-occur with other covered vernal pool crustaceans. Vernal pool fairy shrimp has an estimated range consisting of 66,917 acres within the study area, 4,963 acres of which are within the Plan Area (Table 2-3 and Table 4-2).

Direct Impacts

The mechanisms for permanent and temporary direct impacts on vernal pool fairy shrimp are the same as those described above for Conservancy fairy shrimp. Modeled habitat for vernal pool fairy shrimp in the study area occurs primarily in Solano County. There are also smaller areas of habitat located in eastern Contra Costa and Alameda Counties, and in Napa County. Gas and electric facilities are located throughout these areas.

Covered activities could impact habitat for vernal pool fairy shrimp in Solano, Contra Costa, and Alameda Counties. This habitat would most likely be affected by gas and electric transmission and electric distribution activities. The modeled habitat in the remainder of the Plan Area is scattered

across the study area and could experience impacts from gas and electric covered activities in vernal swales or pools. Table 4-5 identifies specific covered activities that could impact vernal pool fairy shrimp habitat. Conservation measures described in Section 5.5.1, *Avoidance and Minimization of Impacts*, (specifically, FP-04, FP-11, FP-12, FP-15, FP-16, and Wetland-1; see Table 5-1) would ensure that the covered activities avoid and minimize potential adverse impacts.

Permanent Impacts on Habitat

Covered activities are anticipated to permanently remove 0.1 acre (a 66-ft. × 66-ft. area) of vernal pool fairy shrimp habitat in the Plan Area annually and no more than 5 acres over 30 years (Table 4-3).

Temporary Impacts on Habitat

Covered activities would temporarily impact 0.5 acre of vernal pool fairy shrimp habitat annually and no more than 25 acres over 30 years (Table 4-3). These are likely to be impacts on the watershed and swales supporting vernal pool habitat and are not expected to be on vernal pools themselves.

Critical Habitat Impacts

Critical habitat designated for the vernal pool fairy shrimp includes 21,124 acres in the study area, 1,133 acres of which are in the Plan Area. It is anticipated that covered activities would permanently impact 0.02 acre (871 sq. ft.) annually and would temporarily impact 0.02 acre of critical habitat annually. It is estimated that covered activities would permanently impact 1 acre and temporarily impact up to 6 acres of critical habitat over 30 years in multiple critical habitat units (Table 4-4).

Indirect Impacts

The mechanisms for indirect impacts on vernal pool fairy shrimp are the same as those described above for Conservancy fairy shrimp.

4.2.1.5 Vernal Pool Tadpole Shrimp

Life History and Distribution

Vernal pool tadpole shrimp occurs mainly in vernal pools and swales in grassland habitats that pond for time sufficient to enable the shrimp to complete its life cycle (Eriksen and Belk 1999). USFWS (2007) found that tadpole shrimp reach reproductive size as early as 41 days and on average take 54 days to reproduce. This species may co-occur with other covered fairy shrimp species. In the study area, this species generally is found in portions of Solano County near Fairfield and in the Baylands near Milpitas, as shown in Figure 4-5. Vernal pool tadpole shrimp has an estimated range of 61,664 acres within the study area, 4,382 acres of which are within the Plan Area (Table 2-3 and Table 4-2).

Direct Impacts

The mechanisms for direct impacts on vernal pool tadpole shrimp are the same as those described above for Conservancy fairy shrimp. Modeled habitat for vernal pool tadpole shrimp in the study

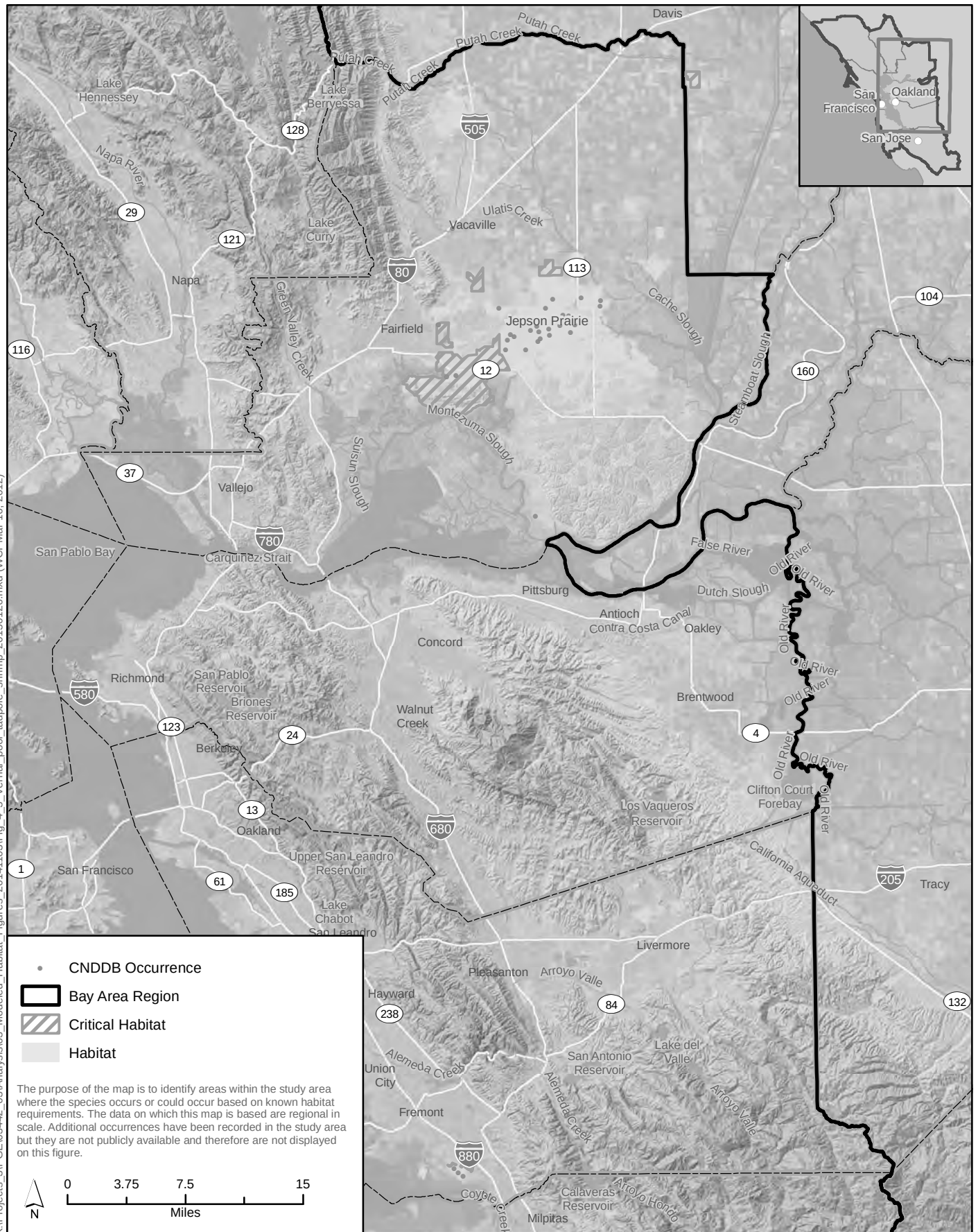


Figure 4-5
Vernal pool tadpole shrimp modeled habitat

area occurs primarily in Solano County. There are also smaller areas of habitat located in eastern Contra Costa and Alameda Counties, and in Napa and Sonoma Counties.

Covered activities could impact habitat for vernal pool tadpole shrimp. Gas and electric transmission and electric distribution covered activities would be most likely to impact habitat in Solano, Contra Costa, and Alameda Counties. Table 4-5 identifies specific covered activities that could impact vernal pool tadpole shrimp habitat. Conservation measures described in Section 5.5.1, *Avoidance and Minimization of Impacts*, (specifically, FP-04, FP-11, FP-12, FP-15, FP-16, and Wetland-1) would ensure that the covered activities avoid and minimize potential death or injury of individuals of the species and minimize permanent and temporary habitat impacts.

Permanent Impacts on Habitat

Covered activities are anticipated to permanently remove 0.1 acre (a 66-ft. × 66-ft. area) of vernal pool tadpole shrimp habitat in the Plan Area annually and no more than 5 acres over 30 years (Table 4-3).

Temporary Impacts on Habitat

Covered activities would temporarily disturb 0.5 acre of vernal pool tadpole shrimp habitat annually and no more than 25 acres over 30 years (Table 4-3).

Critical Habitat Impacts

Critical habitat designated for the vernal pool tadpole shrimp includes 12,663 acres in the study area, 607 acres of which are in the Plan Area. It is anticipated that covered activities would permanently impact 0.01 acre (436 sq. ft.) and temporarily impact 0.01 acre of critical habitat annually. It is estimated that covered activities would permanently impact up to 1 acre and temporarily impact up to 3 acres of critical habitat over 30 years (Table 4-4). These impacts would be in multiple critical habitat units.

Indirect Impacts

The mechanisms for indirect impacts on vernal pool tadpole shrimp are the same as those described above for Conservancy fairy shrimp.

4.2.1.6 Delta Green Ground Beetle

Life History and Distribution

Delta green ground beetle occurs in the vernal pool complexes in the greater Jepson Prairie area in south-central Solano County, as shown in Figure 4-6. Delta green ground beetle is associated with vernal pool complexes and areas adjacent to other seasonal wetlands in the grassland land cover type. The reasons for the species' rarity are not fully understood; however, the species probably depends on habitat attributes that are absent from many of the lands currently containing vernal pools. Occupied habitat for this species was found to consist of the following: plants such *Navarretia* spp., *Frankenia* spp., and *Downingia* spp. (all genera of vernal pool plants); proximity to water; Pescadero clay soils; soil crevices; and adjacent uplands (U.S. Fish and Wildlife Service 2009). Delta green ground beetle has an estimated modeled habitat of 2,284 acres within the study area, 122 acres of which are within the Plan Area (Table 2-3 and Table 4-2).

Direct Impacts

The impact mechanisms described above for Conservancy fairy shrimp also apply to delta green ground beetle. In addition, ground-disturbing activities could result in death of beetle larvae, pupae, or adults if these activities are implemented in or adjacent to vernal pools. Adult delta green ground beetles, larvae, and pupae are particularly vulnerable when taking refuge in soil crevices of dry pools or adjacent uplands because they could be crushed by vehicles, equipment, or excavation activities.

Modeled habitat for Delta green ground beetle occurs in the east-central portion of Solano County, east of Fairfield, in the general vicinity of Jepson Prairie. The majority of this habitat is outside of urbanized areas and contains a low density of gas and electric lines. Covered activities associated with gas transmission and electric distribution and transmission could impact Delta green ground beetle habitat in the vicinity of Jepson Prairie. Table 4-5 identifies specific covered activities that could impact Delta green ground beetle habitat. Conservation measures described in Section 5.5.1, *Avoidance and Minimization of Impacts*, (specifically, FP-11, FP-15, and FP-16 and Wetland-1; see Table 5-1) would ensure that the covered activities avoid and minimize potential death or injury of individuals of the species and minimize permanent and temporary habitat impacts.

Permanent Impacts on Habitat

Covered activities are anticipated to permanently remove 0.02 acre (871 sq. ft.) of Delta green ground beetle habitat annually in the Plan Area and no more than 1 acre over 30 years (Table 4-3).

Temporary Impacts on Habitat

Covered activities would temporarily impact 0.1 acre (a 66-ft. × 66-ft. area) of Delta green ground beetle habitat annually and no more than 5 acres over 30 years (Table 4-3).

Critical Habitat Impacts

The initial 1980 designation of critical habitat for delta green ground beetle identified “vernal pools with their surrounding vegetation, and the land areas which surround and drain into these pools” as the known constituent elements for delta green ground beetle (45 FR 52807).

Critical habitat designated for the Delta green ground beetle includes 969 acres in the study area, 32 acres of which are in the Plan Area. It is anticipated that covered activities would impact 0.01 acre (436 sq. ft.) of critical habitat annually and 0.3 acre over 30 years (Table 4-4).

Indirect Impacts

The mechanisms for indirect impacts on delta green ground beetle are the same as those described above for Conservancy fairy shrimp.

4.2.1.7 Bay Checkerspot Butterfly

Life History and Distribution

Bay checkerspot butterfly inhabits grasslands in the study area. Serpentine grasslands seem to provide more-suitable habitat than non-serpentine grassland. Bay checkerspot butterfly is a non-migratory species that uses primarily the native forb dwarf plantain (*Plantago erecta*) as its larval

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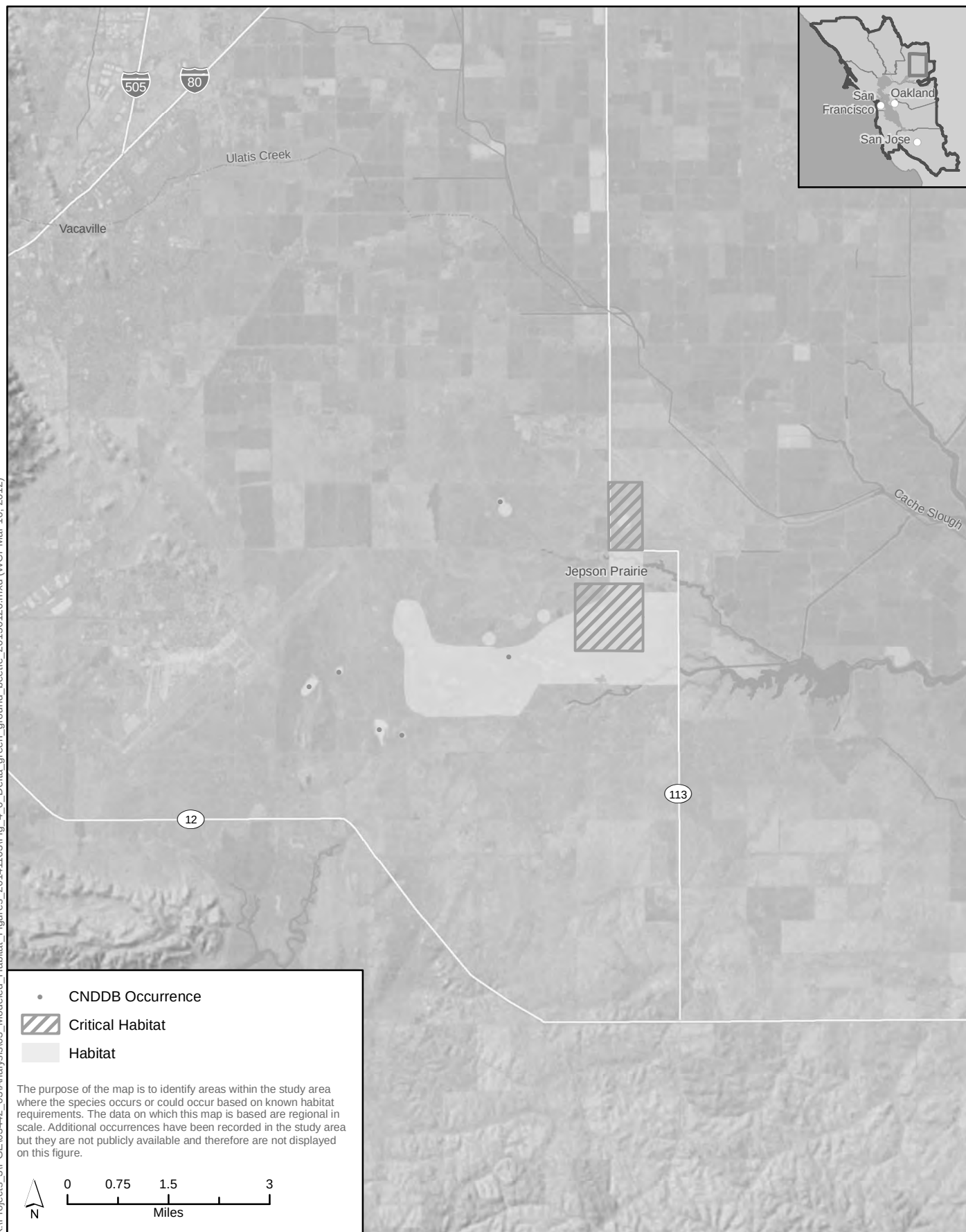


Figure 4-6
Delta green ground beetle modeled habitat

host plant; as an adult it feeds on a number of nectar-producing plants. In the study area this species occurs in San Mateo County (introduced at Edgewood Park in early 2007) and Santa Clara County, as shown in Figure 4-7 (California Department of Fish and Game 2011; U.S. Fish and Wildlife Service 2009).

To account for the reintroduction at Edgewood Park, and potential future reintroductions or recolonizations in other portions of San Mateo County, covered activity impact are given for both counties. The Bay checkerspot butterfly has an estimated range of 8,442 acres within San Mateo and Santa Clara Counties, approximately 10% (912 acres) of which are within the Plan Area (Table 2-3 and Table 4-2). Established Bay checkerspot hot zones include patches of habitat in Santa Clara County (i.e., the east hills from southern San Jose south to an area south of the city of Morgan Hill) and Edgewood Park in San Mateo County. Gas and electric transmission and distribution lines pass through these hot zones.

Direct Impacts

Covered activities could result in death or injury of Bay checkerspot butterfly. Grading, trenching, or excavation activities could crush or bury Bay checkerspot butterfly eggs, larvae, or pupae but such impacts are generally unlikely because of existing practices, such as field protocols. Vehicles and equipment traveling to and from work areas also could potentially harm butterfly eggs, larvae or pupae, and adults. During construction activities, moving vehicles could take adults while they are nectaring, resting, basking, or roosting, particularly during cool times of the day when low temperatures make flight metabolically impossible. Similarly, increased dust in a work area during the flight period could cause butterflies to avoid the area or could result in the inability of host or nectar plants to provide food resources for butterflies during critical periods. Conservation measures described in Section 5.5.1, *Avoidance and Minimization of Impacts*, (specifically, FP-02, FP-03, FP-04, which avoid impacts on vegetation; FP-07 and FP-10; and Hot Zone-5) would avoid and minimize impacts on the species. FP-03 specifies that existing access and ROW roads be used rather than creating new ones. Hot Zone-5, targeted specifically to Bay checkerspot butterfly, requires a biologist to survey for host and nectar plants during the appropriate seasonal window prior to the start of work and flag off-road access for vehicles, or identify the need for access or by foot ATVs. FP-07 restricts vehicle speeds to no more than 15 mph on unpaved roads, which would help butterflies avoid being injured or crushed, and FP-10 instructs field crews to minimize the activity footprint and amount of time spent at each location to reduce the potential for take (Table 5-1). Modeled habitat for Bay checkerspot butterfly occurs in Edgewood County Park and on hilltops from southern San Jose south along the hills on either side of Santa Clara Valley to an area south of Morgan Hill. The largest, most contiguous habitat is on Coyote Ridge, and consists of two large patches and a number of smaller nearby patches. The population along Coyote Ridge is critical to the survival of the species because of its size and area. Population trends in this area indicate that the most important core habitats are topographically diverse areas near the ridge top. The higher-elevation ridge top and adjacent north slopes and canyons have favorable combinations of high topographic diversity, including large expanses of north-facing slopes, and feature the coolest and wettest parts of Bay checkerspot butterfly habitat. Covered activities in high-quality habitat around Coyote Ridge and Tulare Hill could impact this species.

Patches of contiguous, well connected habitat that support greater populations of butterflies and facilitate movement are important to the viability of local populations. However, covered activity impacts in smaller, disjunct habitat patches could also be of concern.

Overall, there is a high density of PG&E facilities in Bay checkerspot butterfly habitat because of its proximity to the Metcalf Energy Center. Habitat that stretches across Coyote Ridge contains a number of electric and gas facilities, which bisect the habitat in some areas. Due to the sensitivity of the serpentine habitat in this area, helicopters perform much of the work. Table 4-5 identifies specific covered activities that could impact Bay checkerspot butterfly habitat. Conservation measures described in Section 5.5.1, *Avoidance and Minimization of Impacts*, (specifically, FP-02, FP-03, FP-04, FP-7, FP-10, and Hot Zone-5) would ensure that the covered activities avoid and minimize habitat impacts and take of Bay checkerspot butterflies (see Table 5-1).

Permanent Impacts on Habitat

Table 4-3 indicates that covered activities would permanently remove 0.08 acre (3,485 sq. ft. or a 59-ft. square) of Bay checkerspot butterfly habitat annually in the Plan Area, and no more than 4 acres over 30 years. Covered activities most likely to permanently impact habitat for Bay checkerspot butterfly generally include upgrading and replacement of gas and electric facilities and maintenance of access roads. Permanent loss of butterfly habitat would result if habitat is replaced by facility infrastructure (e.g., gravel roads, foundations, poles). Ground-disturbing activities, such as construction of new access roads or maintenance of existing roads, could permanently remove habitat.

Temporary Impacts on Habitat

Covered activities would temporarily disturb 1.2 acres annually and no more than 62 acres over 30 years (Table 4-3). Temporary impacts include ground disturbance and excavation from covered activities in non-serpentine grassland areas that recover within 1 year.

Critical Habitat Impacts

There are 18,292 acres of critical habitat in the study area; 1,896 acres occur in the Plan Area. The amount of critical habitat in the Plan Area is greater than the total amount of modeled habitat (912 acres) in the Plan Area because critical habitat includes areas that may be important to the recovery of the species but are not currently suitable habitat. Any impacts on this species' habitat are likely to be within critical habitat (Table 4-4).

The primary constituent elements of critical habitat for Bay checkerspot butterfly include grasslands located in north-south or east-west slopes greater than 7 degrees, presence of the species' primary and secondary host plants, presence of adult nectar sources for feeding, soils derived from serpentinite ultramafic rock or similar, and presence of stable holes and cracks in the soil to provide shelter for the larval stage of the species. Impacts of covered activities on critical habitat, including its primary constituent elements, are consistent with the direct and indirect impacts previously identified. Overall, approximately 10% of the designated critical habitat occurs in the Plan Area, and covered activities would directly or indirectly permanently impact a small fraction, less than 0.05% of the total designated critical habitat for this species (Table 4-4).

Indirect Impacts

The inadvertent introduction of invasive plant species could indirectly impact Bay checkerspot butterfly by displacing host plants and degrading habitat quality over time. Such an outcome could result from leaving ground bare, or from transport of seeds by construction equipment or personnel,

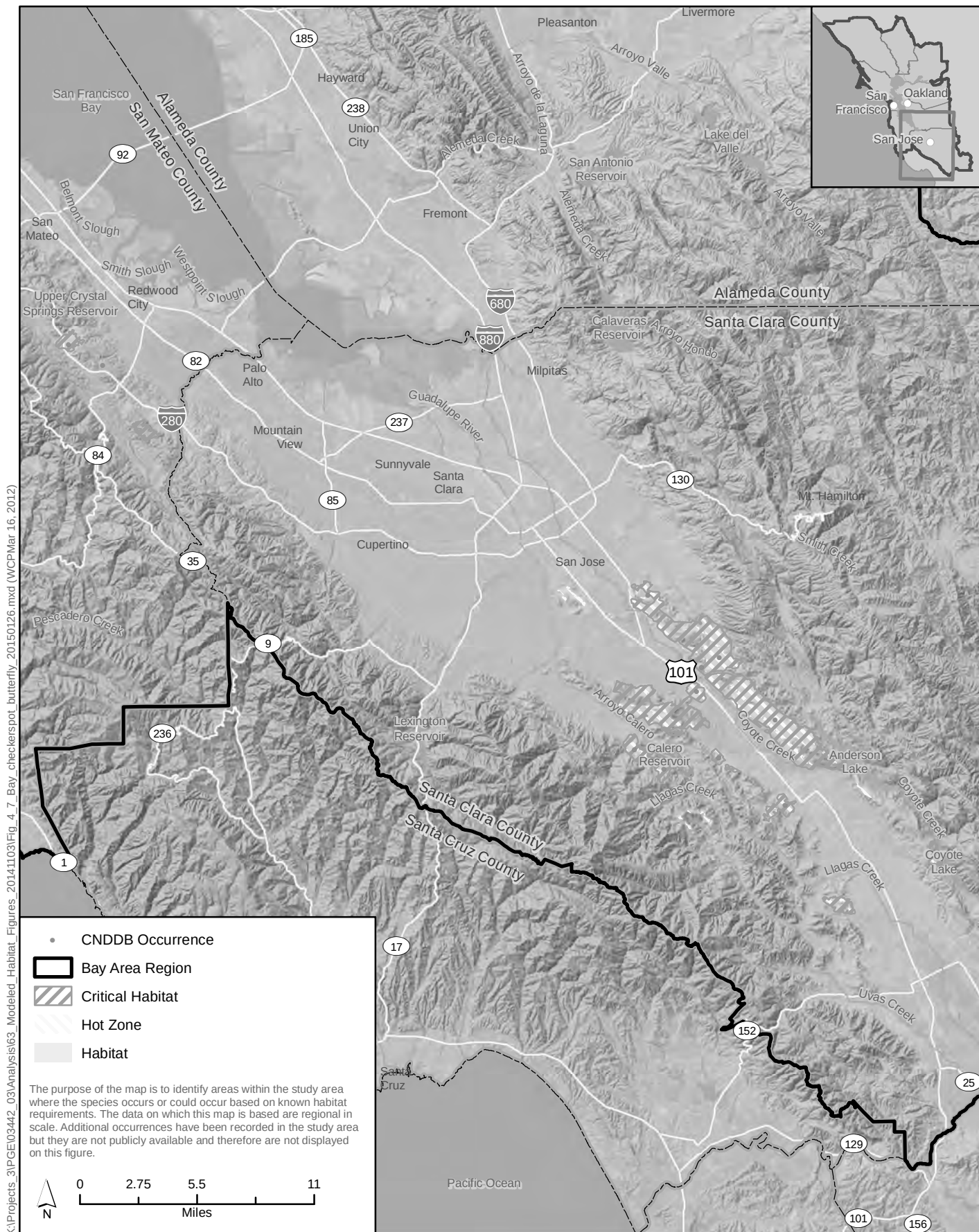


Figure 4-7
Bay checkerspot butterfly modeled habitat

or from contaminated seed or straw. Invasive plants could displace native host or nectar plant species by outcompeting them for space, sun, and water.

4.2.1.8 Callippe Silverspot Butterfly

Life History and Distribution

USFWS currently recognizes two populations of Callippe silverspot butterfly, a San Bruno Mountain population in San Mateo County and a Cordelia Hills population in Solano County, as shown in Figure 4-8 (U.S. Fish and Wildlife Service 2009a). A possible third population may occur in the South Pleasanton Hills, Alameda County, although USFWS has not verified this population. The Callippe silverspot butterfly occupies native grassland habitat and relies on its larval host plant, Jonny jump-up (*Viola pedunculata*), to complete its life cycle. Adult Callippe silverspot butterflies nectar on many species, including mints, thistles, and buckeye.

In the study area, this species primarily occurs in San Mateo and Solano Counties (California Department of Fish and Game 2011; U.S. Fish and Wildlife Service 2009). Assuming habitat in the East Bay is suitable, Callippe silverspot butterfly has an estimated range of 112,051 acres within the study area, 6,807 acres of which are within the Plan Area (Table 2-3 and Table 4-2). Modeled habitat for Callippe silverspot butterfly occurs just south of San Francisco on San Bruno Mountain (3%), in the Cordelia Hills region of Solano County (30%), in Napa County (1%), and in the East Bay hills from northern Contra Costa County (45%) south to southern Alameda County (21%) near Sunol (Table 2-5).

Direct Impacts

The mechanisms for permanent and temporary direct impacts on Callippe silverspot are the same as those described above for Bay checkerspot butterfly. Ground-disturbing activities could permanently and temporarily remove habitat. Johnny jump-up (*Viola pedunculata*)—the host plant for Callippe butterfly—is a difficult plant species to restore to pre-disturbance conditions and may not resprout or recolonize in excavated or heavily compacted work areas; it is therefore likely that some temporary impacts could become permanent.

San Bruno Mountain remains undeveloped, although urbanization surrounds it. Habitat for Callippe silverspot there is contiguous and well connected. Few electric and gas distribution and transmission facilities cross this area, most of which only extend into the edges of the habitat; however, four facility corridors bisect the habitat patch. PG&E's crews are typically accompanied by a biologist when conducting work on San Bruno Mountain to avoid and minimize impacts on Callippe silverspot and other species. Gas and electric transmission lines cross through Callippe silverspot habitat in the Cordelia Hills; gas and electric distribution facilities are located mostly on the edges of this habitat.

The modeled habitat in the East Bay hills consists of a mix of patches of habitat surrounded by development with several gas and electric transmission and distribution facilities. Habitat also occurs in more undeveloped areas containing only a few electric transmission and distribution lines.

Table 4-5 identifies specific covered activities that could impact Callippe silverspot butterfly habitat. Conservation measures described in Section 5.5.1, *Avoidance and Minimization of Impacts*, (specifically, FP-02, FP-03, FP-04, which avoid impacts on vegetation; FP-07, which limits vehicle speed to no more than 15 mph; FP-10, which minimizes activity footprints and time spent at each

location; and Hot Zone-3) would ensure that the covered activities avoid and minimize potential death or injury of individuals of the species, and minimize habitat impacts. Hot Zone-3 requires a biologist to survey for host and nectar plants prior to the start of work and flag off-road access for vehicles, or identify the need for foot access or ATVs (see Table 5-1).

Permanent Impacts on Habitat

PG&E anticipates that covered activities could permanently remove 0.6 acre of Callippe silverspot butterfly habitat annually in the Plan Area and no more than 30 acres over 30 years (Table 4-3). Impacts should be proportionate to modeled habitat by county, with most impacts in Contra Costa, Solano, and Alameda Counties. Less than 5% of the total impacts are expected to occur on San Bruno Mountain in San Mateo County.

Temporary Impacts on Habitat

Covered activities would temporarily disturb 1.1 acres of Callippe silverspot butterfly habitat annually and no more than 55 acres over 30 years (Table 4-3). Impacts should be proportionate to modeled habitat by county, with most impacts in Contra Costa, Solano, and Alameda Counties. Less than 5% of the temporary impacts are expected to occur on San Bruno Mountain in San Francisco County.

Critical Habitat Impacts

There is no designated critical habitat for Callippe silverspot butterfly.

Indirect Impacts

The mechanisms for indirect impacts on Callippe silverspot butterfly are the same as those described above for Bay checkerspot butterfly.

4.2.1.9 Lange's Metalmark Butterfly

Life History and Distribution

Lange's metalmark butterfly is endemic to the remnant Antioch Dunes of Contra Costa County, and the only extant population known is located on and around the Antioch Dunes National Wildlife Refuge (NWR) within the Stamm and Sardis Units, as shown in Figure 4-9 (U.S. Fish and Wildlife Service 2008). The entire range of this species is within the study area. Lange's metalmark butterfly is a non-migratory species that depends on the buckwheat species *Eriogonum nudatum* ssp. *auriculatum* as its larval host plant and on a number of nectar-producing plants, including the buckwheat, as its adult food source.

Lange's metalmark butterfly has an estimated range of 77 acres within the study area, 13 acres of which are within the Plan Area (Table 2-3 and Table 4-2). The Lange's metalmark hot zone includes all modeled habitat for the species within the Antioch Dunes. A gas line and two electric transmission towers are present in this hot zone.

Direct Impacts

The mechanisms for permanent and temporary direct impacts on Lange's metalmark are generally the same as those described above for Bay checkerspot butterfly. Ground-disturbing activities may

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Figure 4-8
Callippe silverspot butterfly modeled habitat

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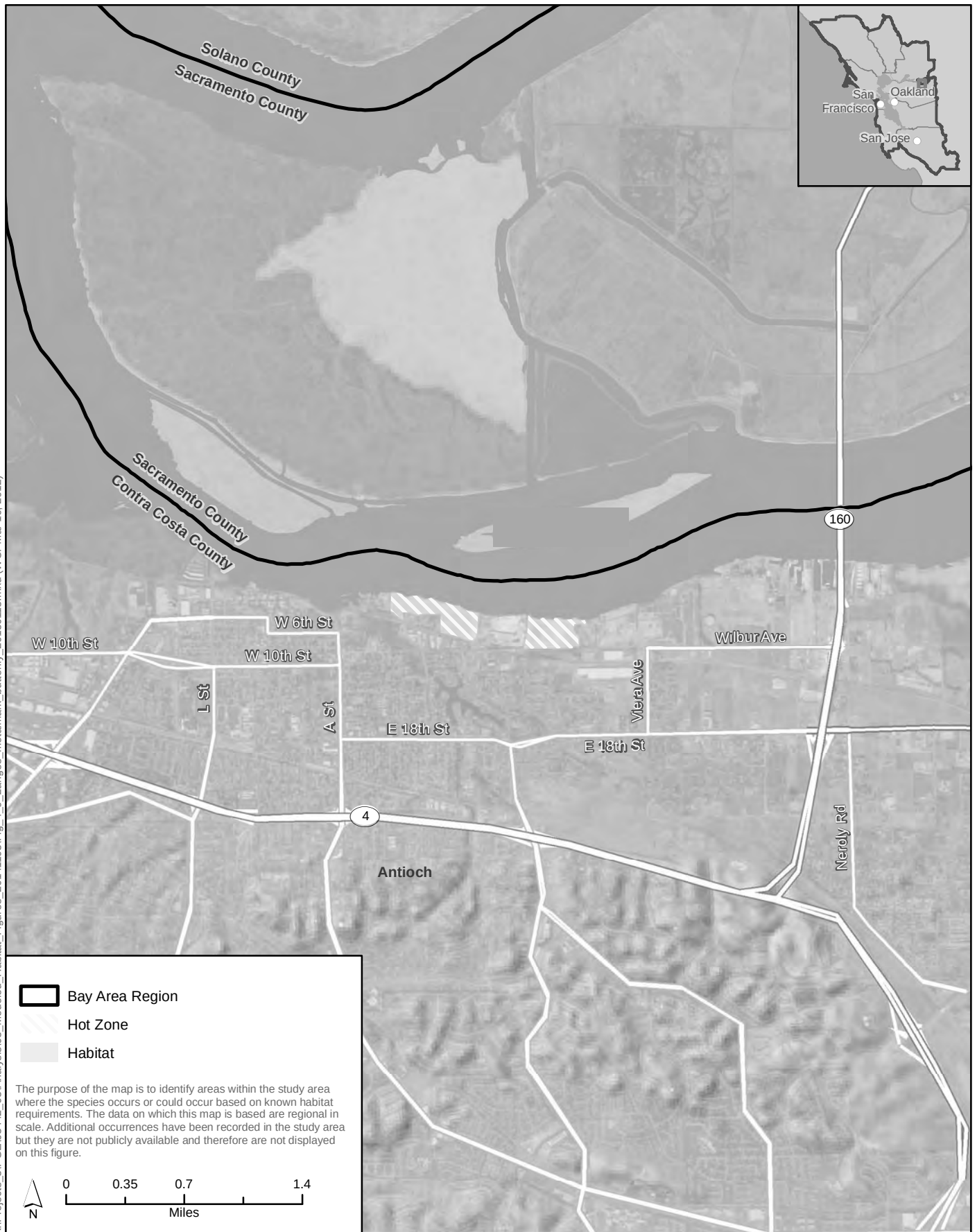


Figure 4-9
Lange's metalmark butterfly modeled habitat

permanently remove the butterfly's host plant as well as temporarily impact habitat and reduce connectivity across the landscape in this important habitat area. PG&E's crews are accompanied by a biologist when conducting work on PG&E's parcels to avoid and minimize impacts on this and other species.

Modeled habitat occurs exclusively at Antioch Dunes NWR site in Contra Costa County and two, 6-acre PG&E parcels that abut the NWR. Each parcel contains one electric transmission steel lattice tower within the ROW. A gas line also runs parallel to Wilber Road through both parcels. A Safe Harbor Agreement between PG&E and USFWS presently covers the two PG&E parcels adjacent to the refuge.

Future work on the electric towers is most likely to impact this species; work performed on the existing gas pipeline is less likely to have impacts because the pipeline follows an existing road and fence. Covered activities that may impact habitat onsite include upgrades and maintenance to the electric system and/or its constituent equipment and work on the tower footings. Travel to facilities and use of equipment onsite could crush the butterfly's host plant.

Conservation measures described in Section 5.5.1, *Avoidance and Minimization of Impacts*, (specifically, FP-02, FP-03, FP-04, which avoid impacts on vegetation; FP-07, which limits vehicle speed to no more than 15 mph; FP-10, which minimizes activity footprints and time spent at each location; and Hot Zone-4) were developed to address the potential impact mechanisms described above and would ensure that the covered activities avoid and minimize potential death or injury of individuals of the species and minimize habitat impacts. Hot Zone-4 requires a biologist to survey for host and nectar plants prior to the start of work and flag off-road access for vehicles, or identify the need for foot access or ATVs.

Permanent Impacts on Habitat

PG&E anticipates that covered activities could permanently remove approximately 0.01 acre (436 sq. ft.) of Lange's metalmark butterfly habitat annually in the Plan Area and no more than 0.3 acre over 30 years (Table 4-3). Activities in or near Lange's metalmark butterfly habitat are likely to impact the species' habitat. Because this area is relatively undisturbed, most of the impacts would result from electric transmission tower footing repair or future tower replacement, tower extensions or relocation, or electric reconductoring. Gas pipeline modernization activities probably would not take place within habitat for Lange's metalmark butterfly.

Temporary Impacts on Habitat

Covered activities would temporarily disturb 0.02 acre (871 sq. ft.) annually and no more than 1 acre over 30 years (Table 4-3).

Critical Habitat Impacts

No critical habitat has been designated for Lange's metalmark.

Indirect Impacts

The mechanisms for indirect impacts on Lange's metalmark are the same as those described above for Bay checkerspot butterfly.

4.2.1.10 Mission Blue Butterfly

Life History and Distribution

Mission blue butterfly inhabits coastal prairie grasslands from 689 to 1,181 feet in elevation and depends on the larval host plants silver lupine (*Lupinus albifrons* var. *collinus*), many-colored lupine (*L. variicolor*), and summer lupine (*L. formosus* var. *formosus*) to reproduce. These plants are early successional species that benefit from some level of ground disturbance. Adult butterflies are known to nectar at a number of nectar-producing flowers, but tend to stay close to larval host plants (U.S. Fish and Wildlife Service 2010b). In the study area, Mission blue butterfly occupies the Twin Peaks region in San Francisco County, San Bruno Mountain in San Mateo County, and Marin Headlands at Fort Baker in Marin County, as shown in Figure 4-10 (U.S. Fish and Wildlife Service 2010b).

The species has an estimated range of 10,693 acres within the study area, 653 acres of which are within the Plan Area (Table 2-3 and Table 4-2). The Mission blue butterfly hot zone includes all modeled habitat within the study area. Modeled habitat for Mission blue butterfly is located in the city of San Francisco, in the Marin headlands, and just south of San Francisco on the peninsula. Contiguous, well connected habitat patches can be found in the Marin headlands, on San Bruno Mountain near San Francisco Airport, near the City of Pacifica, and in the hills west of Millbrae. Gas and electric transmission and distribution lines pass through these hot zones.

Direct Impacts

Mechanisms for permanent and temporary direct impacts on Mission blue butterfly are the same as those described above for Bay checkerspot butterfly. Ground-disturbing covered activities could impact modeled habitat for mission blue butterfly. No gas or electric facilities pass through habitat in the hills west of Millbrae, though there are gas and electric distribution lines adjacent to it. In both Pacifica and San Bruno, gas and electric transmission and electric distribution lines pass through the habitat and gas distribution lines are located along the outer edges of the habitat. A few electric and distribution lines run along the periphery of the habitat in San Francisco. PG&E's crews are typically accompanied by a biologist when conducting work on San Bruno Mountain to avoid and minimize impacts on this and other species. The habitat in Marin Headlands encompasses one electric transmission line and a few electric and gas distribution lines. Table 4-5 identifies specific covered activities that could impact Mission blue butterfly habitat. Conservation measures described in Section 5.5.1, *Avoidance and Minimization of Impacts*, (specifically, FP-02, FP-03, FP-04, which avoid impacts on vegetation; FP-07, which limits vehicle speed to no more than 15 mph; FP-10, which minimizes activity footprints and time spent at each location; and Hot Zone-3, which requires a biologist to survey for host and nectar plants) would ensure that the covered activities avoid and minimize potential death or injury of individuals of the species and minimize habitat impacts.

Permanent Impacts on Habitat

PG&E anticipates that covered activities could permanently remove 0.04 acre (a 42-ft. × 42-ft. area) of Mission blue butterfly habitat annually and no more than 2 acres over 30 years (Table 4-3).

Temporary Impacts on Habitat

Covered activities would temporarily disturb 0.4 acre of Mission blue butterfly habitat annually and no more than 20 acres over 30 years (Table 4-3).

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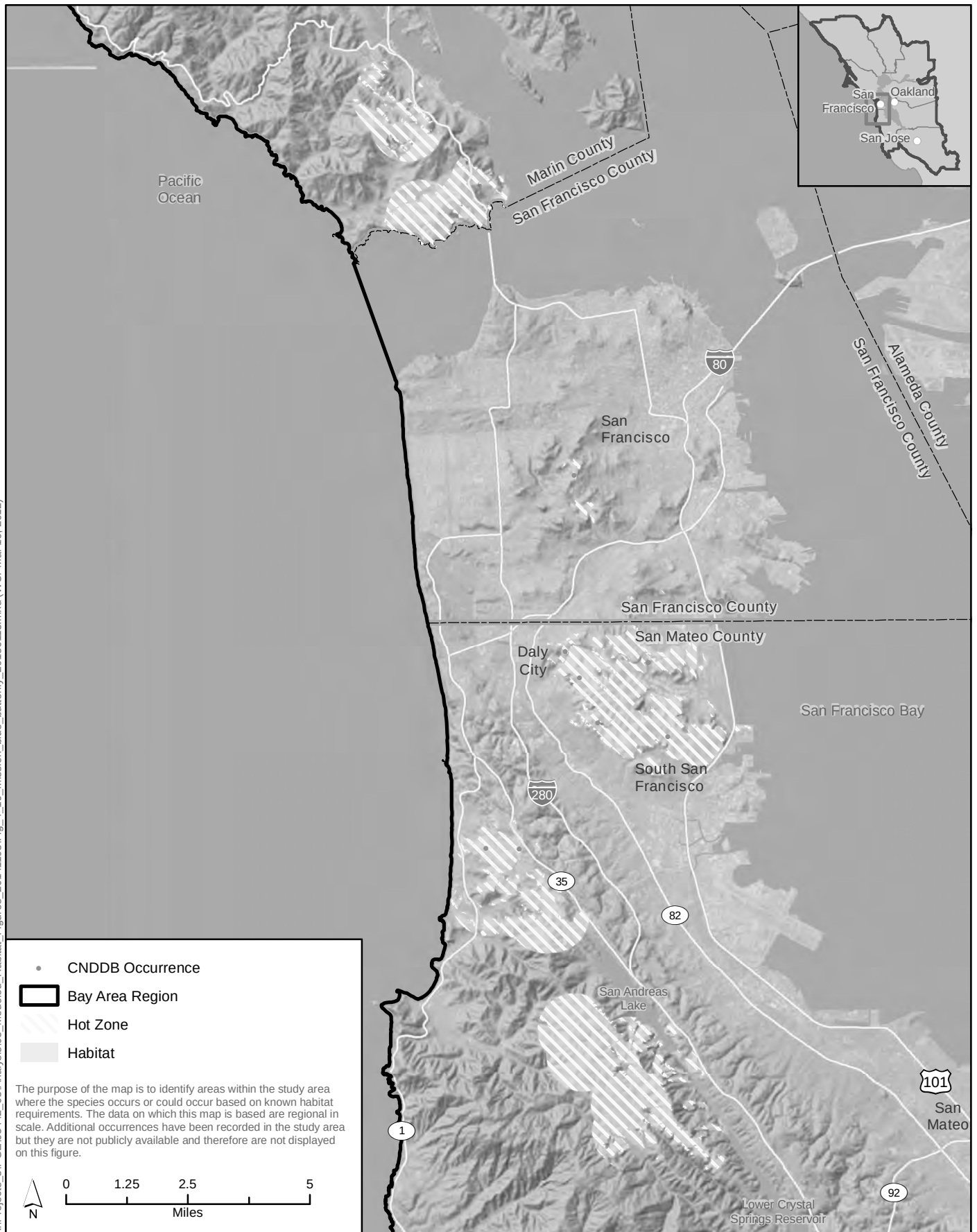


Figure 4-10
Mission blue butterfly modeled habitat

Critical Habitat Impacts

No critical habitat has been designated for Mission blue butterfly.

Indirect Impacts

The mechanisms for indirect impacts on Mission blue butterfly are the same as those described above for Bay checkerspot butterfly.

4.2.1.11 San Bruno Elfin Butterfly

Life History and Distribution

The San Bruno elfin butterfly inhabits coastal chaparral on steep, north-facing slopes in the fog belt, where the larval host plant, stonecrop (*Sedum spathulifolium*), grows. Known locations are restricted to San Mateo County, where several populations occur at San Bruno Mountain, Milagra Ridge, the San Francisco Peninsula Watershed (SFPW), and Montara Mountain, as shown in Figure 4-11 (U.S. Fish and Wildlife Service 2010b). Thus the entire range of this species is within the study area. Although *Sedum spathulifolium* is the only larval host plant, adults feed on a variety of nectar-producing plants.

The CNDDDB contains two records for Marin County and one for Contra Costa County; however, all three of these records come from a species account in Black and Vaughan (2005). No citation supports these sightings, nor is there mention of actual surveys (i.e., no survey date and no identified surveyor). The 2010 USFWS 5-year review for this species does not mention any records or range extension beyond San Mateo County; however, this HCP includes modeled habitat in association with the CNDDDB records for Marin and Contra Costa Counties because of the possible presence of habitat.

The San Bruno elfin butterfly has an estimated range of 15,036 acres within the study area, 372 acres of which are within the Plan Area (Table 2-3 and Table 4-2). These acreages of modeled habitat are inflated by the inclusion of habitat associated with the aforementioned CNDDDB records in Marin and Contra Costa Counties.

The San Bruno elfin butterfly hot zone includes San Bruno Mountain, a small area east of Montara near Peak Mountain, and Edgewood County Park west of Redwood City. An electric transmission line passes through the hot zone near Peak Mountain east of Montara. Gas and electric transmission lines pass through the San Bruno Mountain hot zone while gas and electric distribution lines pass through the outer edge of the hot zone. Gas and electric transmission and distribution lines pass through the Edgewood County Park hot zone.

Direct Impacts

The mechanisms for permanent and temporary direct impacts on San Bruno elfin butterfly are the same as those described above for Bay checkerspot butterfly. Modeled habitat for San Bruno elfin butterfly in the study area extends along the coast just south of Bodega Bay, in the Coast Ranges just east of Bolinas, in Contra Costa County near Mount Diablo State Park, San Bruno Mountain, Milagra Ridge County Park, and an area stretching from McNee Ranch State Park to San Pedro Valley County Park in San Mateo County. The most contiguous, well-connected habitat patches are those in San Mateo County on San Bruno Mountain, in Milagra Ridge County Park, and in the area of McNee

Ranch State Park and San Pedro Valley County Park. Although urbanization surrounds these three sites, they remain undeveloped.

Patches of habitat at San Bruno Mountain and Milagra Ridge County Park each contain a number of electric and gas utility corridors, some of which bisect the habitat. Two electric utility corridors in the western portion of the habitat patch bisect the patch that stretches between McNee Ranch State Park and San Pedro Valley County Park. A few electric distribution lines pass through the smaller, disjunct patches of habitat in Marin and Contra Costa Counties. Ground-disturbing covered activities could permanently remove habitat or create temporary impacts.

Table 4-5 identifies specific covered activities that could impact San Bruno elfin butterfly habitat. Conservation measures described in Section 5.5.1, *Avoidance and Minimization of Impacts*, (specifically, FP-02, FP-03, FP-04, which avoid impacts on vegetation; FP-07, which limits vehicle speed to no more than 15 mph; FP-10, which minimizes activity footprints and time spent at each location; and Hot Zone-3, which requires a biologist to survey for host and nectar plants) would ensure that the covered activities avoid and minimize potential death or injury to individuals of the species and also minimize habitat impacts (see Table 5-1).

Permanent Impacts on Habitat

PG&E anticipates that covered activities could permanently remove 0.04 acre (a 42-ft. × 42-ft. area) of San Bruno elfin butterfly habitat annually in the Plan Area, and no more than 2 acres over 30 years (Table 4-3).

Temporary Impacts on Habitat

Covered activities would temporarily disturb 0.4 acre annually and no more than 20 acres over 30 years (Table 4-3).

Critical Habitat Impacts

No critical habitat has been designated for San Bruno elfin butterfly.

Indirect Impacts

The mechanisms for indirect impacts on San Bruno elfin butterfly are the same as those described above for Bay checkerspot butterfly.

4.2.2 Amphibians

Covered amphibians are broadly distributed in the Plan Area and PG&E's facilities are located throughout these species' ranges. Most impacts resulting in habitat loss or degradation would be small, localized, and temporary. Although habitat would be lost as a result of covered activities, the covered activities are unlikely to alter the overall distribution and status of covered amphibians in the Plan Area.

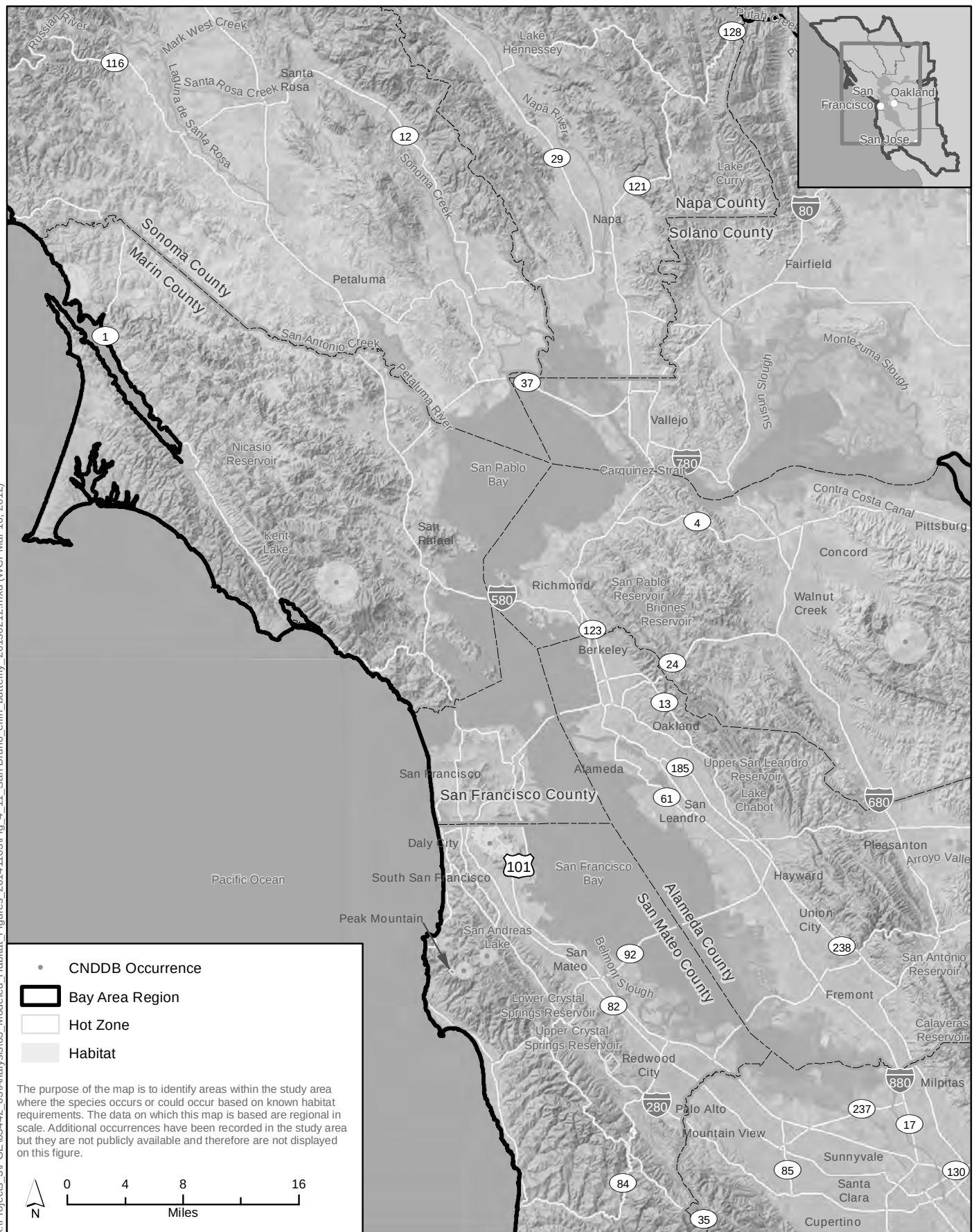


Figure 4-11
San Bruno elfin butterfly modeled habitat

4.2.2.1 California Tiger Salamander—Central California Distinct Population Segment

Life History and Distribution

In the study area, the Central California Distinct Population Segment (DPS) of California tiger salamander occurs in Santa Clara, Alameda, Contra Costa, and Solano Counties, as shown in Figure 4-12 (California Department of Fish and Wildlife 2011). The salamanders within Central California are genetically distinct from other populations in California (those in Sonoma and Santa Barbara Counties), and are known as the Central California DPS. The Central California DPS has an estimated 1.14 million acres of habitat in the study area, 41,152 acres of which occur in the Plan Area (Table 2-3 and Table 4-2). This species occurs throughout much of the non-urbanized parts of the Plan Area, with numerous occurrences in Solano County and eastern Contra Costa, Alameda, and Santa Clara Counties. The species is also known to occur in and around the Stanford University campus in Palo Alto. Specific areas with high-quality habitat include Solano County in east Fairfield (around Travis Air Force Base and between Highway 113 and Jepson Prairie); from Alameda County north of Livermore into northern Contra Costa County; and in Santa Clara County northeast of Gilroy and surrounding San Felipe Lake.

California tiger salamander requires freshwater habitat during the most critical stage of its life cycle, the breeding season. This species congregates in aquatic breeding habitat (primarily vernal pools and stock ponds) prior to breeding and laying eggs. Following breeding, it disperses from the breeding habitat into nearby upland habitat for foraging and aestivation. In the upland habitat, California tiger salamander utilizes burrows created by small mammals such as ground squirrel and pocket gopher for shelter and aestivation. California tiger salamanders remain in the upland habitat until emerging the following year to return to the breeding habitat, typically at night and during rain events. Research conducted on California tiger salamander indicates that the majority of individuals of a population do not disperse far from the breeding habitat. According to Trenham and Shaffer (2005), 90% of individuals of a population did not disperse more than 1,607 feet from the breeding habitat, and only 5% of individuals dispersed beyond 2,067 feet. In addition, research conducted by Searcy and Shaffer (2008) indicates that the density of adult and juvenile California tiger salamanders decreases exponentially as a function of distance from the breeding site. Although, Orloff (2007) found that the majority of California tiger salamanders dispersed within 2,600 feet of a breeding pond, some dispersed as far as 1.37 miles from the pond.

Direct Impacts

Direct impacts include both impacts on individual salamanders that could be encountered during covered activities and the potential impacts on individual salamanders as a result of permanent and temporary loss of modeled habitat.

In addition to the analytical assumptions described in the introduction to Section 4.2, this impact analysis is further guided by the results of research indicating that California tiger salamander population density declines with distance from breeding habitat. Accordingly, California tiger salamander population density is an important factor in the impact analysis. Covered activities in areas with higher population densities (such as breeding habitat and uplands within 1,600 feet of breeding habitat) have greater potential to encounter individuals. Based on dispersal distances, the probability of killing or injuring dispersing or aestivating individuals of the species drops substantially the farther away the covered activity is from the breeding habitat because individuals

are less likely to be present at greater distances. Information regarding population densities away from breeding habitat is reflected in fairly recent approaches for assigning different levels of impact (and compensatory mitigation) based on the distance from breeding habitat. For instance, one approach for compensatory mitigation for the distinct population segment of the Sonoma County California tiger salamander is based on proximity to breeding habitat and established the following ranges, reflecting the decreasing potential for impact with greater distance: 0 to 499 feet, 500 to 2,200 feet, and 2,201 feet to 1.3 miles (U.S. Fish and Wildlife Service 2005a).

The potential for the covered activities to take California tiger salamander is influenced by factors such as the size and duration of activities, timing of activities, and the distance from breeding ponds, as discussed in Section 4.1.3.2, *Direct Impacts on Individual Species*. Other factors, such as the amount of ground disturbance and density of burrows, also play a role. Table 4-5 identifies specific covered activities that could affect Central California DPS California tiger salamander habitat.

Smaller-scale covered activities, such as routine work around an individual pole, lattice tower, or gas pipeline valve, represent the majority of the covered activities. These typically would disturb only small areas, take place over short time frames, and involve few personnel and vehicles. Furthermore, the majority of the time covered activities would not take place close to breeding habitat. Accordingly, the likelihood of encountering individuals of the species while conducting smaller-scale covered activities is low. Larger-scale covered activities involving more heavy equipment, personnel, and ground disturbance, pose greater potential for take of California tiger salamanders. However, because of the planning and coordination required to site facilities and locate work areas away from sensitive habitat, and with implementation of various BMPs, AMMs and other conservation measures, adverse effects would be minimized.

Seasonal timing of work will strongly influence the potential to affect the species. In accordance with PG&E's environmental planning and screening practices, larger-scale covered activities are scheduled to minimize work during the wet season, when breeding adult California tiger salamanders are moving to ponds or moving into the uplands after the breeding season. Covered activities implemented outside of the wet season are unlikely to affect breeding or dispersing California tiger salamanders because these individuals have moved back into the uplands. Smaller-scale activities are conducted year-round but are typically conducted from roads and during the day.

Modeled habitat is based on the best available data of where potentially suitable habitat occurs. California tiger salamander modeled habitat includes breeding and upland components. The breeding components are those that support breeding habitat and represent the areas where the population density is highest during the breeding period, though not all juveniles and adults return to these areas. Modeled breeding habitat currently represents less than one-quarter of one percent (i.e., 0.17%) of the Plan Area (Table 4-2). Upland habitat is broadly defined to include non-urbanized areas within 1.3 miles of breeding habitat. Modeled upland habitat represents 58.9% of the Plan Area, with the majority located in the electric transmission ROW (Table 4-2). Overall, modeled habitat is distributed over the Plan Area as follows: 33% in Contra Costa County, 28% in Alameda County, 23% in Santa Clara County, and 16% in Solano County (Table 2-5).

Within the Plan Area, covered activities would affect both upland and breeding areas. In upland areas, it is anticipated that the potential to encounter and affect individual salamanders decreases the farther the covered activity is from breeding habitat. In the Plan Area, 22% of modeled upland habitat is within 1,600 feet of potential breeding habitat, and 78% is beyond 1,600 feet. Assuming equal distribution of covered activities, it follows that 78% of the time covered activities would take

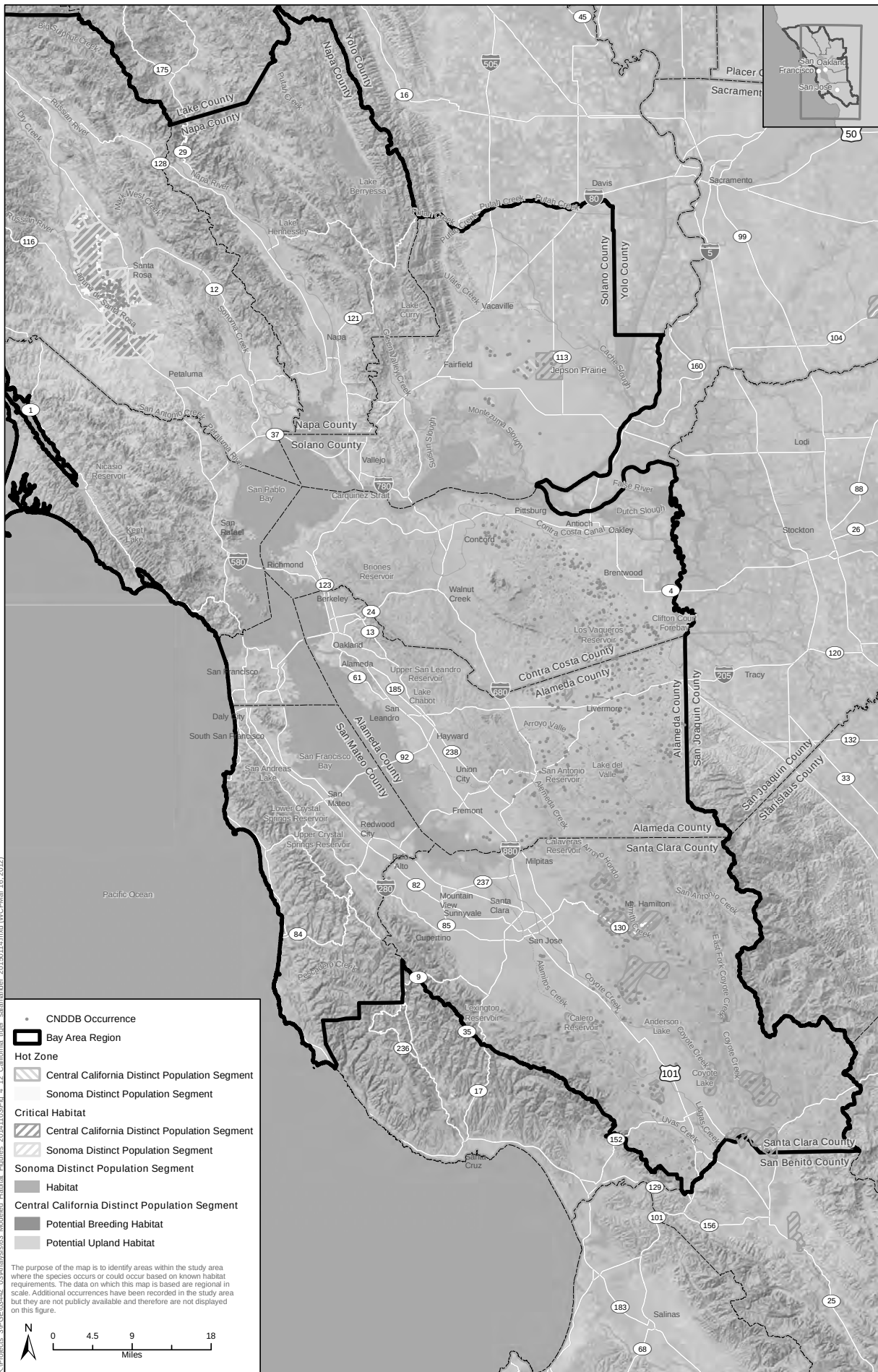


Figure 4-12
California Tiger Salamander (Central California DPS and Sonoma DPS) modeled habitat

place in areas that are in upland habitat that is more than 1,600 feet from a breeding pond; this represents an area where less than 10% of the California tiger salamander population occurs. Covered activities such as grading, trenching, or excavation in uplands could result in direct mortality or injury of adults (e.g., those occupying burrows or soil crevices), particularly when these activities are implemented close to wetland habitats such as vernal pools and stock ponds. In an attempt to minimize direct mortality in an area that will be trenched, there may be instances where PG&E would excavate burrows, which could also take individuals. However, excavating burrows by hand is likely to result in take in the form of harm and harassment rather than mortality. California tiger salamanders found in burrows would be removed to the closest suitable habitat. Vehicles and equipment traveling to and from work areas within upland habitat could potentially take adults when the species is active on the surface, generally at night when humidity is high or in periods of rainfall between fall and spring when salamanders may be actively dispersing. The movement of vehicles and equipment could also crush or injure salamanders in occupied burrows. Except in emergency conditions, crews perform covered activities during daytime hours, so the potential for death or injury of dispersing salamanders is low. A storm-related emergency would be the exception, when construction crews could be active at night and could take adult salamanders that happen to be dispersing through the work area.

Covered activities may occasionally need to be implemented in breeding areas where there is the potential for death or injury of eggs, larvae, or adults. However, less than one-quarter of one percent (0.17%) of the Plan Area is modeled breeding habitat. In addition, PG&E FP-02, FP-03, FP-04 would keep vehicles out of wet areas; FP-11 and FP-12 would avoid soil and sediment runoff into water bodies; and AMMs Wetland-1, Wetland-2, and Hot Zone-6 (see Table 5-1 and Appendix B) would avoid vernal pool impacts. These measures also would be implemented in areas with suitable habitat. Accordingly, impacts on breeding areas are expected to be infrequent.

The AMMs set forth in Chapter 5, *Conservation Strategy*, were developed to address the various mechanisms described above that could affect the species. Construction best management practices to avoid wetlands and ponds, minimizing work at night and during substantial rain events, work practices associated with environmental review, planning and screening, and the conservation measures described in Section 5.5.1, *Avoidance and Minimization of Impacts*, including FP-04, FP-13, FP-15, FP-16, Hot Zone-6, Wetland-1, and Wetland-2, would ensure that the covered activities avoid and minimize potential death or injury of California tiger salamander. For example, FP-04 instructs field crews to locate off-road access routes and work sites to areas that minimize impacts on plants, shrubs, and trees, small mammal burrows, and unique natural features. FP-13 requires escape ramps in open trenches and steep-walled holes. Hot Zone-6 limits work off established roadways to foot traffic only and is specifically targeted to areas of California tiger salamander habitat. FP-15, FP-16, Wetland-1, and Wetland-2 require that vernal pools, stock ponds, and wetland areas be identified and that appropriate protective buffers be established around them (Table 5-1).

Permanent Impacts on Habitat

Covered activities would permanently impact only 0.04 acre (1,742 sq. ft.) of modeled breeding habitat annually (Table 4-3) within the 41,000 acre range of California tiger salamander Central California DPS within the Plan Area. As such, permanent impacts on breeding habitat would be rare and consist of very small impacts dispersed over a large geographic area. In those instances where a facility or equipment may have been sited within a wetland or waterbody in the past, PG&E would implement field protocols, Hot Zone-6, Wetland-1, and Wetland-2 (Table 5-1) to protect wetlands and water bodies, as described above. When PG&E's engineers can, they will site or relocate facilities

outside wetlands or water bodies (for instance, moving a pole a few feet in one direction or another to get it out of the sensitive area). No more than 2 acres of modeled breeding habitat would be affected over 30 years (Table 4-3). The small amount of permanent impact on modeled breeding habitat is not expected to significantly impair the life history requirements of California tiger salamander Central California DPS or reduce the population.

Covered activities would permanently impact 6 acres of modeled upland habitat annually (Table 4-3) within the 41,000 acre range of California tiger salamander Central California DPS within the Plan Area. By permanently impacting the modeled upland habitat, covered activities could potentially result in the loss of areas used for dispersal, foraging, and aestivation. Permanent impacts on upland dispersal habitat would result mainly from siting new or replacement facilities in an area where none currently exist. Most permanent impacts on upland habitat would be 0.25 acre or less and would be geographically dispersed over 41,000 acres of Plan Area habitat across four counties. Such small impacts on habitat are not expected to fragment habitat areas or impair genetic exchange between populations. No more than 298 acres of modeled upland habitat would be permanently affected over 30 years (Table 4-3).

Temporary Impacts on Habitat

Covered activities would temporarily impact 0.5 acre of modeled breeding habitat annually. Because temporarily affected areas regenerate and are available to the species again within 12 months, the amount of temporarily disturbed habitat unavailable to the species at any point in time is not expected to ever be twice the annual disturbance. This is because impacts may occur at the end of one year and the beginning of the next, and restoration and regeneration of habitat for these 2 years may cause the total temporary disturbance area to be larger than the annual average.

Covered activities would temporarily impact 76 acres of modeled upland habitat annually. Temporary impacts on upland habitat represent an extremely small portion of the habitat available to California tiger salamander across four counties in the Plan Area. The temporary impacts on any given habitat area would generally be less than 0.1 acre (4,356 sq. ft. or a 66-ft. square). In cases where the temporary impact is greater than 0.1 acre, conservation measures would require that the impact area be recontoured and restored (i.e., reseeded with native grass seed) to encourage the restoration of the habitat. The temporary loss of small amounts of upland habitat across a large area is not expected to significantly impair essential behavioral patterns for California tiger salamander. For instance, it is unlikely that individuals of the species occupying habitat in and around work areas would be unable to find prey or shelter, or that such small temporary habitat impacts would impair dispersal between breeding habitat and uplands. Further, such small temporary impacts on habitat are not expected to fragment habitat areas or impair genetic exchange between populations. Covered activities would temporarily impact a total of up to 3,800 acres of upland habitat over 30 years.

Covered activities addressing vegetation management activities related to NERC ROW clearing (Activity E10d, Table 4-1) have the potential to directly affect modeled upland habitat by removing canopy above the habitat, which would alter the microclimate conditions and degrade habitat. This could cause California tiger salamanders to travel farther to seek new burrows, increasing their potential to be preyed upon. Approximately 100 line segments will require tree removal activities in the next 5 years. PG&E intersected these lines with tree-dominated habitats and California tiger salamander modeled habitat to estimate approximately 1,726 acres of modeled habitat that may require the removal of canopy. Based on discussions with PG&E's vegetation management staff,

PG&E anticipates selective tree removals could impact 10% of this area, resulting in approximately 173 acres of habitat impacts from canopy removal. Therefore, it is anticipated that selective tree removals associated with NERC ROW clearing could result in annual canopy removal over approximately 34.6 acres of modeled upland habitat across the range of California tiger salamander each year for the first 5 years, for a total of 173 acres. Of these 173 acres, approximately 22% is likely to occur in Alameda County, 25% in Contra Costa County, 1% in Napa County, 52% in Santa Clara County, and less than 1% in Solano County. The effect of limited canopy removal on California tiger salamander is expected to be minimal because these areas would still be suitable for dispersal, sheltering, and foraging.

Conservation measures described in Section 5.5.1, *Avoidance and Minimization of Impacts*, (including field protocols, Hot Zone-6, Wetland-1, and Wetland-2) would ensure that the covered activities minimize impacts on habitat.

Critical Habitat Impacts

The study area contains 47,381 acres of designated critical habitat, 5,438 acres of which are in the Plan Area. Covered activities would permanently impact approximately 0.8 acre of critical habitat and temporarily impact approximately 10 acres annually. PG&E may permanently impact up to 39 acres of critical habitat over 30 years (Table 4-4). This represents approximately 0.08% of the designated critical habitat.

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 vernal pools and suitable upland areas by outcompeting native plant species for space, sun, and water. Such an indirect impact could reduce the quality of the habitat for California tiger salamander or make the habitat unsuitable.

Construction activities within 250 feet of vernal pools could indirectly affect modeled breeding habitat by altering the hydrology or reducing water quality. For example, if PG&E's restoration actions or sediment control measures fail, runoff and sediment could enter the pool.

4.2.2.2 California Tiger Salamander—Sonoma County Distinct Population Segment

Life History and Distribution

In the study area, California tiger salamanders belonging to the Sonoma County DPS occur only in the Santa Rosa Plain in Sonoma County, as shown in Figure 4-12. This analysis treats the population occurring within Sonoma County separately as the Sonoma County DPS because these salamanders are genetically distinct from other populations in California.

The California tiger salamander Sonoma County DPS has an estimated range of 31,355 acres in in the study area, 2,404 acres of which occurs in the Plan Area (Table 2-3 and Table 4-2). In the Santa Rosa Plain, the species' habitat is interspersed with rural residential areas characteristic of

urbanization in this area. California tiger salamander Sonoma County DPS life history requirements are the same as for the Central California DPS.

Direct Impacts

Direct impacts include both temporary and permanent impacts on salamanders and their modeled habitat resulting from covered activities.

In addition to the analytical assumptions described in the introduction to Section 4.2, this analysis also considers recent research that indicates the California tiger salamander population density declines with distance from breeding habitat, as discussed for the Central California DPS. Covered activities in areas with higher population densities (such as breeding habitat and uplands within 1,600 feet of breeding habitat) have greater potential to encounter individuals. The Santa Rosa Plain Conservation Strategy also acknowledges this. Based on dispersal distances, the probability of take of tiger salamanders drops the farther away the covered activity is from the breeding habitat because individuals are less likely to be present at greater distances. However, in the Santa Rosa Plain the density of wetlands to uplands is at a higher percentage than in most areas within the range of the Central California DPS.

Covered activities such as grading, trenching, or excavation in upland habitat could result in death or injury of California tiger salamander Sonoma County DPS individuals, particularly when conducted near aquatic habitat. In an attempt to minimize direct mortality in an area that will be trenched, there may be instances where PG&E would excavate burrows, which could also take individuals. However, excavation of burrows by hand is likely to take in the form of harm and harassment rather than mortality. California tiger salamanders found in burrows would be removed to the closest suitable habitat. The impact mechanisms and the likelihood of resulting impacts are similar to those discussed above for the California tiger salamander Central California DPS.

While some facilities may occasionally be located in an area that would serve as suitable breeding habitat (i.e., ponded water), PG&E implements measures such as Wetland-1 and Wetland-2, which establish buffers around sensitive wet areas and avoid work in aquatic habitats where breeding or egg laying are taking place; therefore, potential to take eggs, larvae, or adults in these areas is low.

Facilities near stock ponds and vernal pool habitat are of key concern because the potential for occupied habitat is higher. PG&E has identified hot zones for the California tiger salamander Sonoma County DPS throughout the Santa Rosa Plain. Both electric transmission and distribution lines and gas distribution lines pass through a few of these hot zones but most of the hot zones only have distribution lines along their borders. Within the hot zones, there are no gas transmission lines, which are the facilities for which covered activities tend to have the largest type of ground-disturbing impacts. Considering that wetland habitats are expected to be a fraction of the 2.87% of modeled habitat for the California tiger salamander Sonoma County DPS in the Plan Area (Table 4-2), impacts on individuals in these areas are likely to be minimal.

Modeled habitat is based on the best available data of where potentially suitable habitat occurs. In this area, the model utilizes data from the Santa Rosa Plain Conservation Strategy. Predicting where species are more likely to occur allows PG&E to anticipate the relative impacts the covered activities pose on the species, both in terms of habitat loss and take of individuals. California tiger salamander Sonoma County DPS modeled habitat does not differentiate between wetland and upland components because a wetland dataset was not available. However, the wetland components are those that support breeding habitat and represent the areas where the population density may be

higher during the breeding period, though not all adults return to ponds each year. It is in these areas that covered activities are most likely to affect individuals if they are encountered during the wet season. Total modeled habitat for this species represents 2.87% of the Plan Area (Table 4-2). Wetland habitats are expected to be similar to other areas with mapped habitat (i.e., less than 1% of the ROW) and a small fraction of the modeled habitat.

The potential for the covered activities to modify habitat in a way that would take California tiger salamander is also influenced by the scale and duration of activities, timing of activities, and the modeled habitat where covered activities take place, as discussed in Section 4.1.3.2, *Direct Impacts on Individual Species*, and above for the Central California DPS. Other factors, such as the amount of ground disturbance and density of burrows, also play a role. Table 4-5 identifies specific covered activities that could affect California tiger salamander Sonoma County DPS habitat.

PG&E recognizes that the entire Santa Rosa Plain is sensitive but that some areas are even more sensitive. These areas include known preserves, known occupied lands and critical habitat. In these areas PG&E created hot zones; these areas compose 78 acres, or two-hundredths of one percent (0.02%) of the Plan Area. Similarly, critical habitat represents areas that are essential to the long-term survival of this population, comprising 870 acres (Table 4-4) of the Plan Area. These areas are incorporated into the modeled habitat used for this impact analysis.

Covered activities with the greatest potential to affect California tiger salamander Sonoma County DPS habitat generally include large projects for electric transmission line reconductoring, trenching associated with exposing gas transmission pipelines for maintenance, the replacement or construction of facilities and structures, and construction of new access roads. By permanently or temporarily altering habitat value, these activities may inhibit dispersal, remove or reduce the value of foraging habitat, remove shelter habitat (e.g., burrows), or limit other life history requirements.

PG&E created field protocols and AMMs to reduce the risk of taking individual salamanders and impacting their habitat during covered activities. The AMMs reduce the potential for impacts by including existing construction best management practices to avoid wetlands and ponds, where population density is expected to be highest. Conservation measures described in Section 5.5.1, *Avoidance and Minimization of Impacts*, and for the Central California DPS, above, (specifically, FP-04, FP-11, FP-12, FP-13, FP-15, FP-16, Hot Zone-6, Wetland-1, and Wetland-2) would ensure that the covered activities avoid and minimize potential death or injury of individuals of the California tiger salamander Sonoma County DPS and minimize impacts on its habitat.

Permanent Impacts on Habitat

PG&E anticipates that covered activities could permanently remove 0.3 acre of California tiger salamander Sonoma County DPS habitat annually. (Table 4-3). These activities would be implemented throughout modeled California tiger salamander Sonoma County DPS habitat in the Plan Area, but impacts on habitat typically would be small and geographically dispersed in the Santa Rosa Plain. For example, routine work around steel or wood electric poles, lattice steel towers, or aboveground gas facilities such as gas pipeline valves generally require only small work areas around the facility or equipment. When PG&E's engineers can, and with property owner permission, they will site or relocate facilities outside wetlands or water bodies (for instance, moving a pole a few feet in one direction or another to get it out of the sensitive area). PG&E, as a matter of practice for O&M work, strives to locate both replacement and new facilities outside wetted habitats. No more than 13 acres of modeled California tiger salamander Sonoma County DPS habitat would be affected over 30 years. There is no modeled breeding habitat for California tiger salamander Sonoma

County DPS because of available data in this area, but breeding habitat could be subject to impacts; these are expected to be approximately 1% of total permanent impacts.

Permanent impacts on upland dispersal habitat may result from siting new or replacement facilities in an area where none currently exist. In addition to the loss of grassland land cover, the permanent loss of small patches of upland habitat is typically scattered and could involve the loss of refugia such as burrows if new or replacement facilities are not sited to avoid these microhabitat areas. The small amount of permanent impacts on modeled habitat is not expected to significantly impair the life history requirements of California tiger salamander Sonoma County DPS.

Temporary Impacts on Habitat

Covered activities would temporarily disturb 1.6 acres of California tiger salamander Sonoma County DPS habitat annually (Table 4-3). Annual impacts would vary based on project need and priority, but as described above, these impacts are not expected to appreciably reduce the overall habitat value for the species, or significantly impair essential behavioral patterns of California tiger salamander Sonoma County DPS. Because temporarily affected areas such as grasslands regenerate and are available to the species again within 12 months, the amount of temporarily disturbed habitat unavailable to the species at any point in time is not expected to ever be twice the annual disturbance. This is because impacts may occur at the end of one year and the beginning of the next, and restoration and regeneration of habitat for these two years may cause the total temporary disturbance area to be larger than the annual average. Covered activities would temporarily impact a total of up to 80 acres of habitat over 30 years (Table 4-3). There is no modeled breeding habitat for California tiger salamander Sonoma County DPS because of available data in this area, but breeding habitat could be subject to impacts; these are expected to be approximately 1% of total permanent impacts.

PG&E conducted additional analysis on its vegetation management activities related to NERC ROW clearing work (Activity E10d, Table 4-1) to assess the potential for impacts on California tiger salamander Sonoma County DPS. NERC ROW work is not expected to have an impact on this species because there is less than 1 acre of NERC work planned in Sonoma County within tree-dominated habitat within the range of Sonoma County DPS modeled habitat.

Critical Habitat Impacts

Designated critical habitat for the California tiger salamander Sonoma County DPS encompasses 47,382 acres in the study area, 870 acres of which are in the Plan Area. Covered activities would permanently impact approximately 0.1 acre (a 66-ft. × 66-ft. area) of critical habitat annually and 5 acres of critical habitat over 30 years (Table 4-4).

The primary constituent elements of critical habitat for California tiger salamander Sonoma County DPS include standing bodies of fresh water that allow the species to complete the aquatic portion of its life cycle, adjacent upland areas that contain small mammal burrows for shelter, and accessible upland habitat to allow dispersal between occupied sites. Impacts of covered activities on critical habitat, including its primary constituent elements, are consistent with the direct and indirect impacts previously identified. Approximately 1.9% of the designated critical habitat of the Sonoma County DPS occurs in the Plan Area. Covered activities would permanently impact approximately 0.1 acre of critical habitat and temporarily impact approximately 1 acre annually. PG&E may permanently impact up to 5 acres of critical habitat over 30 years (Table 4-4). This represents

approximately 0.01% of the designated critical habitat for the California tiger salamander Sonoma County DPS.

Indirect Impacts

Potential indirect impacts caused by covered activities are the same as described under California tiger salamander Central California DPS.

4.2.2.3 California Red-Legged Frog

Life History and Distribution

California red-legged frogs use aquatic habitat (ponds or drainages) in grassland and woodland habitats year round, though they can persist for short periods out of water. If water is present they prefer to be in it or adjacent to it, rather than moving into the uplands. They typically breed from November through April, using aquatic habitats that is typically at least 3 feet deep and still or slow-moving, with vegetation consisting of willows, tules, or cattails. Juvenile frogs seem to favor open, shallow aquatic habitats with dense submergent vegetation. Although California red-legged frog can inhabit both ephemeral and permanent streams and ponds, populations probably cannot persist in ephemeral streams in which all surface water disappears (Jennings and Hayes 1994). As ephemeral streams and ponds dry up in the late summer and fall, California red-legged frogs move to other nearby water sources, or temporarily into the uplands.

Adults may take refuge during dry periods in rodent holes or leaf litter in annual grassland, oak woodland, chaparral, and riparian habitats and may move through these habitats during overland migration to and from aquatic habitat. Although California red-legged frogs typically remain near streams or ponds, marked and radio-tagged frogs have moved up to 1.7 miles through upland habitat (Bulger et al. 2003). These movements typically occur during wet weather and at night (U.S. Fish and Wildlife Service 2002a). California red-legged frogs use long-distance movements to travel between ephemeral breeding pools and permanent water sources where they persist following the breeding period and during the driest months (August through October).

This species occupies all counties in the study area, as shown in Figure 4-13 (California Department of Fish and Wildlife 2013). California red-legged frog has an estimated range of 1.14 million acres in the study area, 33,242 acres of which are in the Plan Area (Table 2-3 and Table 4-2).

Direct Impacts

Direct impacts include both impacts on individual frogs, tadpoles, and eggs that could be encountered during covered activities, and the potential impacts on individual adult or juvenile frogs as a result of permanent and temporary loss of modeled habitat.

The potential for the covered activities to take a California red-legged frog is influenced by factors such as the size and duration of the activity and the proximity of the activity to aquatic habitat. Table 4-5 identifies specific covered activities that could affect California red-legged frog habitat.

The majority of PG&E's work consists of smaller-scale activities that focus on maintenance of a specific pole, gas pipeline valve, or other facility that is generally accessible with limited travel in riparian or wetland areas. Routine work around such facilities generally requires only small work

areas and is typically conducted in a matter of hours or days. Smaller-scale activities are conducted year-round and are typically conducted from roads and during the day.

Larger-scale covered activities include projects that involve more planning and coordination over months or years; they typically involve more habitat disturbance, personnel, and vehicles, and have a longer duration than smaller covered activities. As a result, there is a greater potential for covered activities to adversely affect individuals of the species. However, the planning and coordination required to site facilities, implement permit activities, and locate work areas away from sensitive habitat helps avoid and minimize impacts on riparian and wetland areas, minimizing adverse effects.

California red-legged frog is highly reliant on freshwater wetlands and streams for much of the year. When facilities cross streams or other aquatic areas, overhead facilities (electric transmission and distribution lines) typically span drainages and the ground infrastructure (poles or towers) components are usually located outside of riparian areas. In these cases the impacts on California red-legged frog breeding habitat would be minimal, since aquatic habitat would not be affected or disturbed. Gas lines or underground electric lines that cross streams are typically co-located along bridges, tunneled under waterways, or span the stream/drainage. O&M work on these facilities is usually completed with minimal impact on the aquatic habitat or associated riparian areas. Riparian vegetation clearing is not expected to extend beyond 1,000 feet in one consecutive area, and even 1,000 feet of clearing is anticipated only once every 3 to 5 years. Gas ROW clearing (Activity G13a, Table 4-1) may also have impacts on the species, though there is less specificity regarding the location of this work. If 5% of the gas transmission corridor in riparian areas needs some type of vegetation management, up to 11.6 acres of habitat could be subject to impacts each year over the next 5 years; only a portion of this habitat is expected to be breeding habitat. Covered activities that would have an impact on California red-legged frog breeding habitat are the exception rather than the rule. Facilities are generally not located within water because water can erode or degrade facilities.

Modeled habitat is based on the best available data of where potentially suitable habitat occurs. Modeled habitat is distributed in the following proportions across the Plan Area: 27% in Contra Costa County, 27% in Alameda County, 23% in Santa Clara County, 9% in San Mateo County, 6% in Solano County, 4% in Sonoma County, 3% in Marin County, 2% in Napa County and less than 1% in San Francisco County (Table 2-5). These percentages are related more to the extent and density of gas and electric infrastructure in the Plan Area than the distribution of California red-legged frogs in those counties. Within modeled habitat, covered activities would affect both potential breeding and dispersal habitat.

Habitat models indicate that approximately 10.75% of all ROWs in the Plan Area may contain suitable breeding habitat (Table 4-2). The potential breeding habitat is characterized as the riparian area and the actual wetted areas of the stream, creek, or drainage. PG&E used a conservative estimate of 300 feet on each side of the stream to delineate suitable breeding habitat. However, the areas of wetted habitat most important for breeding within the breeding habitat model are typically much smaller, ranging from 5 to 30 feet wide. Therefore, actual wetted habitat used for breeding would be approximately 5% of the modeled breeding habitat (i.e., $30 \text{ feet} \div 600 \text{ feet} = .05$, or 5%).

The proximity of the work to breeding habitat would influence the potential to affect the species. As a matter of current practice, PG&E avoids and minimizes the siting of facilities and work areas in riparian and wetland areas. However, in some instances, work may need to be conducted in riparian

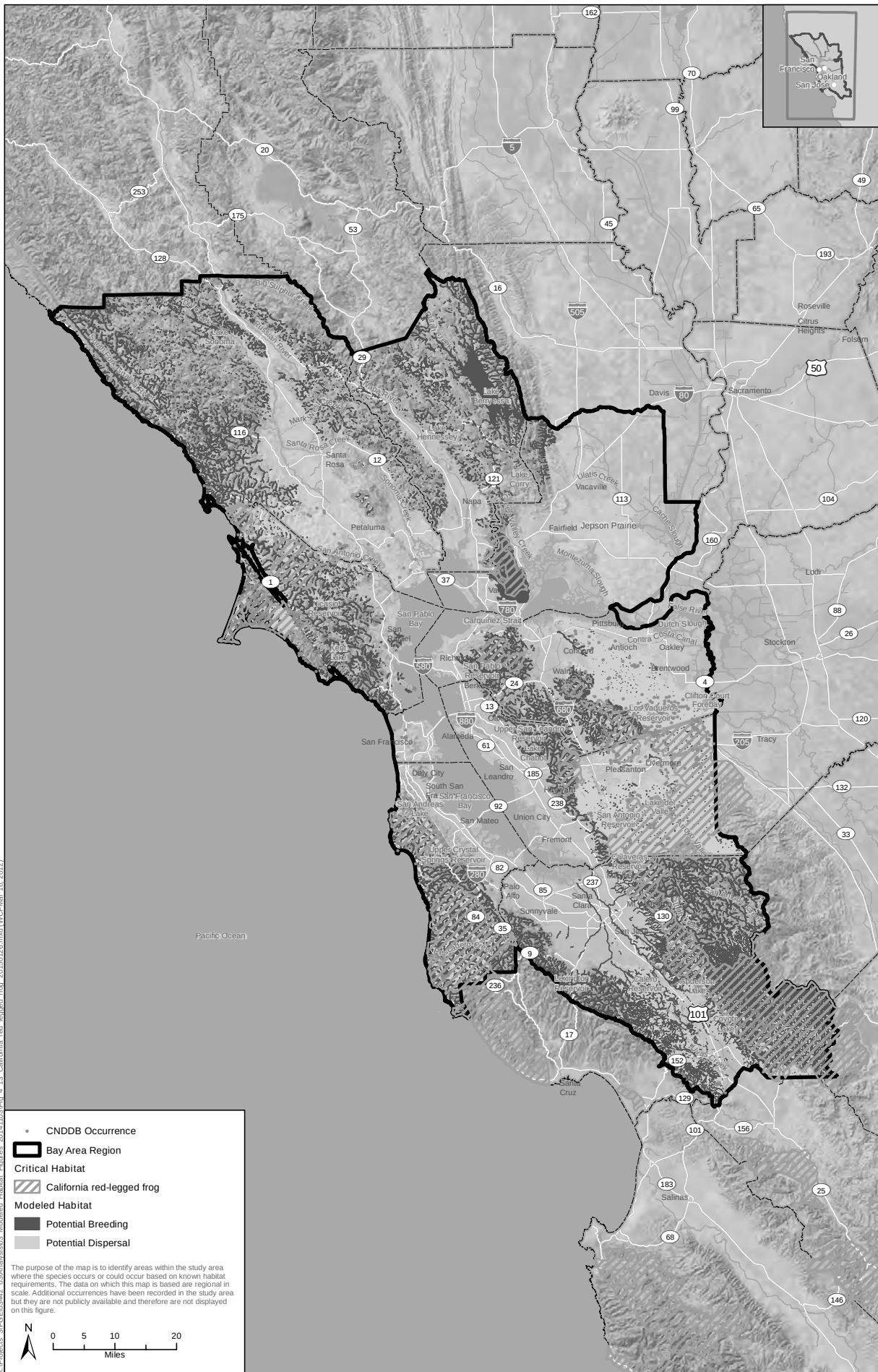


Figure 4-13
California red-legged frog modeled habitat

and wetland areas. In these instances, PG&E evaluates the area for potential presence of the species, delays the work if a sensitive life stage is present and, if a work delay is not possible, then conducts the work with the smallest possible footprint of disturbance. When PG&E performs work in a riparian area in proximity to potentially occupied aquatic habitat, a PG&E biologist would minimize the work area to the greatest extent possible to ensure frogs are not taken while completing the work activity.

The habitat models indicate that about 35% of all ROWs in the Plan Area may contain suitable upland habitat for California red-legged frog (Table 4-2). Upland habitat is characterized as dispersal habitat, critical habitat, and recovery areas within the Plan Area. Covered activities such as grading, trenching, or excavation in upland habitat could result in death or injury of adults, particularly when these activities are implemented close to wetland habitats such as riparian areas and stock ponds. There is an increased chance of encountering California red-legged frogs in the uplands around aquatic resources when the water is drying down, late in the year, or at the end of the breeding season (summer months) when juvenile frogs are dispersing to new ponds or streams in response to dryer conditions at the breeding site. Throughout the year, work in these areas is typically sited to avoid boulders, rocks, mammal burrows, and areas with large amounts of organic debris that provide refuge and shelter for frogs. Vehicles and equipment traveling to and from work areas within dispersal habitat could potentially take adults or juveniles when the species is active on the surface, generally at night when humidity is high or in periods of rainfall between fall and spring when frogs may be actively dispersing. The movement of vehicles and equipment could also crush or injure frogs. Except in emergency conditions, crews perform covered activities during daytime hours, so the potential for death or injury of dispersing frogs is low. A storm-related 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 the work area.

The protocols and AMMs set forth in Chapter 5, *Conservation Strategy*, including FP-11, FP-12, FP-13, FP-15, FP-16, and Wetland-2 (Table 5-1), were developed to address the various mechanisms that could affect the species. They reduce the potential for direct impacts by including construction best management practices to avoid wetlands and riparian areas, and by minimizing work at night and during substantial rain events. Implementing field protocols such as FP-11 and FP 12 (use standard erosion and sediment control BMPs) and Wetland-2 (establish buffer zones around wetlands, ponds, and riparian areas) would reduce the impact on natural land cover types and the potential for the actions of work crews to have a direct impact on the species. Work practices associated with environmental review, planning and screening, and the conservation measures described in Section 5.5.1, *Avoidance and Minimization of Impacts*, would ensure that the covered activities avoid and minimize potential impacts on California red-legged frog and its habitat.

Permanent Impacts on Habitat

Covered activities would permanently impact 1 acre of modeled breeding habitat (i.e., the wetted area and the adjacent riparian areas) annually and would not exceed 42 acres over 30 years. Covered activities would permanently impact 5% or 2.1 acres of actual breeding areas (i.e., wetted area) over the 30-year period (Table 4-3). Annual permanent impacts from covered activities represents less than one-half of 1% of all modeled breeding habitat in the Plan Area.

Covered activities would permanently impact 4 acres of modeled upland habitat annually and 177 acres of upland habitat over 30 years (Table 4-3). The small amount of permanent impacts on

modeled upland habitat used for dispersal is not expected to significantly impair the life history requirements of California red-legged frog.

Temporary Impacts on Habitat

Covered activities would temporarily disturb 8 acres of California red-legged frog modeled breeding habitat (i.e., wetted area and the adjacent riparian areas) annually. Over 30 years, of 377 acres total breeding habitat temporarily affected, approximately 5% or 19 acres of actual breeding habitat (i.e., wetted areas) would be subject to temporary impacts.

Covered activities would have temporary impacts on 30 acres of upland habitat annually, and 1,500 acres of upland habitat over 30 years (Table 4-3). Because temporarily affected areas regenerate and are available to the species again within 12 months, the amount of temporarily disturbed habitat unavailable to the species at any point in time is not expected to ever be twice the annual disturbance. This is because impacts may occur at the end of one year and the beginning of the next, and restoration and regeneration of habitat for these two years may cause the total temporary disturbance area to be larger than the annual average.

Covered vegetation management activities related to NERC ROW clearing (Activity E10d, Table 4-1) have the potential to affect modeled upland habitat by removing canopy above the habitat, which would alter the microclimate conditions.

Approximately 100 line segments will require vegetation removal activities. PG&E intersected these lines with tree-dominated habitats and California red-legged frog modeled habitat to determine how much modeled habitat may be affected. PG&E anticipates selective tree removals could impact approximately 28.6 acres of modeled habitat each year over the next 5 years. Of these, approximately 22% is likely to occur in Alameda County, 22% in Contra Costa County, 6% in San Mateo County, 46% in Santa Clara County, 1% in Solano County, and 4% in Sonoma County. Marin and Napa Counties probably will not require NERC work that could impact California red-legged frog.

Conservation measures described in Section 5.5.1, *Avoidance and Minimization of Impacts*, (specifically, FP-11, FP-13, FP-15, FP-16, and Wetland-2) would ensure that the covered activities minimize impacts on both breeding and upland habitat.

Critical Habitat Impacts

Critical habitat for the California red-legged frog encompasses 640,112 acres in the study area, 10,348 acres of which are in the Plan Area. Covered activities would impact approximately 1.1 acre of critical habitat annually and 55 acres of critical habitat in the Plan Area over 30 years. This represents disturbance to 0.09% of the designated critical habitat.

Impacts of O&M, minor new construction, vegetation management, and pipeline replacement activities on critical habitat, including its primary constituent elements, are consistent with the direct impacts discussed above and indirect impacts discussed below. Impacts on specific critical habitat units are not expected to result within one specific unit, as summarized in Table 4-4.

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 areas or adjacent suitable upland areas by outcompeting native plant species for space, sun, and water. Such an indirect impact could reduce the quality of the habitat for California red-legged frog or make the habitat unsuitable.

Construction activities 300 feet beyond riparian areas could indirectly affect modeled breeding habitat by altering the hydrology or reducing water quality. For example, if PG&E's restoration actions or sediment control measures fail, runoff and sediment could affect wetlands or dispersal habitat.

4.2.3 Reptiles

Covered reptiles occur in specific locations throughout the Plan Area. Most impacts resulting in habitat loss or degradation would be small and temporary. Although some habitat would be lost as a result of covered activities, the covered activities are unlikely to alter the overall distribution and status of covered reptiles because of the limited number of activities that PG&E would implement in these species' habitats.

4.2.3.1 Alameda Whipsnake

Life History and Distribution

Alameda whipsnake depends on complexes of coastal scrub and chaparral with varied vegetation structure for reproduction and growth. Suitable habitat for this species includes communities in the inner Coast Ranges that support mixed chaparral, coastal scrub, annual grassland, and oak woodlands that are adjacent to scrub habitats. Grassland areas with rock outcrops linked to scrub by river corridors are also primary constituent elements for the species. (U.S. Fish and Wildlife Service 2002b).

Rock outcrops with deep crevices or abundant rodent burrows are important habitat components for overnight dens, refuges from predators and heat, foraging, egg laying, and winter hibernation. Alameda whipsnake habitat must consist of a mix of sunny and shady sites in order to provide a range of temperatures for the snake's activities. A sparse shrub canopy is ideal because it also provides a visual barrier from avian predators. The Alameda whipsnake spends November through March in a winter hibernaculum (Swaim 1994; U.S. Fish and Wildlife Service 2000). Their primary prey is lizards, though their diet may include other snakes, birds, and frogs. Telemetry data indicate that, although home ranges of Alameda whipsnakes are centered on shrub communities, they venture up to 500 feet into adjacent habitats, including grassland, oak savanna, and occasionally oak-bay woodland (U.S. Fish and Wildlife Service 2005c). There are some instances where Alameda whipsnakes have dispersed more than 1,000 feet when rock outcrops are nearby, but long-range dispersal may not be common (U.S. Fish and Wildlife Service 2002c). Alameda whipsnakes lay a clutch of eggs in loose soil and under logs or rocks (California Department of Fish and Wildlife 2010). Female whipsnakes use grassland areas after mating, possibly in their search for suitable egg-laying sites (Swaim 1994).

In the study area, CNDDDB documents the presence of Alameda whipsnake in Contra Costa and Alameda Counties, and the northernmost portion of eastern Santa Clara County, as shown in Figure 4-14 (California Department of Fish and Game 2011). The species has 335,452 acres of modeled habitat in the study area, of which 10,803 acres are within the Plan Area (Table 2-3 and Table 4-2). The majority (64%) of the modeled habitat for Alameda whipsnake falls within Contra Costa County, with 35% in Alameda County and 1% Santa Clara County (Table 2-5).

Direct Impacts

Direct impacts include both impacts on individual whipsnakes that could be encountered during implementation of covered activities and the permanent and temporary loss of modeled habitat. In addition to the analytical assumptions described in the introduction to Section 4.2, this impact analysis is further guided by the results of research indicating that Alameda whipsnakes primarily use scrub and chaparral (i.e., core and perimeter core) habitat.

Smaller-scale covered activities focus on maintenance of a specific pole, gas pipeline valve, or other discrete facility that is generally accessible from existing roads, and represent the majority of PG&E's work, as described in Section 4.1.3.2, *Direct Impacts on Individual Species*. The probability of encountering individuals of the species during smaller-scale covered activities is low because most activities involve small areas and few personnel and vehicles, whipsnakes would likely move away from the source of disturbance, and activities would not require the removal of scrub or chaparral habitat. These activities are not typically located in core or perimeter core habitats due to the difficulty of accessing these areas and because few electric and gas distribution facilities are located in these areas (Table 4-2). Smaller-scale activities are conducted year-round from roads and have limited impacts on scrub and chaparral communities.

Larger-scale covered activities involve planning and coordination over months or years, and typically involve more habitat disturbance over longer durations than smaller-scale covered activities, as described in Section 4.1.3.2. As a result, there is a greater potential for larger-scale covered activities to adversely affect individuals of the species, but the probability that individuals would be killed or injured remains low because of the planning and coordination required to site facilities, implement permit activities, and locate work areas away from sensitive habitat. PG&E does anticipate the need to reclaim the gas transmission pipeline ROW in areas of core and perimeter core habitat that have become overgrown with chaparral or scrub vegetation by permanently removing vegetation. These overgrown areas are located in areas of the East Bay Regional Park system. Under PG&E's current utility standard, chaparral is considered incompatible vegetation and would be permanently removed if found within 10 feet of the pipeline. The extent of anticipated clearing in the core and perimeter core areas is anticipated to not exceed 34 acres, and is more likely to be less than 1.2 acres of core and 4.6 acres of perimeter core, or less than 6 acres in total over the permit term. PG&E generally schedules larger-scale covered activities to minimize work during the winter, when the species is inactive. Large covered activities would be implemented outside of winter and would affect Alameda whipsnake because some activities would take place in core or perimeter core habitats.

The potential to affect Alameda whipsnakes is greatest in core and perimeter core habitats. Movement of vehicles, removal of vegetation, or grading of roads during the day in core and perimeter core habitats could result in take of whipsnake. The potential for the covered activities to take Alameda whipsnake is influenced by factors such as the presence of scrub, chaparral, and rock outcrops, the duration of the activities, time of year, time of day, amount of ground disturbance, and

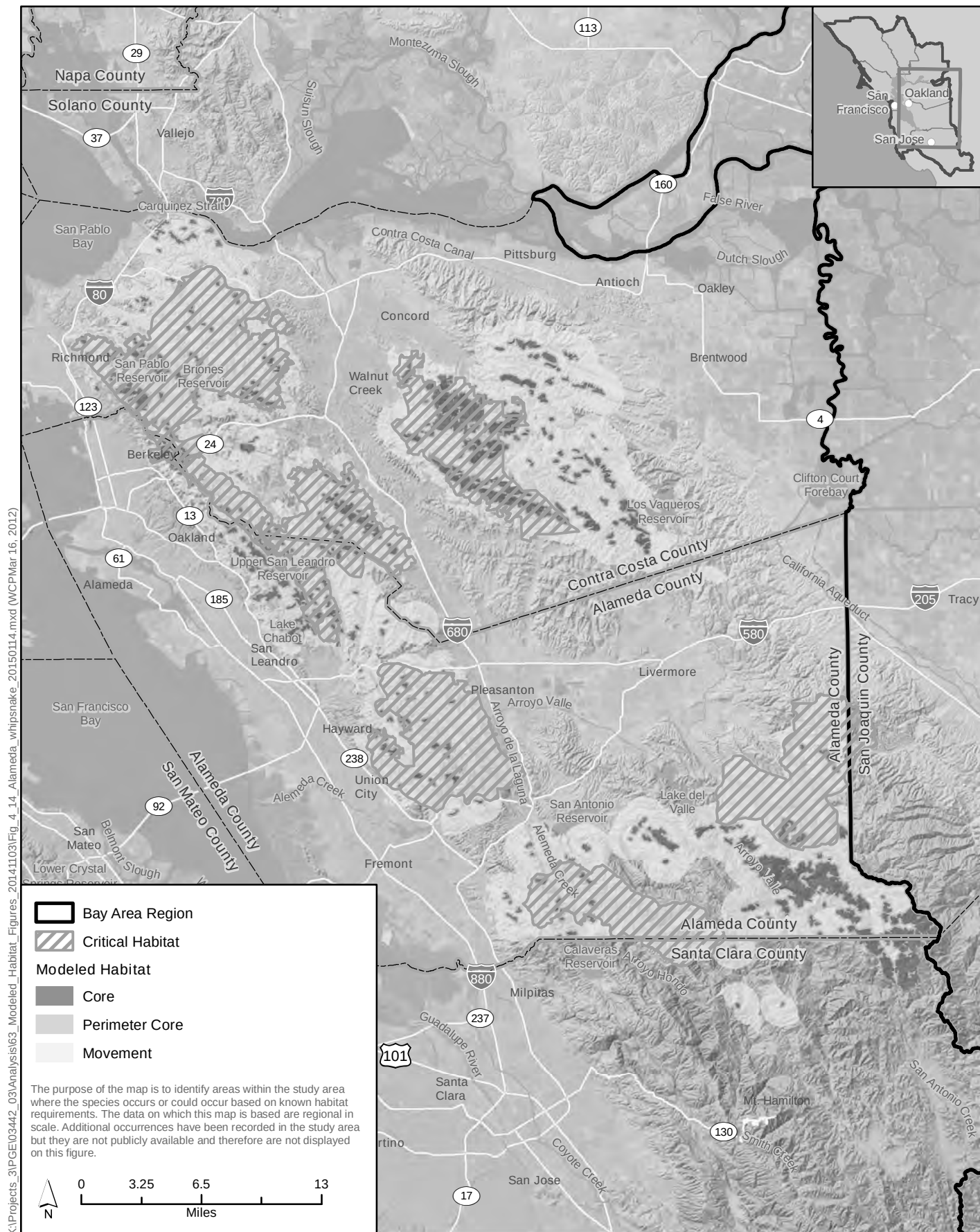


Figure 4-14
Alameda whipsnake modeled habitat

the habitat where the covered activities take place. Table 4-2 indicates the amount of ROW located within modeled habitat by facility type. Table 4-5 identifies specific covered activities that could affect Alameda whipsnake habitat.

Covered activities that include grading, trenching, or excavation could result in death or injury of adults, juveniles, or eggs in each of these habitat types. FP-13, which specifies fitting open trenches or steep-walled holes with escape ramps, would help minimize impacts on individual Alameda whipsnakes. Activities in movement habitat are less likely to impact individuals because Alameda whipsnakes use these areas less frequently and their density in these areas is lower, though vehicles and equipment traveling to and from work areas could potentially crush adults or juveniles. For those activities, the highest potential for impacts is during the day from April to November, when snakes are above-ground and active. Movement habitat occurs in 12.59% of the Plan Area (Table 4-2). Movement (or dispersal) habitat represents the area used by snakes for the purpose of moving between territories in search of food, mates, or shelter. Movement habitat consists of all natural land cover types within 1,000 feet of perimeter core habitats.

Modeled habitat for Alameda whipsnake is based on the best available data of where potentially suitable habitat occurs. Within modeled habitat, PG&E would impact core, perimeter core, and movement habitat. Alameda whipsnake modeled habitat in the Plan Area includes 0.5% core habitat (Table 4-2). Core habitat consists of scrub and chaparral communities where Alameda whipsnake is most likely to occur. Core habitats—particularly rock outcrops located within scrub and chaparral land cover types—are used during the mating period and throughout the breeding season.

The Plan Area contains 1.65% perimeter core habitat, which includes primary dispersal areas of 500 feet around core habitats. These areas could be used during daily movements or as whipsnakes move from one core habitat block to another. There are 34 acres of core habitat within gas transmission line corridors and 17 acres of core habitat within gas distribution line corridors (Table 4-2). It is anticipated that the entire gas transmission corridor could be entirely reclaimed in areas where chaparral or scrub vegetation have overgrown the pipeline and, therefore, a maximum of 34 acres of modeled habitat would be permanently impacted early in the permit term.

Removing overstory vegetation could leave the Alameda whipsnake more susceptible to predation or it could change the microclimate within core and perimeter core habitats, especially around rock outcrops where basking and mating occur. Constructing new access roads could fragment habitat or make snakes more susceptible to death or injury.

Conservation measures described in Section 5.5.1, *Avoidance and Minimization of Impacts*, specifically, FP-02, FP-03, FP-04, which avoid impacts on vegetation; FP-07, which limits vehicle speed to no more than 15 mph; FP-10, which minimizes activity footprints and time spent at each location; and FP-13 (Table 5-1), would help ensure that the covered activities avoid and minimize potential death or injury of individual Alameda whipsnakes and impacts on their habitat.

Permanent Impacts on Habitat

Permanent impacts on core or perimeter core habitat may result from siting new or replacement facilities in an area where none currently exist. These could result in the loss of small patches of habitat and the loss of core and perimeter core habitat. Covered activities could permanently impact 0.68 acre of Alameda whipsnake core and 0.5 acres of perimeter core habitat annually within its 335,000-acre range (Table 4-3). No more than 34 acres of core and 25 acres of perimeter core habitat would be permanently affected over 30 years (Table 4-3). Covered activities could

permanently impact 0.5 acre of movement habitat annually, and 27 acres of movement habitat over 30 years (Table 4-3).

Except for clearing the gas line to maintain safety and access, permanent impacts on core and perimeter core habitat would be rare and consist of very small impacts dispersed across the species' range. However, to reclaim the pipeline ROW, areas that have become overgrown with chaparral or scrub vegetation need to be permanently cleared to allow for inspections and ease of access. In those instances where a facility or equipment may have been sited within scrub or chaparral in the past, PG&E would minimize additional disturbance when feasible to do so. Access roads and staging areas are already in place to access existing facilities in these typically impenetrable land cover types. Because most facilities in core and perimeter core habitats are near existing roads, only a small number of activities that would be implemented in core and perimeter core habitats and result in vegetation removal or earth moving activities that could affect snakes underground. The amount of permanent impacts on core, perimeter core, and movement habitat is not expected to significantly impair the life history requirements of Alameda whipsnake.

Temporary Impacts on Habitat

Covered activities would temporarily disturb 0.3 acres of core and 1.4 acres of perimeter core Alameda whipsnake habitat annually, and have temporary impacts on up to 13 acres of core and 70 acres of perimeter core habitat over 30 years. Covered activities would also temporarily disturb 6.6 acres of Alameda whipsnake movement habitat annually, and 329 acres over 30 years (Table 4-3).

Once a pipeline ROW is cleared of vegetation, temporary impacts on chaparral and scrub vegetation (as described above) would result from maintaining a clear path over the pipeline ROW. The pruning of vegetation is not expected to alter habitat values in a way that would limit use of the ROW by Alameda whipsnake once the covered activity is complete. For example, if an access road is being overgrown or crews cannot walk to a facility, hand pruning may be needed to allow access by vehicle or on foot. Most temporary impacts would be on perimeter core and movement habitat. Habitat would be inaccessible for a matter of several hours or days, and whipsnakes would move back into the core habitat once equipment moves out of the area. When grassland excavation occurs in perimeter core or movement habitat, those areas are expected to regenerate and provide the same habitat value to the species again within 12 months; therefore, the amount of temporarily disturbed habitat unavailable to the species at any point in time is not expected to ever be twice the annual estimate. This is because impacts may occur at the end of one year and the beginning of the next, and restoration and regeneration of dispersal habitat for these two years may cause the total temporary disturbance area to be larger than the annual average.

Field protocols, AMMs, and other conservation measures described in Section 5.5.1, *Avoidance and Minimization of Impacts*, would ensure that the covered activities avoid and minimize potential death or injury of individuals of the species and impacts on its habitat.

Critical Habitat Impacts

The study area contains 154,169 acres of designated critical habitat, 4,255 acres of which are in the Plan Area. Primary constituent elements for the species consist of scrub/shrub communities with a mosaic of open and closed canopy; woodland or annual grassland plant communities contiguous to lands containing scrub/shrub communities; and lands containing rock outcrops, talus, and small mammal burrows within or adjacent to scrub/shrub communities. Covered activities would permanently impact 0.3 acre of critical habitat and temporarily impact 3 acres annually (Table 4-4).

PG&E may permanently impact up to 13 acres of critical habitat over 30 years (Table 4-4). This represents approximately 0.01% of critical habitat.

Indirect Impacts

Potential indirect impacts caused by covered activities could include inadvertently introducing invasive plant species by means of construction equipment, personnel, or contaminated seed or straw. Invasive plants could reduce dispersal habitat suitability by outcompeting native plant species for space, sun, and water.

4.2.3.2 San Francisco Garter Snake

Life History and Distribution

San Francisco garter snake inhabits primarily permanent freshwater wetlands and adjacent open water, using these areas for feeding, and adjacent grasslands and shrublands for upland cover and breeding. Dispersal can be either by water or upland. San Francisco garter snake depends on upland rodent burrows, fallen logs, and open basking sites. California red-legged frogs and Pacific tree frogs are important prey species. San Francisco garter snake can be inactive in the winter as well as periods during the summer when aquatic habitats are dry.

In the study area, CNDDB documents the San Francisco garter snake only in San Mateo County, as shown in Figure 4-15 (California Department of Fish and Game 2011). The species has an estimated range of 438,835 acres in California. There are 6,020 acres of modeled habitat in the study area, 573 acres of which are in the Plan Area (Table 2-3 and Table 4-2).

Direct Impacts

Ground-disturbing activities (grading, trenching, or excavating) could crush or bury newborns, juveniles, and adults in upland areas and as well as snakes using adjacent aquatic areas for dispersal, basking, foraging, or sheltering.

Vehicles and equipment traveling to and from work areas also could potentially take newborn, juveniles, and adults when traveling through upland habitats while the species is using these areas for cover or dispersal. Moving vehicles can kill or injure snakes when they are active in the uplands or crush them while they seek refuge in small burrows that collapse from the weight of vehicles and equipment.

PG&E has identified hot zones in association with modeled habitat for San Francisco garter snake in the study area, which includes freshwater habitats in and around the city of Half Moon Bay, open water habitat within the mountains to the east of Half Moon Bay (i.e., Crystal Springs Reservoir), habitat south of Pacifica, off Highway 1 near Año Nuevo State Reserve, and habitat west of Highway 101 near San Francisco International Airport. Gas and electric transmission lines pass through the hot zones near the airport, in habitat adjacent to the reservoirs just west of I-280, and in some of the habitat around Half Moon Bay. Gas and electric distribution lines are present in the habitat near Pacifica, Half Moon Bay, San Francisco International Airport, and in habitat just south of Skyline College.

Table 4-5 identifies specific covered activities that could impact San Francisco garter snake habitat. Conservation measures described in Section 5.5.1, *Avoidance and Minimization of Impact*,

specifically, FP-11 (erosion control), FP-13 (escape ramps), FP-15 and FP-16 (buffers), Hot Zone-7, and Wetland-2 (buffer aquatic habitats), would ensure that the covered activities avoid potential death or injury of individuals of the species, and avoid and minimize potential impacts on habitat (Table 5-1). Hot Zone-7 is specifically targeted to San Francisco garter snake. It limits ground-disturbing activities to the active season; instructs field crews to use hand tools to cut vegetation to 3 inches high so a biologist can conduct a survey before activity can continue, and to install exclusion fencing if the species is present (Table 5-1).

Permanent Impacts on Habitat

PG&E anticipates that covered activities could permanently remove 0.04 acre of core habitat (a 59-ft. × 59-ft. area) and 0.04 acre of dispersal habitat for San Francisco garter snake annually in the Plan Area, and no more than 2 acres of core habitat and 2 acres of dispersal habitat over 30 years (Table 4-3). Covered activities would result in incremental impacts throughout San Mateo County, but not in one specific location.

Temporary Impacts on Habitat

Covered activities would temporarily disturb 0.3 acre of core habitat and 0.2 acre of dispersal habitat annually, and no more than 16 acres of core habitat and 10 acres of dispersal habitat over 30 years (Table 4-3). Covered activities would result in incremental impacts throughout San Mateo County but not in one specific location.

Critical Habitat Impact

No critical habitat has been designated for San Francisco garter snake.

Indirect Impacts

Reduction in both the quality and availability of habitat over time could cause snakes to move to other less-desirable areas with limited food or cover where they are less able to survive. Installing new infrastructure that results in the modification of aquatic habitats over time could have adverse consequences for San Francisco garter snake if habitats become unsuitable for the species through changes in vegetative cover, hydrology, or changes to water quality that impact its prey base.

4.2.4 Birds

PG&E is covering one bird species, Ridgway's rail. Most impacts resulting in habitat loss or degradation would be small and temporary. Direct impacts on this species would vary based on the environmental setting at a covered activity location, the type and extent of activities undertaken, the duration and timing of the activity, the sensitivity and habituation of the species, and the AMMs implemented. This analysis focuses on nesting habitat because covered activities could have the greatest impact on nesting birds. While foraging habitat is an important component of this species' life history, it is typically not the limiting factor for species persistence and survival.

The HCP is focused on habitat disturbances and does not address bird electrocutions and bird strikes or collisions on overhead electric facilities. PG&E's Avian Protection Plan addresses these issues separately.

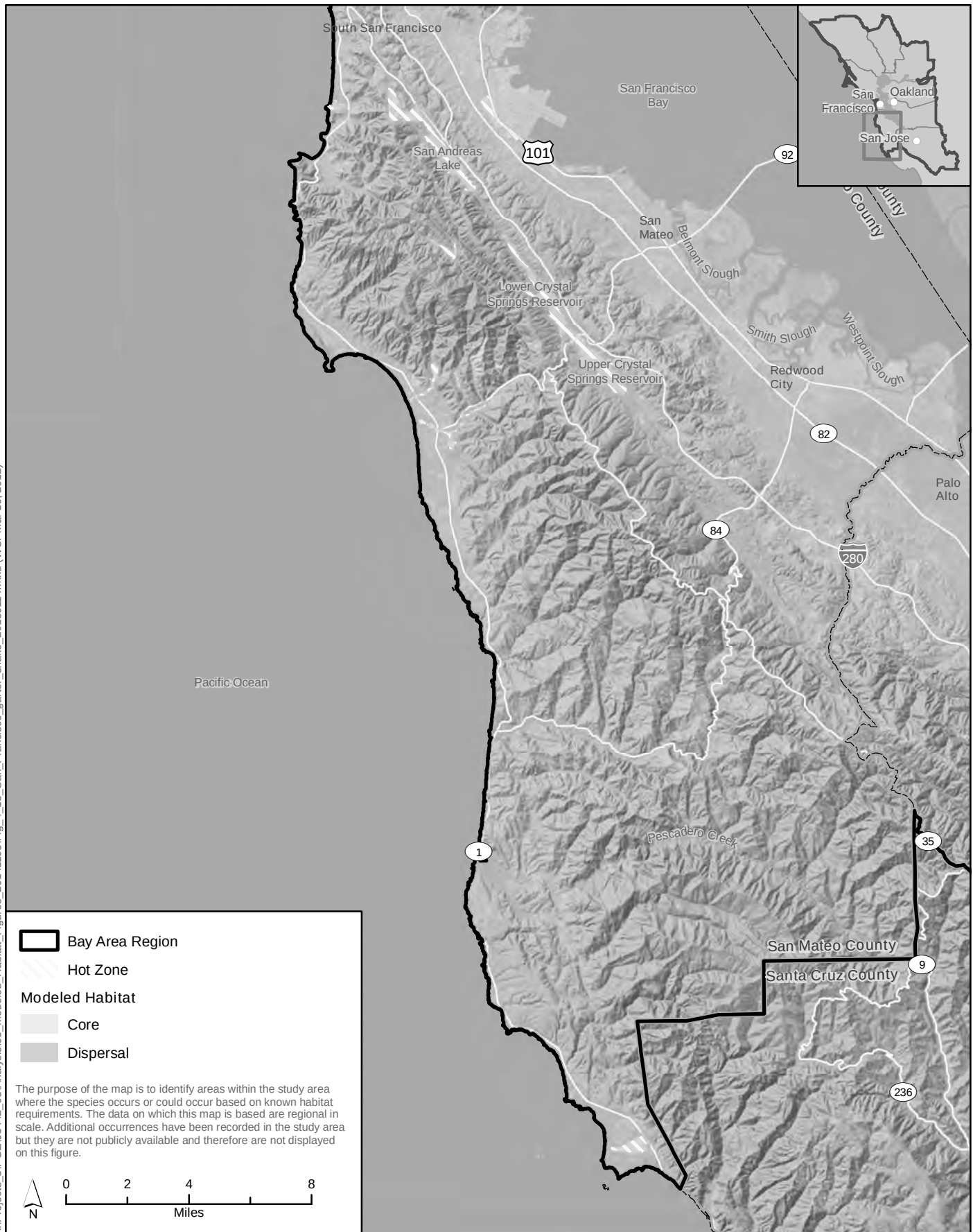


Figure 4-15
San Francisco garter snake modeled habitat

4.2.4.1 Ridgway's Rail

Life History and Distribution

Ridgway's rail populations currently occupy only San Francisco and San Pablo Bays and Suisun Marsh in Solano County, as shown in Figure 4-16. The species uses primarily saline-brackish permanent wetland for breeding and foraging and less frequently associates itself with saline-brackish seasonal wetlands. There are 135,044 acres of modeled habitat in the study area, 2,622 acres of which are in the Plan Area (Table 2-3 and Table 4-2).

Direct Impacts

Modeled habitat for Ridgway's rail occurs along the fringe of San Francisco Bay, extending into remnant salt marshes bordering the salt ponds of the South Bay, Suisun Marsh, Petaluma Marsh, Napa Sonoma Marsh, and other areas along northern San Pablo Bay. The largest, most contiguous patch of habitat is Suisun Marsh. One gas transmission line traverses this habitat patch, crossing into it from the east near Birds Landing and one electric transmission line crosses the northern extent of Suisun Marsh. Several electric distribution lines are also situated within this marsh. Another large patch of habitat is the Napa Sonoma Marsh north of San Pablo Bay, which has one electric transmission line and a few electric distribution lines crossing it.

Additional habitat can be found around San Francisco and San Pablo Bays. Included are Petaluma Marsh and habitat extending into remnant salt marshes bordering the salt ponds of the South Bay. Many of these smaller habitat patches contain electric transmission and distribution lines.

Covered activities associated with electric transmission and distribution lines could impact Ridgway's rail and its habitat in these areas. Ground-disturbing activities (grading, trenching, or excavating) could crush eggs. Similarly, vehicles and equipment traveling to and from work areas also could potentially crush eggs, kill or injure chicks or adults when traveling through pickleweed or marsh habitats. Table 4-5 identifies specific covered activities that could impact Ridgway's rail habitat. Conservation measures described in Section 5.5.1, *Avoidance and Minimization of Impacts* (specifically, FP-02, FP-03, FP-04, FP-05, FP-16, FP-18, and Hot Zone-8) would ensure that the covered activities avoid impacts on individuals and avoid and minimize impacts on their habitat (Table 5-1).

Permanent Impacts on Habitat

PG&E anticipates that covered activities could permanently remove 0.1 acre (a 66-ft. × 66-ft. area) of Ridgway's rail habitat annually in the Plan Area and no more than 3.4 acres over 30 years (Table 4-3).

Temporary Impacts on Habitat

Covered activities would temporarily disturb 0.7 acre of habitat annually and no more than 34 acres over 30 years (Table 4-3).

Critical Habitat Impacts

No critical habitat has been designated for Ridgway's rail.

Indirect Impacts

The inadvertent introduction of an invasive plant species, such as invasive cordgrass (*Spartina* spp.), by construction equipment, personnel, or contaminated seed or straw is an indirect impact that could have serious implications for Ridgway's rail. Invasive plants such as cordgrass can displace native plant species and alter the sediment accretion rate in mudflats, impacting foraging and nesting habitat. However, as noted in the recovery plan, this is complicated by the fact that hybrid *Spartina* currently provides habitat for Ridgway's rail (U.S. Fish and Wildlife Service 2013).

Human presence and activity associated with covered activities may also lead to indirect impacts. Attractants and scents from ground disturbance could invite native and nonnative predators to a work site after personnel have left. Feral and non-feral pet cats and dogs, coyotes, raccoons, and other wildlife all could prey upon Ridgway's rail eggs, young, and adults. Also, any new poles and towers, in addition to existing ones, increase the risk of predation from ravens and red-tailed hawks that are known to use these areas for perches and nest sites (U.S. Fish and Wildlife Service 2013). However, PG&E would implement FP-8 and FP-10 to avoid these types of impacts. FP-8 prohibits pets at work sites; FP-10 minimizes activity footprints and time spent at each location.

4.2.5 Mammals

PG&E is covering two mammal species, the salt marsh harvest mouse and the San Joaquin kit fox. PG&E's covered activities are unlikely to alter the overall distribution and status of covered mammals or impact a large number of individuals. Impacts of habitat loss on covered mammals would be minimal because the majority of covered activity impacts are small and temporary. Large-scale activities are also unlikely to result in substantial habitat loss because of PG&E's practices to minimize impacts in sensitive habitat. For example, planners and biologists often incorporate engineering and construction alternatives into construction plans to avoid and minimize impacts. Impacts on covered mammals would vary depending on the implementation of avoidance, minimization, and mitigation measures described in Chapter 5, *Conservation Strategy*.

4.2.5.1 Salt Marsh Harvest Mouse

Life History and Distribution

Salt marsh harvest mouse is endemic to salt marshes bordering San Francisco Bay, San Pablo Bay, and Suisun Bay. Salt marsh harvest mouse uses primarily saline-brackish permanent marsh; it also uses adjacent saline-brackish seasonal wetland and grassland for foraging, movement, and refugia. Salt marsh harvest mouse occurs in all of the counties within the study area except San Francisco County, as shown in Figure 4-17 (California Department of Fish and Game 2011). The species' range is entirely within the study area. There are approximately 60,064 acres of modeled habitat in the study area, 2,138 acres of which are in the Plan Area (Table 2-3 and Table 4-2).

Because this is a narrow-distribution species, patches of contiguous, well-connected pickleweed (*Salicornia* spp.) habitat that support movement are important to the viability of local populations. Habitat for this species occurs in salt marsh and the sloughs and channels that border salt marsh habitat along the Bay fringe in the South San Francisco Bay, San Pablo Bay, Suisun Bay, and Grizzly Bay. Patches of high-quality habitat also occur in a number of sloughs of the South Bay, as well as sloughs and salt marshes of San Pablo and Suisun Bays. Many of these patches of habitat are relatively large and contiguous, but isolated from one another by unsuitable habitat and urban

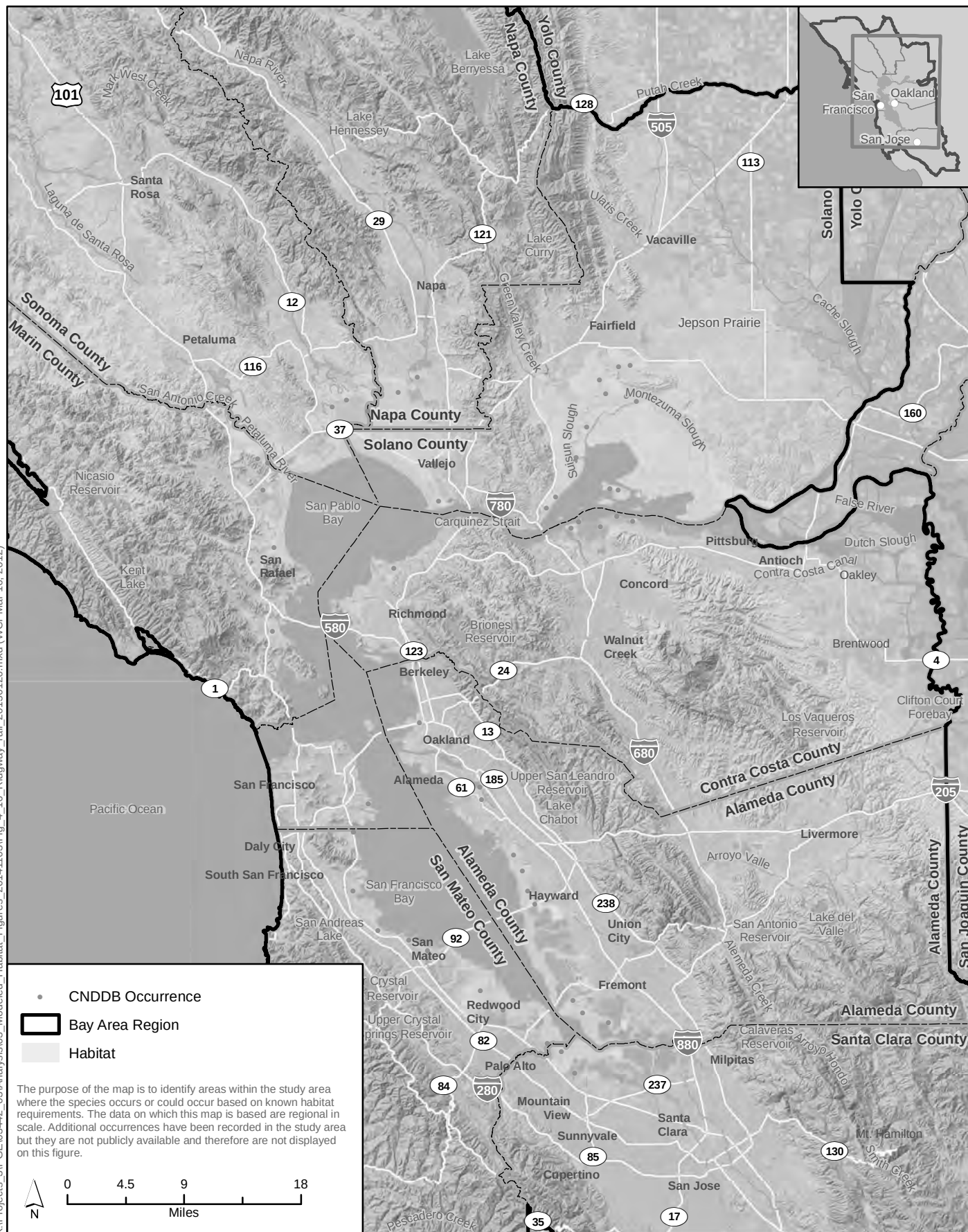


Figure 4-16
California Ridgway's rail modeled habitat

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Figure 4-17
Salt marsh harvest mouse modeled habitat

development. A number of PG&E facilities cross the most suitable patches located throughout bay fringe habitats, including electric and gas facility corridors and boardwalks in a number of locations.

Direct Impacts

Covered activities could result in death or injury of salt marsh harvest mice and habitat removal. Covered activities that include trenching or excavation could result in death or injury of young and adults.

Covered activities within or adjacent to habitat for salt marsh harvest mouse could result in the take of individuals. The presence and movement of work vehicles, equipment, and personnel, and associated noises could disrupt normal behaviors of individuals and result in increased energy expenditures (e.g., increased foraging time), decreased reproductive success (e.g., decreased ability to feed young, inability to find mates), and reduced overall survivorship. However, these impacts are generally unlikely because of current practices when working in marsh habitat. Conservation measures described in Section 5.5.1, *Avoidance and Minimization of Impacts* (specifically, FP-05, FP-06, FP-13, and Hot Zone-8) would ensure that the covered activities avoid and minimize adverse effects. FP-06 instructs field crews to inspect pipes and culverts for covered wildlife and contact a biologist if animals are discovered. Hot Zone-8 requires a biologist to flag access routes for crews when working in tidal marsh or coastal wetland habitat; assess the site to determine if the use of vegetation mats or helicopters, or hand tools for vegetation removal would be necessary; and whether an onsite biological monitor is needed to protect salt marsh harvest mouse. This measure also prescribes flushing vegetation to force salt marsh harvest mouse out of work areas and into adjacent habitat before placing vegetation mats or removing vegetation (Table 5-1).

Covered activities most likely to permanently impact salt marsh harvest mouse habitat generally include minor new construction activities sited in areas of suitable habitat that may be occupied by the species. Ground disturbance caused by these activities would be the result of off-road travel, construction, or equipment laydown.

A small number of electric transmission and distribution lines and gas transmission lines cross the most suitable patches of habitat in the marshes bordering Suisun Bay and Grizzly Bay. Included is one of this area's highly suitable, contiguous patches of habitat, located just north of China Camp State Park. An electric transmission line bisects the area. Ground-disturbing activities could temporarily impact habitat; however, the lack of urbanization in these areas reduces the frequency with which maintenance and upgrades would be necessary.

Large blocks of salt marsh harvest mouse habitat lie along and north of San Pablo Bay (Napa Sonoma Marsh and Petaluma Marsh); only a few electric transmission and distribution lines cross these areas. Ground-disturbing activities associated with these lines could temporarily impact salt marsh harvest mouse habitat.

A number of patches occur throughout the salt marshes of the South Bay. Some of these patches are relatively large and well-connected with one another and with patches of higher suitability. A number of electric transmission lines and a few electric distribution and gas transmission lines cross these patches. Electric transmission lines and associated boardwalks cross a large, well connected patch of habitat located near Redwood City. Ground-disturbing activities associated with these lines could temporarily impact salt marsh harvest mouse habitat.

Smaller, disjunct patches comprise the rest of the habitat for this species, and many of these patches contain electric transmission and distribution lines and a few gas transmission lines; however the overall number of lines in these habitats is low. Many of these patches are near urbanized areas along the Bay fringe. Ground-disturbing activities associated with these lines could temporarily impact salt marsh harvest mouse habitat.

Tidal brackish emergent marsh bordering San Francisco, San Pablo, Grizzly Bay, and Suisun Bay are generally of particular concern. A gas transmission line passes through occupied habitat in Suisun Marsh. This line runs through habitat from the east starting around Bird's Landing and heading ultimately to the west toward Grizzly Bay. Any excavation along this line could impact habitat and result in take, including mortality of salt marsh harvest mouse. PG&E has designated all marshes a hot zone.

Several large-scale restoration projects are underway in San Francisco Bay that could expand this species' habitat. Over time, as the salt marsh establishes, covered activities could impact newly established salt marsh habitat. Table 4-5 identifies specific covered activities that could impact salt marsh harvest mouse habitat. Conservation measures described in Section 5.5.1, *Avoidance and Minimization of Impacts* (specifically, FP-02, FP-03, FP-04, FP-05, and Hot Zone-8) would ensure that the covered activities avoid and minimize potential impacts on habitat.

Permanent Impacts on Habitat

PG&E anticipates that covered activities could permanently remove 0.07 acre (a 55-ft × 55-ft area) of salt marsh harvest mouse habitat annually in the Plan Area, and no more than 3.7 acres over 30 years (Table 4-3).

Temporary Impacts on Habitat

Covered activities would temporarily disturb 0.7 acre of salt marsh harvest mouse habitat annually and no more than 35 acres over 30 years (Table 4-3).

Critical Habitat Impacts

Critical habitat has not been designated for salt marsh harvest mouse.

Indirect Impacts

Inadvertent introduction of an invasive plant species, such as iceplant (*Carpobrotus* spp.) or perennial pepperweed (*Lepidium latifolium*), by construction equipment, personnel, or contaminated seed or straw is an indirect impact that could have serious implications for salt marsh harvest mouse. Invasive plants can outcompete and displace pickleweed (*Salicornia pacifica*), the salt marsh harvest mouse's preferred habitat.

Human presence and activity associated with covered activities may also lead to indirect impacts. Attractants and scents from ground disturbance could invite native and nonnative predators to a work site after personnel have left. Feral and pet cats and dogs, coyotes, raccoons, and other wildlife all could prey upon salt marsh harvest mouse young and adults.

4.2.5.2 San Joaquin Kit Fox

Life History and Distribution

San Joaquin kit fox uses primarily grasslands for denning and foraging. Less frequently, the species utilizes non-flooded cropland and oak woodland for foraging purposes. San Joaquin kit foxes prefer loose-textured and deeper soils, but have occupied a wide range of soil types. They may construct their own dens, but where soils make digging difficult, foxes frequently modify and use burrows built by other animals, particularly those of California ground squirrels. Structures such as culverts, abandoned pipelines, and well casings may also serve as den sites.

There are 182,959 acres of modeled habitat in the study area, 8,279 acres of which occur in the Plan Area (Table 2-3 and Table 4-2). In the study area, there are CNDDDB records for San Joaquin kit fox in Contra Costa, Alameda, and Santa Clara Counties, as shown in Figure 4-18; however, observations in these areas are rare and though it has been observed in recent decades no population are known to be present (California Department of Fish and Wildlife 2013; Cypher *et al.* 2013). According to Cypher *et al.* (2013), the northern range is characterized by highly fragmented medium suitability habitat consisting primarily of dense grasslands dominated by wild oats, and these conditions may not be sufficient to sustain persistent kit fox populations. In the Plan Area, San Joaquin kit fox has historically been found in eastern Alameda and Contra Costa Counties, and the southeastern corner of Santa Clara County.

Direct Impacts

Covered activities could result in death or injury of adults and young, although take of any kit fox is unlikely. Adults and young could be killed or injured during ground-disturbing (grading, trenching, and excavating) activities if occupied dens collapse. Vehicular movement associated with covered activities could take individuals inhabiting or moving through the work area. Kit foxes are curious animals and construction sites may also attract individuals 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. Because most ground-disturbing work is undertaken in the summer, encounters with kit foxes would be greatest during and immediately following the pupping season (generally March through August) when adults are actively hunting to feed their young and young are exploring and dispersing from natal sites.

Covered activities within or adjacent to suitable core habitat for San Joaquin kit fox could result in the harassment of individuals. The presence and movement of work vehicles, equipment, and personnel, and associated noises, could disrupt normal behaviors of individuals and result in increased energy expenditures (e.g., flushing from dens, increased foraging time), decreased reproductive success (e.g., natal den abandonment, decreased ability to feed young, inability to find mates), and reduced overall survivorship. These impacts are generally unlikely, however, because of limited known individuals in this portion of the species' range and PG&E's current practices to minimize burrow impacts. For example, FP-02, FP-03, and FP-04 direct field crews to park on existing pavement or other designated areas, to use existing access and ROW roads rather than creating new ones, and to locate off-road access routes to minimize impacts on land cover and small mammal burrows. FP-06 provides for a biologist to inspect pipes and culverts to ensure no wildlife is present in them, FP-07 limits speed on unpaved roads to avoid collisions. Species-specific AMM SJKF-1 calls for a biologist to inspect the work site for dens and occupants, and specifies protective measures to avoid killing or injuring kit fox or disturbing or destroying dens (Table 5-1). These and

additional field protocols and AMMs described in Section 5.5.1, *Avoidance and Minimization of Impacts*, would ensure that the covered activities avoid and minimize potential death or injury of individuals.

Ground-disturbing activities (particularly trenching) could have the greatest potential to result in impacts when conducted within or adjacent to suitable core habitat. Table 4-5 identifies specific covered activities that could impact San Joaquin kit fox habitat. Activities such as pole replacements and pole equipment repair that are most likely to affect kit foxes are generally of short duration, and temporary disturbances to habitat or harassment of the species would not be expected to have long-term effects on survival or reproductive success.

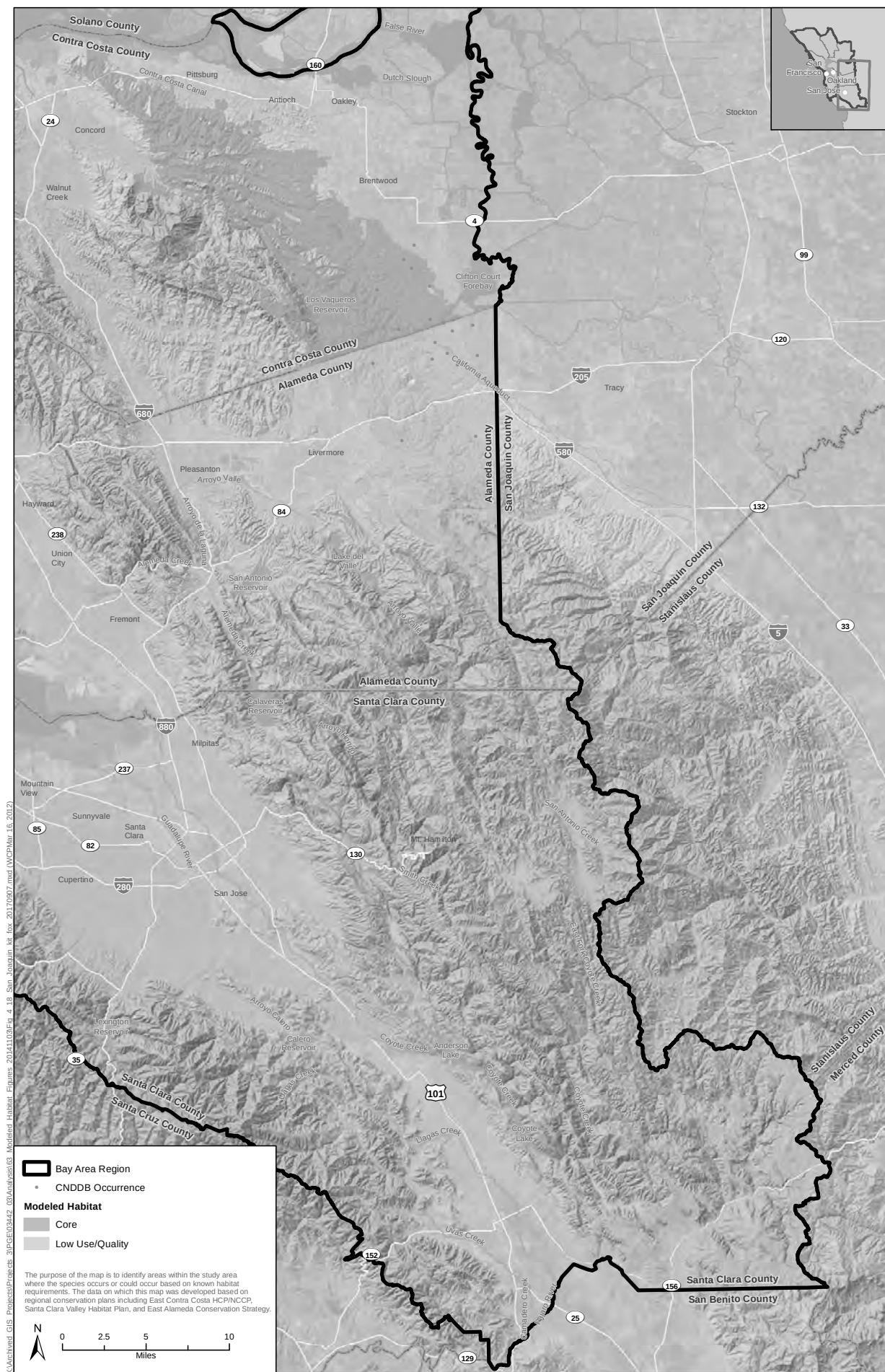
Grassland habitats in eastern Contra Costa and Alameda counties are areas of particular concern for San Joaquin kit fox because of the number of CNDDDB records and the suitability of the habitat. A specific area of concern is the area near Bethany Reservoir where CNDDDB documents several occurrences of the species. Numerous electric transmission lines and a gas transmission line traverse the area. Habitat models being relied upon for this species categorize some areas within the Plan Area as low use/quality due to lack of recent records, surrounding land use, unsuitable land cover or unsuitable slopes and barriers identified as part of other regional conservation planning efforts; East Contra Costa HCP/NCCP uses the term “suitable low use,” Santa Clara Valley Habitat Plan uses the terms “secondary habitat” and “secondary habitat low use,” and East Alameda Conservation Strategy uses the term “low quality habitat.” Disturbance of these low-use/quality habitat areas by covered activities is unlikely to have negative impacts on the species because of the degraded habitat conditions and low probability that the species is using or relying on these areas. Furthermore, FP-14 requires that grassland impacts of 0.25 acre or more be revegetated. Regardless of habitat quality, overall encounters with San Joaquin kit fox in the Plan Area are expected to be few, due to the low number of recent observations.

Permanent Impacts on Habitat

PG&E anticipates that covered activities could permanently remove 0.7 acre of San Joaquin kit fox suitable core habitat and 0.3 acre of low-use/quality habitat annually in the Plan Area. Activities that remove habitat (such as the placement of new facilities or access roads in habitat) result in permanent impacts. Other permanent impacts include disturbing, crushing, or altering burrows and potential dens in the area to the extent that these important habitat components do not recover over time, reducing the ability of these areas to support a prey base and den sites. Covered activities would remove no more than 37 acres of suitable core habitat and 16 acres of low-use/quality habitat over 30 years (Table 4-3).

Temporary Impacts on Habitat

Covered activities would temporarily disturb 8.5 acres of San Joaquin kit fox suitable core habitat and 5.3 acres of low-use/quality habitat annually. Ground disturbance resulting from vehicular travel, construction, pull and tensioning sites, and electric pole removals or replacements in grasslands would generally result in temporary habitat impacts. Covered activities would temporarily impact no more than 426 acres of suitable core habitat and 264 acres of low-use/quality habitat over 30 years (Table 4-3). The amount of habitat unavailable to the species at any point in time as a result of temporary impacts is not expected to ever be twice the annual disturbance.



Critical Habitat Impacts

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

Indirect Impacts

Human presence and activity associated with covered activities may also lead to indirect impacts. Attractants and scents from ground disturbance could invite native and nonnative predators to a work site after personnel have left. Domesticated dogs and coyotes could potentially prey upon young San Joaquin kit fox and adults. FP-08 prohibits pets, barbecues, and trash at work sites.

4.2.6 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 4-6 summarizes the acreage of covered plant species' habitat and the number of individual plants potentially subject to impacts over the next 30 years. 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 4-6. Summary of Estimated Impacts on Covered Plant Species in the Plan Area

Species	Study Area (ac)	Habitat in Plan Area Near Facilities (ac)	Temp. Impacts over 30 Years (ac)	Number of Plants ^a	Percent of Habitat with Impacts	Notes
Pallid manzanita	158.6	130.2	2.27	15	1.4%	Perennial plant
Sonoma sunshine	500.8	2.5	2.5	<250,000	0.5%	Annual wildflower
Coyote ceanothus	436.1	295.0	3.5	2,516	1.1%	Shrub
Fountain thistle	44.0	8.0	0.8	17	4.2%	Perennial herb
Santa Clara Valley dudleya	1,559.8	593.3	3.84	381	0.3%	Perennial succulent
Contra Costa wallflower	48.3	24.0	0.17	2	0.4%	Perennial herb
Marin dwarf-flax	457.9	252.7	1.95	87	0.4%	Annual herb
Burke's goldfields	667.2	198.6	1.51	211	0.2%	Annual wildflower
Contra Costa goldfields	507.1	236	5.48	14,539	1.1%	Annual wildflower, occurs in large numbers where present.
Sebastopol meadowfoam	698.6	65	0.04	189	0.1%	Annual herb
Antioch Dunes evening primrose	69.7	31.1	0.17	1	0.2%	Perennial plant
White-rayed pentachaeta	22.0	TBD	0.04	300	0.2%	Annual wildflower
Metcalf Canyon jewelflower	816.9	760.7	8.03	265	1.0%	Annual wildflower

^a Text describes each CNDDB occurrence evaluated in more detail. Permanent impacts are not described because they will have to be evaluated on a case-by-case basis.

Based on the proximity of facilities to covered plants (see Chapter 2, *Environmental Setting*), one or more CNDDDB element occurrences (EO, or “occurrence,” hereafter) of each covered plant species are potentially subject to impacts during the next 30 years. Covered activities could result in permanent or temporary impacts on habitat (discussed in Section 4.1.1, *Definitions of Permanent and Temporary Impacts*) as well as direct and indirect impacts on covered plant species populations.

The covered activities that would result in the greatest habitat impacts would be those associated with work on gas transmission lines (Covered Activity G5–G12). These covered activities would mostly result in temporary habitat loss from pipeline replacement, pipeline recoating, and gas valve installation. However, in some instances pipeline excavations could result in permanent habitat loss.

Covered activity impacts associated with electric lines (Covered Activity E6–E10) would consist mostly of vegetation removal for routine maintenance such as wood pole testing and treating, and vegetation clearing of poles and towers. Larger projects such as electric reconductoring typically require moderate removal of vegetation associated with both temporary work spaces and to accommodate any work required at or near the base of towers or wood poles. A description of these activities is provided in Chapter 3, *Covered Activities*.

Impacts on plant species may be direct or indirect. Direct impacts include those where the movement or parking of vehicles and/or the placement of equipment and staging materials may damage or crush adult plants, saplings, and seedlings. Ground disturbance such as blading and excavation can destroy or damage mature individual plants, destroy or bury seeds, and provide opportunities for colonization by invasive plants. Excavation and grading has the potential to alter soil properties, create conditions unsuitable for the growth of some species (but for other species it may promote germination or seedling establishment), and can change surface drainage patterns. The roots of shrubs and other perennial species are susceptible to damage from soil compaction by equipment or staging materials. Pruning could also adversely affect shrubs if they are pruned during their reproductive phase or if the pruning inflicts damage that makes them more susceptible to herbivory or pathogens.

Possible indirect impacts on covered plants could result from covered activities that cause erosion that degrades habitat, ground disturbance that facilitates the establishment of invasive plant species that compete with native vegetation, or accidental ignition of a fire that damages or kills individuals. Sidecast soil from excavation, spilled materials, and other substances (such as broadcast herbicides) could be carried by ditches or swales to nearby sensitive areas, causing physical or physiological damage to the plants there.

Most of these indirect impacts would be within a short distance from the covered activity and would attenuate rapidly with increasing distance (Forman 1995; Forman *et al.* 2003). This analysis assumes that indirect impacts would be non-substantial for plants occurring more than 100 feet from covered activities given the methods PG&E uses to access its facilities.

Section 4.1.4, *Calculating Covered Plant Impacts*, describes the approach used to determine the area of potential impact and the method used to estimate the number of covered plants and acreage of occupied habitat affected by covered activities. In this section, impacts are discussed in terms of numbers and percentages of occurrences as well as estimates of absolute numbers of individuals, where such estimates are feasible.

The information used to determine the impacts of covered activities on covered plant species consisted of occurrence information from the CNDDDB, U.S. Fish and Wildlife Service 5-Year Reviews,

field surveys, expert botanist opinion, and aerial photograph review and interpretation. The majority of the data for population sizes and distribution for known occurrences of covered plant species was obtained from the CNDDDB; however, database information for known occurrences does not always include a current population estimate, and population estimates may vary between years based on environmental conditions and survey methods.

For annual plant species, discussion of absolute numbers is difficult as the populations can fluctuate significantly from year to year due to environmental variation (e.g., rainfall). Some occurrences in the CNDDDB include estimates of numbers of individual plants, although many occurrences do not, or the numbers are from only 1 year. Additionally, in the rare cases where there are multiple years of data, these numbers often vary widely (e.g., from hundreds in a given year to thousands in another for only one occurrence).

For a few covered species (i.e., Burke's goldfields, Contra Costa goldfields, Sebastopol meadowfoam, and Sonoma sunshine), field surveys have been conducted to obtain more current field data about population size and distribution within proposed Map Book zones (i.e., where a CNDDDB occurrence overlaps with PG&E facilities and specific AMMs would be implemented). Field survey results used to evaluate the impacts of covered activities on covered species are provided in the individual discussions, where applicable.

The estimates of habitat and individual plants affected for each covered species are conservative "worst-case scenarios" and likely overestimate impacts on the actual area and number of individuals of covered species sustaining impacts in a given year. The actual impacts would likely be lower than provided estimates because PG&E is able to identify and avoid these populations. Further, PG&E assumed covered plants are uniformly distributed throughout their occupied habitat though their actual distribution may be more clumped or scattered. Therefore, in areas where known covered species occurrences overlap with facilities, covered activities could either impact areas where individuals are sparse or where they are more dense. The impacts of covered activities could also be higher if new populations of a covered species are found in the Plan Area.

Chapter 5, *Conservation Strategy*, includes discussion of the conservation strategy implemented to minimize impacts on covered plant species and other sensitive resources in the Plan Area. Map Book zones (see Section 5.4.3) would be created to alert crews to the presence of covered plant species. Each Map Book zone would be based on a one-time survey that establishes the location and extent of occupied habitat and determines the location of the facilities with respect to the occupied habitat.

Because species occurrences and facilities are often not mapped precisely, the Map Book zone surveys are necessary to field-verify the initial GIS-based impacts analysis and to determine whether covered activities may actually impact the plants in question. If a previously unknown population of a covered plant species is found within the footprint of a facility, then a new Map Book zone would be created for it, along with appropriate AMMs.

Where there is potential for impacts, facilities would be tagged with Map Book zone markers. When future activities are identified at these locations, the AMMs prescribed for each Map Book zone would be implemented. PG&E initiated the map book surveys for the Bay Area O&M HCP Plan Area in 2012 and should complete the surveys and Map Book zone marking by 2015. PG&E will submit the results of the Map Book zone surveys to USFWS when they are completed.

4.2.6.1 Pallid Manzanita

Pallid manzanita, an evergreen shrub, occurs in siliceous shale, sandy, or gravelly soils in broadleaved upland forest, chaparral, closed-cone coniferous forest, cismontane woodland, and coastal scrub at elevations ranging from 607 to 1,526 feet above MSL (California Native Plant Society 2012). There are eight extant element occurrences (EO) and one extirpated occurrence in the study area (California Department of Fish and Game 2011), five of which were surveyed in 2012. Five occurrences, EO's 1, 2, 8, 12, and 15, would not be affected by covered activities.

- EO 1: Sobrante Ridge Regional Preserve, three polygons (one extirpated); nearest facilities more than 100 feet from the two southern extant polygons (surveyed in 2012).
- EO 2: Tilden Regional Preserve, two polygons (transplanted); gas and electric distribution lines undergrounded at roadside, not in habitat.
- EO 8: Oakland Hills; two polygons, nearest electric distribution facility more than 1,000 feet from occurrence.
- EO 12: Oakland Hills, occurrence extirpated; habitat converted to residential development.
- EO 15: Sibley Volcanic Regional Preserve; nearest electric distribution facility more than 800 feet from occurrence.

Habitat Impacts

Electric distribution lines cross four occurrences, electric transmission lines cross one occurrence, and gas distribution lines cross four occurrences. Indirect impacts associated with covered activities (E7–E10, G5–G12) could affect these occurrences.

- EO 3: Joaquin Miller Park; eight polygons, a gas distribution line crosses two polygons, an electric distribution line crosses one polygon (surveyed in 2012).
- EO 4: Huckleberry Botanical Regional Preserve; 14 polygons, multiple electric and gas distribution lines cross area, most polygons with lines undergrounded at roadside, not in habitat, the largest polygon is crossed by electric distribution and transmission lines with at least four poles and four towers within the polygon (surveyed in 2012).
- EO 9: Redwood Regional Preserve; two polygons, one polygon with six poles in urban setting, electric and gas distribution lines not in habitat but within 100 feet, second polygon with nearest facilities more than 100 feet away (surveyed in 2012).
- EO 13: Tilden Regional Preserve; one polygon, transplant site, electric distribution lines cross the polygon (surveyed in 2012).

Covered activities could result in direct impacts on habitat for pallid manzanita at three occurrences. At EO 3, the primary impacts would consist of habitat loss from gas pipeline activities (G5–G12). At EOs 3, 4, and 13, impacts associated with the electric distribution lines would be mostly from vegetation management and remedial maintenance (E7–E9). At EO 4, impacts associated with electric transmission lines would be mostly from vegetation removal for routine maintenance and tower clearing (E10), reconductoring (E9), and maintenance and repair activities (E6, E7). The area of habitat occupied by pallid manzanita that could be affected by these covered activities is 2.27 acres over 30 years. With an estimated total area of 158.6 acres of occupied habitat in the study area, this would be a potential impact of 1.4% of the species' habitat in the study area (Table 4-6).

Direct Impacts on Pallid Manzanita

Direct impacts on individual pallid manzanita plants would be expected at Occurrences 3 and 4 (Table 4-7).

Based on the area affected and the number of plants present at the occurrences, less than 10 plants would be directly affected at EO 3 and only five or six plants would be affected at EO 4. No direct impacts on pallid manzanita plants would occur at EO 9 or 13, based on the results of surveys done in 2012. Based on this assessment, covered activities would not substantially affect the population viability of any occurrences of pallid manzanita. The species is susceptible to sudden oak death, but PG&E follows standard protocols (BMP 17) to minimize the spread of sudden oak death and is not expected to further spread or exacerbate this problem.

Table 4-7. Potential Impacts on Pallid Manzanita

Occurrence Number	Precision	Habitat (acres)	Population Size ^a	Potential Direct Impacts	
				Habitat (acres)	Plants
3	Specific polygons	23.5	51 mature, 40 seedlings in 2006	1.92	< 10
4	Specific polygons	98.1	325 mature plants and 176 seedlings in 2004	0.20	5 or 6
9	Specific polygons	3.6	1 mature, 41 seedlings in 2010	0.10	0
13	Specific polygons	5.0	6 in 2004	0.05	0

^a USFWS 2014

Critical Habitat

Critical habitat has not been designated for pallid manzanita.

4.2.6.2 Sonoma Sunshine

Sonoma sunshine, an annual herb, grows in vernal pools and mesic (i.e., moist) areas in valley and foothill grasslands at elevations from 33 to 361 feet above MSL (California Native Plant Society 2012). Sonoma sunshine is known from 23 occurrences in Sonoma County, 18 of which are presumed extant (California Department of Fish and Wildlife 2015). Map Book surveys were conducted at 10 occurrences in 2011. The following five occurrences are extirpated or possibly extirpated.

- EO 2: Sonoma Valley, south of El Verano; all habitat at this location has been converted to vineyards (California Department of Fish and Wildlife 2013).
- EO 3: Sonoma; all habitat at this location has been converted to residential development (California Department of Fish and Wildlife 2013) (surveyed in 2011).
- EO 13: Santa Rosa; all habitat at this location converted to a residential development (school) (California Department of Fish and Wildlife 2013).

- EO 18: South of Santa Rosa along Horn Road, extirpated by land alterations (California Department of Fish and Wildlife 2013); potential habitat remains in area but no PG&E facilities are in the habitat (surveyed in 2011).

Nine occurrences are not located near PG&E facilities, and covered activities would not affect Sonoma sunshine.

- EO 7: East of Laguna de Santa Rosa; nearest electric distribution facility located more than 600 feet from occurrence.
- EO 12: North of Laguna de Santa Rosa; nearest electric distribution facility located more than 1,400 feet from occurrence.
- EO 24: Northwest of Santa Rosa; nearest electric distribution facility located more than 200 feet from occurrence.
- EO 28: Southwest of Santa Rosa; nearest electric distribution facility located more than 100 feet from occurrence.
- EO 29: North of Rohnert Park; nearest electric distribution facility located more than 500 feet from occurrence.
- EO 30: Southwest of Santa Rosa and North of Todd Road; nearest electric distribution facility located more than 300 feet from occurrence.
- EO 31: Southwest of Santa Rosa and North of Todd Road; nearest electric distribution facility located more than 200 feet from occurrence.
- EO 32: Sonoma County Airport; nearest electric distribution facility located more than 150 feet from occurrence.

Habitat Impacts

Ten occurrences have PG&E facilities within 100 feet, but the facilities are not located within habitat for Sonoma sunshine. At these occurrences, access to the facilities is from existing paved roads and populations are outside of the location of direct impacts of covered activities. However, indirect impacts could result from some covered activities (E7, E8, E9, E10b). These occurrences include the following.

- EO 5: Sonoma Valley Restoration Preserve; an electric distribution line at roadside is not in habitat but is within 100 feet of habitat (surveyed and tagged Map Book zone in 2013).
- EO 6: Northwest of Santa Rosa and West of Fulton Road; electric distribution lines at roadside are not in habitat but are within 100 feet of habitat (surveyed and tagged Map Book zone in 2013).
- EO 8: Southeast of Sebastopol along Todd Road; electric distribution lines at roadside are not in habitat but are within 100 feet of habitat (surveyed in 2011).
- EO 9: West of Santa Rosa and South of Piner Avenue; electric distribution line in vineyard along west side of occurrence is not in habitat but is within 100 feet of habitat; other lines at roadside are more than 100 feet from occurrence (surveyed in 2011 and tagged Map Book zone in 2013).
- EO 15: West of Santa Rosa and North of Piner Avenue; electric distribution lines at roadside are not in habitat but are within 100 feet of habitat (surveyed in 2011).

- EO 16: North of Bonneau Road; electric distribution lines at roadside are not in habitat but are within 100 feet of habitat (surveyed in 2011).
- EO 17: South of Santa Rosa and North of Scenic Avenue; electric distribution lines at roadside along south side of road are not in habitat but are within 100 feet of habitat on north side of road (surveyed in 2011).
- EO 20: Northwest of Cotati along Stoney Point Road, part of occurrence on west side of road extirpated (California Department of Fish and Wildlife 2013); electric distribution lines at roadside on west side of road are not in habitat but are within 100 feet of habitat on east side of road (surveyed in 2011).
- EO 22: Sonoma; undergrounded electric distribution line at west edge of parcel outside of habitat (surveyed in 2011), population not observed at this occurrence since 1995 (California Department of Fish and Wildlife 2013).
- EO37: Slippery Rock Conservation Bank, south of Hall Road (a translocated population), poles are located with 100 feet of created pools.

Two occurrences are crossed by a gas transmission line and could be directly affected by covered activities associated with maintenance or replacement of the pipeline (Covered Activities G5–G12) or indirectly affected by impacts from maintenance and repair, reconductoring, pole testing and treating (Covered Activities E7, E8, E9, E10b) associated with the electric distribution and transmission lines also present at the occurrences.

- EO 10 (includes former occurrences 23, 25, 26, and 27): Northwest of Santa Rosa on East side of Francisco Road, a gas transmission line crosses the east edge of the occurrence, and electric distribution and transmission lines are within 100 feet of the occurrence; north of Raplee Terrace, a gas transmission line crosses the east edge of the occurrence, and an electric transmission line is within 100 feet of the occurrence.

The anticipated area of habitat potentially occupied by Sonoma sunshine that could be directly affected by covered activities is up to 2.5 acres over 30 years. With an estimated total area of 500.8 acres of occupied habitat in the study area, this would be a potential impact of 0.5% of the habitat for this species in the study area (Table 4-6).

Direct Impacts on Individual Sonoma Sunshine

Maintenance or replacement of the gas transmission pipeline that crosses EOs 23 and 25 has the potential to directly impact Sonoma sunshine and result in the direct loss of individual plants. The location of the plants relative to the gas pipeline and the current status of the populations are not known. The reported population size for EO 23 was 74,000 in 1991 and for EO 25 was 750 in 1988 but the populations have been combined in the latest version of CNDDDB and the population has been estimated to be as large as 1.8 million (California Department of Fish and Wildlife 2013). Because the extent and area of the populations are not known, the area and number of individuals affected at these occurrences cannot be accurately determined until the occurrences have been surveyed. However, based on the occurrences' specific map locations and the location of the gas pipeline, it is unlikely that more than 25% of each occurrence would be directly affected (i.e., up to 250,000 plants). Based on this assessment, and given the large number of other extant occurrences, covered activities would not substantially impact the population viability of any occurrences of Sonoma sunshine.

Critical Habitat

Critical habitat has not been designated for Sonoma sunshine.

4.2.6.3 Coyote Ceanothus

Coyote ceanothus, an evergreen shrub, grows in serpentine soils in chaparral, coastal scrub, and valley and foothill grasslands at elevations from 394 to 1,509 feet above MSL (California Native Plant Society 2012). Coyote ceanothus is known from four occurrences in Santa Clara County, all of which are within the study area (California Department of Fish and Wildlife 2013). Three of the occurrences are located on the Morgan Hill 7.5-minute USGS quadrangle, and one is located on the Loma Prieta 7.5-minute USGS quadrangle. PG&E facilities overlap with three of these occurrences; however, covered activities are not likely to affect the occurrence reported in Croy Canyon (EO 4); it is a non-specific occurrence that appears to be erroneous because no coyote ceanothus has been observed in the area during multiple surveys (California Department of Fish and Wildlife 2015). The two specific occurrences more likely to be affected by covered activities are:

- EO 6; formerly EO 8: Both sides of Anderson Lake Dam; gas transmission line crosses main part of occurrence.
- EO 12: Northwest of Llagas Road between Murphy Springs Court and Castle Lake Drive in Morgan Hill (California Department of Fish and Wildlife 2013); electric transmission line crosses one occurrence and a tower is in habitat.

Habitat Impacts

Occurrence 11 is located north of Morgan Hill at Kirby Canyon. Because the nearest electric distribution facilities are over 250 feet away, covered activities would have no direct or indirect habitat impacts.

Occurrence 4 is based on a specimen collected in Croy Canyon in 1929 (California Department of Fish and Wildlife 2013). The location of the collection is not known with certainty, and because the specimen consists of non-reproductive material, it cannot be definitively identified to species. An electric distribution line along Croy Road crosses this location, and activities associated with maintenance of this facility (E7, E8, E9, E10b) potentially could affect coyote ceanothus. The poles are located at roadside, and access and other activities would be unlikely to directly affect occupied habitat for the species. However, indirect impacts could result if occupied habitat were within 100 feet.

Occurrence 6 is located east of Morgan Hill on both sides of Anderson Dam. A gas transmission line crosses the main part of the occurrence west of Anderson Dam. The gas line crosses 3,066 linear feet of mapped habitat. The primary impact would consist of vegetation removal for gas pipeline repair or replacement (Covered Activities G5–G12). Up to 7.04 acres of habitat could be directly affected, but it is more likely that only a portion of this habitat would be affected, so it was assumed to be up to 3.5 acres. Gas work in this area may require localized pruning and removal. The species successfully colonized this hillside after fires in the late 1990s, and localized impacts from O&M activities are unlikely to affect the long-term viability of the population in this area.

Occurrence 12 is located in northwest Morgan Hill, north of Llagas Road. Two habitat polygons are mapped at this occurrence. An electric transmission line crosses the smaller polygon, with one tower located within the polygon. Access to the tower is provided by an existing unpaved access

road. Covered activities that could affect habitat for Coyote ceanothus at this location consist of tower maintenance or replacement (E6, E7), reconductoring (E9), and vegetation removal (E10e). About 0.02 acre (871 sq. ft.) of habitat at the tower location could be directly affected by covered activities.

With an estimated total area of 367.2 acres of occupied habitat in the study area, 7.06 acres of affected habitat would be 1.0% of the species' habitat in the study area.

Direct Impacts on Individual Coyote Ceanothus

Based on a direct effect of up to 3.5 acres of mapped habitat, out of a total of 295.0 acres (1.2%), an estimated 2,516 plants would be directly affected (Table 4-6). Locations of the affected plants have not been mapped but would be within the areas of direct impacts (Table 4-8). At Occurrence 12, about 30 plants are present along a ravine in the smaller of two polygons (U.S. Fish and Wildlife Service 2011; California Department of Fish and Wildlife 2013). These plants are on the slopes below the hilltop where the electric transmission tower is located, so no direct impacts on these individuals would result from covered activities.

At Occurrence 6, 188,175 Coyote ceanothus plants were surveyed in 2009 in the polygons west of Anderson Dam (California Department of Fish and Wildlife 2013). Most of these plants were established in 2003 after a fire and are now reproductively mature, appearing healthy with no observed herbivory or other signs of distress (U.S. Fish and Wildlife Service 2011). Based on the relatively small amount of habitat and plants affected, covered activities would not substantially affect the population viability of this occurrence.

Table 4-8. Potential Impacts on Coyote Ceanothus

Occurrence Number	Precision	Habitat (acres)	Population Size	Potential Direct Impacts	
				Habitat (acres)	Plants
4	Non-specific point	Not recorded	Not recorded	0	0
11	Specific polygon	20.0	150 in 2010, 2011	0	0
6	Specific polygon	295.0	188,475 in 2009	3.5	2,516
12	Specific polygon	52.2	1,030–2,030 in 2010, 2011	0.02	0

Critical Habitat

Critical habitat has not been designated for Coyote ceanothus.

4.2.6.4 Fountain Thistle

Fountain thistle, a perennial herb, grows in serpentine seeps in cismontane woodland, openings in chaparral, and valley and foothill grassland at elevations from 148 to 574 feet above MSL (California Native Plant Society 2012). There are four extant occurrences (EOs 1, 4, 7, and 8) and one possibly extirpated occurrence (EO 6) of fountain thistle in the state, all of which occur in the study area (California Department of Fish and Wildlife 2015). Covered activities would result in no impacts at three occurrences.

- EO 4: West of Edgewood Park, occurrence has declined and may no longer be extant (U.S. Fish and Wildlife Service 2010c); nearest electric transmission facility located more than 400 feet from the occurrence
- EO 6: South end of Edgewood Park, occurrence based on a single plant, last observed in 1993; nearest electric transmission facility located more than 500 feet from the occurrence
- EO 7: Stulsaft Park; nearest electric distribution facilities located in residential lots more than 100 feet from the occurrence

Habitat Impacts

Covered activities could have direct and indirect impacts at two occurrences.

- EO 1: Both sides of I-280 between Upper and Lower Crystal Springs Reservoirs to the west and Pulgas Ridge to the east; electric distribution and gas transmission lines cross two of the 10 occurrences
- EO 8: East of Woodside Glens; gas transmission line crosses 150 feet of the occurrence

At Occurrence 1 the 10 stands comprise a total of 21 acres. PG&E facilities cross two of the stands. An electric distribution line crosses a 2.1-acre stand, located on the west side of I-280 and the north side of Ralston Avenue. Two wooden poles are present, and about 1,414 sq. ft. (0.032 acre) could be affected by pole clearing (E10b) or replacement (E7, E8). Vehicle travel between the poles for pole maintenance or reconductoring (E9) could temporarily disturb about 360 linear feet of habitat (0.10 acre).

The same electric distribution line and a gas transmission line cross a second 1.8-acre stand on the east side of I-280. One wooden pole is present within the stand, and about 707 sq. ft. (0.016 acre) could be affected by pole clearing or replacement (E10b or E8). Vehicle travel between the poles for pole inspection, maintenance, or reconductoring could temporarily disturb about 145 linear feet of habitat (approximately 0.04 acre). The gas transmission line also crosses the stand within the same right-of-way. Maintenance, repair, or replacement of the pipeline (G3a, G9, or G10) could affect up to 0.33 acres of habitat. No facilities come within 100 feet of the eight other stands. Up to 0.46 acres (1.3%) of the 39.0-acre occurrence could be affected by covered activities.

Occurrence 8 consists of a single 8-acre stand that contained about 20 plants in 1993 (California Department of Fish and Wildlife 2013). The current status of the population is not known. A gas transmission line crosses 150 feet of the stand, and maintenance, repair, or replacement of the pipeline (G5–G12) could affect up to 0.34 acre of habitat. About 4.2% of the occurrence could be affected.

Direct Impacts on Fountain Thistle

Covered activities that directly affect habitat for fountain thistle have the potential to directly affect individual plants (Table 4-9). At Occurrence 1, about 2.2% of the habitat could be disturbed, but the number of plants affected is expected to be much lower. About 25,000 plants are present in this occurrence, 97% of which occur in a single patch adjacent to Lower Crystal Springs Reservoir (U.S. Fish and Wildlife Service 2010c), which would not be affected by covered activities because there are no facilities in this area. Therefore, approximately 100 plants are likely to be subject to direct loss over 30 years at EO 1.

At EO 8, the 20 plants were observed scattered across 8 acres of habitat, and impacts on 4.2% of the habitat could be expected to affect one plant.

Table 4-9. Potential Impacts on Fountain Thistle

Occurrence Number	Precision	Habitat (acres)	Population Size	Potential Direct Impacts	
				Habitat (acres)	Plants
1	Specific polygons	36.0	25,000 in 2010	0.46	100
8	Specific polygon	8.0	20 in 2003	0.34	1

Critical Habitat

Critical habitat has not been designated for fountain thistle.

4.2.6.5 Santa Clara Valley Dudleya

Santa Clara Valley dudleya, a perennial herb, grows in serpentine or rocky soils in cismontane woodland and valley and foothill grassland at elevations from 197 to 1,493 feet above MSL (California Native Plant Society 2012). Its range is restricted to the southeastern portion of the Bay Area, including portions of Santa Clara County. There are 55 extant occurrences of Santa Clara Valley dudleya in the study area (California Department of Fish and Wildlife 2015). Covered activities could affect 20 occurrences. Covered activities would have no direct or indirect impacts on Santa Clara Valley dudleya at 35 occurrences where no PG&E facilities are present.

- EO 2: At Calero County Park; more than 3,600 feet to nearest electric distribution facilities.
- EO 6: About 4.5 miles east of Morgan Hill; more than 2,700 feet from nearest electric distribution facilities.
- EO 8: San Jose, between Guadalupe Parkway and Monterey Highway, most of which has been converted to urban development; electric and gas distribution facilities overlapping the map polygons are underground along city streets in urban areas.
- EO 12: San Jose, Valley Christian School site, most of which has been converted to urban development; electric distribution facilities overlapping the map polygons are underground along city streets in urban areas.
- EO 15: Northwest of Morgan Hill; more than 250 feet from nearest electric distribution facilities.
- EO 18: Morgan Hill, near junction of Llagas Creek and Paradise Creek, part of occurrence converted to urban development; electric distribution facilities underground along a city street.
- EO 19: At New Almaden Quicksilver Mine County Park; more than 250 feet from nearest electric distribution facilities.
- EO 24: Morgan Hill, along Llagas Ave, part of occurrence converted to urban development; electric distribution facilities underground along a city street.
- EO 25: In Morgan Hill, at the foot of the Santa Teresa Hills; more than 500 feet from nearest electric distribution facilities.
- EO 26: West of Calero Reservoir; more than 1,000 feet from nearest electric transmission facilities.

- EO 27: Near the Santa Teresa Mine; more than 1,000 feet from nearest electric transmission facilities.
- EO 28: In the hills southwest of Santa Clara County Fairgrounds, south polygon converted to urban development; more than 100 feet from nearest gas distribution facilities, with electric distribution facilities underground along a city street.
- EO 29: Specific polygon near Santa Teresa Golf Course; more than 150 feet from nearest electric distribution facilities.
- EO 31: At New Almaden Quicksilver Mine County Park; more than 100 feet from nearest electric distribution facilities.
- EO 33: On the north slope of Almaden Canyon; more than 600 feet from nearest electric transmission facilities.
- EO 34: Near the south shore of Calero Reservoir; more than 2,000 feet from nearest electric distribution facilities.
- EO 37: West of Anderson Reservoir; more than 1,100 feet from nearest gas transmission facilities.
- EO 39: In Baldy Ryan Canyon; more than 2,500 feet from nearest electric distribution facilities.
- EO 40: At the head of Llagas Creek, southwest of Portezuela; more than 4,000 feet from nearest electric distribution facilities.
- EO 43: At Mount Madonna County Park; more than 500 feet from nearest electric transmission facilities.
- EO 44: West of Mud Springs; more than 2,000 feet from nearest electric distribution facilities.
- EO 45: Southwest of the mouth of Baldy Ryan Canyon; more than 600 feet from nearest electric distribution facilities.
- EO 46: Near Fern Peak; more than 4,500 feet from nearest electric distribution facilities.
- EO 47: Non-specific polygon, along Gilroy Hot Springs Road; more than 10,000 feet from nearest electric distribution facilities.
- EO 50: North of Kelly Lake; more than 4.5 miles from nearest electric distribution facilities.
- EO 55: Near Coyote Reservoir; more than 1,700 feet from nearest electric distribution facilities.
- EO 58: South of Chesbro Reservoir; more than 700 feet from nearest electric distribution facilities.
- EO 59: Henry Coe State Park; no facilities in vicinity.
- EO 60: Mine Hill Area in Almaden Quicksilver Park; nearest facilities are over 400 feet away.
- EO 61: Sierra Azul Open Space; no facilities in vicinity.
- EO 62: Sierra Azul Open Space; nearest facilities are over 350 feet away.
- EO 63: West of San Felipe Road; nearest facilities are over 1,000 feet away.
- EO 65: Young Ranch; nearest facilities are over 650 feet away.
- EO 66: Young Ranch; nearest facilities are over 1,000 feet away.

- EO 67: Young Ranch; nearest facilities are over 1,000 feet away.

Habitat Impacts

The area of habitat occupied by Santa Clara Valley dudleya that could potentially be directly affected by these covered activities is 3.84 acres over 30 years. With an estimated total area of 1,559.8 acres of occupied habitat in the study area, this would be a potential impact of 0.3% of the total study area range of the species (Table 4-6).

At eight locations, covered activities would not directly affect habitat for Santa Clara Valley dudleya, but covered activities (E1–E11, G1–G12) could indirectly affect occupied habitat that occurs within 100 feet of facilities.

- EO 1: On Tulare Hill, an unpaved access road to an electric transmission line crosses one polygon.
- EO 4: On Coyote Ridge, an electric distribution line spans one polygon, with one pole within 100 feet.
- EO 22: Along Coyote Ridge near Kirby Canyon, electric transmission lines are close to two polygons, with three towers within 100 feet.
- EO 23: South of Morgan Hill, along Hayes Lane, an electric distribution line along the road spans the occurrence, with two poles within 100 feet.
- EO 30: On the north slope of Coyote Peak, an electric distribution line passes between two polygons, with one pole within 100 feet.
- EO 51: Along the Almaden-Calero Canal, an electric transmission line spans the occurrence, with one tower within 100 feet.
- EO 56: Adjacent to the Almaden Reservoir Dam, an electric distribution line spans the occurrence, with one pole within 100 feet.
- EO 57: In south San Jose, near Malech Road, three electric transmission lines span the occurrence, with one tower within 100 feet, a gas transmission line within 100 feet, and unpaved access roads crossing the occurrence.
- EO 64: Along Metcalf Canyon Road; electric distribution line crosses or passes near the occurrence.

At 11 occurrences, covered activities (Covered Activities E6–E10 and G5–G12) could have both direct and indirect impacts.

- EO 3: Near Morgan Hill, upslope from the northwest ends of Murphy Springs Court and Llagas Vista Drive, electric transmission lines cross the occurrence, with three towers located in the occurrence and an unpaved access road to the towers crossing the occurrence.
- EO 5: In Metcalf Canyon, an electric transmission line crosses one polygon, with one tower in the polygon and two towers within 100 feet, with unpaved access roads.
- EO 7: Southeast end of San Jose, at Cerra Plata Development, gas transmission lines cross three polygons (Covered Activities G1–G12) and electric transmission lines cross two polygons, with three towers in the polygons (Covered Activities E6–E10), with unpaved access roads.

- EO 9: In San Martin, north of Highland Avenue, an electric transmission line crosses the occurrence, with one tower in the occurrence.
- EO 10: At the IBM Almaden Research Center and the southern portion of Santa Teresa County Park, an electric transmission line crosses one polygon, with one tower within the polygon, and an electric distribution line crosses another polygon, with one pole in the polygon and two poles within 100 feet, with unpaved access roads.
- EO 11: In the Santa Teresa Hills, an electric transmission line crosses the occurrence, with one tower in the occurrence, with unpaved access roads.
- EO 32: At the Almaden Quicksilver Mine Park, along Mine Hill Road, an electric distribution line crosses the occurrence, with one pole in the occurrence and one pole within 100 feet, with an unpaved access road.
- EO 36: On Bernal Hill, multiple electric transmission lines cross the occurrence, with 17 towers and one pole in the occurrence, with unpaved access roads.
- EO 38: in the vicinity of North New Almaden Mine, north of Tennant Road, with a gas transmission line crossing the occurrence; an electric distribution line spans the occurrence, but the nearest towers are more than 250 feet away and access road does not cross polygons. Includes former occurrence 53 and 54.
- EO 48: 0.5 air mile south-southeast of the El Toro summit, electric transmission lines cross the occurrence, with one tower located in the occurrence, unpaved access roads between the towers.
- EO 49: In the hills north of little Arthur Creek, an electric distribution line crosses the occurrence, with three poles located in the occurrence and two poles within 100 feet, and an unpaved access road crossing the occurrence.

Table 4-10. Potential Impacts on Santa Clara Valley Dudleya

Occurrence Number	Precision	Habitat (acres)	Population Size	Potential Direct Impacts	
				Habitat (acres)	Plants
3	Specific polygon	80.0	5,000+ in 1988, 750–1,000 in 2002	0.07	< 5
5	Specific polygons	41.0	Not recorded	0.02	0
7	Specific polygons	183.0	25,375 in 2001	0.07 ^a 2.4 ^b	342
9	Specific polygon	65.5	150 in 1992 (partial census only)	0.02	0
10	Specific polygon	132.0	5,520 (not all polygons censused)	0.04	424
11	Non-specific polygons	Not recorded	600 in 1990	0.02	0
32	Specific polygons	14.8	400 in 2000	0.02	0
36	Specific polygons	77.0	4,000 in 2000	0.41	21
38	Specific polygons	47.0	120 in 2004	0.7	10
48	Specific point	Not recorded	250 in 2003	0.02	1
49	Specific point	Not recorded	44 in 2003	0.05	0

^a Electric transmission towers.

^b Gas transmission line.

Direct Impacts on Santa Clara Valley Dudleya

Direct impacts on Santa Clara Valley dudleya would be expected at the 11 occurrences where construction activities are likely to be implemented (Table 4-10). At most of the known locations, the impacts on individuals would result from maintenance or repair of electric transmission towers. At two locations, the impacts on individual plants would result from maintenance or replacement of gas transmission pipelines. The number of individuals directly affected would be proportional to the amount of habitat affected. Most of the direct impacts on individuals would be at Occurrences 7 and 10. Overall, the estimated number of plants subject to direct loss is 800 plants over 30 years (Table 4-6). Direct and indirect impacts on Santa Clara Valley individuals would not substantially affect the population viability of any occurrences of Santa Clara Valley dudleya.

Critical Habitat

Critical habitat has not been designated for Santa Clara Valley dudleya.

4.2.6.6 Contra Costa Wallflower

Contra Costa wallflower, a perennial herb, grows on inland dunes at elevations from 10 to 66 feet above MSL (California Native Plant Society 2012). Contra Costa wallflower is known only from four occurrences in Contra Costa County (California Department of Fish and Wildlife 2015). Covered activities would not affect three locations.

- EO 1: Antioch Dunes NWR, Stamm Unit, no facilities in habitat, more than 100 feet from nearest electric transmission facility.
- EO 3: East of Antioch, north of Wilbur Avenue, more than 1,000 feet to nearest substation facility.
- EO 4: On Brown's island, no facilities present on Brown's Island.

Habitat Impacts

Covered activities could impact the occurrence (EO 2) that is located in the Sardis Unit of the Antioch Dunes NWR. An electric transmission line crosses the occurrence, and one tower is located within the occurrence. Covered activity impacts would be expected from tower maintenance and repair (E6, E7, E9, E10).

The area of habitat occupied by Contra Costa wallflower that could be affected by these covered activities is 0.17 acre. With an estimated total area of 48.3 acres of habitat in the study area (not all of which is occupied), this would be a potential impact of 0.4% of the total study area range of the species (Table 4-6).

Direct Impacts on Contra Costa Wallflower

Occurrence 2 consists of several hundred plants on approximately 22 acres of habitat (California Department of Fish and Wildlife 2013). The last reported count for the Sardis Unit was 671 plants in 1985. Although counts for individual areas have not been reported since then, the total number of plants in all occurrences is about 4,000 (U.S. Fish and Wildlife Service 2008). The tower location was surveyed in July, 2012. The survey found two Contra Costa wallflower plants within the area that could be potentially affected by covered activities, and 11 other plants were within 100 feet (Table 4-11). More could potentially grow in this area in the future. Based on this assessment, covered activities would not substantially affect the population viability of this occurrence.

Table 4-11. Potential Impacts on Contra Costa Wallflower

Occurrence Number	Precision	Habitat (acres)	Population Size	Potential Direct Impacts	
				Habitat (acres)	Plants
2	Specific polygon	24.0	Decreasing, 671 in 1985	0.17	35

Critical Habitat

The Antioch Dunes were designated as critical habitat for Contra Costa wallflower in 1978 and the Antioch Dunes NWR, which encompasses 55 acres of former dunes that are adjacent to the 12 acres of the dunes owned by PG&E, was established in 1980. Critical habitat for Contra Costa wallflower encompasses approximately 281 acres in the study area and 41 acres in the Plan Area. Over the next 30 years, it is estimated that 0.2 acre of critical habitat for this species would be affected by covered activities; this equates to no more than 0.06% of the total critical habitat designated for this species (Table 4-4).

4.2.6.7 Marin Dwarf Flax (a.k.a. Marin Western Flax)

Marin dwarf flax, an annual herb, grows in serpentine soils in valley and foothill grasslands and chaparral at elevations from 16 to 1,214 feet above MSL (California Native Plant Society 2012). Its range is restricted to the northwestern portion of the Bay Area, including portions of Marin, San Francisco, and San Mateo Counties. There are 23 extant occurrences in the study area (California Department of Fish and Wildlife 2015). Three occurrences are extirpated or possibly extirpated. A new occurrence not yet documented in the CNDDB was discovered during the course of replacing a portion of gas line L109. This population is located near Woodside and I-280.

- EO 2: Located at Crystal Springs Dam, last observed in 1961; habitat removed by road construction (California Department of Fish and Wildlife 2013), electric transmission pole present.
- EO 10: Located near Marin County Day School in Tiburon, last observed in 1961, apparently extirpated (or possibly mismapped) (California Department of Fish and Wildlife 2013); nearest electric distribution facilities are more than 200 feet away.
- EO 14: Located at the Laurel Hill Cemetery in San Francisco, last observed in 1912; no native habitat occurs in this area, multiple facilities located in urban areas around this occurrence.
- EO 20: Located at Inspiration Point, in San Francisco and listed as “presumed extant” in CNDDB; native plants appear to have died out, and attempts to re-establish the population by translocating seed into the site do not appear to have been successful.
- EO 21: Located in Hillsborough Heights Estates, last observed in 1987; habitat at this location removed by urban development between 2002 and 2012.

Covered activities would have no impacts on Marin dwarf flax at 14 occurrences where no facilities are present.

- EO 4: Located at Edgewood County Park; more than 500 feet from nearest electric transmission facilities.
- EO 5: Located at Woodside Glens; more than 150 feet from nearest gas distribution facility.
- EO 9: Located at Ring Mountain; 16 polygons more than 100 feet from nearest gas distribution facility.
- EO 12: Located on Carson Ridge in Marin County; more than 600 feet from nearest electric transmission facilities.
- EO 13: Located along the south side of Lucas Valley Road; more than 150 feet from nearest electric distribution facility.
- EO 16: Located in the San Francisco Presidio near the War Memorial; more than 1,000 feet from nearest gas distribution facility.
- EO 22: Located along the north side of Crystal Springs Road in San Mateo County; over 300 feet from nearest electric and gas distribution facilities.
- EO 23: Located near Alpine Lake in Marin County; over 1,400 feet from nearest electric distribution facilities.
- EO 25: Located in Mount Burdell Open Space; over 700 feet from nearest electric distribution facilities.

- EO 26: Located in Mount Burdell Open Space; over 3,700 feet from nearest electric distribution facilities.
- EO 28: Located south of Nicasio Reservoir; over 700 feet from nearest electric transmission facilities.
- EO 29: Located at Stulsaft Park in Redwood City; over 150 feet from nearest electric distribution facility, located within residential parcels.
- EO 31: Located near Hillcrest Detention Home in San Mateo; over 300 feet from nearest electric distribution facility.
- EO 32: Located in Lucas Valley, Marin County; over 300 feet to nearest electric distribution facility.

One occurrence (EO 11) of Marin dwarf flax is historic and non-specific: "San Rafael." Information on this occurrence is insufficient to determine whether covered impacts would result in impacts on habitat. However, habitat impacts are unlikely because this area is highly developed with PG&E facilities located within developed areas.

- EO 11: Located in San Rafael, last observed in 1880s; no habitat remains where occurrence is mapped.

Habitat Impacts

The area of habitat occupied by Marin dwarf flax that could be affected by covered activities is about 1.95 acres over 30 years. With an estimated total of 457.9 acres of occupied habitat in the study area, this would be a potential impact of 0.8% of the total study area range of the species (Table 4-6).

Covered activities (E6–E10, G5–G12) could directly and indirectly affect Marin dwarf flax at eight occurrences.

- At Occurrence 1, six polygons located east of Lower Crystal Springs Reservoir. Direct and indirect impacts on habitat could occur at two polygons. At one polygon, an electric transmission tower is present, two towers are within 50 feet, and a gas transmission line parallels the east side of the polygon. At a second polygon, six wooden poles (electric distribution and transmission) are present, and another pole is within 100 feet. Covered activities could also result in indirect impacts where an electric transmission line mapped along Skyline Boulevard is within 100 feet of two polygons.
- At Occurrence 3, 10 polygons located east of Lower Crystal Springs Reservoir. Covered activities could result in direct and indirect impacts at three polygons. An electric distribution line crosses one polygon, with one wooden pole located within the polygon. An electric transmission line crosses two polygons with three wooden poles located within the polygons. Covered activities could result in indirect impacts where other electric and gas lines are mapped within 100 feet of three other polygons.
- At Occurrence 6, a single large polygon near Saint Hilary's Church in Tiburon. An electric distribution line runs along the west edge of the occurrence, with two poles located within the mapped polygon. Covered activities could result in direct and indirect impacts at these two pole locations, and in indirect impacts where four other poles come within 100 feet of the occurrence. The occurrence was surveyed in 2013 and the Map Book zone was marked.

- At Occurrence 8, six polygons on the middle ridge of Tiburon Peninsula. An electric distribution line is present at roadside at the north end of the large, central polygon, with three poles within 100 feet of the polygon. Covered activities could result in indirect impacts associated with pole maintenance or replacement at this location. The occurrence was surveyed in 2013 and the Map Book zone was marked.
- At Occurrence 17, a single population located at Edgewood County Park in San Mateo County. The extent of the habitat is not recorded, although about 3,000 plants were observed there in 1983. Two gas transmission lines run directly through the center of the occurrence. Maintenance, repair, or replacement of the pipeline could directly affect all of the habitat.
- At Occurrence 18, located northeast of Canada College in Redwood City. According to the occurrence record, this population was extirpated by construction of a church (California Department of Fish and Wildlife 2013). However, the habitat polygon is mapped about 0.2 mile south of the church, and habitat appears to be extant at the mapped location. Two gas transmission lines run directly through west side of the occurrence. Maintenance, repair, or replacement of the pipeline could directly affect 1.0 acre of habitat.
- At Occurrence 30, located 0.5 mile south-southeast of Crystal Springs Dam in San Mateo County. An electric distribution line runs along the east edge of the occurrence, with one pole located within the mapped polygon. Covered activities could result in direct impacts at this pole location and in indirect impacts at this location and where another pole is located within 100 feet of the occurrence.
- At the Woodside occurrence in San Mateo County. Covered activities could result in direct impacts if additional maintenance or repair is needed on the gas pipeline in this area, although additional improvements are not anticipated given recent maintenance work here.

Table 4-12. Potential Impacts on Marin Dwarf Flax

Occurrence Number	Precision	Habitat (acres)	Population Size	Potential Direct Impacts	
				Habitat (acres)	Plants
1	Specific polygons	88.0	Varies: 1,100 in all polygons in 1991, 5,000 in one polygon in 2000	0.14 ^a 0.69 ^b	10 to 100
3	Specific polygons	37.0	>15,600 plants in 1988	0.065 ^a	27
6	Specific polygon	68.0	16 in 1997 to 100s in 1998	0.032 ^a	0
8	Specific polygons	50.0	Varies: < 100 in 1983, 1,875 in 1990	0	0
17	Specific point	2.0	Varies: <3,000 in 1983, 30–50 in 1987, 900 in 1992; > 4,000 in 2004	100% ^b	100%
18	Specific polygon	6.9	100s in the 1970s	1.0 ^b	27%
30	Specific polygon	11.0	Varies: 2,486 in 2000, 160 in 2001; 1,000s in 2013	0.02 ^a	< 10
NA	Specific polygon	0.26	10,000-15,000 plants	0.02	1,500

^a Electric distribution and transmission poles and towers.

^b Gas transmission lines.

Direct Impacts on Individual Marin Dwarf Flax

Covered activities would result in direct impacts on Marin dwarf flax individuals at the six locations (Table 4-12). At most of the locations, the impacts on individuals would result from maintenance or repair of electric transmission towers. At two occurrences, the impacts on individuals would result from maintenance or replacement of gas transmission pipelines. The number of individuals present in each occurrence varies annually in response to differences in annual rainfall. The number of plants directly affected would differ annually but would be proportional to the amount of habitat affected.

At Occurrence 1, the number of plants present has not been consistently reported for all polygons. In 1991, 1,100 plants were present in all polygons. In 1989, more than 1,000 plants were observed in two polygons, and in 2000, 5,000 plants were observed in another polygon. Assuming that the minimum number of plants in the occurrence is 1,100 and that the number of plants can vary by an order of magnitude, between 10 and 100 plants could be directly affected by covered activities.

- At Occurrence 3, 15,600 plants were observed in all polygons in 1988. About 27 plants could be directly affected by covered activities.
- At Occurrence 6, plant numbers have varied from 180 plants in 1986, to more than 250 observed in 1987, to 16 in 1997, and to hundreds in 1998. Based on the low number of plants present and the small amount of habitat disturbed, direct impacts on plants are unlikely at this occurrence.

- At Occurrence 17, fewer than 3,000 plants were observed at this site in 1983, and population sizes have varied from as low as 30 to 50 in 1987, to 900 plants in 1992; 40 to 50 individuals were observed in 2014 as part of Map Book zone surveys. Because the two gas pipelines cross directly through this occurrence, activities requiring the excavation of these pipelines would be likely to remove all of the plants. Because the gas pipelines were installed long before the plants were found at this location, it is possible that the plants were established after the pipeline was installed, but it is also possible that the population was present before the pipeline was installed and was able to re-establish following the construction.
- At Occurrence 18, the number of plants present was not reported. Assuming that the number of plants directly affected would be proportional to the amount of habitat disturbed, about 27% of the plants would be directly affected.
- At Occurrence 30, the number of plants has varied from a high of 2,486 in 2000 to a low of 160 in 2001. Based on the small amount of habitat that would be disturbed, less than 10 plants are likely to be directly affected at this occurrence.
- At the Woodside occurrence, the number of plants was between 10,000 and 15,000. Based on the amount of habitat that would be disturbed, approximately 1,500 plants are likely to be directly affected at this occurrence.

Based on this assessment, covered activities could substantially affect the population viability at EO 17. Covered activities would not substantially affect the population viability at any of the other occurrences.

Critical Habitat

Critical habitat has not been designated for Marin dwarf flax.

4.2.6.8 Burke's Goldfields

Burke's goldfields, an annual herb, grows in vernal pools and wet meadows at elevations from 49 to 1,968 feet above MSL (California Native Plant Society 2012). Its range is restricted to the southern portion of the inner North Coast Ranges in Sonoma County. There are 29 documented occurrences of Burke's goldfields in the study area, 25 of which are considered to be extant (California Department of Fish and Wildlife 2015). Covered activities could affect 12 locations. Covered activities would not affect 12 occurrences where no facilities are present. One occurrence (EO 36) from Napa County is based on a poorly-documented record, and its reported location, near the Calistoga Geyser, is based on conjecture. Information on this occurrence is insufficient to determine whether covered activities would affect this occurrence. Four other occurrences recently added to the CNDDDB have not been analyzed; however, these occurrences are located in constructed pools within mitigation banks and are unlikely to be directly affected by O&M activities.

EO 1: At Todd Road Preserve; more than 300 feet from nearest electric distribution facility

- EO 2: Northeast of Graton, at Laguna de Santa Rosa, last seen in 1969 and extirpated by habitat conversion; more than 200 feet from nearest electric distribution facility.
- EO 3: East of Graton, at Laguna de Santa Rosa, extirpated by habitat conversion; more than 1,000 feet from nearest electric distribution facility.

- EO 5: North of Ukiah, just west of Coyote Dam; more than 500 feet from nearest electric distribution facility.
- EO 14: East of Sebastopol, along Laguna de Santa Rosa; more than 200 feet from nearest electric distribution facility.
- EO 16: North-northeast of Sebastopol, along Hall Road; more than 150 feet from nearest electric distribution facility.
- EO 22: Near Windsor Grange; more than 400 feet from nearest electric and gas distribution facilities.
- EO 26: Northwest of Santa Rosa, west of Alton Lane, mostly converted to vineyards; remnants are more than 650 feet from nearest electric distribution facilities.
- EO 29: West of Rohnert Park, along Stony Point Road; an electric distribution line located at roadside is more than 100 feet from occupied habitat (population observed during 2103 survey).
- EO 30: In Alexander Valley; more than 100 feet from an electric distribution line located at roadside (population observed during 2103 survey).
- EO 31: At the Wikiup Wetlands Mitigation Bank; more than 150 feet from nearest electric and gas distribution facilities.
- EO 37: North Santa Rosa; electric and gas distribution facilities are underground along a city street and 100 feet from habitat.

Habitat Impacts

The estimated area of habitat occupied by Burke's goldfields that could potentially be affected by these covered activities is 1.51 acres over 30 years. Most of the covered activity impacts would be expected from ground disturbance for gas pipeline activities. With an estimated 667.2 acres of occupied habitat in the study area, this would be a potential impact of 0.2% of the total study area range of the species (Table 4-6).

At six occurrences, facilities are accessed from paved roads, and covered activities would be far enough away that no direct effect on habitat for Burke's goldfields would result. However, habitat within 100 feet of facilities could be indirectly affected by repair and maintenance of electric facilities (E7–E10) and gas facilities (G5–G12).

- EO 7: At the Sonoma County Airport, four of 24 mapped polygons less than 100 feet from an electric distribution line located at roadside (surveyed in 2013 and tagged as Map Book zone).
- EO 17: North-northeast of Sebastopol, at the intersection of Hall Road and Piezzi Road; less than 100 feet from an electric distribution line located at roadside (surveyed in 2011).
- EO 21: West of Santa Rosa, on north side of Piner Road; less than 100 feet from an electric distribution line located at roadside (surveyed in 2011).
- EO 24: Northwest of Santa Rosa, along Fulton Road; less than 100 feet from an electric distribution line located at roadside, poles not in habitat but within 50 feet (surveyed in 2011).
- EO 25: At the Alton Road Vernal Pool Preserve; less than 100 feet from an electric distribution line located at roadside (surveyed in 2013 and tagged as Map Book zone).

- EO 27: Northwest of Santa Rosa along Piner Road, at the north polygon the electric and gas distribution lines located at roadside and within 20 feet of habitat (surveyed in 2011).

At six occurrences, facilities are present within occupied habitat, and covered activities (E7–E10, G5–G12) could have direct and indirect impacts on Burke’s goldfields.

- EO 4: At Windsor, electric distribution lines cross three map polygons, with four poles located within polygons (surveyed in 2013 and tagged as Map Book zone), and a gas transmission pipeline crosses one polygon.
- EO 13: West of Santa Rosa, along Abramson Road, electric distribution lines border two polygons, one pole is located in map polygon, and three poles are within 100 feet of polygon (surveyed in 2013 and tagged as Map Book zone).
- EO 15: Northeast of Sebastopol, on north side of Occidental Road, electric distribution lines border two map polygons; one pole is located in polygon, other poles within 100 feet.
- EO 19: Northwest of Santa Rosa near Piner Road, one polygon is crossed by an electric distribution line (one pole) and a gas transmission line, another polygon is crossed by an electric distribution line (one pole).
- EO 23: West of Santa Rosa, near Wood Road, an electric distribution line crosses one polygon (one pole), four poles are within 100 feet of polygons, and a gas distribution pipeline is less than 100 feet from a polygon (surveyed in 2013 and tagged as Map Book zone).
- EO 28: West of Santa Rosa, at the intersection of Fulton Road and Hall Road, an electric transmission line crosses a map polygon, with one pole in polygon.

Table 4-13. Potential Impacts on Burke’s Goldfields

Occurrence Number	Precision	Habitat (acres)	Population Size	Potential Direct Impacts	
				Habitat (acres)	Plants
4	Specific polygons	29.0	Varies, 100 to 150,000 (decreasing)	0.08 ^a 0.37 ^b	100–1,000
13	Specific polygons	15.0	1,000 to 5,000 in 1992, 0 in 2002	0.02	0
15	Specific and nonspecific polygons	Not recorded	Millions 2008 and 2009; 192,622 in 2013	0.02	0
19	Specific polygons	46.0	Varies annually, thousands to millions, not all polygons censused	0.02 ^a 0.44 ^b	100–1,000
23	Specific and nonspecific polygons	Not recorded	1,000-5,000 in 1988; decreasing, 0 in 2011–2012 (not all polygons censused)	0.02	9
28	Specific polygons	10.0	Varies, 500–1,000 in 1991–1993; millions in created habitat 2008–2013	0.02	2

^a Electric distribution and transmission poles and towers.

^b Gas transmission lines.

Direct Impacts on Individual Burke's Goldfields

Covered activities would result in direct impacts on Burke's goldfields at six occurrences (Table 4-13). The number of plants directly affected would vary annually but would be proportional to the amount of habitat affected.

- EO 4: Plant numbers in each of the six mapped polygons have varied from hundreds to thousands of plants; in 1989, over 150,000 plants were observed in a single polygon. Most of the direct impacts on individuals would be in one polygon as a result of maintenance or replacement of a gas transmission line. Covered activities could affect about 10% of this polygon, which could result in impacts on hundreds to thousands of plants.
- EO 13: Population numbers have been decreasing; there are no recorded observation of the plants here since 1992, when 1,000 to 5,000 plants were observed. A single electric distribution pole at this occurrence is located adjacent to potential habitat, although no Burke's goldfields were observed there during a survey in 2011. Direct impacts on plants are unlikely at this occurrence.
- EO 15: Hundreds of plants were present in 1986 and 1988. Most of the occurrence along Occidental Road has been converted to agriculture, although potential habitat is still present. A single electric distribution pole at this occurrence is located adjacent to potential habitat, although no Burke's goldfields were observed there during a survey in 2011. Direct impacts on plants are unlikely at this occurrence.
- EO 19: Much of the habitat has been converted to urban development, and population numbers have been decreasing from a high of 40,000 in 1985 to 3,500 to 5,000 in 2002. Most of the direct impacts on individuals would be in one polygon as a result of maintenance or replacement of a gas transmission line. Covered activities could affect about 15% of this polygon, which could result in impacts on hundreds to thousands of plants.
- EO 23: Four mapped polygons are present, each with hundreds to thousands of plants. A single electric distribution pole at this occurrence is located in potential habitat, which could result in direct impacts on an estimated 10 plants.
- EO 28: Population numbers have varied, with 500 to 1,000 plants observed between 1991 and 1993. A single electric transmission pole at this occurrence is located in potential habitat, which could result in direct impacts on an estimated two plants.

The number of plants that would be directly affected is difficult to estimate, because population numbers vary annually. Not all habitat within each occurrence has been surveyed; portions of some populations have been lost since they were surveyed. Nevertheless, up to 2,000 Burke's goldfields plants could be subject to direct loss from covered activities over 30 years (Table 4-6), primarily associated with gas transmission lines at Occurrences 4 and 19. Based on this assessment, covered activities would not substantially affect the population viability at any occurrences Burke's goldfields.

Critical Habitat

Critical habitat has not been designated for Burke's goldfields.

4.2.6.9 Contra Costa Goldfields

Contra Costa goldfields, an annual herb, grows in vernal pools and in mesic areas in cismontane woodland, valley and foothill grassland, and alkaline playas at elevations up to 1,542 feet above MSL (California Native Plant Society 2012). Its range is restricted to the North Coast, southern portion of the Sacramento Valley, San Francisco Bay Area, and South Coast regions. This range includes portions of Alameda, Contra Costa, Napa, Santa Clara, and Solano Counties. There are 20 extant occurrences of Contra Costa goldfields in the study area (California Department of Fish and Wildlife 2015). Covered activities could affect 10 occurrences.

Eight occurrences are extirpated and would not be affected by covered activities.

- EO 2: North of Napa, along the east side of the Silverado Trail, last seen in 1960 and extirpated by habitat conversion; electric distribution and transmission facilities in this area at roadside or in vineyards and not in potential habitat.
- EO 8: Antioch, last seen in 1895; facilities in this locale in developed areas, not in potential habitat.
- EO 10: Walnut Creek, last seen in 1884; facilities in this locale in developed areas, not in potential habitat.
- EO 11: Concord, last seen in 1946; facilities in this locale in developed areas, not in potential habitat.
- EO 13: Newark, last seen in 1895; facilities in this locale in developed areas, not in potential habitat.
- EO 14: San Jose, last seen in 1958; facilities in this locale in developed areas, not in potential habitat.
- EO 36: Vacaville (Little Oak Ranch), last seen in 1918; facilities in this locale are in developed areas, not in potential habitat.
- EO 37: Hayward, at west end of Depot Road, last seen in 1959; facilities in this locale in developed areas, not in potential habitat.

Covered activities would not affect 10 extant occurrences.

- EO 4: South of Travis Air Force Base, along the north side of SR 12; more than 2,500 feet to nearest electric distribution facility.
- EO 21: Along Atlas peak Road; more than 900 feet to nearest electric distribution facility.
- EO 22: Travis Air Force Base; more than 350 feet to nearest gas transmission facility.
- EO 23: North of Highway 4, at headwaters of Rodeo Creek; more than 150 feet to nearest electric distribution facility.
- EO 30: Fremont, at Don Edwards NWR; more than 300 feet to nearest electric distribution facility.
- EO 34: South of Travis AFB, along north side of SR 12; more than 2,500 feet to nearest electric transmission facility.
- EO 35: Along Highway 1, south of Americano Creek; more than 400 feet to nearest electric distribution facility.

- EO 40: East of SR 121, west of the Napa River; more than 1,000 feet to nearest electric distribution facility.
- EO 42: Travis AFB, near the south gate; more than 100 feet to nearest electric distribution facility.
- EO 43: Rush Ranch; more than 7,500 feet to nearest electric transmission facility.

Habitat Impacts

The estimated area of habitat occupied by Contra Costa goldfields that could be affected by these covered activities is 5.48 acres over 30 years. With an estimated total area of 507.1 acres of occupied habitat in the study area, this would be a potential impact of 1.1% of the total study area range of the species (Table 4-6).

At six occurrences, covered activities would not directly affect habitat for Contra Costa goldfields, but habitat within 100 feet of facilities could be indirectly affected by covered activities (E7–E10, G5–G12).

- EO 5: 2 miles northeast of Vanden, last seen in 1974; possibly extirpated, but potential habitat remains at this location, less than 100 feet from nearest electric distribution facilities.
- EO 7: Fairfield, west of Travis AFB; less than 100 feet from nearest electric transmission and electric and gas distribution facilities (surveyed in 2013 and tagged portions as Map Book zone).
- EO 28: Northeast of Fairfield, south of Cement Hill; gas distribution facilities at roadside but less than 100 feet (surveyed in 2013 and tagged as Map Book zone).
- EO 29: Fremont, near former Sky Sailing Airport: electric transmission pole less than 100 feet from mapped polygon but located in a paved parking lot.
- EO 33: Cordelia; electric distribution facilities span occurrence, nearest poles possibly less than 100 feet (surveyed in 2013 and tagged as Map Book zone).
- EO 39: East of Petaluma, west of Stage Gulch Road; electric distribution facilities span occurrence, with one pole located within 100 feet (surveyed in 2013).

At four occurrences, facilities are present within occupied habitat, and covered activities (E7–E10, G5–G12) could have direct and indirect impacts on Contra Costa goldfields.

- EO 1: South of Napa, north of Soscol Creek, a gas transmission pipeline crosses west edge of mapped polygon, and an electric distribution line (three poles) is located within 100 feet of the west edge of the polygon (surveyed in 2013 and tagged as Map Book zone).
- EO 3: West of Suisun City, along Cordelia Road, habitat altered by commercial development, electric and gas transmission lines cross occurrence, towers and poles in and within 100 feet of occurrence (surveyed in 2013 and tagged portions as Map Book zone).
- EO 20: South of Travis Air Force Base, along Scally Road, an electric transmission line crosses occurrence, with one tower in occurrence, two towers less than 100 feet from occurrence.
- EO 24: Northwest of Travis Air Force Base, a gas distribution line crosses the occurrence, electric distribution line less than 100 feet from occurrence.

Table 4-14. Potential Impacts on Contra Costa Goldfields

Occurrence Number	Precision	Habitat (acres)	Population Size	Potential Direct Impacts	
				Habitat (acres)	Plants
1	Specific polygon	21.0	Varies annually, up to 18,000	0.92 ^a	788
3	Specific polygons	16.0	Varies, > 10,000 in 2002	0.14 ^a 1.45 ^b	> 1,000
20	Specific polygons	130.0	Varies, 18,000,000 in 2004, not all polygons censused	0.02	2,770
24	Specific polygons	69.0	Varies, 250,000 in 1995 10,000 in 1999	2.75	9,981

^a Electric distribution and transmission poles and towers.
^b Gas transmission lines.

Direct Impacts on Individual Contra Costa Goldfields

Covered activities would result in direct impacts on Contra Costa goldfields at four occurrences (Table 4-14). The number of plants directly affected would vary annually but would be proportional to the amount of habitat affected. Based on this assessment, covered activities would not substantially affect the population viability of any occurrences of Contra Costa goldfields.

At Occurrence 1, population numbers have varied from 0 in 1990, a low rainfall year, to more than 18,000 in 1995. Direct impacts on individuals could result from maintenance or replacement of a gas transmission line. About 4.3% of the mapped polygon could be affected, which could result in up to 788 individuals directly affected.

At Occurrence 3, population numbers varied from 1,500 to 6,500 in the 1990s, and 10,000 plants were observed in the south half of the occurrence in 2002. Direct impacts on individuals could result from covered activities associated with both electric transmission lines and a gas transmission pipeline. About 10% of the mapped polygon could be affected, which could result in over 1,000 individuals directly affected.

At Occurrence 20, one large polygon and 10 smaller polygons, with an estimated 18,000,000 individuals observed in 2004. Direct impacts on individuals could result from covered activities associated with maintenance or repair of one electric transmission tower, which would affect less than 0.02% of the occurrence, or up to 2,770 individuals.

At Occurrence 24, population numbers have varied from 250,000 in 1995 to 10,000 in 1999. Direct impacts on individuals could result from maintenance or replacement of a gas distribution line. About 4.0% of the mapped polygon could be affected, which could result in up to 9,981 individuals directly affected.

Critical Habitat

Critical habitat for Contra Costa goldfields encompasses approximately 12,093 acres in the study area and 1,138 acres in the Plan Area. Annually, covered activities would permanently affect no more than 0.1 acre (a 66-ft. X 66-ft. area) of critical habitat. Over the next 30 years it is estimated that 5.5 acres of critical habitat for this species would be permanently affected by covered activities;

this equates to no more than 0.05% of the total critical habitat designated for this species (Table 4-4).

4.2.6.10 Sebastopol Meadowfoam

Sebastopol meadowfoam, an annual herb, grows in wet meadows, vernal mesic areas in valley and foothill grassland, and vernal pools at elevations from 49 to 1,001 feet above MSL (California Native Plant Society 2012). Its range is restricted to the southern portion of the outer North Coast Ranges, including portions of Napa and Sonoma Counties. There are 38 extant occurrences of Sebastopol meadowfoam in the study area (California Department of Fish and Wildlife 2015). Covered activities could affect 10 occurrences. Four occurrences were recently added to the CNDDDB and are more than 250 feet from PG&E facilities.

Covered activities would not affect 31 occurrences.

- EO 2: In Santa Rosa, at Sam Jones Wetland Preserve; more than 100 feet to nearest electric distribution facility (surveyed in 2013).
- EO 3: West of Santa Rosa, on the north side of Occidental Road; more than 100 feet to nearest electric distribution facility (surveyed in 2013).
- EO 6: 1 mile south of Llano; more than 800 feet to nearest electric distribution facilities.
- EO 7: East of Llano at west end of Concord Road, last observed in 1983 and possibly extirpated; more than 150 feet to nearest electric distribution facilities.
- EO 9: North of Sebastopol, west of Laguna de Santa Rosa; more than 150 feet to nearest electric distribution facilities.
- EO 10: East of Sebastopol, east of Laguna de Santa Rosa; more than 100 feet to nearest electric distribution facility (surveyed in 2013).
- EO 14: South of Santa Rosa at the intersection of Scenic and Whistler Avenues; more than 250 feet to nearest electric distribution facilities.
- EO 16: Theiller Sebastopol Meadowfoam Ecological Reserve; more than 400 feet to nearest electric and gas distribution facilities.
- EO 17: Cunningham Marsh; more than 850 feet to nearest electric and gas distribution facilities.
- EO 18: Northwest of Santa Rosa, at Piner Elementary School, last seen in the 1970s and possibly extirpated; no habitat within 100 feet of electric and gas distribution facilities (surveyed in 2011).
- EO 20: Atascadero Creek marsh, last seen in 1958 and possibly extirpated; more than 600 feet from nearest electric distribution facilities.
- EO 24: Northeast of Sebastopol, along Highway 12; more than 450 feet from nearest electric and gas distribution facilities.
- EO 25: East of Sebastopol, along Laguna de Santa Rosa; more than 400 feet from nearest electric and gas distribution facilities. Includes former EO 51.
- EO 26: South of Santa Rosa, at the intersection of Todd Road and Stony Point Road; more than 400 feet from nearest electric distribution facilities (surveyed in 2013).

- EO 27: North of Sebastopol, between hall Road and Occidental Road; more than 150 feet from nearest electric facilities.
- EO 29: East of Sebastopol, and the intersection of Highway 12 and Llano Road; more than 100 feet from nearest electric distribution facilities.
- EO 30: West of Santa Rosa, at the intersection of Piezzi Road and Hall Road; more than 350 feet from nearest electric and gas distribution facilities.
- EO 31: West of Santa Rosa, south of Highway 12, last seen in 1993 and possibly extirpated; habitat converted to urban development, all facilities along city streets.
- EO 33: Southeast of Sebastopol, along Highway 12; more than 200 feet from nearest electric distribution facilities.
- EO 35: West of Rohnert Park, at the intersection of Highway 101 and Gravenstein Highway; more than 500 feet from nearest electric and gas distribution facilities.
- EO 36: Santa Rosa, along Primrose Avenue; more than 150 feet from nearest electric and gas distribution facilities.
- EO 37: Southwest of Santa Rosa, south of Todd Road; more than 700 feet from nearest electric distribution facilities.
- EO 38: North of Cunningham, and the intersection of Todd Road and Highway 116, extirpated by habitat conversion; all facilities in this area are roadside, not in potential habitat.
- EO 39: Yountville Ecological Reserve; more than 300 feet from nearest electric distribution facilities.
- EO 40: Northwest of Calistoga at Bavarian Lion Ranch; more than 900 feet from nearest electric distribution facilities.
- EO 42: Between Santa Rosa and Rohnert park, and the intersection of Langer Road and Scenic Avenue; more than 1,000 feet from nearest electric and gas distribution facilities.
- EO 46: Sonoma County Airport, extirpated by habitat conversion; more than 650 feet from nearest electric distribution facilities.
- EO 47: West of Santa Rosa, along Piner Road; more than 200 feet from nearest gas distribution facilities.
- EO 49: Between Sebastopol and Santa Rosa, along Occidental Road; more than 400 feet from nearest electric and gas distribution facilities.
- EO 50: Transplanted population at the northeast corner of the Sonoma County Airport; more than 150 feet from nearest electric distribution facilities.
- EO 52: North of Sebastopol, at the intersection of Hall Road and Cahil Lane; more than 300 feet from nearest electric distribution facilities.

Habitat Impacts

The estimated area of habitat occupied by Sebastopol meadowfoam that could potentially be affected by these covered activities is 0.04 acre (1,742 sq. ft.) over 30 years. With an estimated total area of 698.6 acres of occupied habitat in the study area, this would be a potential impact of less than 0.1% of the total study area range of the species (Table 4-6).

At nine occurrences, covered activities (E7–E10, G5–G12) would not directly affect habitat for Sebastopol meadowfoam, but habitat within 100 feet of facilities could be indirectly affected.

- EO 12: Santa Rosa, along Horn Avenue, electric distribution line is present at roadside, four poles are within 100 feet of map polygon.
- EO 15: At the Desmond Mitigation Bank, west of Llano Road; electric distribution line runs along east side of road, with one pole on the west side of the road within 100 feet of the map polygon (surveyed in 2013 and tagged as Map Book zone).
- EO 21: At the Alton Road Vernal Pool Preserve, an electric distribution line is present at roadside, with 5 poles within 100 feet of the map polygon (surveyed in 2013 and tagged as Map Book zone).
- EO 22: Santa Rosa, between Hall Road and Occidental Road, electric distribution and transmission lines are within 100 feet of three of 36 polygons, with three poles within less than 100 feet.
- EO 28: Northwest of Santa Rosa, near Wood Road, an electric distribution line along Woolsey Road has one pole less than 100 feet from map polygon.
- EO 34: South of Santa Rosa, east of Walker Avenue, electric distribution lines are adjacent to or spanning the occurrence, with five poles within 100 feet of map polygons.
- EO 43: Southwest of Santa Rosa, north of Wilfred Avenue, electric and gas distribution lines are less than 100 feet from map polygon.
- EO 53: Southeast of Calistoga, and the intersection of Heintz Way and Highway 29, an electric distribution line is adjacent to the occurrence with one pole within 50 feet, and a gas transmission pipeline is about 100 feet from the habitat (surveyed in 2013 and tagged as Map Book zone).

At two occurrences, facilities are present within occupied habitat, and covered activities (E7–E10) could have direct and indirect impacts on Sebastopol meadowfoam.

- EO 1: This large occurrence, which includes former EO5, is west of Stony Point Road, southeast of Sebastopol, along Todd Road. Electric distribution lines cross or are adjacent to 11 of 34 polygons. One pole is located within a polygon, and 12 poles are within 100 feet of polygons (surveyed in 2013 and tagged as Map Book zone).
- EO 48: South of Sebastopol, east of the intersection of Canfield Road and Schaeffer Road, an electric distribution line crosses the occurrence, with one pole located in the map polygon (surveyed in 2013 and tagged as Map Book zone).

Table 4-15. Potential Impacts on Sebastopol Meadowfoam

Occurrence Number	Precision	Habitat (acres)	Population Size	Potential Direct Impacts	
				Habitat (acres)	Plants
1	Specific polygons	558.0	Varies: > 550,000 in 1996; >300,000 in 2008; 254,263 in 2012; 20,043 in 2013 (not all polygons censused)	0.02	500
48	Specific polygon	7.0	Not recorded	0.02	NA
NA = Not available					

Direct Impacts on Individual Sebastopol Meadowfoam

Direct impacts on Sebastopol meadowfoam would be likely at two occurrences (Table 4-15). The number of plants directly affected would vary annually but would be proportional to the amount of habitat affected.

- EO 1: Southeast of Sebastopol, west of Stony Point Road, electric distribution lines cross or are adjacent to 14 of 78 polygons. One pole is located within a polygon, and 12 poles are within 100 feet of polygons (surveyed in 2013 and tagged as Map Book Zone).
- EO 48: No estimate of the number of plants present has been reported. Direct impacts on individuals could result from maintenance or replacement of an electric power pole. About 0.03% of this occurrence could be affected, and a proportional number of individuals could be affected.

Covered activities have the potential to result in direct loss and reduced habitat quality, as discussed above, and the number of individuals that could be affected is a few hundred plants over 30 years. However, most of the known occurrences that overlap with PG&E facilities would not directly affect Sebastopol meadowfoam individuals. Based on this assessment, covered activities would not substantially affect the population viability of any occurrences of Sebastopol meadowfoam.

Critical Habitat

Critical habitat has not been designated for Sebastopol meadowfoam.

4.2.6.11 Antioch Dunes Evening Primrose

Antioch Dunes evening primrose, a perennial herb, grows on inland dunes at elevations below 100 feet MSL (California Native Plant Society 2012). There are nine occurrences of Antioch Dunes evening primrose that are presumed extant, eight of which occur in the study area (California Department of Fish and Wildlife 2015). Four of these occurrences, including two in the study area, are experimental populations established through transplantation. Covered activities could affect one of the native occurrences.

Covered activities would not affect seven occurrences.

- EO 1: Antioch Dunes NWR, Stamm Unit; no facilities in habitat, electric transmission lines nearby are in fenced, paved area.
- EO 3: Antioch, along east 18th Street; no habitat remains at this location, facilities in this area are at roadsides, not in potential habitat.
- EO 7: A transplanted population located at the south edge of Browns Island; no facilities present on Browns Island.
- EO 8: A transplanted population located at the west end of Browns Island; no facilities present on Browns Island.
- EO 9: North of Oakley, near Big Bend; a gas distribution line crosses the occurrence, surveyed in 2013, and the gas line is within the railroad right-of-way where no habitat is present.
- EO 10: East Antioch, located west of the Antioch Bridge; more than 1,000 feet to nearest electric transmission facility.
- EO 11: Lime Ridge Open Space, surveyed in 2012; species not found in vicinity of electric or gas transmission facilities.

Habitat Impacts

At one occurrence, covered activities (E7–E10, G5–G12) could have direct and indirect impacts on habitat for Antioch Dunes evening primrose.

- EO 4: At the Sardis Unit of the Antioch Dunes NWR, an electric transmission line crosses the occurrence, with one tower located within the occurrence (surveyed in 2012 and tagged as a Map Book zone).

Table 4-16. Potential Impacts on Antioch Dunes Evening Primrose

Occurrence Number	Precision	Habitat (acres)	Population Size	Potential Direct Impacts	
				Habitat (acres)	Plants
4	Specific polygon	31.1	Declining, 500 in 2007 (total for EO 1 and 4)	0.17 ^a	10

^a Electric distribution and transmission poles and towers.

The estimated area of habitat occupied by Antioch Dunes evening primrose that could potentially be affected by these covered activities is 0.17 acre over 30 years. With an estimated total area of 69.7 acres of occupied habitat in the study area, this would be a potential impact on 0.2% of the total study area range of the species (Table 4-6).

Direct Impacts on Individual Antioch Dunes Evening Primrose

Population sizes of Antioch Dunes evening primrose vary annually and among occurrences, and overall population numbers have been in decline. In 1978, when the species was listed, 1,248 plants were counted at the Sardis Unit, but in 2007, fewer than 500 plants were observed in all of the occurrences (U.S. Fish and Wildlife Service 2008). In a July, 2012 survey of the Map Book zone at EO 4, six Antioch Dunes evening primrose individuals were located within 100 feet of the electric transmission tower, one of which was located next to a tower leg.

Because Antioch Dunes evening primrose is a short-lived perennial, these specific plants are not likely to be affected by covered activities, but they are representative of the magnitude of impacts that individuals at this location would experience. Fewer than 10 plants would be affected by covered activities, most of which would be indirectly affected (Table 4-15). Ground-disturbing activities, such as mowing or foot traffic, may actually benefit Antioch Dunes evening primrose by removing nonnative weedy plants that appear to inhibit germination of evening-primrose seeds (U.S. Fish and Wildlife Service 2008). Based on this assessment, covered activities would not adversely affect the population viability of this occurrence.

Critical Habitat

Critical habitat for Antioch Dunes evening primrose encompasses approximately 281 acres in the study area and 41 acres in the Plan Area. Currently, covered activities do not affect critical habitat for the species on an annual basis. Over the next 30 years, however, it is estimated that no more than 0.2 acre of critical habitat for this species could be permanently affected by covered activities; this equates to 0.06% of the total critical habitat designated for this species (Table 4-4).

4.2.6.12 White-Rayé Pentachaeta

White-rayed pentachaeta, an annual herb, grows in cismontane woodland and in valley and foothill grasslands (often in serpentine soils) at elevations from 115 to 2,034 feet above MSL (California Native Plant Society 2012). Its range is restricted to the Bay Area, including portions of Marin and San Mateo Counties. Only one occurrence in the study area is presumed to be extant (California Department of Fish and Wildlife 2015). Nine other occurrences in the study area are extirpated or are based on historic, non-specific collections.

- EO 2: Located along Skyline Boulevard east of San Andreas Reservoir, last seen in 1948; extirpated by road construction.
- EO 3: Located in Marin County in the Greenbrae Hills, last seen in 1946; extirpated by habitat conversion.
- EO 4: Located in Larkspur, last seen in 1969; extirpated by habitat conversion.
- EO 5: Located east of Kentfield, last seen in 1936; extirpated by habitat conversion.
- EO 6: Located on the east edge of San Bruno Mountain, date of last observation not reported; possibly extirpated.
- EO 7: Near Crystal Springs, last seen in 1867; exact location unknown.
- EO 8: On the San Quentin Peninsula, last seen in 1980; extirpated by off-road vehicle traffic.
- EO 12: Marin City, date of last observation not reported; extirpated by habitat conversion.
- EO 14: Kentfield, last seen in 1912; exact location unknown.

Habitat Impacts

Occurrence 1 is located in the triangle-shaped area formed by I-280, Edgewood Drive, and Cañada Road, and east of the highway in Edgewood Park in San Mateo County. This occurrence was surveyed in 2013. East of the highway, transmission lines are adjacent to the occurrence, but no white-rayed pentachaeta was found within 100 feet of the transmission towers. West of the highway, no white-rayed pentachaeta was observed within 100 feet of the gas transmission pipeline.

However, a large stand of white-rayed pentachaeta was observed at the location of the electric distribution line. Two wood poles are located within 10 feet of the plants, and the line spans the stand. The potential area of impacts from Covered Activities (E7–E10) is 0.04 acre (1,742 sq. ft.). With an estimated total area of 22.0 acres of occupied habitat in the study area, this would be a potential impact of 0.2% (Table 4-6).

Direct and Indirect Impacts on Individual White-Ray Pentachaeta

Because the poles are located at the edge of the affected stand, very few plants (none to 500) would be affected by covered activities over 30 years (Table 4-16). The poles have been tagged as a Map Book zone. The population at Occurrence 1 fluctuates in size annually, but millions of plants have been observed in multiple years between 1982 and 2000 (U.S. Department of Fish and Wildlife 2011). Therefore, covered activities would not adversely affect the population viability of this occurrence.

Table 4-17. Potential Impacts on White-Ray Pentachaeta

Occurrence Number	Precision	Habitat (acres)	Population Size	Potential Direct Impacts	
				Habitat (acres)	Plants
1	Specific polygons	22.0	1,000,000s	0.0085	500

Critical Habitat

Critical habitat has not been designated for white-rayed pentachaeta.

4.2.6.13 Metcalf Canyon Jewelflower

Metcalf Canyon jewelflower, an annual herb, grows in serpentine soils in valley and foothill grassland at elevations from 148 to 2,625 feet above MSL (California Native Plant Society 2012). Its range is restricted to the southeastern portion of the Bay Area, in Santa Clara County. Twelve occurrences of Metcalf Canyon jewelflower have been reported in the study area: 11 of these occurrences are presumed extant and one is extirpated (California Department of Fish and Wildlife 2015). Covered activities could affect two of the occurrences. Covered activities would not affect ten occurrences.

- EO 11: At Tulare Hill, extirpated in 1980 by housing development.
- EO 12: Along Silver Creek Road; more than 100 feet to nearest electric distribution facilities.
- EO 17: At Dana Rock Park, most of the habitat converted to development; electric distribution facilities underground along city streets.
- EO 18: Between Highway 101 and Silver Creek Road; more than 200 feet to nearest electric and gas distribution facilities.
- EO 19: Communication Hill; more than 200 feet to nearest electric distribution facilities.
- EO 22: Young Ranch, northeast of Silver Creek; more than 2,000 feet to nearest electric transmission facilities.
- EO23: East portion of Young Ranch; more than 600 feet to nearest electric distribution facilities.

- EO 24: Northwest portion of Young Ranch; more than 200 feet to nearest electric transmission facilities.
- EO 25: Northwest portion of Young Ranch; more than 150 feet to nearest electric transmission facilities.
- EO 26: Along the east side of Hellyer Avenue; more than 150 feet to nearest electric distribution facilities.

Habitat Impacts

The area of habitat occupied by Metcalf Canyon jewelflower that could be affected by these covered activities is 0.96 acre over 30 years. With an estimated total area of 279 acres of occupied habitat in the study area, this would be a potential impact of 0.3% of the total study area range of the species (Table 4-6).

At two occurrences, covered activities (E7–E10, G5–G12) could have direct and indirect impacts on habitat for Metcalf Canyon jewelflower.

- EO 2: In Metcalf Canyon, three of twelve map polygons are crossed by electric distribution and transmission lines, with four towers and one pole located within map polygons and four more towers within 100 feet of polygons; a gas transmission line crosses one polygon.
- EO 15: Located between Highway 101 and Silver Creek Road, electric transmission lines cross one of four polygons, with two towers located in the polygon; a gas transmission line is within 100 feet of two polygons.

Table 4-18. Potential Impacts on Metcalf Canyon Jewelflower

Occurrence Number	Precision	Habitat (acres)	Population Size	Potential Direct Impacts	
				Habitat (acres)	Plants
2	Specific polygons	75.0	1,000s	0.11 ^a 0.80 ^b	< 100
15	Specific polygons	34.3	Varies, from 75,000 in 1998 to 0 in 1999	0.05 ^a	< 110

^a Electric distribution and transmission poles and towers.
^b Gas distribution and transmission lines.

Direct Impacts on Individual Metcalf Canyon Jewelflower

Direct impacts on Metcalf Canyon jewelflower individuals would be expected at four occurrences (Table 4-18). Because this is an annual species, the number of plants potentially affected would vary annually but would be proportional to the amount of habitat affected.

- EO 2: Thousands of plants were reported in 1986 and 1991. No more recent population counts have been reported. Direct impacts on 0.91 acre of habitat (1.2%) could result in direct impacts on several dozen plants.
- EO 15: Population numbers have fluctuated between a high of 75,000 in 1998 and a low of 0 in 1999. Recently reported population numbers include 17,395 in 2007 and 120 in 2013. Direct

impacts on 0.05 acre of habitat (0.1%) could result in direct impacts on individuals ranging from 0 to 110 plants.

The estimated number of Metcalf Canyon jewelflower plants subject to direct loss would be 500 individual plants over 30 years. Based on this assessment, covered activities would not adversely affect the population viability of any occurrence of Metcalf Canyon jewelflower.

Critical Habitat

Critical habitat has not been designated for Metcalf Canyon jewelflower.

4.3 Requested Incidental Take Authorization

Table 4-19 provides the covered species' legal status and requested incidental take authorization for covered wildlife species covered under this plan. This table summarizes the species' legal status and PG&E's requested take authorization. The amount of incidental take in Table 4-19 reflects the maximum allowable take under the permit.

Although 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 permits in recognition of the conservation benefits provided to the species. Table 4-20 addresses the amount of occupied habitat (acres) and estimates of plants that would be affected over the term of the HCP. Impacts on the extremely rare plant species would mostly be avoided because PG&E would follow the Map Book zone process, implement species-specific AMMs, implement vegetation management BMPs, and, if necessary, work with the USFWS to ensure protection measures are feasible and can be successfully implemented. Impacts on listed plant species also would be avoided, minimized, and offset through the environmental review and screening process.

Table 4-19. Requested Federal Take Authorizations for Wildlife

Common Name	Federal Legal Status	Federal Requested Authorization	Amount of Take Requested over 30 Years (acres of suitable habitat) ^a	Number of Individuals Possibly Taken Annually ^b
Invertebrates				
California freshwater shrimp	E	Take	2.3	12/10 years
Conservancy fairy shrimp	E	Take	2.5	Unknown
Longhorn fairy shrimp	E	Take	1.1	Unknown
Vernal pool fairy shrimp	T	Take	30	Unknown
Vernal pool tadpole shrimp	E	Take	30	Unknown
Delta green ground beetle	T	Take	6	Unknown
Bay checkerspot butterfly	T	Take	66	Unknown
Callippe silverspot butterfly	E	Take	85	Unknown
Lange's metalmark butterfly	E	Take	1.3	Unknown
Mission blue butterfly	E	Take	22	Unknown
San Bruno elfin butterfly	E	Take	22	Unknown
Amphibians				
California tiger salamander (Central CA DPS) – Upland habitat	T	Take	4,098	16
California tiger salamander (Central CA DPS) – Breeding habitat	T	Take	27	See above
California tiger salamander (Sonoma County DPS) – Upland Habitat	E	Take	93	2
California tiger salamander (Sonoma County DPS) – Breeding Habitat	E	Take	1	See above
California red-legged frog – Upland habitat	T	Take	1,677	12
California red-legged frog – Breeding habitat	T	Take	21.1 ^c	See above
Reptiles				
Alameda whipsnake – Core habitat	T	Take	47	6
Alameda whipsnake – Perimeter core habitat	T	Take	95	See above
Alameda whipsnake – Movement habitat	T	Take	356	See above
San Francisco garter snake – Core habitat	E	Take	18	4
San Francisco garter snake – Dispersal habitat	E	Take	12	See above
Birds				
Ridgway's rail	E	Take	37.4	Unknown
Mammals				
Salt marsh harvest mouse	E	Take	38.7	Unknown
San Joaquin kit fox – Core habitat	E	Take	463	Unknown
San Joaquin kit fox – Low-use/quality	E	Take	280	Unknown

^a The nature of the take that could result from covered activities is more completely described in Chapter 4. This column represents the sum of the permanent and temporary take estimates from Table 4-3.

^b A specific number of individuals is requested for species that could be detected during the course of work.

^c The impact analysis assumed impacts on 419 acres of modeled habitat; however, actual impacts to breeding habitat will be much lower and are shown as the take request.

Table 4-20. Requested Take Authorizations for Covered Plants

Common Name	Status ^a		California Rare Plant Rank	Requested Authorization		Amount of Take of Occupied Habitat (acres) and Plants over 30 years ^b
	Federal	State		Federal	State	
Pallid manzanita	T	E	1B.1	Take	–	2.27 acres; 15 plants
Sonoma sunshine	E	E	1B.1	Take	–	2.5 acres; 250,000 plants
Coyote ceanothus	E	–	1B.1	Take	–	3.5 acres; 2,500 plants
Fountain thistle	E	E	1B.1	Take	–	0.8 acres; 100 plants
Santa Clara Valley dudleya	E	–	1B.1	Take	–	3.84 acres; 800 plants
Contra Costa wallflower	E	E	1B.1	Take	–	0.17 acres; 35 plants
Marin dwarf flax	T	T	1B.1	Take	–	1.958 acres; 1,700 plants
Burke's goldfields	E	E	1B.1	Take	–	1.51 acres; 2,000 plants
Contra Costa goldfields	E	–	1B.1	Take	–	5.48 acres; 14,539 plants
Sebastopol meadowfoam	E	E	1B.1	Take	–	0.04 acres; 500 plants
Antioch Dunes evening primrose	E	E	1B.1	Take	–	0.17 acres; 10 plants
White-rayed pentachaeta	E	E	1B.1	Take	–	0.11 acres; 500 plants
Metcalf Canyon jewelflower	E	–	1B.1	Take	–	0.96 acres; 210 plants

^a Status explanations:

Federal

E = listed as endangered under the federal Endangered Species Act

T = listed as threatened under the federal Endangered Species Act

State

E = listed as endangered under the California Endangered Species Act

T = listed as threatened under the California Endangered Species Act

– = no status.

California Rare Plant Rank

1B = List 1B species: rare, threatened, or endangered in California and elsewhere

.1 = Seriously endangered in California

^b Acreage and number of plants would be limited by each specific occurrence and would not exceed 20% of a specific Element Occurrence.

4.3.1 Caps on Habitat Loss (Take)

The number of O&M activities conducted each year varies significantly based on many factors, including the reliability and age of the facility, regulatory requirements, local demand, permit or license requirements, available budgets. To ensure that impacts on covered species are not disproportionately large in any 10-year period and that PG&E does not exhaust its aggregated take authorization too quickly, PG&E would not exceed 33.3% of its take authorization for a 10-year period for California tiger salamander (both the Central California and Sonoma County DPSs) and California red-legged frog unless mitigation is provided in advance of impacts. For all other species, take would not exceed 50% of the take authorization in a 15-year period unless mitigation is provided in advance of impacts. The total take authorization requested represents a cap that cannot be exceeded under the incidental take permits.

4.4 Impacts Associated with Mitigation

Habitat acquisition and other mitigation efforts would benefit covered species; however, in the conduct of the conservation strategy, some adverse impacts could result. For example, standard maintenance and monitoring of mitigation lands (e.g., fencing, surveying, conducting biological surveys, and conducting habitat enhancements) could result in impacts.

4.4.1 Covered Wildlife

During the maintenance of vernal pools, wetlands, riparian habitats, and grasslands, individual covered wildlife species could be harmed or harassed. 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. Management plans for mitigation efforts would maximize beneficial impacts and minimize adverse impacts through the incorporation of AMMs for covered species.

The amount and extent of take will be reported to USFWS as part of the *PG&E Bay Area O&M HCP Annual Report* (Annual Report) on the status and progress of the Bay Area O&M HCP. Details of the Annual Report are discussed in Chapter 6, *Plan Implementation*.

4.4.2 Covered Plants

In the course of implementing conservation measures for covered plants, direct and indirect impacts could result. The magnitude of potential impacts would depend on the size and type of activity, proximity of individuals or a population to the covered activity, the life stage of the species, and the short- and long-term impacts on habitat characteristics. However, specific management plans for plant mitigation efforts would maximize beneficial impacts and minimize adverse impacts.

[Summary: PG&E's Bay Area O&M HCP 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 aimed at tracking and reporting activities; 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, minimize, and mitigate impacts on species and habitat in the Plan Area. 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 either in advance or at the time of covered activity impacts over the term of the HCP.]

5.1 Conservation Strategy Overview

The purpose of the Bay Area O&M HCP is to enable PG&E to continue to conduct covered activities in the Bay Area while avoiding and minimizing impacts on covered species (see Chapter 1, *Introduction*, Tables 1-2 and 1-3 for covered wildlife and plants, respectively) and mitigating for impacts on covered species' habitats in compliance with the ESA.

Five key principles guide the 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 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 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.

Figure 5-1 provides an overview of the key elements of the conservation strategy. Training, environmental review, planning and screening, biological surveys and monitoring, avoidance and minimization, and habitat mitigation are described in this chapter. Recordkeeping and data tracking are described in Chapter 6, *Plan Implementation and Funding*.

5.2 Biological Goals and Objectives

The USFWS 5-Point Policy (65 FR 35242–35357, June 1, 2000) recommends that HCPs include biological goals and objectives. The purpose of biological goals and objectives is to describe the vision and commitments of the conservation strategy and to articulate the objectives of the HCP. Goals are broad, guiding principles based on the conservation needs of the resources. Biological objectives express specific and measurable conservation targets or actions. Objectives should clearly state a desired result that is measurable and achievable within a given timeframe.

The Bay Area O&M HCP biological goals and objectives are organized by maintaining, preserving, or obtaining high-quality habitat with direct benefits for covered species. These goals and objectives provide the framework for developing an integrated conservation strategy that identifies specific management and minimization actions. Associated biological goals and objectives for the conservation strategy are as follows.

- **Goal 1:** Maintain habitat quality for covered species in the Plan Area by restoring disturbed areas.
 - **Objective 1.1.** Re-contour 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.
- **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 acreage totals for covered species.
- **Goal 3:** Pursue conservation actions that result in clear and direct species benefits (e.g., restoration and recovery projects).
 - **Objective 3.1.** Contribute to tidal marsh restoration via in-kind services or monetary contributions to organizations whose missions are to conduct conservation work.
 - **Objective 3.2.** Contribute to habitat enhancement and restoration for covered species via in-kind services or monetary contributions.

5.3 Annual Training

PG&E will implement an annual environmental awareness training program for staff who conduct or supervise covered activities performed under the Bay Area O&M HCP. PG&E will provide the training both in person and on-line 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.

Training will include an overview of the Bay Area O&M HCP, the importance of compliance with the HCP and all environmental laws, and a summary of all AMMs and BMPs outlined in the HCP. A

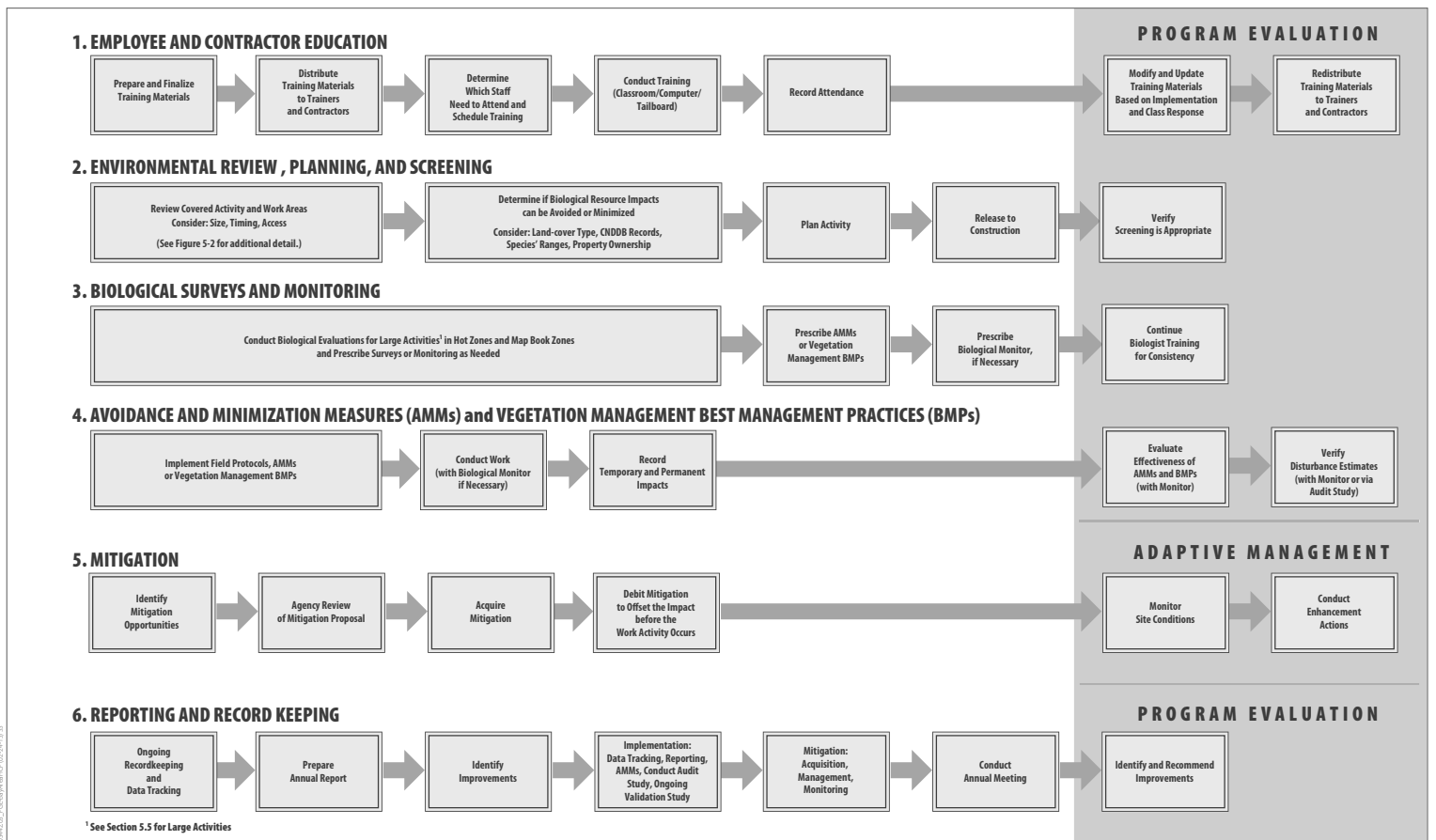


Figure 5-1
Conservation Strategy Overview

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 working 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.

5.4 Environmental Review, Planning, and Screening Process

This section describes how PG&E will integrate the use of a habitat model into its current environmental screening processes to evaluate impacts on species and their habitat.

PG&E conducts early planning and review of activities to avoid or minimize impacts on protected species and habitat. 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 (see Figure 1-2).

- Adjusting or changing access routes.
- Relocating or modifying work areas.
- Minimizing the size of work sites.
- Modifying work practices.
- Adjusting or changing work periods.

5.4.1 Purpose and Application of Habitat Models

For the numerous and small covered activities affecting less than 0.1 acre, a 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. 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, identify the modeled habitat that will be affected, and identify the location of Map Book zones and hot zones (explained in Sections 5.4.2 and 5.4.3). The type of modeled habitat that will be affected and the potential impacts on Map Book zones or hot zones inform the land planner or biologist on how to prescribe the appropriate AMMs or BMPs. 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 to calculate mitigation and prepare annual reports.

The estimates of impacts on modeled habitat will be used to derive mitigation for impacts resulting from small activities. PG&E used impact estimates from Table 4-1 in Chapter 4 to develop its conservation strategy for activities generally considered "small" (affecting 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 are G3a (fencing), G3b, G5, G6, G7, G8, and E5, E6a, E6b, E7, E8b, E9b, E10b, E10c, E11a, E11b, E15. The temporary or permanent impacts from these small activities will not be restored in the field because the impacts will be extremely small and compensatory mitigation will be

provided for most of these activities. Additionally, PG&E will periodically validate the restoration progress from a subset of these small activities, as described in Chapter 6, *Plan Implementation and Funding*, to ensure that average on-the-ground impacts occur as estimated and that habitat impacts do not exceed estimates (e.g., temporary impacts do not become permanent impacts).

For those covered activities affecting 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 (Ergon mats), G9, G10, G11, G12, G13a, G14, G15, G16, G17, G18, and E9a, E10d, E12, E13, E14. Impacts from these activities will then be used to calculate required mitigation. Activities G1, G2, G4, G13b, and E1, E2, E3, E4, E8a, E10a, E10e, E10f are not expected to result in ground disturbance and, therefore, are unlikely to cause loss of covered species habitat.

5.4.1.1 Exceptions to the Use of the Models

PG&E's environmental review, planning, and screening processes will evaluate potential habitat impacts based on the species' modeled habitat and the site specific location of the covered activity. In three cases PG&E may determine that the habitat models are inaccurate at a fine scale.

1. The area is not habitat (e.g., the area contains urban lands, including landscaped areas that would not be considered habitat).
2. The area is no longer habitat (e.g., completed development projects have removed natural vegetation from a site) as demonstrated through aerial photographs or a site visit (e.g., contains areas adjacent to roads or urban land-cover without burrows, or certain agricultural crops that are removed from adjacent habitat).
3. The area has other site-specific land use changes that make it unsuitable as demonstrated through reports, survey data, or other site-specific information (e.g., the area has been graded or otherwise substantially altered).

In these instances, PG&E will not implement AMMs, BMPs, or provide mitigation. Conversely, PG&E's land planners and biologists may detect suitable habitat where the habitat models indicate lack of habitat at a fine scale.

5.4.1.2 Updates to the Habitat Models

To ensure accurate representation of habitat available for the covered species, PG&E will review the habitat models for wildlife species once every 10 years, or more frequently as habitat model data becomes available. For example, if the current land cover (modeled habitat) datasets are updated, PG&E, with concurrence of USFWS, will update the modeled habitat data layers and provide the data layers to USFWS. When PG&E receives better wetland data for Santa Rosa Plain and Solano County, PG&E will integrate this dataset into the models to assist PG&E in avoiding wetland habitats. Similarly, USFWS may recommend integration of additional information into the habitat models and PG&E will incorporate this information. PG&E will continue to subscribe to Rarefind/CNDDDB and integrate CNDDDB updates into its MapGuide GIS system twice a year to augment the habitat models. If a species range begins to expand as noted in CNDDDB, the model for that species will be updated.

5.4.2 Hot Zones

To refine the model-based approach, PG&E has developed “hot zones” for select covered wildlife species that only occur within specific and localized habitat types. A hot zone is a defined 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 created hot zones for the following habitat and species. Work in these areas requires implementation of hot zone AMMs.

- **Riparian hot zone:** California freshwater shrimp (occupied streams identified in the USFWS recovery plan and based on discussions with CDFW).
- **Vernal pool hot zone:** Longhorn fairy shrimp (critical habitat), Conservancy fairy shrimp (critical habitat).
- **Butterfly hot zone:** Mission blue butterfly and Lange’s metalmark butterfly (Antioch Dunes), and Bay checkerspot butterfly and San Bruno elfin butterfly (Coyote Ridge, Tulare Hill, and San Bruno Mountain).
- **Amphibian hot zone:** California tiger salamander (in the Santa Rosa Plain, several key areas in Solano County, and in the vicinity of Stanford University).
- **Reptile hot zone:** San Francisco garter snake (near San Francisco International Airport and Crystal Springs Reservoir, and several other locations on the Peninsula).
- **Marsh hot zone:** Ridgway’s rail and salt marsh harvest mouse (bay fringe marsh habitats and salt ponds).

5.4.3 Map Book Zones

PG&E developed “Map Book zones” for covered plant species. These Map Book zones are areas with extant, known, or recently confirmed plant occurrences, as determined by a series of one-time botanical surveys, that warrants implementation of unique AMMs. PG&E began conducting these botanical surveys of occupied and potentially occupied areas using CNDDDB records of covered plant species with accuracy classes 1 through 4 and review of aerial photos as a guide to create the one-time survey of Map Book zones. CNDDDB defines accuracy class 1 as a specific bounded occurrence with a 262-foot radius; accuracy class 2 as a specific noncircular bounded area; accuracy class 3 as a nonspecific bounded area; and accuracy class 4 as a nonspecific circular feature with a 492-foot radius. During this initial series of surveys, biologists developed AMMs for each Map Book zone. The Map Book zone development process consisted of an aerial photo review of these locations to eliminate sites where the land use has changed, visiting reference sites, and conducting seasonally appropriate botanical surveys. In general, property owner access is required to complete these surveys. Surveys include suitable habitat within 300 feet of CNDDDB occurrences with an accuracy class of 1, 2, or 3, and suitable habitat within 1 mile of CNDDDB occurrences with an accuracy class of 4. These maps will help ensure that PG&E can avoid or minimize ground-disturbing impacts in habitat known to be occupied by covered plant species. When additional data are obtained in the future through surveys conducted for larger activities, such information will be incorporated into the Map Book zones.

5.4.4 Environmental Review, Planning, and Screening Processes by Line of Business

PG&E's environmental review, planning, and screening process varies by the specific 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 Bay Area O&M HCP, the respective environmental screening groups will be responsible for maintaining compliance with the HCP. In general, each of the environmental review groups will do the following for its respective LOB.

- Screen covered and noncovered activities (i.e., planners and biologists review all types of projects, including new projects that are not covered under this HCP).
- Apply AMMs, FPs, 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 HCP annual report.

For most projects presented in Figure 5-2, a team of land planners, biologists, cultural resource specialists, and environmental field specialists will first review, plan, and screen covered activities. After the completion of surveys, studies, and analyses, the appropriate natural resource protection measures (including AMMs) will be documented in a release-to-construction memorandum. PG&E will also use an AEA screening tool to screen many of the small electric (e.g., pole replacements) and small gas covered activities. Projects undergoing AEA will be automatically screened using a variety of data layers (e.g., waterways, CNDDDB, serpentine soils, conservation easements, critical habitat, kit fox dens, levees, protected lands, anadromous fish streams, and vernal pools) and then released to construction if no data layers are flagged for manual review. 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. 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 conduct environmental review of vegetation management covered activities before work in the field commences.

Environmental Review and Screening for Covered Plants

PG&E's approach to maintaining ESA compliance for listed plant species focuses on avoidance and minimization. PG&E strives to avoid the direct loss of individuals of covered plant species, but some loss will occur during O&M activities. The conservation strategy for covered plants is in line with PG&E's current practices for protecting listed plant species and implementing AMMs where

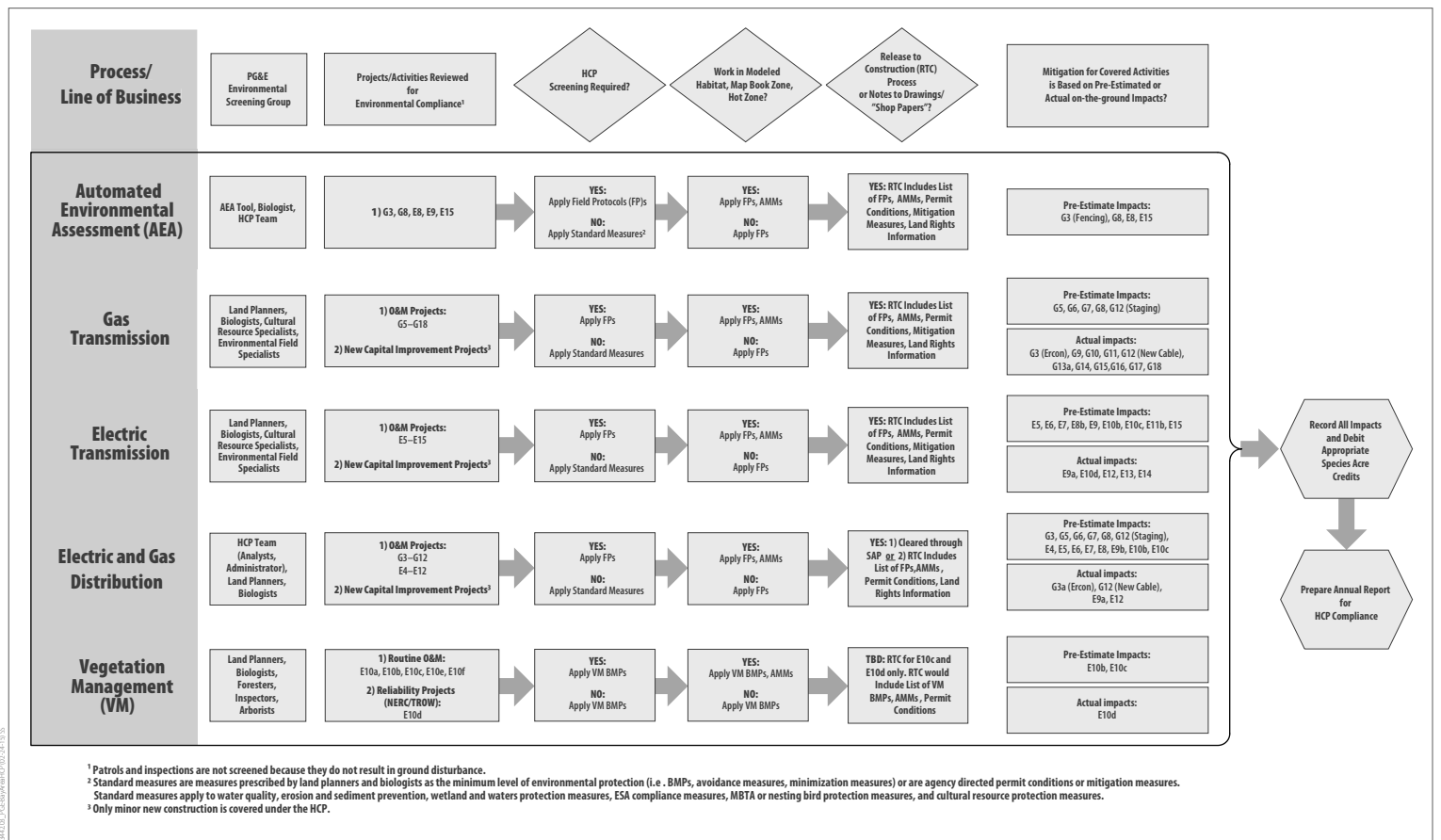


Figure 5-2
Environmental Review Process
by Line of Business

practicable. Map Book zones provide the foundation for the implementation of AMMs for plants. The specific process that will be followed is illustrated in Figure 5-3 and described as follows.

Small Activities within Map Book Zones

For small activities within a Map Book zone, PG&E will implement the AMMs. If the impact is minimized and not avoided, PG&E will assume the activity results in a permanent impact. Similarly, if it is not feasible to implement an AMM, PG&E will assume the activity results in a permanent impact. PG&E will mitigate these impacts based on the average area of disturbance for that type of small activity. PG&E is not proposing additional surveys or monitoring of these locations because the area will have already been surveyed during the correct seasonal window and the cost of additional surveys or monitoring typically exceeds the cost of providing mitigation. However, there may be instances where PG&E prepares surveys to determine if impacts are temporary or permanent. 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.

Large Activities within Map Book Zones

For large activities within Map Book zones, PG&E will use the Map Book zones data layers to assist in its overall environmental review and screening process. In some instances, additional site-specific review or surveys will be conducted to confirm the location of existing plant populations in relation to work areas. These reviews and surveys will help inform decisions regarding the presence or absence of habitat and if AMMs need to be assigned. Based on the Map Book zone and additional site evaluation, PG&E will implement the appropriate AMM. If the impact cannot be avoided, PG&E will prepare a restoration plan for USFWS to review and approve (see Section 5.6.2.4, *Mitigation Summary for Plants*). PG&E will adhere to the restoration plan and subsequent monitoring will reveal if the impact is permanent or temporary. PG&E will provide mitigation for large activities based on the number of plants affected or based on the amount of habitat affected. PG&E will monitor mitigation sites to determine the success of the restoration effort.

For some activities, such as emergency activities, work may occur in a Map Book zone without additional evaluation or AMMs. In these instances, PG&E will assume that impacts are permanent.

Large Activities outside Map Book Zones

For large activities outside of Map Book zones, PG&E will screen and evaluate areas outside of Map Book zone data layers and may discover additional CNDDDB occurrences or suitable habitat. If a planner or biologist believes that the species might be present, they will conduct additional analyses and possibly prescribe a survey. If the site has suitable habitat and the survey cannot be conducted during the correct seasonal window, the work will be conducted consistent with the AMMs to minimize impacts; however, PG&E will assume the species is present and mitigate accordingly based on acreage of habitat disturbed. If the survey is conducted in 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 AMM. 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 5.6.2.4, *Mitigation Summary for Plants*). PG&E will implement the restoration plan, and subsequent monitoring will reveal if the restoration is successful and if the impact is permanent or temporary. Mitigation, if any, will be based on the results of the monitoring effort.

5.5 Biological Surveys and Monitoring

Biological surveys and monitoring will be limited for most, if not all, small covered activities because habitat models will drive the assessment of potential impacts and the required mitigation. However, for larger gas activities (G9, G10, G11, G12, G13a, G14, G15, G16, G17, and G18) and electric activities (E9a, E10d, E12, E13, and E14), PG&E will follow its existing work streams, in which a team of planners and biologists will conduct site assessments to position laydown areas, access routes, and exclusion zones (see Figure 5-2). Also for these larger activities, PG&E will employ biologists to evaluate activities in hot zones and Map Book zones and determine the need for additional surveys or monitoring.

Biological monitors may prescribe site-specific AMMs and will have the authority to stop work if a covered species is observed or if work is conducted in a way that may take 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.

If the biologist or onsite biological monitor detect or observe any special-status species before, during, or after construction, he or she will submit their observations to the CNDDDB with landowner approval.

5.5.1 Avoidance and Minimization of Impacts

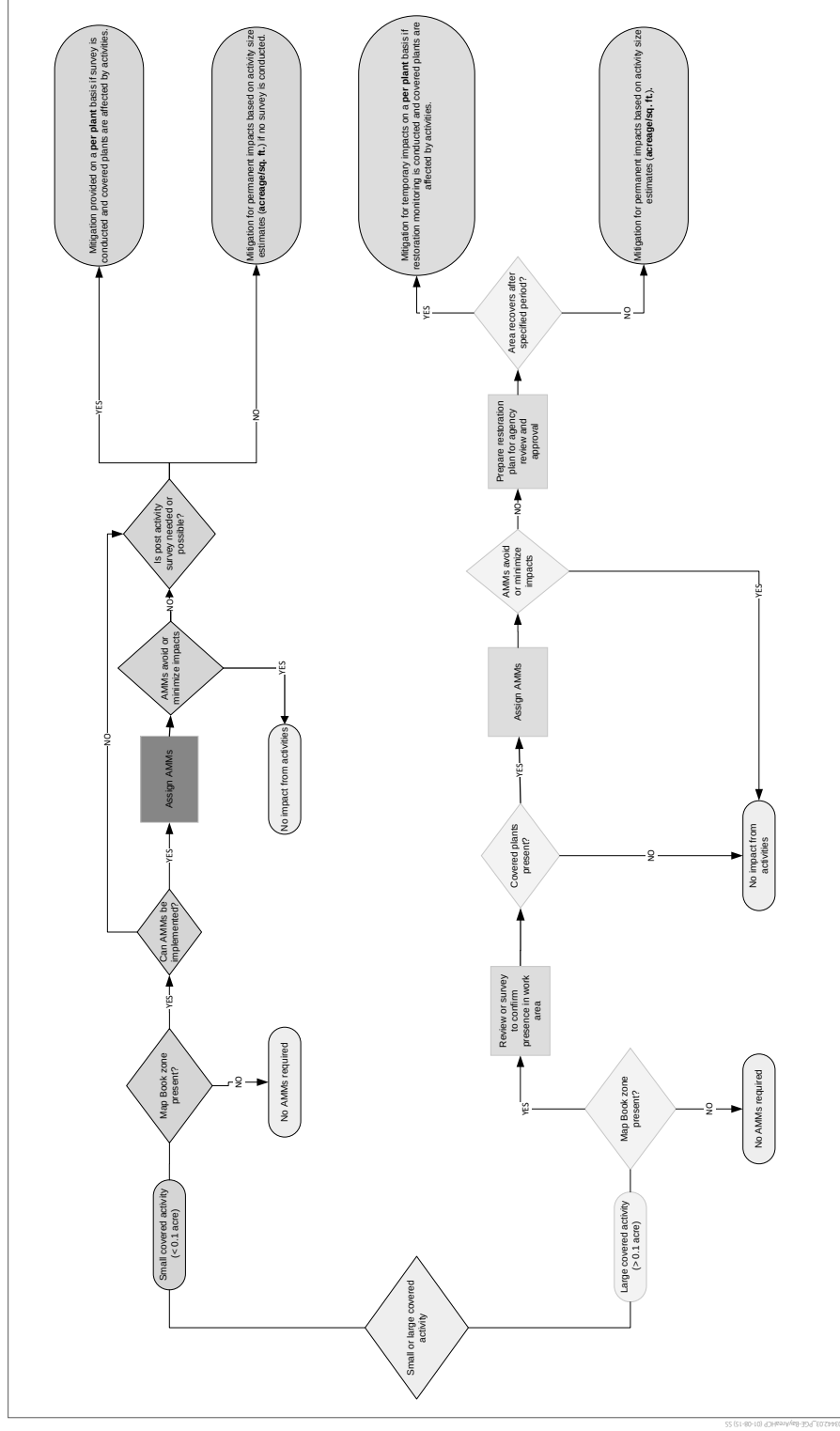
PG&E will avoid and minimize the impacts associated with covered activities through the use of field protocols and AMMs (hot zone AMMs, species-specific AMMs, and covered plant AMMs) (Table 5-1) and vegetation management BMPs (Table 5-2).

5.5.1.1 Field Protocols

Field protocols are PG&E's general measures designed to avoid or minimize potential impacts on biological resources and covered species. These measures provide clear and consistent guidance to address a broad range of issues including training, access, worksite management, erosion control, and natural resource protection (Table 5-1). PG&E trains crews and contractors on these measures and they are expected to implement the measures during their daily work.

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 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.



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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	Applicable Covered Species
Field Protocols			
<i>Training</i>			
HCP Team	FP-01	Hold 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.	All covered species
<i>Access and Worksite Management</i>			
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
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
Field Crew	FP-04	Locate off-road access routes and work sites to minimize impacts on plants, shrubs, and trees, small mammal burrows, and unique natural features (e.g., rock outcrops).	All covered species
HCP Team, Land Planners	FP-05	Notify conservation land owner at least 2 business days prior to conducting covered activities on protected lands (state and federally owned wildlife areas, ecological reserves, or conservation areas); more notice will be provided if possible 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 land owner within 48 hours after initiating emergency work. While this notification is intended only to inform conservation land owner, PG&E will attempt to work with the conservation land owner to address landowner concerns.	All covered species
Field Crew	FP-06	Minimize potential for covered species to seek refuge or shelter in pipes and culverts. Inspect pipes and culverts, of diameter 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. Immediately contact a biologist if a covered species is suspected or discovered.	All covered amphibians, reptiles and mammals
Field Crew	FP-07	Vehicle speeds on unpaved roads will not exceed 15 miles per hour.	All covered species
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

Table 5-1. Continued

Staff Responsible	Code	Description of Measure	Covered Species Benefiting from Measure
Field Protocols			
<i>Access and Worksite Management (continued)</i>			
Field Crew	FP-09	During fire season in designated State Responsibility Areas, equip all motorized equipment with federally approved or state-approved spark arrestors. Use a backpack pump filled with water and a shovel and fire-resistant mats and/or windscreens when welding. During fire “red flag” conditions as determined by Cal Fire, curtail 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
Field Crew	FP-10	Minimize the activity footprint and minimize the amount of time spent at a work location to reduce the potential for take of species.	All covered species
<i>Erosion Control</i>			
Field Crew	FP-11	Utilize standard erosion and sediment control BMPs (pursuant to the most current version of PG&E’s <i>Stormwater Field Manual for Construction Best Management Practices</i>) to prevent construction site runoff into waterways.	All covered aquatic species
Field Crew	FP-12	Stockpile soil within established work area 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
<i>Natural Resource Protection</i>			
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 are not trapped. If any wildlife are found, a biologist will be notified and 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
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.	All covered grassland species
Field Crew	FP-15	Prohibit vehicular and equipment refueling 250 feet from the edge of vernal pools, and 100 feet from the edge of other 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 freshwater shrimp, California red-legged frog, California tiger salamander (both Central California and Sonoma County DPSs), San Francisco garter snake

Table 5-1. Continued

Staff Responsible	Code	Description of Measure	Covered Species Benefiting from Measure
Field Protocols			
<i>Natural Resource Protection (continued)</i>			
Land Planner or Biologist, and Field Crew	FP-16	Maintain a buffer of 250 feet from the edge of vernal pools and 50 feet from the edge of wetlands, ponds, or riparian areas. If maintaining the buffer is not possible because the areas are either in or adjacent to facilities, the field crew will implement other measures as prescribed by the land planner, biologist, or HCP administrator to minimize impacts by flagging access, requiring foot access, restricting work until dry season, or requiring a biological monitor during the activity.	Vernal pool species, California freshwater shrimp, California red-legged frog, California tiger salamander (both Central California and Sonoma County DPSs), San Francisco garter snake
Field Crew	FP-17	Directionally fell trees away from an exclusion zone, if an exclusion zone has been defined. If this is not possible, remove the tree in sections. Avoid damage to adjacent trees to the extent possible. Avoid removal of snags and conifers with basal hollows, crown deformities, and/or limbs over 6 inches in diameter.	All covered species
Land Planner or Biologist, and Field Crew	FP-18	Nests with eggs and/or chicks will be avoided: contact a biologist, land planner or the Avian Protection Program manager for further guidance.	All nesting bird species
Hot Zone Avoidance and Minimization Measures			
Biologist/Field Crew	Hot Zone-1	Work will avoid pools and streams. Field crew will prevent any damage to the bank and streamside vegetation during placement or movement of materials on the stream banks. Streamside vegetation overhanging into pools or runs will, to the maximum extent practical, not be removed, trimmed, or otherwise modified.	California freshwater shrimp
Biologist/Field Crew	Hot Zone-2	Ground-disturbing activities will not occur from the first significant rain (1 inch) during the wet season, October 15–April 15, 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 occur 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 directing crews on access, use of erosion/sediment fencing, use of access mats, and other techniques to avoid direct or indirect effects. PG&E may seek guidance from USFWS as to the suitability of additional measures to avoid or minimize take of this species.	Longhorn fairy shrimp

Table 5-1. Continued

Staff Responsible	Code	Description of Measure	Covered Species Benefiting from Measure
Hot Zone Avoidance and Minimization Measures (continued)			
Biologist/ Field Crew	Hot Zone-3	A biologist will survey for host and nectar plants (lupine, thistles, viola) prior to activity commencement and flag off-road access for vehicles, or identify if foot access or ATVs are necessary. In cases where plants cannot be avoided activities will only be allowed during flight period, March 1 – July 15, to reduce the risk of butterfly mortality. PG&E will avoid and minimize the introduction or spread of noxious weeds from vehicular traffic through employee education, minimizing off-road travel, and inspecting vehicles to be sure they are not transporting observable noxious weeds.	San Bruno elfin butterfly, Callippe silverspot butterfly, Mission blue butterfly (San Bruno Mountain)
Biologist/ Field Crew	Hot Zone-4	A biologist will survey for host and nectar plants (naked-stem buckwheat) prior to activity commencement and flag off-road access for vehicles, or identify if foot access or ATVs are necessary. In cases where plants cannot be avoided activities will only be allowed during flight period, August 1–September 30, to reduce the risk of butterfly mortality. USFWS refuge biologist will be contacted if work is to occur on USFWS-owned refuge lands, and PG&E will adhere to USFWS guidance on methods to avoid and minimize effects.	Lange’s metalmark butterfly (Antioch Dunes National Wildlife Refuge)
Biologist/ Field Crew	Hot Zone-5	A biologist will survey for host and nectar plants (dwarf plantain, purple owl’s clover, or paintbrush) prior to activity commencement and flag off-road access for vehicles, or identify if foot access or ATVs are necessary. In cases where plants cannot be avoided activities will be allowed during flight period, March 1–April 30. PG&E will avoid and minimize the introduction or spread of noxious weeds from vehicular traffic through employee education, minimizing off-road travel, and inspecting vehicles to be sure they are not transporting observable noxious weeds.	Bay checkerspot butterfly (Mapped serpentine grassland in Santa Clara County)
Biologist/ Field Crew	Hot Zone-6	Limit activities to foot access only when working off of established roadways unless a biological monitor flags off-road access routes for equipment that minimize impacts on habitat and species. This includes the identification and avoidance of vernal pools and stock ponds. Covered activities that cannot avoid vernal pool impacts will be completed when pools are clearly dry.	California tiger salamander (both Central California and Sonoma County DPSs)

Table 5-1. Continued

Staff Responsible	Code	Description of Measure	Covered Species Benefiting from Measure
Hot Zone Avoidance and Minimization Measures (continued)			
Biologist/ Field Crew	Hot Zone-7	Activities that result in ground disturbance will occur May 1–October 30 (active season). Vegetation will be cut using hand tools to 3 inches in height. Once the ground is visible, a visual survey for San Francisco garter snake will be conducted by the biologist prior to additional ground disturbance. Field crews will install solid exclusion fencing if the work is in areas of known species presence. If work needs to occur during the inactive period (November 1–April 30) and is located in an area of known occupancy, flag and avoid any burrows by at least 10 feet wherever possible. If any burrows cannot be avoided by this distance, a biologist will inspect following activities to determine whether or not the burrow has been collapsed. If a burrow is collapsed, the biologist shall make efforts to open the burrow.	San Francisco garter snake
Biologist and Field Crew	Hot Zone-8	For activities that will result in ground disturbance in tidal marsh or coastal wetland habitat, including the removal of marsh vegetation, a biologist will flag access routes for crews when working in pickleweed (<i>Salicornia</i>) or smooth cordgrass (<i>Spartina alterniflora</i>) dominated habitats in order to minimize impacts on these species. Crews will hand-carry equipment and use protection mats (landing pads, pallets) to minimize ground disturbance when working within pickleweed or smooth cordgrass. Small areas of healthy vegetation will be cleared by hand prior to placement of protective mats. To avoid take of salt marsh harvest mouse, the biologist will assess the site to determine if: vegetation protection mats are appropriate, use of helicopters is needed, vegetation removal by hand is needed, and an onsite biological monitor is needed. Prior to placement of mats or removal of vegetation, the vegetation will be disturbed (i.e., flushed) to force movement of salt marsh harvest mouse into adjacent tidal marsh areas. Immediately following flushing, the field crew will place a mat or manually remove vegetation with nonmotorized tools (e.g., hoe, rake, trowel, or shovel) to the bare ground. Conduct work within 700 feet of wetlands suitable for the Ridgway's rail September 1–January 15.	Ridgway's rail, salt marsh harvest mouse (Marsh/Bay Fringe)

Staff Responsible	Code	Description of Measure	Covered Species Benefiting from Measure
Species-Specific Avoidance and Minimization Measures for Activities E9b (reconductoring) , E12-E14 (pole and tower line construction and substation expansion), and G16-18 (pipeline safety enhancement projects)			
Biologist and Field Crew	SJKF-1	A biologist will inspect the work site no more than 30 days prior to 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 tracks are observed and then the den is presumed occupied. Exit ramps will also be installed in these areas at both ends of the excavated areas. 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 possible. 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 immediately notified to discuss protective measures; if USFWS staff are unable to be reached, PG&E will set up exclusion zones, visual screens, and construction monitors to ensure direct mortality is avoided. Under no circumstances will the den be disturbed or destroyed.	San Joaquin kit fox (Grasslands in eastern Alameda, and southeastern Contra Costa Counties)
Biologist/ Field Crew/ HCP Administrator	Wetland-1	Identify vernal pools and establish buffers. Maintain a buffer of 250 feet around vernal pools and vernal pool complexes. If maintaining the buffer is not possible because the areas are either in or adjacent to facilities, the field crew will implement other measures as prescribed by the biologist or HCP administrator to minimize impacts. These measures include flagging access, requiring foot access, restricting work until the dry season, requiring a biological monitor during the activity, or excavating burrows in ROWs where trenching will occur. Activities must maintain the downstream hydrology to the vernal pool or complex. Additional minimization measures may be implemented with prior concurrence from USFWS.	Vernal pool species, including California tiger salamander (both Central California and Sonoma County DPSs)
Biologist/ Field Crew	Wetland-2	Identify wetlands, ponds, and riparian areas and establish buffers. Maintain a buffer of 50 feet around wetlands, ponds, and riparian areas. If maintaining the buffer is not possible because the areas are either in or adjacent to facilities, the field crew will implement other measures as prescribed by the biologist or HCP administrator to minimize impacts. These measures include flagging access, requiring foot access, restricting work until the dry season, requiring a biological monitor during the activity, or excavating burrows in ROWs where trenching will occur. Activities must maintain the downstream hydrology to the wetland, pond, or riparian area. Additional minimization measures may be implemented with prior concurrence from USFWS.	California freshwater shrimp, California tiger salamander (both Central California and Sonoma County DPSs), California red-legged frog, San Francisco garter snake

Table 5-1. Continued

Staff Responsible	Code	Description of Measure	Covered Species Benefiting from Measure
Other Regional Planning Measures			
HCP Administrator	Minor New-1	For minor new construction activities under 2 miles in length, excluding upgrades and replacements, (G15, E12, E13, and E15), PG&E will notify the 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 the effects of the project on covered species, confirm there is adequate take authorization remaining for the covered species, and confirm that activity does not have a reasonably certain likelihood of take of listed non-covered species. If the USFWS has concerns about the work they will notify PG&E within 5 business days and resolve the concerns within 10 days.	All covered species
HCP Administrator	Edgewood Park-1	When PG&E is planning a new gas pipeline extension or pipeline replacement project in Edgewood Park, PG&E will meet with the USFWS and affected stakeholders during the planning phase to provide an opportunity for input.	San Bruno elfin butterfly, Callippe silverspot butterfly, Mission blue butterfly and listed plants
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 (MBZ) (except vegetation management's direct application to cut stumps when greater than 25 feet from a MBZ and in conformance with applicable pesticide regulations).	All covered 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
Biologist/ Field Crew	Plant-03	Stockpile separately the upper 4 inches of topsoil during excavations associated with covered activities. Stockpiles topsoil will be used to restore the disturbed ROW.	All covered annual plants ^a
Biologist	Plant-04	When covered activities greater than 0.1 acre in size within a MBZ will have direct impacts on covered species, work with the crew to place flagging, fencing, or other physical exclusion barriers to minimize disturbances. If the work will directly impact covered plant species, implement Plant-05, -06, -07, and -08 AMMs.	All covered plants
Biologist	Plant-05	If a covered plant species is present and it cannot be avoided, PG&E will salvage plant material (i.e., 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

Staff Responsible	Code	Description of Measure	Covered Species Benefiting from Measure
Covered Plant Avoidance and Minimization Measures (continued)			
Biologist	Plant-06	If a covered annual plant species is present and it cannot be avoided, conduct covered activities after seeds have matured to the extent possible.	All covered annual plants ^a
Biologist	Plant-07	If a covered perennial plant species is present and it cannot be avoided, conduct covered activities after seeds have matured to the extent possible. Minimize disturbance to the below-ground portions of the plants (e.g., roots, bulbs, tubers).	All covered perennial plants ^b
Biologist/ Field Crew	Plant-08	PG&E will follow current best management practices to prevent the spread of <i>Phytophthora</i> when working on <i>gas transmission</i> facilities in the Map Book Zone for coyote ceanothus in Santa Clara County. PG&E will clean equipment (i.e., vehicles, equipment, tools, footwear and clothes) at designated cleaning stations before and after leaving these work locations. All PG&E staff and subcontractors working in these areas will be trained on the risks of spreading <i>Phytophthora</i> and will work to minimize the unnecessary movement of soil and plant materials when in this area. PG&E will also take care to prevent the spread or contamination during plantings or restoration activities. (See <i>Phytophthoras</i> in Native Habitats Working Group Recommendations, October 2016 for more information.)	Coyote ceanothus
Biologist	Plant-08	PG&E will prune shrubs in a manner that promotes re-sprouting. If permanent impacts are unavoidable, establish new individuals by planting seedlings or from cuttings in adjacent suitable habitat. PG&E will implement best management practices including vehicle, equipment, and personnel hygiene protocols; procedures for conducting activities in infected areas; and timing restrictions that avoid working when soils are moist and the likelihood of spreading <i>P. cinnamomi</i> is greatest.	Pallid manzanita
Note: In some instances biologists with additional training or permits will be used when PG&E is surveying for the covered species, species require handling, or other instances when take is likely.			
^a Covered annual plant species are Sonoma sunshine, Marin dwarf-flax, Burke's goldfields, Contra Costa goldfields, Sebastopol meadowfoam, white-rayed pentachaeta, and Metcalf Canyon jewelflower.			
^b Covered perennial plant species are pallid manzanita, coyote ceanothus, fountain thistle, Santa Clara Valley dudleya, Contra Costa wallflower, and Antioch Dunes evening primrose.			

Table 5-2. Vegetation Management Best Management Practices to Reduce Environmental Impacts

BMP # ^a	Best Management Practice
BMP 1 (FP-01)	PG&E employees and vegetation management contractors performing Vegetation Management activities shall receive ongoing environmental orientation. Orientation shall include review of environmental laws and guidelines that must be followed by all PG&E employees and contract vegetation management personnel to reduce or avoid impacts on covered species during vegetation management activities.
BMP 2 (FP-05)	Notify federal and state land managers of pending work, and schedule annual meetings with these land managers, as requested. Notify local agency land managers of pending work as requested, or as sensitive issues arise.
BMP 3 (FP-09)	During fire season in designated State Responsibility Areas, motorized equipment shall have federally approved or state-approved spark arrestors; all vehicles shall be equipped with firefighting tools as appropriate and in accordance with all applicable laws, rules, regulations, orders, and ordinances.
BMP 4	Contractor shall be responsible for checking the daily Project Activity Level (a measure of fire weather conditions that, at certain levels, restricts activities otherwise permitted) during fire season when working on U.S. Forest Service (USFS) property.
BMP 5	Smoking shall not be permitted during fire season, except in a barren area or in an area cleared to mineral soil at least 3 feet in diameter. Under no circumstances shall smoking be permitted during fire season while employees are operating light or heavy equipment, or walking or working in grass and woodlands.
BMP 6 (FP-08)	Hunting, firearms, portable stoves, open fires (such as barbecues) not required for the vegetation management activity, and pets (except for safety in remote locations) shall be prohibited in vegetation management work activity sites. All trash, food items, and human-generated debris shall be properly contained and/or removed from the site.
BMP 7 (FP-07)	To avoid hitting or crushing wildlife in the roadway and to avoid generating dust, vehicles will not exceed a speed limit of 15 miles per hour on low-use unpaved roads such as agricultural field roads, transmission right-of-way roads, and non-system numbered USFS roads with locked gates. Travel on high-use unpaved roads such as USFS logging roads shall be as slow as local traffic conditions allow.
BMP 8	All roads, fences, and structures damaged as a result of vegetation management operations shall be repaired and reported to the work group supervisor and the PG&E vegetation management representative. All gates shall be left open if found open or locked if found locked.
BMP 9 (FP-02, FP-03)	Vehicles and equipment shall be parked on pavement, existing roads, and previously disturbed areas to the extent practicable. In environmentally sensitive areas, vehicle access to work sites shall be restricted to existing roadways.
BMP 10 (FP-15)	When practical, fuel vehicles and equipment offsite. If it is necessary to fuel onsite the following precautions shall be taken: No vehicles or equipment shall be refueled within 250 feet of vernal pools, and 100 feet of a watercourse, ditch, wetland, or a pond, unless a bermed and lined refueling area is constructed. The fueling operator must stay with the fueling operation at all times. Do not top off tanks. Spill containment and cleanup materials must be available. Spills must be immediately cleaned up and contaminated materials disposed of properly. Fueling trucks and operators must have all necessary permits, licenses and training. Any spills must be reported immediately to supervisor and PG&E vegetation management representative.
BMP 11	Debris that remains from lop and scatter operations shall be left at a height no greater than 18 inches.
BMP 12 (FP-11)	After vegetation management activities, if the amount of bare soil exposed in one location exceeds 0.1 acre, then erosion control measures shall be implemented. These measures may include straw mulching, seeding, and use of straw wattles. (No rice straw will be used around wetlands containing vernal pools.)
BMP 13 (FP-16, Wetland-1)	Avoid operating vehicles and equipment within 250 feet (or the maximum distance practicable) of the edge of a vernal pool and, to the extent practicable, avoid walking through a vernal pool.

Table 5-2. Continued

BMP # ^a	Best Management Practice
BMP 14	When routine vegetation management activities are conducted in an area of potential valley elderberry longhorn beetle habitat, a qualified individual will survey for the presence of elderberry plants within a minimum of 20 feet from the work site within the utility easement, ROW, franchise, or license, and shall note in vegetation management work request documents to avoid or minimize potential impacts on elderberry plants. If elderberry plants have one or more stems 1 inch or more in diameter at ground level, additional measures identified in the <i>Valley Elderberry Longhorn Beetle Conservation Plan</i> shall be implemented. Otherwise, no additional minimization, avoidance, or protective measures are required.
BMP 15 (FP-18)	When vegetation management staff is aware of known active northern spotted owl nests through either the CNDDDB viewer or property owner information, PG&E will implement the following. If the work is within 0.25 mile of a known active nest(s), the work will be performed either during a limited operating period of August 1 to January 31, or, if the work falls within the breeding period and is within 300 feet of the nest, the PG&E Avian Protection Program manager will be contacted for guidance and work will be performed as directed by the Avian Protection Program manager. If the work is scheduled during breeding season and if the work is 300 feet to 1/4-mile from the nest, work will be performed using hand tools (not chainsaws) or hydraulic pruners if the work is accessible from a regularly trafficked roadway. If the work cannot be performed with hand tools or hydraulic tools, then vegetation management staff will contact the Bird Program manager for guidance. In locations where known active nests occur, vegetation management staff will increase pruning distances from the conductors or pursue tree/brush removals in order to minimize the number of return visits to the area.
BMP 16	All PG&E employees and contractors shall follow the Vegetation Management Migratory Bird Process, when applicable to vegetation management activities, to comply with Migratory Bird Treaty Act.
BMP 17	When performing work in counties subject to the Sudden Oak Death quarantine, Vegetation Management Sudden Oak Death Protocols must be followed.
BMP 18	Vegetation management personnel shall verify that the environmental screening process was followed prior to conducting vegetation management activities associated with capital jobs and other non-vegetation management work. Vegetation management personnel shall follow any environmental protection measures identified for the job.
BMP 19	If cultural resources are found (e.g., old bottles, cans, buildings), they shall 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 PG&E vegetation management representative.
BMP 20	All equipment shall be permitted by the Air Resources Board as required, including portable equipment or new stationary equipment with internal combustion engines greater than 50 Brake HP, (e.g., tow-behind generators, chippers, and truck- or trailer-mounted air compressors and pumps).
BMP 21	When working within 50 feet of residences or government or commercial buildings, engine idling, noise, and odor should be minimized to the extent practicable. Also adhere to the restrictions noted in the Commercial Vehicle Idling Tailboard when working on school grounds or within 100 feet of a school (K-12 and below, including play areas and sports fields, and day care facilities).
BMP 22	Contractor shall have the ability to communicate quickly with their supervisor and/or PGE. This can be done 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 telephone and familiarizing all employees with that location.
BMP 23	If an environmental protection incident occurs, such as accidental introduction of substances into waterways or wetlands, accidental taking of an endangered species, or hazardous material spills, etc., call your supervisor and the PG&E vegetation management representative immediately.

Table 5-2. Continued

BMP # ^a	Best Management Practice
BMP 24	Vegetation removal shall be completed without the use of self-propelled mechanical equipment (e.g., Hydro-ax, Brontosaurus, Slashbuster).
BMP 25 (FP-10)	The disturbance or removal of vegetation within the work area shall not exceed the minimum necessary to complete operations, subject to other public and health and safety directives governing the safe operations and maintenance of electric and gas facilities. Precautions shall be taken to avoid damage to non-target vegetation.
BMP 26	Cleared or pruned vegetation, grass clippings and woody debris (including chips) shall be disposed of in a legal manner. All cleared vegetation and debris, grass clippings and woody debris (including chips) shall be removed from any wetland, ditch, pond, or stream and placed or secured where they cannot re-enter the watercourse.
BMP 27	Vegetation that at mature height does not pose a threat to the conductors shall not be removed, unless the removal is required to maintain compliance with California Public Resource Code Section 4292 (pole clearing).
BMP 28	Any vehicles driven and/or operated within or adjacent to streams shall be checked and maintained daily to prevent leaks of materials that, if introduced to the water, could be harmful to aquatic life.
BMP 29 (Plant-02)	Vehicle access to streams and wetlands shall be limited to existing roads and crossings.
BMP 30	When possible, activities near streams, wetlands, or on saturated soils shall be conducted during the dry season (generally May 15–October 15) or during periods of minimum flow. If it is not possible to perform the work in the dry season, perform rainy season work during dry spells between rain events.
BMP 31 (Plant-01)	All herbicide applications performed by vegetation management contractors shall be made in compliance with label requirements as well as all appropriate federal, state, and local laws, rules, and regulations. Note: Use of herbicides and pesticides is not covered activities under the HCP.
BMP 32	Only herbicides registered by the federal Environmental Protection Agency and California Environmental Protection Agency shall be applied.
BMP 33	During the performance of Vegetation Management ROW Enhancement Operations, operator ID numbers and Site ID numbers shall be obtained for each facility as required by the County Agricultural Commissioner.
BMP 34	Each application shall be covered by a written <i>Pest Control Recommendation</i> .
BMP 35	A Licensed Pest Control Advisor shall oversee all herbicide and tree growth regulator applications. A qualified applicator shall supervise contractors making herbicide and tree growth regulator applications for vegetation management.
BMP 36	County Agricultural Commissioners shall be invited to inspect the applicator and application operations when appropriate.
BMP 37	The Pest Control Business License holder (applicator) shall report herbicide use monthly to the County Agricultural Commissioner.
BMP 38	Contractor shall conduct annual worker safety training sessions for all contractor employees involved in the herbicide applications and manual/mechanical clearing. As requested, documentation of this training shall be on file with the PG&E representative who administers their contract.
BMP 39 (Plant-01)	Selective application techniques should be used for Vegetation Management ROW Enhancement Operations wherever practical so that desirable vegetation is not adversely affected.
BMP 40	Buffer widths shall apply pursuant to <i>Vegetation Management Herbicide Buffer Widths to Protect Non-Target Organisms</i> as identified on product packaging.

Table 5-2. Continued

BMP # ^a	Best Management Practice
BMP 41	Mixing and loading of herbicides is prohibited in watercourse protection zones (see BMPs 60 and 61 for watercourse protection zones).
BMP 42	Applicator shall have a spill prevention and cleanup kit in their vehicle and at the job site.
BMP 43	Backpack equipment or light-capacity power equipment shall be used for all directed foliar applications.
BMP 44	Empty herbicide containers shall be taken offsite, triple rinsed, and disposed of in a proper manner.
BMP 45	Minimum operating pressures shall be used. Nozzle tips that produce a coarser droplet should be used to minimize drift.
BMP 46	Pesticides shall not be transported in the same compartment with persons, food, or feed. Pesticide containers shall be secured to the vehicle during transportation in a manner that shall prevent spillage into or off the vehicle.
BMP 47	The contractor shall have a written training program for employees who handle pesticides. The written program must describe the materials and the information that shall be provided and used to train the employees.
BMP 48	Training must be completed before an employee is allowed to handle any pesticide and continually updated to cover any new pesticides that shall be handled. Training must be repeated at least annually thereafter.
BMP 49	These special precautions shall be observed during periods of inclement weather: Applications shall not be made in, immediately prior to, or immediately following rain when runoff could be expected. Applications shall not be made when wind and/or fog conditions have the potential to cause drift. Basal bark applications shall not be made when stems are wet with rain, snow, or ice.
BMP 50	Prior to any ROW clearing project or any enhancement project, the CNDDDB shall be checked for any records of threatened, endangered, or sensitive species.
BMP 51	Any locations identified through the CNDDDB search shall be flagged and appropriate avoidance measures shall be put in place. Tailboards shall be held before work begins.
BMP 52 (Wetland-01, Wetland-02)	Sensitive habitats such as meadows, riparian areas, wetlands, vernal pools, and serpentine outcrops shall be flagged and appropriate avoidance measures shall be put in place. Tailboards shall be held before work begins.
BMP 53	All existing roads shall be kept open and erosion control measures re-installed after the project is completed or during inclement weather.
BMP 54	Contractor shall clear all vegetation 10 feet around and under all towers/poles and guy wires. Only manual clearing work can occur within the above-mentioned 10 feet. No mechanical equipment shall be used within 10 feet of the above-mentioned structures. All vegetation cut under and within 10 feet of the towers shall be removed from the area and mulched to a depth not greater than 18 inches.
BMP 55	All debris that remains from mowing operations shall be mulched to a depth not greater than 18 inches.
BMP 56	Trees greater than 12 inches in diameter at breast height shall be hand-felled and then the top and limbs removed and the bole decked on the side of the ROW.
BMP 57	Contractor shall flag all guy wires 200 feet in advance of working an area, using bright colored flagging (a minimum of three flags per wire).

Table 5-2. Continued

BMP # ^a	Best Management Practice
BMP 58	Contractor shall have a water source containing a minimum of 300 gallons of water and 250 feet of 1-inch hose onsite 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/terrain allows, contractor's water source must always be within 500 feet of the mowing/cutting operation. Excess water shall be disposed of in accordance with all laws and regulations.
BMP 59	Each mower shall have a minimum of a 10-pound, Class A, B, C fire extinguisher mounted in the cab.
BMP 60	Contractor must stay onsite for one-half hour after mowing operations end for the day to ensure fire safety. When extreme fire levels are reached, the following extra precautions must be implemented immediately. • An additional support person shall be dedicated to follow the mower with an Indian Back Pump and McLeod. • Mowing hours will be reduced to the hours of 5:00 a.m. through 12:30 p.m. • The use of a humidity meter shall occur. A reading of less than (<) 20% humidity shall stop the mowing operation for the day. Readings shall be taken every 3 hours during operation.
BMP 61	Watercourse protection zones shall be marked by the PG&E representative in charge with brightly colored flagging prior to the start of any mowing/timber operation. Water classes are defined by the California Forest Practice Rules (14 California Code of Regulations Section 916.5). The following watercourse protection zone clearances must be maintained at all times. • Class 1 and 2 watercourses with a slope < 30%: No heavy equipment within 50 feet. • Class 1 and 2 watercourses with a slope > 30%: No heavy equipment within 75 feet. • Class 3 watercourse: No heavy equipment within 25 feet. • Unclassified watercourses with a defined channel: No heavy equipment within 25 feet. No mowing shall be allowed within the above distances. Trees within the above distances shall be removed manually. Brush and other small vegetation shall be left for a shade canopy on the watercourse. The actual width of the watercourse protection zone may vary based on a PG&E representative's judgment in the field. All impaired watercourses and their protection zone clearances shall be identified before the project begins.
BMP 62	The following protection measures are designed to prevent adverse impacts on water quality, help protect soil resources, and minimize the loss of riparian vegetation. 1. Plants in watercourse protection zones that do not pose an imminent or clearly foreseeable future threat to conductors shall not be removed. 2. To help prevent erosion and soil displacement, exclusion zones may be increased in areas with steep slopes or highly erodible soils. 3. Leave at least 50% soil cover (i.e., mulch or vegetative ground cover) for erosion control in watercourse protection zones.
^a Where PG&E 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 approach to site restoration is contingent on whether covered activities would affect 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 affect less than 0.1 acre, PG&E would provide no site restoration. For larger covered activities affecting more than 0.1 acre, site restoration could include soil compaction, recontouring excavated areas to follow natural contours, reseeding areas cleared of plant cover, and

planting trees or other vegetation. While the majority of areas that are affected 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 as a disturbed or ruderal area. In other parts of PG&E's service territory (San Joaquin Valley) 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 affecting 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 affected. If covered plants are affected, PG&E will be required to prepare a site-specific restoration plan that typically includes a monitoring component.

PG&E will infrequently directly affect vernal pools and will need a permit under Section 404 or 401 of the CWA. PG&E will restore and mitigate impacts on the vernal pool wetlands, which typically includes both restoration and creation of habitat as well as preservation of habitat; preservation is described in Section 5.6, *Habitat Mitigation*. Habitat restoration and creation plans typically include specific detailed information on the restoration and creation design, procedures and implementation approach, performance criteria and monitoring, maintenance, contingency, and long-term management obligations. The restoration or creation of wetland habitat will be reviewed and approved by USFWS as described later in the chapter. PG&E will restore wetlands it directly impacts as well as 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.

Hot Zone and Map Book Zone Screening: Vegetation management activities will be screened against hot zones and Map Book zones. Hot zone- or Map Book zone-specific AMMs (Table 5-1) will be implemented when a covered vegetation management activity is performed in a hot zone or Map Book zone, with the exception of emergency work.

Nesting Bird Management Guidance: In addition to the vegetation management BMPs (listed in Table 5-2), the vegetation management program follows the process and procedures outlined in PG&E's Avian Protection Plan and associated Nesting Bird Management Plan to protect birds that nest in areas that could be affected by vegetation management activities. The process involves a systematic evaluation of nest occurrence during pre-activity biological surveys and during vegetation management work. If a vegetation management specialist identifies an active nest near a proposed work area, the specialist will prescribe measures to avoid disturbing the nest, including working the line at another time of year, maintaining 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 riparian work, PG&E employs a vegetation management program that utilizes a riparian review standard which begins with pre-inspectors. If pre-inspectors identify the need for vegetation management within riparian vegetation or close to a creek or stream (approximately 25 feet) the pre-inspector documents the site for riparian review utilizing a paper form or a hand-held computer. If riparian vegetation requires pruning or removal, the pre-inspector prepares the riparian review form that includes the following information.

- 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).

A forester or inspector will review the form for accuracy and completeness, and forward the form to a biologist or land planner for further review. The biologist or land planner will conduct a complete environmental review of the scheduled 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. Vegetation management staff will prescribe BMPs based on the site needs prior to beginning work. Where PG&E Field Protocols or AMMs are similar or overlap, they are also referenced in parenthesis under the BMP number. Vegetation management BMPs generally apply in the following areas.

- BMPs 1–23 are general BMPs implemented for all vegetation management covered activities.
- BMPs 24–30 are implemented for vegetation management covered activities within a wetland, ditch, pond, or stream with a defined stream channel or banks.
- BMPs 31–49 pertain to the use of herbicides (not a covered activity).
- BMPs 50–53 are implemented during electric distribution vegetation removal and transmission ROW clearing activities (Activities E10a and E10d, respectively).
- BMPs 54–62 are implemented during electric transmission ROW mechanical clearing operations (Activity E10d).

5.5.2 Overview of Approach by Activity

Table 5-3 provides a summary of covered activities, sorted by size, and PG&E's approach to avoiding, minimizing and mitigating impacts of its O&M activities.

Table 5-3. Conservation Strategy Summary for Covered Activities

Activity	Average impact size of covered activity	Annual impacts	Annual covered activities	Approach										Clarifications
				In Field						Post Field				
				Field Protocols	Screening Allows for Review of Hot Zone or Map Book Zone AMMs	Flexible Location of Work Area	Env. Review Allows Avoidance of Burrows	Track and Report if in Modeled Habitat	Onsite Rest. of Work Area	Include in Validation Study	Mitigate for Permanent Impacts ^a	Mitigate for Temporary Impacts ^b	Mitigation for Temporary Impacts Based on Estimates or Actuals	
Small activities (0.1 acre or less of impact)														
Gas														
G1. Patrols	0	0.00	1	Yes	No	NA	NA	No	No	No	No	No	NA	No ground disturbance. Crews will be trained annually on BAHCP compliance requirements.
G2. Inspections	0	0.00	1	Yes	No	NA	NA	No	No	No	No	No	NA	No ground disturbance. Crews will be trained annually on BAHCP compliance requirements.
G3a. Pipeline Remedial Maintenance (Fencing)	0.06	1.15	10	Yes	Yes	Yes	Yes	Yes	No	No	Yes	No	Estimate	Some ability to make minor adjustments to work areas.
G3b. Internal Pipeline Inspection	0.06	2.98	50	Yes	Yes	Yes	No	Yes	No	No	No	Yes	Estimate	Some ability to make minor adjustments to work areas.
G4. Compressor Station Upgrades and Maintenance (Mowing)	0.28	0.28	1	Yes	No	No	No	Yes	No	No	No	No	NA	Mowing around facility.
G5. Pipeline Electric Test System Installation	0.06	0.40	7	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	Yes	Yes	No	No	Yes	No	Yes	No	Yes	Estimate	Some ability to make minor adjustments to work areas.
G7. Pipeline Valve Maintenance – Replacement or Automation	0	0.00	0	Yes	Yes	No	No	Yes	No	Yes	No	Yes	Estimate	Some ability to make minor adjustments to work areas.
G8. Pipeline Cathodic Protection	0.02	0.11	5	Yes	Yes	Yes	Yes	Yes	No	No	Yes	Yes	Estimate	Limited ground disturbance, very small footprint with deep well anodes.

Table 5-3. Continued

Activity	Average impact size of covered activity	Annual Impacts	Annual covered activities	Approach											Clarifications
				In Field							Post Field				
				Field Protocols	Screening Allows for Review of Hot Zone or Map Book Zone AMMs	Flexible Location of Work Area	Env. Review Allows Avoidance of Burrows	Track and Report if in Modeled Habitat	Onsite Rest. of Work Area	Include in Validation Study	Mitigate for Permanent Impacts ^a	Mitigate for Temporary Impacts ^b	Mitigation for Temporary Impacts Based on Estimates or Actuals		
Small activities (0.1 acre or less of impact) (continued)															
Gas(continued)															
G12. Pipeline Telecommunication Site Maintenance (Staging Area)	0.01	0.34	1	Yes	Yes	Yes	Yes	Yes	No	Yes	No	Yes	Estimate	Limited ground disturbance.	
G13b. Pipeline Right-of-Way Vegetation Management and Access Road Maintenance	0.01	0.05	5	Yes	Yes	No	No	No	No	No	No	No	NA	Limited ground disturbance.	
Electric															
E1. Patrols	0	0.00	1	Yes	No	NA	NA	No	No	No	No	No	NA	No ground disturbance. Crews will be trained annually on BAHCP compliance requirements.	
E2. Inspections	0	0.00	1	Yes	Yes	NA	NA	No	No	No	No	No	NA	No ground disturbance. Crews will be trained annually on BAHCP compliance requirements.	
E3. Insulator Washing or Replacement	0	0.00	2	Yes	Yes	Yes	Yes	No	No	No	No	No	NA	No ground disturbance.	
E5. System Outage Repair	0.01	5.56	500	No	No	No	No	No	No	No	Yes	Yes	Estimate	Limited ground disturbance.	
E6a. Tower Replacement or Repair	0.02	8.68	360	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	15	Yes	Yes	No	NA	Yes	No	No	Yes	Yes	Estimate	Several square feet of ground disturbance.	
E7. Facility Installations (Shoo-Flies)	0.06	5.74	100	Yes	Yes	Yes	Yes	Yes	No	No	No	Yes	Estimate	Limited ground disturbance. These are temporary structures to keep electricity flowing.	

Table 5-3. Continued

Activity	Average impact size of covered activity	Annual impacts	Annual covered activities	Approach										Clarifications
				In Field						Post Field				
				Field Protocols	Screening Allows for Review of Hot Zone or Map Book Zone AMMs	Flexible Location of Work Area	Env. Review Allows Avoidance of Burrows	Track and Report if in Modeled Habitat	Onsite Rest. of Work Area	Include in Validation Study	Mitigate for Permanent Impacts ^a	Mitigate for Temporary Impacts ^b	Mitigation for Temporary Impacts Based on Estimates or Actuals	
Small activities (0.1 acre or less of impact) (continued)														
Electric (continued)														
E8a. Pole Equipment Repair and Replacement	0	0.00	500	Yes	Yes	Yes	Yes	No	No	No	No	No	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	0.80	500	Yes	Yes	Yes	Yes	Yes	No	Yes	No	Yes	Estimate	Several square feet of ground disturbance.
E9b. Line Reconductoring (Distribution)	0.00	0.57	250	Yes	Yes	Yes	Yes	Yes	No	No	No	Yes	Estimate	Limited ground disturbance. Most facilities are near roads, on shoulders.
E10a. Vegetation Management Routine Maintenance	0.00	1.84	20	Yes	No	No	No	Yes	No	No	No	No	NA	Limited ground disturbance. Applies to new subject poles.
E10b. Vegetation Management Pole Clearing	0.00	0.23	100	Yes	No	No	No	Yes	No	No	Yes	No	Estimate	Limited ground disturbance. Applies to new subject poles.
E10c. Vegetation Management Tree Removal – Small Groups	0.00	2.50	25	Yes	Yes	No	No	Yes	No	No	No	Yes	Estimate	Limited ground disturbance.
E10e. Vegetation Management Tower Cage Clearing	0.04	0.29	8	Yes	Yes	No	No	Yes	No	No	No	No	NA	Limited ground disturbance.
E10f. Vegetation Management Fee Strip Maintenance	3.03	3.03	1	Yes	Yes	No	No	Yes	No	No	No	No	NA	Mowing of fee lands by regulation.
E11a. Wood Pole Test and Treat – Inspection and Maintenance	0.00	1.24	6000	Yes	Yes	No	No	No	No	No	No	No	NA	Several square feet of ground disturbance.
E11b. Wood Pole Test and Treat – Reinforcement	0.00	0.15	180	Yes	Yes	No	Yes	No	No	No	No	Yes	Estimate	Several square feet of ground disturbance.

Table 5-3. Continued

Activity	Average impact size of covered activity	Annual Impacts	Annual covered activities	Approach										Clarifications
				In Field						Post Field				
				Field Protocols	Screening Allows for Review of Hot Zone or Map Book Zone AMMs	Flexible Location of Work Area	Env. Review Allows Avoidance of Burrows	Track and Report if in Modeled Habitat	Onsite Rest. of Work Area	Include in Validation Study	Mitigate for Permanent Impacts ^a	Mitigate for Temporary Impacts ^b	Mitigation for Temporary Impacts Based on Estimates or Actuals	
Small activities (0.1 acre or less of impact) (continued)														
Electric (continued)														
E15. Underground Line Construction	0.01	0.03	1	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Estimate	Most likely to be in urban areas.
Subtotal		36.00	8,650											
Medium activities (0.11 acre to 0.5 acre of impact)														
Gas														
G3a. Pipeline Remedial Maintenance (Ercon Mats)	0.11	0.11	1	Yes	Yes	No	No	Yes	Yes	No	Yes	Yes	Actual	Restoration standard as part of additional permit requirements.
G10. Pipeline Coating Replacement	0.23	0.05	0.2	Yes	Yes	No	No	Yes	Yes	Yes	No	Yes	Actual	Some ability to make minor adjustments to work areas.
G12. Pipeline Telecommunication Site Maintenance (New Cable)	0.34	0.34	1	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Actual	Minor excavation.
Electric														
E4. Substation Maintenance	0.46	0.46	1	Yes	Yes	No	No	No	No	No	No	No	NA	Mowing around facilities.
E12. New Distribution and Transmission Line Construction or Relocation (New Line and Access Road_	0.06	0.57	2	Yes	Yes	Yes	Yes	Yes	Yes	Yes	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	Yes	No	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	Yes	No	Yes	Actual	Limited ground disturbance.

Table 5-3. Continued

Activity	Average impact size of covered activity	Annual impacts	Annual covered activities	Approach										Clarifications
				In Field						Post Field				
				Field Protocols	Screening Allows for Review of Hot Zone or Map Book Zone AMMs	Flexible Location of Work Area	Env. Review Allows Avoidance of Burrows	Track and Report if in Modeled Habitat	Onsite Rest. of Work Area	Include in Validation Study	Mitigate for Permanent Impacts ^a	Mitigate for Temporary Impacts ^b	Mitigation for Temporary Impacts Based on Estimates or Actuals	
Medium activities (0.11 acre to 0.5 acre of impact) (continued)														
Electric (continued)														
E13. Tower Line Construction (Footings and Pull Sites)	0.17	1.09	2	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Actual	Use existing disturbed areas where possible.
Subtotal		3.00	11.2											
Large activities (0.51 acre or larger)														
Gas														
G9. Pipeline Lowering	2.42	0.80	0.3	Yes	Yes	No	No	Yes	Yes	Yes	No	Yes	Actual	Some ability to make minor adjustments to work areas.
G11. Pipeline Replacement	2.42	12.41	5	Yes	Yes	No	No	Yes	Yes	Yes	Yes	Yes	Actual	Less flexibility in making adjustments to work areas.
G13a. Pipeline Right-of-Way Vegetation Management and Access Road Maintenance	2.42	36.36	10	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 areas.
G14. Gas Pressure Limiting Station (Laydown Area)	0.23	0.05	0.2	Yes	Yes	Yes	Yes	Yes	Yes	No	No	Yes	Actual	Some ability to make minor adjustments to work areas.
G14. Gas Pressure Limiting Station (Excavation/Stock)	0.23	0.05	0.2	Yes	Yes	Yes	Yes	Yes	Yes	No	No	Yes	Actual	Some ability to make minor adjustments to work areas.
G15. New Customer/Business Pipeline Extension	0.06	2.48	1	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Actual	Some ability to make minor adjustments to work areas.
G16. CPSI – Existing Pipeline Replacement (In place)	1.21	19.39	8	Yes	Yes	No	No	Yes	Yes	Yes	Yes	Yes	Actual	Less flexibility in making adjustments to work areas.

Table 5-3. Continued

Activity	Average impact size of covered activity	Annual impacts	Annual covered activities	Approach											Clarifications
				In Field							Post Field				
				Field Protocols	Screening Allows for Review of Hot Zone or Map Book Zone AMMs	Flexible Location of Work Area	Env. Review Allows Avoidance of Burrows	Track and Report if in Modeled Habitat	Onsite Rest. of Work Area	Include in Validation Study	Mitigate for Permanent Impacts ^a	Mitigate for Temporary Impacts ^b	Mitigation for Temporary Impacts Based on Estimates or Actuals		
Large activities (0.51 acre or larger) (continued)															
Gas (continued)															
G16. CPSI – Existing Pipeline Replacement (Relocation)	1.21	14.55	8	Yes	Yes	No	No	Yes	Yes	Yes	Yes	Yes	Actual	Some ability to make minor adjustments to work areas.	
G17. CPSI – Valve Replacement or Automation– (Fencing)	0.52	4.19	8	Yes	Yes	Yes	No	Yes	Yes	No	Yes	Yes	Actual	Some ability to make minor adjustments to work areas.	
G18. CPSI - Hydrostatic Testing (Excavation at end of pipeline)	0.09	0.46	5	Yes	Yes	No	No	Yes	Yes	Yes	No	Yes	Actual	Less flexibility in making adjustments to work areas.	
G18. CPSI - Hydrostatic Testing (Laydown)	0.92	0.92	1	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Actual	Impacts in sensitive areas can be minimized.	
G18. CPSI - Hydrostatic Testing (Staging)	0.23	1.15	5	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Actual	Impacts in sensitive areas can be minimized.	
Electric															
E9a. Line Reconductoring (Transmission)	2.87	29.1	10	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Actual	Impacts in sensitive areas can be minimized.	
E10d. Vegetation Management Tree Removal – ROW Clearing	3.03	48.5	10	Yes	Yes	Yes	No	Yes	No	Yes	Yes	Yes	Actual	Must maintain clearance distances. Selective clearing in riparian areas.	
E14. Minor Substation Expansion	10.0	1.00	0.1	Yes	Yes	No	No	Yes	Yes	No	Yes	Yes	Actual	Permanent impact from expansion.	
Subtotal		171.5	72.0												
Total ^c		210	8,733												

Notes:

^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 and promote the recovery of covered species in the Bay Area. Proposed mitigation is subject to USFWS review and approval. Habitat preservation will be considered complete when USFWS approves a conservation easement, a management plan, the endowment, and the easement holder. Habitat enhancement and restoration efforts may be implemented in partnership with local or regional land trusts where land is already protected but funding or management is lacking to promote species conservation and recovery.

5.6.1 Approach

PG&E will provide habitat mitigation in advance of impacts on covered species except as described in Section 5.6.2.2. PG&E will base its mitigation on acreages of estimated and actual habitat losses, and will adjust the timing of acquisitions based on forecasted habitat impacts and the amount of mitigation that has previously been implemented. The majority of all impacts will be from temporary disturbances. PG&E will provide mitigation for both permanent and temporary impacts on modeled habitat.

For many covered species, particularly broadly distributed species, most mitigation will be provided early in the permit term, with most mitigation provided 5 years, 10 years, or even 20 years in advance of impacts. For California tiger salamander (Central California DPS), California red-legged frog, and non-core Alameda whipsnake habitat, PG&E will provide mitigation in 5-year increments in advance of impacts. For some narrowly distributed species, PG&E will provide mitigation closer to the time of anticipated impacts. However, because the impacts on such species will be small, there may be an instance where a mitigation opportunity becomes available that meets the entire mitigation obligation for a species many years in advance of impacts, such as California freshwater shrimp.

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 may provide habitat mitigation through the following mechanisms (in order of preference), further described in Section 5.6.3 *Types of Mitigation*.

- Purchase of high-quality habitat with encumbrance of the purchased property with a conservation easement and endowment.
- Purchase or placement of conservation easements on land containing habitat for and occupied by covered species.
- 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.

5.6.2 Determination of Habitat Mitigation Needs

The mitigation requirement will be calculated as described in Section 4.1, *Methods for Analysis*. Over the permit term, PG&E will adjust the amount of habitat mitigation required to reflect the difference between the estimated and the actual habitat loss for covered species. The overall intent is to ensure appropriate mitigation is provided in advance of the impact, as discussed in greater detail in Chapter 6, *Plan Implementation and Funding*.

PG&E does not intend to mitigate temporary disturbance of urban, barren, ruderal, row crop, orchard, or vineyard lands because these lands are unsuitable for covered species and undergo regular disturbance comparable in intensity to, or more extensive than, the impacts of O&M activities. In the event that one of these areas is determined by a PG&E biologist to be suitable for a covered species, the impacts associated with covered activities in that specific area will be mitigated. Conditions resulting from O&M activities will be consistent with existing conditions on agricultural fields and developed or disturbed lands.

5.6.2.1 Mitigation for Permanent Impacts

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 affected). As previously described, there will be fewer permanent impacts than temporary impacts as a result of O&M activities. Permanent impacts typically result from the construction of new facilities. PG&E will provide mitigation for permanent impacts on a specific location only once during the duration of the HCP even if subsequent impacts occur in the same location.

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 offset temporary impacts on covered species by mitigating at the following ratios.

- For impacts on all covered invertebrates, California tiger salamander (Sonoma County DPS), San Francisco garter snake, Ridgway's rail, and salt marsh harvest mouse, a mitigation ratio of 1:1 will be used to mitigate temporary impacts on modeled habitat for these species.
- Temporary impacts on breeding habitat for California tiger salamander (both Central California and Sonoma County DPSs) and California red-legged frog will be mitigated at a 1:1 ratio.
- Temporary impacts within all critical habitat units for all covered species will be mitigated at a 1:1 ratio.
- Temporary impacts on modeled upland habitat for California tiger salamander (Central California DPS) will be mitigated at a ratio of 0.5:1 when mitigation is provided in advance of impacts. For the first 5 years, mitigation that is not in place will be at a 1:1 ratio.
- Temporary impacts on modeled upland (dispersal) habitat for California red-legged frog will be mitigated at a ratio of 0.5:1 when mitigation is provided in advance of impacts. For the first 5 years, mitigation that is not in place will be at a 1:1 ratio.
- Temporary impacts on non-core (movement or dispersal) habitat for Alameda whipsnake will be mitigated at a ratio of 0.5:1 when mitigation is provided in advance of impacts. For the first 5 years, mitigation that is not in place will be at a 1:1 ratio.

- A mitigation ratio of 1:1 will be used to mitigate temporary impacts on Alameda whipsnake core or perimeter core habitat.
- Temporary impacts on low-quality/use modeled habitat for San Joaquin kit fox will be mitigated at a ratio of 0.5:1 when mitigation is provided in advance of the impact. If the mitigation is not in place, the ratio will be 1:1.
- A mitigation ratio of 1:1 will be used for temporary impacts on core modeled habitat for San Joaquin kit fox.

These ratios are appropriate based on the types of habitat impacts and timing of mitigation. Mitigation ratios for California tiger salamander, California red-legged frog, and Alameda whipsnake are appropriate for species with broader distributions where the majority of impacts are the result of temporary disturbances. PG&E intends to acquire mitigation in advance of impacts to ensure the biological goals and objectives are met; however, should PG&E be unable to fulfill its mitigation commitments in advance of impacts on California tiger salamander (Central California DPS), California red-legged frog, and Alameda whipsnake (non-core habitats), the mitigation ratio for these species will increase to 1:1 until mitigation is again provided in advance of impacts.

5.6.2.3 Mitigation Summary for Wildlife

PG&E's mitigation for covered wildlife is described in Table 5-4. Wildlife mitigation is grouped according to those species that may co-occur, though site-specific assessments 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 columns on the right of Table 5-4 and will be subject to review and approval by USFWS, as described in Section 5.6.4, *Mitigation Approval Process*. As an important note, mitigation totals are not additive because there will be some overlap between species (i.e., summing totals without factoring in overlap leads to a larger mitigation requirement). Additional information on mitigation locations and priorities can be found in Section 5.6.5.2, *Location of Mitigation Areas*.

Overall, PG&E's HCP provides a comprehensive mitigation program that mitigates PG&E impacts 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. PG&E will consider the regional allocation of mitigation between the North Bay, East Bay, South Bay and the San Francisco Peninsula in relation to overall impacts on species, and it will follow these basic conservation biology principles as it evaluates mitigation options.

- Patch size:
 - Large patches are better than small patches.
 - Connected patches are better than separated patches.
 - Unified patches are better than fragmented patches.
 - Nearness to other conserved lands is better than separation.
- Corridors:
 - Continuous corridors are better than fragmented corridors.
 - Wider corridors are better than narrow corridors.
 - Natural connectivity should be maintained or restored.

PG&E will focus on acquisitions that foster 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.

Invertebrates

PG&E intends to acquire fee title or conservation easements, or will partner with regional conservation entities to advance conservation for most invertebrate species covered under this HCP. Secondly, PG&E will seek to fund implementation of recovery actions with the approval of USFWS. However, California freshwater shrimp has unique habitat requirements that are met only in Marin, Sonoma and Napa Counties; therefore, habitat for this species will be conserved in a recovery planning area within one of these three counties. PG&E will focus on one acquisition in Sonoma County because most facilities that cross habitat are in Sonoma County, and one parcel will maximize the conservation benefit to the species.

PG&E will mitigate impacts on conservancy fairy shrimp in Solano County by purchasing habitat by fee title, conservation easements, or conservation bank credits. For longhorn fairy shrimp, PG&E will work with the East Contra Costa HCP/NCCP implementing agency to explore ways to meet mutual conservation objectives. If this approach is not possible, PG&E will seek partners, such as the East Bay Regional Park District, to conserve lands for the species.

Vernal pool fairy shrimp and vernal pool tadpole shrimp have a broader distribution and could occur in Solano, Contra Costa or Alameda Counties. Impacts on Delta green ground beetle will be mitigated within occupied habitat, designated critical habitat, or adjacent suitable habitat approved by the USFWS, in Solano County. PG&E will acquire wetted habitat as well as some of the swale systems and surrounding upland habitat to protect the vernal pool species. PG&E will purchase conservation easements or obtain fee title for these species from willing sellers, or will acquire credits from mitigation banks.

Table 5-4. Covered Wildlife Species Mitigation Groupings and Mitigation

Covered Species	Permanent Habitat Loss (acres)			Temporary Habitat Loss (acres)			Total Mitigation (acres) ^a	Specific Mitigation Options
	Requested Take	Mitigation Ratio	Mitigation	Requested Take	Mitigation Ratio	Mitigation		
California freshwater shrimp	0.3	3:1	0.9	2	1:1	2	2.9	1. Acquire fee title or conservation easement ^b in Marin, Sonoma, and/or Napa Counties. 2. Contribute funds for habitat management or restoration in other core areas on public or land trust lands.
Conservancy fairy shrimp	0.5	3:1	1.5	2	1:1	2	3.5	1. Purchase easement or credit in Solano County.
Longhorn fairy shrimp	0.1	3:1	0.3	1	1:1	1	1.3	1. Contribute funds to the East Contra Costa HCP/NCCP implementing agency.
Vernal pool mitigation								
Vernal pool fairy shrimp	5	3:1	15	25	1:1	25	40	1. Acquire lands suitable for species and dedicate to a conservation organization. ^c 2. Acquire credits from mitigation banks in Solano County.
Vernal pool tadpole shrimp	5	3:1	15	25	1:1	25	40	
Delta green ground beetle	1	3:1	3	5	1:1	5	8	
Mission blue and San Bruno butterfly mitigation								
Mission blue butterfly	2	3:1	6	20	1:1	20	26	1. Contribute funds to the San Bruno Mountain HCP implementing agency. 2. Contribute funds for habitat management.
San Bruno elfin butterfly	2	3:1	6	20	1:1	20	26	

Table 5-4. Continued

Covered Species	Permanent Habitat Loss (acres)			Temporary Habitat Loss (acres)			Total Mitigation (acres) ^a	Specific Mitigation Options
	Requested Take	Mitigation Ratio	Mitigation	Requested Take	Mitigation Ratio	Mitigation		
Callippe silverspot butterfly	30	3:1	90	55	1:1	55	145	1. Acquire fee title or conservation easements in Solano, Contra Costa, or Alameda Counties. 2. Contribute funds to other regional HCPs. (Mitigation for impacts on this species may be combined with mitigation for impacts on Mission blue butterfly.) 3. Contribute to habitat enhancement and restoration efforts of Solano Land Trust.
Lange's metalmark butterfly	0.3	3:1	0.9	1	1:1	1	1.9	1. Place conservation easement on portion of PG&E property. 2. Contribute funds for habitat management at Antioch Dunes National Wildlife Refuge.
Bay checkerspot butterfly	4	3:1	12	62	1:1	62	74	1. Place conservation easement on property. 2. Contribute funds to the <i>Santa Clara Valley Habitat Plan</i> implementing agency. 3. Contribute funds for habitat management at Edgewood Natural Preserve, Santa Teresa County Park, or other appropriate sites.

Table 5-4. Continued

Covered Species	Permanent Habitat Loss (acres)			Temporary Habitat Loss (acres)			Total Mitigation (acres) ^a	Specific Mitigation Options
	Requested Take	Mitigation Ratio	Mitigation	Requested Take	Mitigation Ratio	Mitigation		
California tiger salamander (Central California DPS)	259	3:1	777	2,811	0.5:1 ^d	1,405	2,183	1. Acquire lands or conservation easements in Contra Costa, Alameda, Santa Clara, and Solano Counties. 2. Contribute funds to agencies implementing the East Contra Costa HCP/NCCP and/or <i>Santa Clara Valley Habitat Plan</i> for the purchase of habitat mitigation beyond that required in those plans. 3. Acquire credits from mitigation banks. (Mitigation for impacts on this species may be combined with mitigation for impacts on California red-legged frog.) PG&E will acquire mitigation in advance for impacts on this species' dispersal habitat.
	39 critical habitat	3:1	117	507 critical habitat	1:1	507	624	See above.
	2 modeled breeding habitat	3:1	6	25 modeled breeding habitat	1:1	25	31	See above.
California tiger salamander (Sonoma County DPS)	13	3:1	39	80	1:1	80	119	1. Acquire lands or conservation easements consistent with the <i>Santa Rosa Plain Conservation Strategy</i>. 2. Purchase mitigation credits.

Table 5-4. Continued

Covered Species	Permanent Habitat Loss (acres)			Temporary Habitat Loss (acres)			Total Mitigation (acres) ^a	Specific Mitigation Options
	Requested Take	Mitigation Ratio	Mitigation	Requested Take	Mitigation Ratio	Mitigation		
California red-legged frog	122	3:1	366	1,488	0.5:1 ^d	744	1,110	1. Acquire lands or conservation easements primarily in Contra Costa, Alameda, and Santa Clara Counties. Also pursue a small amount in the North Bay. 2. Contribute funds to agencies implementing the East Contra Costa HCP/NCCP or the <i>Santa Clara Valley Habitat Plan</i> for purchase of habitat mitigation beyond that required in those plans. 3. Acquire credits from mitigation banks. 4. Utilize mitigation credits being developed in cooperation with the Solano Land Trust on Swett Ranch. 5. Contribute to conservation efforts by SFPUC or Mid-Peninsula Open Space and Conservation District. (Approximately 30% of mitigation may be combined with mitigation for impacts on California tiger salamander [Central California DPS] dispersal habitat.) PG&E will acquire mitigation in advance for impacts on this species' dispersal habitat.
	55 critical habitat	3:1	165	12 critical habitat	1:1	12	177	See above.

Table 5-4. Continued

Covered Species	Permanent Habitat Loss (acres)			Temporary Habitat Loss (acres)			Total Mitigation (acres) ^a	Specific Mitigation Options
	Requested Take	Mitigation Ratio	Mitigation	Requested Take	Mitigation Ratio	Mitigation		
California red-legged frog (continued)	42 modeled breeding habitat	3:1	126	377 modeled breeding habitat	1:1	377	503	95% of this area is composed of riparian habitat with approximately 5% (25 acres) as breeding habitat.
Alameda whipsnake	34 core habitat	3:1	102	13 core habitat	1:1	13 core	115	1. Acquire lands or conservation easements in Contra Costa, Alameda, and Santa Clara counties. 2. Contribute funds to agencies implementing the East Contra Costa HCP/NCCP and/or <i>Santa Clara Valley Habitat Plan</i> for the purchase of habitat mitigation beyond that required in those plans. (Mitigation for impacts on this species may be combined with mitigation for impacts on California tiger salamander [Central California DPS] and California red-legged frog dispersal habitat.)
	25 perimeter core habitat	3:1	75	70	1:1	70	145	
	27 movement habitat	3:1	81	329 movement habitat	0.5:1 ^d	164	245.5	See above. PG&E will acquire mitigation in advance for impacts on this species' movement habitat.
San Francisco garter snake	4	3:1	12	26	1:1	26	38	1. Pursue partnerships for conservation on the Peninsula. 2. Contribute funds for habitat management in other core areas on public or land trust lands. Potential partners include SFPUC and Mid-Peninsula Open Space and Conservation District. (Mitigation for impacts on this species may be combined with mitigation for impacts on California red-legged frog.)

Table 5-4. Continued

Covered Species	Permanent Habitat Loss (acres)			Temporary Habitat Loss (acres)			Total Mitigation (acres) ^a	Specific Mitigation Options
	Requested Take	Mitigation Ratio	Mitigation	Requested Take	Mitigation Ratio	Mitigation		
Salt marsh mitigation								
Salt marsh harvest mouse	3.7	3:1	11	35	1:1	35	46	1. Acquire lands or conservation easements in bay-fringe habitats.
Ridgway's rail	3.4	3:1	10.2	34	1:1	34	44	2. Contribute to South Bay or other tidal marsh restoration projects including the possible use of PG&E's parcel of tidal marsh habitat in Solano County.
San Joaquin kit fox	37	3:1	159	426	1:1	426	585	1. Acquire and protect grassland mitigation area in eastern Contra Costa, Alameda, or Santa Clara Counties.
core habitat				core habitat				2. Contribute funds to the East Contra Costa HCP/NCCP implementing agency. (Mitigation for impacts on this species may be combined with mitigation for impacts on other species.)
	16	1:1	16	264	0.5:1 ^d	132	148	See above.
low quality/ use habitat ^e				low quality/ use				

SFPUC = San Francisco Public Utilities Commission

Notes:

^a For species that are grouped or have multiple habitat categories, the boldface number indicates the total acreage that will be mitigated. For total mitigation acreages and cost see Chapter 6, *Plan Implementation and Funding*.

^b Conservation easements and fee title lands acquired for mitigation will also require an endowment to fund ongoing monitoring and management.

^c Mitigation for impacts on wetlands will also include either a restoration or creation component.

^d Assumes mitigation is provided in advance. A mitigation ration of 1:1 will be required if mitigation is not provided in advance of impacts.

^e Low-quality/low-use modeled habitat was identified based on the low-quality habitat criteria developed under other regional conservation plans. Low-quality/low-use 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.

Butterflies are grouped together by similar habitat requirements. Mitigation for impacts on butterfly species will focus on conserving habitat within their respective dispersal ranges. Some covered butterfly species, such as the Mission blue butterfly and San Bruno elfin butterfly, have unique habitat needs and only occur in San Mateo County. Therefore, PG&E will focus its conservation efforts on the Peninsula and work to fund conservation efforts in and around San Bruno Mountain, where PG&E will focus on partnering opportunities with the San Bruno Mountain HCP habitat manager, HCP trustees, and USFWS. In contrast, the Callippe silverspot butterfly has a much broader distribution with habitat in the eastern and western portions of the study area. PG&E may direct some mitigation toward Solano, Contra Costa or Alameda Counties, and toward other HCP recovery efforts (e.g., San Bruno Mountain HCP). PG&E may also partner with the Solano County Water Agency to meet mutually beneficial HCP mitigation needs of the two organizations by enhancing habitat within Solano County (e.g., Solano Land Trust lands). In the event conservation lands are not available, PG&E will fund other recovery efforts that are approved by USFWS.

For the Lange's metalmark butterfly, PG&E will place a conservation easement on a portion of its property or, with agency approval, will contribute funds for habitat management at Antioch Dunes NWR. For the Bay checkerspot butterfly, PG&E is looking toward conservation of suitable habitat but may also work with others to conserve lands and may contribute funds in a way that directly benefits the species (e.g., habitat management and species reintroductions).

Amphibians

California tiger salamander (Central California DPS) is the primary species driving the conservation strategy for the HCP. This species requires more mitigation than all other species because its habitat is the most extensive throughout the Plan Area. PG&E's conservation strategy is to acquire fee title or conservation easements, or partner with other regional conservation entities to advance conservation for most covered amphibian and reptile species. PG&E will focus on lands in Contra Costa, Alameda, Solano, and Santa Clara Counties, and explore the possibility of contributing funds to regional conservation efforts for these species (i.e., East Contra Costa HCP/NCCP, *Santa Clara Valley Habitat Plan*). 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. Because PG&E infrequently impacts this species breeding habitat, it will provide limited breeding habitat as mitigation. However, to ensure overall habitat connectivity and suitability, PG&E will ensure mitigation lands are located near stock ponds, vernal pools, or other breeding habitat. PG&E will implement mitigation in advance of impacts on California tiger salamander (Central California DPS) dispersal habitat.

To mitigate for impacts on California tiger salamanders (Sonoma County DPS) in Sonoma County, acquisitions will be consistent with the *Santa Rosa Plain Conservation Strategy*. PG&E will focus its acquisition efforts on areas that are targeted for conservation, are likely to be occupied by California tiger salamander, and that would provide important corridor habitat for the species. PG&E owns some fee title lands in this area and may record a conservation easement on a portion of the land for species protection and management.

PG&E will use multiple conservation mechanisms to protect and enhance California red-legged frog habitat. Approximately 60% of impacts will result in the eastern portion of the Plan Area in Solano, Contra Costa, and Alameda Counties. Another 30% of impacts will result in the western and southern portions of the Plan Area in Contra Costa and San Mateo Counties, and 10% in the northern portion of the Plan Area in Marin, Sonoma, and Napa Counties. Mitigation will similarly be

distributed in these regional areas. Additional conservation mechanisms could include contributing to the protection and enhancement of previously identified parcels (e.g., Swett Ranch) or contributing to the conservation, protection, and enhancement efforts of other entities (e.g., SFPUC or Mid-Peninsula Open Space and Conservation District). When acquiring easements or lands, PG&E will prioritize sites that contain habitat for both California tiger salamander and California red-legged frog. PG&E expects that 30% of its mitigation for impacts on California red-legged frog could be combined with mitigation for impacts on California tiger salamander because California red-legged frog dispersal habitat overlaps with that of the California tiger salamander.

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. Riparian waterways contribute up to 5% of the modeled breeding habitat, and PG&E will mitigate for these impacts by preserving riparian habitat. PG&E will acquire mitigation in advance for impacts on California red-legged frog dispersal habitat.

Reptiles

PG&E will impact Alameda whipsnake in Contra Costa and Alameda Counties; therefore, PG&E will mitigate in these counties. PG&E will acquire lands or conservation easements in these counties or will contribute funds to the East Contra Costa HCP/NCCP implementing agency to support the purchase of habitat mitigation beyond that required in the East Contra Costa HCP/NCCP. Mitigation for impacts on core, perimeter core, and movement habitats for Alameda whipsnake may be combined with mitigation for impacts on the California red-legged frog and California tiger salamander (Central California DPS) depending on the habitat characteristics of the site being evaluated for mitigation. Because fewer acres of mitigation are required for Alameda whipsnake than California red-legged frog and California tiger salamander (Central California DPS), PG&E may work with a regional conservation entity that is working to conserve the species, such as East Bay Regional Park District. PG&E will acquire mitigation in advance for impacts on Alameda whipsnake movement habitat.

San Francisco garter snake occurs primarily in San Mateo County; therefore, mitigation will be provided there. Because there is limited opportunities to acquire habitat for this species near San Francisco International Airport or Crystal Springs Reservoir, PG&E will pursue the possibility of conservation partnerships with airport management and SFPUC to determine if habitat management or enhancement is feasible. If this is not feasible, PG&E may pursue additional conservation actions with regional conservation organizations (e.g., Mid-Peninsula Open Space and Conservation District), or acquire conservation easements or fee title along riparian areas closer to the coast. Mitigation for impacts on this species may be combined with mitigation for impacts on California red-legged frog.

Marsh Species

PG&E will conserve bay-fringe habitats to provide mitigation for impacts on the Ridgway's rail and salt marsh harvest mouse. By moving tower footings during past projects and by supporting tidal marsh restoration in the South Bay, PG&E accumulated advance mitigation of 5 acres of habitat for these species. Further, PG&E will identify additional lands for easement or fee title acquisition. There are many bay-fringe habitat restoration projects under way, and PG&E will evaluate whether it is better to mitigate on its own property or partner with others to maximize the conservation

benefits to these species. Approximately 30% of the mitigation for impacts on marsh species will be implemented in the South Bay, 50% in the East Bay, and 20% in the North Bay.

Grassland Species

PG&E will acquire and protect grassland in eastern Contra Costa, Alameda or Santa Clara Counties, or partner with a regional conservation entity (e.g., East Contra Costa County Habitat Conservancy) to offset impacts on the San Joaquin kit fox. This species' habitat is likely to co-occur with habitat for other covered species, such as the California tiger salamander (Central California DPS), California red legged frog, or Alameda whipsnake. Because there are also multiple mitigation banks under development in this area, PG&E may buy credits from a mitigation bank as well.

5.6.2.4 Mitigation Summary for Plants

Unlike mitigation for wildlife that may be implemented far in advance of impacts, mitigation for direct impacts on 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 and based on the success of restored habitat. Habitat could be restored onsite in a ROW or offsite on protected lands as a potential means to mitigate for impacts on plants. However, mitigation will be challenging for covered plants because of the limited availability of occupied plant habitat. While there may be some opportunities to concurrently mitigate in some areas for impacts on plant and wildlife species (e.g., plants in vernal pool systems), onsite restoration and partnerships that promote plant recovery and conservation offer greater conservation benefits for covered plant species than acquisition.

Table 5-5 provides a summary of the conservation strategy for covered plants. Map Book zones and actual site-specific data on plant locality will determine the acreage of impact and the number of plants that could be taken. For small activities where additional surveys or monitoring are not conducted, acreages may serve as a surrogate for assessing take 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 the appropriate times of year, PG&E will use acreage as a surrogate to estimate the amount of impacts on covered annual plant species.

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 taken over the permit term. Permanent impacts for plants are defined as absence of the plant after it is affected. Temporary impacts for plants are defined as trimming, 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.
 - For every perennial or manzanita plant that is permanently affected, PG&E will provide mitigation at a 3:1 ratio (3 plants grown or protected for every 1 plant permanently affected). In addition, the general acres of habitat affected will be similar to the mitigation area.
 - For every acre of permanent impacts, PG&E will provide mitigation at a 3:1 ratio.

- For temporary impacts, PG&E will provide mitigation in one of the following ways.
 - For every perennial or manzanita plant species that is temporarily affected, PG&E will provide mitigation at a 1:1 ratio (1 plant grown or protected for every 1 plant temporarily affected).
 - For every acre of temporary impacts, PG&E will provide mitigation at a 1:1 ratio.

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, PG&E will pursue other mitigation options to ensure biological goals are met. For perennial species, an option is to propagate replacement stock and plant it within suitable habitat within the ROW. For annual plant species, these options vary based on the type of habitat 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.
- Serpentine endemic species – partner with or contribute funds to efforts that will promote and protect listed plant species in Santa Clara County.

For activities affecting more than 0.1 acre in Map Book zones and for which AMMs are ineffective or unable to 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; 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 individuals expected to benefit from implementing the restoration plan.

Additional measures could include relocating facilities away from occupied habitat on a case-by-case basis as allowable by the operations groups and subject to landowner approval or 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

Plant Species	Documented CNDDDB Habitat (acres)	Impacts within the Plan Area (acres)	Impacts on Plants (individuals)	Mitigation Approach
Pallid manzanita	159	2.27	15	1. Salvage and replant as a component of ROW restoration, plus monitor success.
Sonoma sunshine	501	2.5	250,000	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 <i>Santa Rosa Plain Conservation Strategy</i> . 3. Acquire lands or conservation easements consistent with the <i>Santa Rosa Plain Conservation Strategy</i> . 4. Purchase mitigation credits.
Coyote ceanothus	436	3.5	2,516	1. Salvage and re-plant as a component of ROW restoration, plus monitor to determine success. 2. Partner with <i>Santa Clara Valley Habitat Plan</i> implementing agency to enhance restoration efforts. 3. Acquire lands or conservation easements consistent with the <i>Santa Clara Valley Habitat Plan</i> .
Fountain thistle	39	0.8	100	1. Salvage topsoil, and replace and recontour as a component of ROW restoration, plus monitor success. 2. Fund restoration activities including habitat protection, enhancement, and restoration.
Santa Clara Valley dudleya	1,560	3.84	800	1. Salvage and re-plant as a component of ROW restoration, plus monitor to determine success. 2. Propagate replacement stock and transplant into ROW locations with suitable habitat, plus monitor to determine success. 3. Partner with <i>Santa Clara Valley Habitat Plan</i> implementing agency to enhance restoration efforts. 4. Acquire lands or conservation easements consistent with the <i>Santa Clara Valley Habitat Plan</i> .
Contra Costa wallflower	54	0.17	35	1. Establish a conservation easement on PG&E lands at Antioch Dunes National Wildlife Refuge. 2. Coordinate with USFWS to fund habitat restoration activities or propagation and transplantation activities.
Marin dwarf flax	436	1.95	1,700	1. Salvage topsoil, and replace and recontour as a component of ROW restoration, plus monitor success. 2. Coordinate with SFPUC to fund restoration activities.

Table 5-5. Continued

Plant Species	Documented CNDDDB Habitat (acres)	Impacts within the Plan Area (acres)	Impacts on Plants (individuals)	Mitigation Approach
Burke's goldfields	667	1.51	2,000	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 <i>Santa Rosa Plain Conservation Strategy</i>. 3. Acquire lands or conservation easements consistent with the <i>Santa Rosa Plain Conservation Strategy</i>. 4. Purchase mitigation credits.
Contra Costa goldfields	507	5.48	14,539	1. Salvage topsoil, and replace and recontour as a component of ROW restoration, plus monitor success. 2. Acquire lands or conservation easements in Solano County. 3. Purchase mitigation credits.
Sebastopol meadowfoam	699	0.04	500	1. Salvage topsoil, and replace and recontour as a component of ROW restoration, plus monitor success. 2. Acquire lands or conservation easements consistent with the <i>Santa Rosa Plain Conservation Strategy</i>. 3. Purchase mitigation credits.
Antioch Dunes evening primrose	70	0.17	10	1. Establish a conservation easement on PG&E lands at Antioch Dunes National Wildlife Refuge. 2. Coordinate with USFWS to fund habitat restoration activities or propagation and transplantation activities.
White-rayed pentachaeta	41	0.11	500	1. Salvage topsoil, and replace and recontour as a component of ROW restoration, plus monitor success. 2. Coordinate with SFPUC to fund restoration activities.
Metcalf Canyon jewelflower	817	0.96	210	1. Salvage topsoil, and replace and recontour as a component of ROW restoration, plus monitor to determine success. 2. Partner with <i>Santa Clara Valley Habitat Plan</i> implementing agency to enhance restoration efforts. 3. Acquire lands or conservation easements consistent with the <i>Santa Clara Valley Habitat Plan</i>.

5.6.3 Types of Mitigation

PG&E may utilize a variety of approaches to fulfill its mitigation obligation. Descriptions of these approaches appear below; the specific approval process and requirements for each type of mitigation appears in Section 5.6.4, *Mitigation Approval Process*.

5.6.3.1 Fee Title

PG&E may purchase lands in fee. 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.

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 high-quality habitat. PG&E also owns several parcels of land that have high conservation values and that may be suitable for mitigation.

5.6.3.3 Conservation Partnerships

PG&E may partner with conservation organizations to further regional conservation efforts. In the Bay Area, many local, state, and federal government organizations and nonprofit organizations (including but not limited to land trusts and special districts) have species or habitat conservation as part of their mission. PG&E funds contributed to land acquisitions and management will serve as mitigation. Further, several regional, multiple-species HCPs/NCCPs and conservation strategies have been adopted in the Bay Area (see Table 5-6). PG&E could contribute to these efforts by making other financial contributions or in-kind services to these plans that benefit covered species. These types of financial contributions have the advantage of building on species-focused conservation efforts that are part of a broad regional conservation planning effort.

Financial and In-Kind Contribution to Local Land Managers

Many federal, state, and local land managers, including the Golden Gate National Recreation Area (GGNRA), NWRs, state parks and wildlife areas, park districts, and nonprofit organizations (e.g., The Nature Conservancy, Mid-Peninsula Open Space District) have missions that include the protection and conservation of endangered species. PG&E could contribute to these efforts by making financial or in-kind service contributions to these organizations if these contributions are shown to have direct benefits to covered species. PG&E's contributions would be subject to USFWS review and approval. This type of mitigation will have a discrete timeline for implementation of the restoration project, will result in restoration or habitat enhancement for the covered species and demonstrates that PG&E's contribution resulted in a measurable benefit to the species that meets PGE's mitigation needs.

Table 5-6. Covered Species that Occur in Other Habitat Conservation Plans or Joint Habitat Conservation Plans and Natural Community Conservation Plans

PG&E's Covered Species	Species not Covered by an HCP or NCCP	Approved/Issued/Authorized					In Preparation: Solano HCP/ 2081 Permit
		East Contra Costa HCP/ NCCP	East Alameda County Conservation Strategy Biological Opinion	Santa Rosa Plain Conservation Strategy	San Bruno Mountain HCP	Santa Clara Valley Habitat Plan	
Invertebrates							
<i>California freshwater shrimp</i>	X						
Conservancy fairy shrimp							X
Longhorn fairy shrimp		X					
Vernal pool fairy shrimp		X	X				X
Vernal pool tadpole shrimp		X					X
Delta green ground beetle							X
Bay checkerspot butterfly						X	
Callippe silverspot butterfly			X		X		X
Lange's metalmark butterfly	X						
Mission blue butterfly					X		
San Bruno elfin butterfly					X		
Amphibians							
California tiger salamander (Central California DPS)		X	X			X	X
California tiger salamander (Sonoma County DPS)				X			
California red-legged frog		X	X			X	X
Reptiles							
Alameda whipsnake		X	X				
San Francisco garter snake					X ^a		
Birds							
Ridgway's rail							X
Mammals							
Salt marsh harvest mouse							X
San Joaquin kit fox		X	X			X	
Plants							
Pallid manzanita	X						
Sonoma sunshine				X			
Coyote ceanothus						X	
Fountain thistle	X						
Santa Clara Valley dudleya						X	
Contra Costa wallflower	X						
Marin dwarf flax	X						
Burke's goldfield				X			
Contra Costa goldfields							X
Sebastopol meadowfoam				X			
Antioch Dunes evening primrose	X						
White-rayed pentachaeta	X						
Metcalf canyon jewelflower						X	

^a No mitigation will occur for this species on this site under the Bay Area O&M HCP.

Financial and In-Kind Contribution to Restoration Efforts

Extensive restoration activities by various agencies are underway in the North Bay and South Bay. PG&E could make financial or in-kind contributions to restoration efforts to benefit covered species; the specific financial contribution and acreage of benefit would need to be identified and agreed to by the USFWS. PG&E contributed to the first phase of the South Bay Restoration Project by upgrading the footings of facilities in Alviso Pond A-6 in South San Francisco Bay to facilitate the breaching and restoration of the pond. This action was analyzed in the biological opinion for the South Bay Salt Pond Restoration Project, and the project itself was analyzed in the *South Bay Salt Pond Restoration Project Final Environmental Impact Statement/Report* (EDAW et al. 2007). PG&E subsequently executed a mitigation credit agreement with USFWS that provided 1 acre of credit available initially and then PG&E received the additional 4 acres of mitigation credit when the pond was breached in 2010. These credits can be used solely by PG&E and can be used for covered activities under the Bay Area O&M HCP.

5.6.3.4 Conservation/Mitigation Banks

PG&E may purchase credits from a conservation or mitigation bank with the approval of USFWS. Conservation/mitigation bank credits are available to meet some of PG&E's needs, but currently there are no credits for some species. However, additional conservation/mitigation banks will likely be created and approved over the next 30 years, expanding the number of sensitive species for which credits would be available. Upon USFWS approval of the bank, PG&E may use these banks to mitigate its impacts if credits are available.

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 infeasible or very difficult to achieve. For example, there may be very limited or no opportunities to purchase fee title lands or easements for some wildlife species, such as Lange's metalmark butterfly, San Bruno elfin butterfly, Callippe silverspot butterfly, 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 planting host plants for listed butterflies and relocating or transplanting covered plants. 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.

5.6.4 Mitigation Approval Process

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 documents they need to make informed decisions. The process parallels the steps required of project applicants when working with USFWS on reviewing habitat management land acquisitions. The review process is generally the same whether another party holds the easement and USFWS is a third party. PG&E and USFWS will work to complete habitat acquisition transactions as quickly as possible. USFWS will be involved with all mitigation for impacts on covered species.

Step 1. Habitat Acquisition Site Evaluation

PG&E will prepare a mitigation acquisition form that provides USFWS with a summary of the mitigation opportunity. PG&E will specify 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, their agent, and the landowner.

Step 2. Conceptual Approval

PG&E will work with USFWS to obtain conceptual approval of the site. If USFWS supports selection of the site, they will provide confirmation that additional investigation of the site is merited. If the subject site is located within a conservation priority area of an existing HCP or is identified in The Conservation Lands Network's recommendations for conservation (e.g., land in "Areas Essential to Conservation Goals," "Areas Important to Conservation Goals," "Stream Priority 1," or "Stream Priority 2"), it is likely to be suitable.

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. Draft management plans will be submitted as part of the acquisition package. 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 the following other items.

- 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 transactions.
- A document specifying the names of the individuals who are legally authorized to sign the documents.

As these materials are being drafted, PG&E will work with USFWS on the preliminary review of these items and discuss any known potential issues of concern prior to submission of the complete package. PG&E will also work with USFWS on the easement language or grant deed if there are deviations from the template.

PG&E will submit the conservation easement and the rest of the supporting documents (i.e., the habitat acquisition package and checklist of items provided above). PG&E will submit a complete set

to the USFWS, and one set to each of any other agencies that may be involved in mitigation site acquisition approval.

Step 4. Review of the Habitat Acquisition Package

USFWS will review the habitat acquisition package within 60 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.

Step 5. Revised Drafts of Documents in the Habitat Acquisition Package

PG&E will incorporate revisions and edits to draft documents in the habitat acquisition package that PG&E receives from USFWS within 60 working days. If no comments are received during this time, the documents will be deemed acceptable. For those revisions received 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.

Step 6. Proceed with Transaction

Once USFWS have 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 approved HCPs or an HCP/NCCP will need the advance approval of the permitted entity, USFWS. PG&E will develop a proposal for each of these contributions, indicating the amount to be contributed, the types of activities on which funds could be spent, the species expected to benefit, and PG&E's and the implementing entities' future commitments regarding species protection, monitoring, reporting, and additional contributions. For example, PG&E will work with the 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, there would need to be direct benefits to covered species habitat. USFWS will review the proposal within 60 working days of submittal and indicate if the proposal is: (1) complete and acceptable, (2) acceptable with modifications, or (3) incomplete. If PG&E does not receive notice from the wildlife agencies, it will contact the appropriate regional manager at USFWS to determine the status and timing of the package. If a response is not received after an additional 30 working days, the request will be elevated.

5.6.4.3 Approval Process for Purchasing Credits from Conservation/Mitigation Banks

PG&E may purchase available mitigation credits from conservation/mitigation banks. To ensure the purchases of credits is regionally appropriate for the impacts being mitigated, the credit purchase will need review and approval by USFWS.

5.6.4.4 Approval Process for Offsite Habitat Enhancement and Restoration

PG&E may collaborate with others to pursue habitat enhancement and restoration opportunities in the Bay Area. Often, there is a need for specialized habitat enhancement or restoration, and PG&E

will work with conservation partners to pursue options that benefit covered species. In some instances PG&E may pursue these options alone. Proposals must be specific and identify which species are intended 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. A conservation easement may not be required for these lands, but compliance with the success criteria is required. USFWS must approve the plan and success criteria. Any lands that are proposed must be permanently protected such as USFWS lands. USFWS will respond to the proposal within 60 working days. If a response is not received after an additional 30 days, the request will be elevated.

5.6.5 Selection, Location, and Management of Habitat Mitigation Lands

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 used. Additionally, PG&E will work with the agencies to identify critical or high-threat areas that could be pursued for mitigation and priority conservation.

The following characteristics are desirable attributes of conservation lands.

- 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, riparian areas) that may not be a target of mitigation efforts.
- Minimum levels of past site disturbance or high potential for restoration from disturbance.
- Of high conservation priority due to high threat of impacts (i.e., 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 presence (including vegetation structure and suitability of the site as habitat, proximity to CNDDDB occurrences, and observations of scat or other signs of covered species' presence).
 - b. Property contributes to protecting important corridors.

For some species, factors may render it challenging to demonstrate that habitat is occupied habitat because of population fluctuations (e.g., butterflies); difficulty detecting species (e.g., San Francisco

garter snake); or infrequent species occurrence in the study area (e.g., San Joaquin kit fox). In these instances, the mitigation site will be selected based on criterion 2, suitability.

5.6.5.1 Mitigation Land Selection

PG&E will identify mitigation habitat based on the specific habitat requirements of affected covered species. Although suitability of areas for covered species is the primary factor in choosing mitigation areas, PG&E will consider the following factors that may affect both the quality and priority of mitigation lands for covered species.

- **Size:** Large contiguous areas of habitat are preferable to an equal acreage of small, separated areas.
- **Surrounding land uses:** Mitigation habitat should be surrounded by compatible land uses and/or buffered from adverse adjacent land uses.
- **Coordination with other local and regional conservation efforts:** Location of mitigation lands should build on other related conservation efforts.
- **Location relative to impact areas:** Mitigation habitat that is in-kind or close to the affected site is preferable to more distant habitat or to different habitat types.
- **Threat level:** Lands that are sensitive to pressures from development or other land use changes and that provide important conservation value due to patch size or habitat corridors are a priority for conservation.

To ensure that mitigation areas will provide the type and quality of habitats needed by covered species, these factors will be key considerations in acquiring lands for mitigation. While PG&E will strive to acquire lands that satisfy these key factors, this outcome may not always be possible. For example, mitigation lands needed for covered species such as California freshwater shrimp may not be a large acquisition adjacent to other protected lands because this species has highly specialized habitat needs. The following sections address the factors and attributes of specific habitat types affecting suitability of mitigation lands and the resulting management implications. Both the suitability of habitats and the ability to maintain habitats at a required level are key to selecting appropriate mitigation lands. PG&E will work with USFWS to identify mitigation opportunities that will fulfill its mitigation obligations.

Riparian Habitats and Wetlands

Habitat mitigation lands may include riparian habitat, permanent freshwater wetlands, vernal pools, and other seasonal wetlands. Preservation of these habitat types or other land cover types providing habitat for covered species is desirable because the transition zone augments the quality and quantity of habitat provided by both the upland and wetland areas. Some species such as California red-legged frog, San Francisco garter snake, and California tiger salamander need both upland and wetland areas to survive and reproduce. Connections among rivers, riparian vegetation, and seasonal and permanent wetlands are desirable for mitigation and are consistent with biological principles.

California red-legged frog benefits from cover from understory vegetation. Accordingly, sites with structural diversity, including over- and understory components, will be selected as mitigation areas for California red-legged frog. Management will entail control of livestock to ensure it does not degrade important habitat.

Considerations for riparian- and wetland-dependent covered species include the following factors.

- Presence of permanent or semi-permanent water for California red-legged frog.
- Presence of rodent burrows or comparable small crevices for California red-legged frog, San Francisco garter snake, and California tiger salamander.
- Absence or control of predatory bullfrogs and nonnative fish for California tiger salamander, San Francisco garter snake, and California red-legged frog.

Grasslands

Grasslands can be most beneficial as mitigation lands if they are located adjacent to other preserved or protected areas of grassland habitat. Proximity to aquatic habitats increases the quality of grassland habitat for a number of species that breed in riparian and aquatic habitats but forage or seek shelter in grasslands (e.g., California tiger salamander, California red-legged frog). Other species rely almost completely on grasslands for breeding and foraging habitat and will benefit most from the preservation of large, contiguous grasslands specific to their needs. For individual grassland species, the following other attributes are important considerations for selecting mitigation lands.

- Maintained presence of ground squirrel burrows for San Joaquin kit fox and California tiger salamander.
- Proximity to suitable aquatic breeding sites for California tiger salamander and California red-legged frog that do not support predatory fish and bullfrogs.
- Protection from disking and agricultural uses.
- Restricted use of rodenticides and herbicides.
- Prescribed and managed livestock grazing where needed as a tool to maintain suitable vegetation conditions.

Oak Woodlands

Desirable mitigation lands include the valley oak, live oak, and blue oak woodland habitats. Bay Area woodlands contain few oaks because woodcutting and livestock grazing impede their recruitment and growth. A management plan designed to protect acquired oak woodland mitigation areas will address these conflicts.

Woodland habitats important to covered species contain the following characteristics.

- Proximity to water sources for California tiger salamander and California red-legged frog.
- Presence of rodent burrows, rock crevices, or fallen logs for California tiger salamander and California red-legged frog.
- Retention of snags (standing dead trees) and downed woody debris to benefit multiple wildlife species.

Shrublands

Habitat mitigation lands may include shrubland habitats. Management goals for shrublands vary by species and localized habitat types. In general, management goals for shrublands may include the following attributes.

- Exclusion or restriction of livestock.
- Establishment and maintenance of adequate buffers from developed lands or roads (with specific distances based on site-specific conditions estimated by the preserve land manager).
- Monitoring for the presence and control of invasive nonnative plant species.
- Risk assessment and containment of wildfire through management plans. Wildfire has a strong influence on habitat and consequences for both wildlife and public safety.

5.6.5.2 Location of Mitigation Areas

PG&E will locate mitigation opportunities in accordance with land-selection factors and attributes identified above. The location of potential mitigation opportunities will vary based on species distribution. These opportunities are conceptually described in Table 5-4 and in text earlier in the chapter, although specific mitigation locations may change based on available mitigation opportunities. PG&E will implement mitigation in three regions: the North Bay (Marin, Napa, and Sonoma Counties); the East Bay (Solano, Contra Costa, and Alameda Counties); and the Peninsula/South Bay (San Francisco, San Mateo, and Santa Clara Counties). This regional framework will ensure that mitigation coincides appropriately with impacts from covered activities.

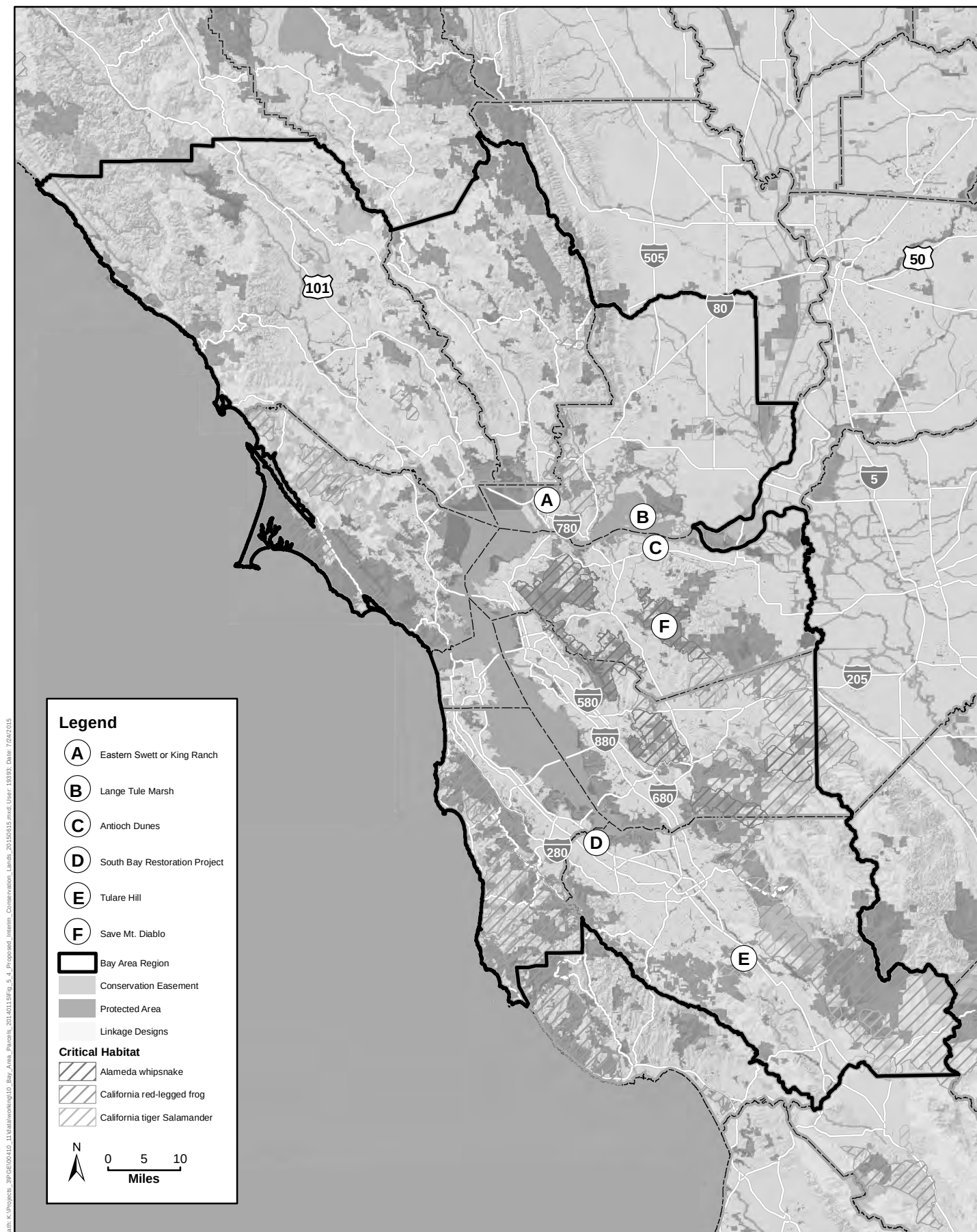
5.6.5.3 Mitigation Management Plans

Management plans for each conservation parcel will be prepared in consultation with USFWS. Management plans will include a Property Analysis Record (PAR), or PAR-like analysis to determine the required endowment amount for management.

All management plans require approval by USFWS. USFWS will review and comment and strive to approve management plans within 60 days of submittal.

Management plans prepared under this HCP will include information as outlined in Appendix C or will adhere to other USFWS approved management plans. These plans typically will contain the following elements, but actual required sections may vary with prior approval from USFWS.

- 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 needed fence and sign locations.
- Description of anticipated management activities to be performed, including vegetation management.
- Maps of habitat anticipated to result from enhancement.



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Figure 5-4
Proposed Interim Conservation Lands

- Success criteria for habitat enhancement or restoration and restoration plans to be implemented if success criteria are unmet.
- Description of applicable monitoring activities.
- Name and agreement with conservation easement holder, if any, or deed restrictions on fee-owned land.
- Cost of management and endowment (PAR or PAR-like analysis).
- Name and agreement with 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.

5.6.6 Mitigation Debit Process

PG&E will maintain a database-supported ledger of mitigation acreage acquired and used for covered species and activities. PG&E will retain surplus mitigation credits at the end of the permit duration or upon permit termination for use on future PG&E activities.

5.6.7 Advanced Mitigation Lands

PG&E proposes to acquire conservation lands during HCP development that will count towards compliance requirements when the HCP permit is issued (Table 5-7 and Figure 5-4). Evaluating land acquisition and other compensation mechanisms require a significant amount of time and resources and can take years to complete. Both PG&E and USFWS staff (as well as CDFW, when appropriate) 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's compensatory mitigation would stay ahead of impacts. These advanced mitigation lands are evaluated per the HCP requirements and would count toward requirements upon recording of the conservation easements.

The opportunities presented below are a mix of potential advanced mitigation opportunities that are currently being considered. These lands currently are located in areas in Solano, Contra Costa, and Santa Clara Counties.

- **Eastern Swett or King Ranches** PG&E is working with Solano County Water Agency and Solano Land Trust to partner on thousands of acres and targets two covered species in Solano County. The grasslands, riparian woodlands, and ponds support California red-legged frog and Callippe silverspot butterfly. It is identified as an important conservation area in the Solano HCP and is located in critical habitat for California red-legged frog. Several hundred acres would be credited toward PG&E's mitigation needs. A conservation easement, management plan, and endowment are proposed.
- **Lang Tule Marsh** is 256 acre parcel, 128 acres of which will be credited to PG&E, and targets several covered species in Solano County. The emergent marsh supports black rails (not covered by this HCP) and salt marsh harvest mouse. The upland/vernal pool habitat is designated critical habitat for vernal pool fairy shrimp, vernal pool tadpole shrimp, Conservancy fairy shrimp, and Contra Costa goldfields. Goldfields have been documented on the property, and summer surveys have been completed for vernal pool shrimp species but no positive identifications have occurred. The site also includes designated critical habitat for green sturgeon and Delta smelt (not covered by this HCP). A conservation easement, management plan, and endowment are proposed.
- **Antioch Dunes** is approximately 12 acres covering two parcels of land owned by PG&E that are currently covered by a Safe Harbor Agreement that expires in 2020. These parcels provide habitat for two covered species in Contra Costa County, Lange's metalmark butterfly and Antioch dunes evening primrose. Protection and management of these lands is important for the recovery and survival of these species. A fee title donation with an endowment to the USFWS to manage these parcels is under consideration to allow expansion of the Antioch Dunes NWR to aid in recovery of these imperiled species.
- **South Bay Salt Pond Restoration Project Habitat Credit Agreement (2009)** As part of the South Bay Salt Pond Restoration Project, PG&E agreed to relocate electric transmission towers to allow for expansion of the restoration of emergent saltwater marsh habitat to aid in the recovery and protection Ridgeway's rail and salt marsh harvest mouse. The Biological Opinion and Habitat Credit agreement for the project allocated 5 acres of habitat compensation credits to PG&E for later use.
- **Santa Clara Valley Habitat Plan** PG&E is working with the administrator of the Santa Clara Habitat Plan to partner in future parcel acquisitions in the South Bay (Santa Clara County) with the goal of acquiring larger parcels to benefit both HCP programs. Future acquisitions will target habitat for Bay checkerspot butterfly, California red-legged frog, California tiger salamander, and Coyote ceanothus.
- **Save Mount Diablo** PG&E is working with the land trust to partner on properties which they currently own and future acquisitions to conserve properties within the Mount Diablo core area. These properties provide habitat for Alameda whipsnake, California red-legged frog, and California tiger salamander.

Table 5-7. 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.)
A	Eastern Swett or King Ranches	>2,000 ac/ 200-600	Solano	CE, MP, E	Grassland, riparian, ponds	California tiger salamander, California red- legged frog, Callippe silverspot butterfly	Important conservation area in Solano HCP. Critical habitat for CRLF.
B	Lange Tule Marsh	256/ 128	Solano	FT, CE, MP, E	Emergent marsh	Salt marsh harvest mouse, vernal pool fairy shrimp, tadpole shrimp Conservancy shrimp, and Contra Costa goldfields	Important conservation area in Solano HCP. Critical habitat for vernal pool fairy shrimp, tadpole shrimp Conservancy shrimp, and Contra Costa goldfields. Critical habitat also designated for green sturgeon and Delta smelt.
C	Antioch Dunes	12/ 12	Contra Costa	CE, MP, E	Dune, grassland	Lange's metalmark, Antioch dunes evening primrose	PG&E owned lands currently managed under a Safe Harbor Agreement. Important for long- term species survival; last known populations.
D	South Bay Restoration Project	5	Santa Clara	Cr	Emergent marsh	Ridgway's rail, salt marsh harvest mouse	PG&E moved towers to allow expansion of restoration areas. BO for the project included these credits.
E	Santa Clara Valley Habitat Plan	To be determined	Santa Clara	CE, MP, E	Grassland, wetland	Bay checkerspot butterfly, California red-legged frog, California tiger salamander	Important conservation areas have been identified, and will help jump start additional conservation acquisitions in the Santa Clara Valley Habitat Plan.
CE = Conservation Easement, FT = Fee Title Acquisition, MP = Management Plan, E = Endowment, Cr = Credit							

5.7 Summary of Conservation Strategy

Tables 5-8 and 5-9 provide a species-by-species summary of how implementation of the conservation strategy will avoid, minimize, and mitigate impacts on the covered wildlife and plant species. The conservation strategy will ensure that the impacts from covered activities are avoided, minimized, and mitigated in a way that is preferable to ad-hoc permitting, and that serves to create a more consistent program that benefits covered species.

Table 5-8. Conservation Strategy Summary for Covered Wildlife Species

Species	Avoidance and Minimization Measures	Mitigation	Conclusion
Invertebrates			
California freshwater shrimp	FP-04, FP-11, FP-12, FP-15, FP-16, Hot Zone-1, Wetland-2	Restore and enhance habitat if direct impacts cannot be avoided and preserve 2.9 acres for freshwater shrimp mitigation.	Direct impacts avoided or minimized with the hot zone AMM and application of large activity AMM and FPs. Mitigation ensures impacts will be mitigated.
Conservancy fairy shrimp	FP-04, FP-11, FP-12, FP-15, FP-16, Wetland-1	Preserve 3.5 acres of habitat.	Direct impacts avoided or minimized with the application of large activity AMM and FPs. Any remaining impacts will be mitigated.
Longhorn fairy shrimp	FP-04, FP-11, FP-15, FP-16, Hot Zone-2, Wetland-1	Contribute to the conservation of 1.3 acres of habitat.	Direct impacts avoided or minimized with the hot zone AMM, large activity AMM, and application of FPs. Any remaining impacts will be mitigated.
Vernal pool fairy shrimp	FP-04, FP-11, FP-15, FP-16, Wetland-1	Preserve 40 acres for vernal pool mitigation.	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-04, FP-11, FP-15, FP-16, Wetland-1	See vernal pool fairy shrimp.	Direct impacts avoided or minimized with the application of large activity AMM and FPs. Any remaining impacts will be mitigated.
Delta green ground beetle	FP-11, FP-15, FP-16, Wetland-1	Mitigation for this species (8 acres) is provided in Solano County.	Direct impacts avoided or minimized with the application of large activity AMM and FPs. Any remaining impacts will be mitigated.
Bay checkerspot butterfly	FP-07, FP-10, FP-14, Hot Zone-5	PG&E will provide 74 acres of mitigation.	Direct impacts avoided or minimized with the application of the hot zone AMM and FPs. Any remaining impacts will be mitigated.

Table 5-8. Continued

Species	Avoidance and Minimization Measures	Mitigation	Conclusion
Invertebrates (continued)			
Callippe silverspot butterfly	FP-03, FP-04, FP-07, FP-10, FP-14, Hot Zone-3	Preserve 145 acres for habitat management or enhancement programs.	Direct impacts avoided or minimized with the application of the hot zone AMM on San Bruno Mountain and FPs elsewhere. Any remaining impacts will be mitigated.
Lange's metalmark butterfly	FP-03, FP-04, FP-07, FP-10, Hot Zone-4	Enhance or preserve 1.9 acres of habitat.	Direct impacts avoided or minimized with the application of the hot zone AMM and FPs. Habitat enhancement is expected to exceed direct impacts, resulting in a benefit to this species.
Mission blue butterfly	FP-03, FP-04, FP-07, FP-10, FP-14, Hot Zone-3	Contribute funds to San Bruno Mountain HCP toward restoration or enhancement of up to 26 acres of habitat.	Direct impacts avoided or minimized with the application of the hot zone AMM on San Bruno Mountain and FPs. Any remaining impacts will be mitigated.
San Bruno elfin butterfly	FP-03, FP-04, FP-07, FP-10, Hot Zone-3	See Mission blue butterfly.	Direct impacts avoided or minimized with the application of the hot zone AMM on San Bruno Mountain and FPs. Any remaining impacts will be mitigated.
Amphibians			
California tiger salamander (Central California DPS)	FP-04, FP-11, FP-12, FP-13, FP-15, FP-16, Hot Zone-6, Wetland-1, Wetland-2	Acquire up to 2,183 acres of upland habitat; acquire 624 acres of critical habitat; acquire wetland habitat consistent with impacts – up to 31 acres.	Direct impacts avoided or minimized with the application of hot zone AMM, large activity AMM, and FPs. Any remaining impacts will be fully mitigated.
California tiger salamander (Sonoma County DPS)	FP-04, FP-11, FP-13, FP-15, FP-16, Hot Zone-6, Wetland-1, Wetland-2	Acquire 119 acres consistent with the <i>Santa Rosa Plain Conservation Strategy</i> .	Direct impacts avoided or minimized with the application of AMMs and FPs in known locations and in hot zones and AMMs for large activities. Any remaining impacts will be fully mitigated.

Table 5-8. Continued

Species	Avoidance and Minimization Measures	Mitigation	Conclusion
Amphibians (continued)			
California red-legged frog	FP-11, FP-12, FP-13, FP-15, FP-16, Wetland-2	Acquire up to 1,110 acres of dispersal habitat; acquire 177 acres of critical habitat; acquire 503 acres of modeled breeding habitat (25 acres of actual wetted habitat). Approximately 30% of mitigation may co-occur with mitigation for impacts on California tiger salamander (Central California DPS) dispersal habitat.	Direct impacts avoided or minimized with the application of AMMs and FPs and AMM for large activities. Any remaining impacts will be mitigated.
Reptiles			
Alameda whipsnake	FP-04, FP-07, FP-10, FP-13, FP-14	Contribute to the conservation of up to 115 acres of core habitat, 145 acres of perimeter core habitat, and 245.5 acres of movement habitat.	Direct impacts avoided or minimized with the application of FPs. Any remaining impacts will be fully mitigated.
San Francisco garter snake	FP-04, FP-11, FP-12, FP-13, FP-15, FP-16, Hot Zone-7 Wetland-2	Contribute to the conservation of 38 acres of habitat.	Direct impacts avoided or minimized with the application of the hot zone AMM, large activity AMM, and FPs. Any remaining impacts will be mitigated.
Birds			
Ridgway's rail	FP-02, FP-03, FP-04, FP-05 FP-16, FP-18, Hot Zone-8	See Salt marsh-harvest mouse.	Direct impacts avoided or minimized with the application of the hot zone AMM and FP. Any remaining impacts will be mitigated.
Mammals			
Salt marsh harvest mouse	FP-05, FP-06, FP-13, Hot Zone-8	46 acres of marsh preservation or restoration.	Direct impacts avoided or minimized with the application of the hot zone AMMs and FPs. Any remaining impacts will be mitigated.
San Joaquin kit fox	FP-04, FP-06, FP-07, FP-08, FP-13, FP-14, SJKF-1	Contribute to the conservation of 733 acres of grassland habitat.	Direct impacts avoided or minimized with the application of the species-specific AMM for large activities and FPs. Any remaining impacts will be fully mitigated.
FP-01 and FP-02 benefit all species and are not included in table.			
NWR = National Wildlife Refuge			

Table 5-9. Conservation Strategy Summary for Covered Plant Species by Category

Plant Species	Avoidance and Mitigation Measures	Mitigation	Conclusion
Pallid manzanita	Plant-01, Plant-02, Plant-04, Plant-05, Plant-07, Plant-08	1. Salvage and replant as a component of ROW restoration, plus monitor success.	Direct impacts minimized with AMMs. Any remaining impacts will be mitigated. Additional coordination with USFWS and custom mitigation may be necessary to ensure impacts are mitigated.
Sonoma sunshine	Plant-01, Plant-02, Plant-03, Plant-04, Plant-05, Plant-06	1. Salvage topsoil, replace and recontour as a component of ROW restoration, plus monitor success. 2. Partner with conservation entity working to support the <i>Santa Rosa Plain Conservation Strategy</i> . 3. Acquire lands or conservation easements consistent with the <i>Santa Rosa Plain Conservation Strategy</i> . 4. Purchase mitigation credits.	Direct impacts minimized with AMMs. Any remaining impacts will be mitigated.
Coyote ceanothus	Plant-01, Plant-02, Plant-04, Plant-05, Plant-07	1. Salvage and re-plant as a component of ROW restoration, plus monitor to determine success. 2. Partner with <i>Santa Clara Valley Habitat Plan</i> implementing agency to enhance restoration efforts. 3. Acquire lands or conservation easements consistent with the <i>Santa Clara Valley Habitat Plan</i> .	Direct impacts minimized with AMMs. Any remaining impacts will be mitigated.
Fountain thistle	Plant-01, Plant-02, Plant-05, Plant-07	1. Salvage and re-plant as a component of ROW restoration, plus monitor to determine success. 2. Acquire lands or conservation easements consistent with the <i>Santa Clara Valley Habitat Plan</i> .	Direct impacts minimized with AMMs. Any remaining impacts will be mitigated. Additional coordination with USFWS and custom mitigation may be necessary to ensure impacts are mitigated.
Santa Clara Valley dudleya	Plant-01, Plant-02, Plant-05, Plant-07	1. Salvage and re-plant as a component of ROW restoration, plus monitor to determine success. 2. Propagate replacement stock and transplant into ROW locations with suitable habitat, plus monitor to determine success. 3. Partner with <i>Santa Clara Valley Habitat Plan</i> implementing agency to enhance restoration efforts. 4. Acquire lands or conservation easements consistent with the <i>Santa Clara Valley Habitat Plan</i> .	Direct impacts minimized with AMMs. Any remaining impacts will be mitigated.

Table 5-9. Continued

Plant Species	Avoidance and Mitigation Measures	Mitigation	Conclusion
Contra Costa wallflower	Plant-01, Plant-02, Plant-05, Plant-07	1. Establish a conservation easement on PG&E lands at Antioch Dunes NWR. 2. Coordinate with USFWS to fund habitat restoration activities or propagation and transplantation activities.	Direct impacts minimized with AMMs. Any remaining impacts will be mitigated.
Marin dwarf flax	Plant-01, Plant-02, Plant-03, Plant-04, Plant-06	1. Salvage topsoil, replace and recontour as a component of ROW restoration, plus monitor success. 2. Coordinate with SFPUC to fund restoration activities.	Direct impacts minimized with AMMs. Any remaining impacts will be mitigated.
Burke's goldfields	Plant-01, Plant-02, Plant-03, Plant-04, Plant-06	1. Salvage topsoil, replace and recontour as a component of ROW restoration, plus monitor success. 2. Partner with conservation entity working to support the <i>Santa Rosa Plain Conservation Strategy</i>. 3. Acquire lands or conservation easements consistent with the <i>Santa Rosa Plain Conservation Strategy</i>. 4. Purchase mitigation credits.	Direct impacts minimized with AMMs. Any remaining impacts will be mitigated.
Contra Costa goldfields	Plant-01, Plant-02, Plant-03, Plant-04, Plant-06	1. Salvage topsoil, replace and recontour as a component of ROW restoration, plus monitor success. 2. Partner with Solano Land Trust to support conservation efforts. 3. Acquire lands or conservation easements in Solano County. 4. Purchase mitigation credits.	Direct impacts minimized with AMMs. Any remaining impacts will be mitigated.
Sebastopol meadowfoam	Plant-01, Plant-02, Plant-03, Plant-04, Plant-06	1. Salvage topsoil, replace and recontour as a component of ROW restoration, plus monitor success. 2. Partner with conservation entity working to support the <i>Santa Rosa Plain Conservation Strategy</i>. 3. Acquire lands or conservation easements consistent with the <i>Santa Rosa Plain Conservation Strategy</i>. 4. Purchase mitigation credits.	Direct impacts minimized with AMMs. Any remaining impacts will be mitigated.
Antioch Dunes evening primrose	Plant-01, Plant-02, Plant-04, Plant-07	1. Establish a conservation easement on PG&E lands at Antioch Dunes NWR. 2. Coordinate with USFWS to fund habitat restoration activities or propagation and transplantation activities.	Direct impacts minimized with AMMs. Any remaining impacts will be mitigated.

Table 5-9. Continued

Plant Species	Avoidance and Mitigation Measures	Mitigation	Conclusion
White-rayed pentachaeta	Plant-01, Plant-02, Plant-04, Plant-05,	1. Salvage topsoil, replace and recontour as a component of ROW restoration, plus monitor success. 2. Coordinate with SFPUC to fund restoration activities.	Direct impacts minimized with AMMs. Any remaining impacts will be mitigated. Additional coordination with USFWS and custom mitigation may be necessary to ensure impacts are mitigated.
Metcalf Canyon jewelflower	Plant-01, Plant-02, Plant-03, Plant-04, Plant-05, Plant-06	1. Salvage topsoil, replace and recontour as a component of ROW restoration, plus monitor to determine success. 2. Partner with <i>Santa Clara Valley Habitat Plan</i> implementing agency to enhance restoration efforts. 3. Acquire lands or conservation easements consistent with the <i>Santa Clara Valley Habitat Plan</i>.	Direct impacts minimized with AMMs. Any remaining impacts will be mitigated.
NWR = National Wildlife Refuge			

Chapter 6

Plan Implementation and Funding

[Summary: This chapter describes the implementation structure, implementation tasks, monitoring, reporting, and adaptive management requirements for the HCP. 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 HCP is approximately \$124.1 million over the next 30 years, adjusted for inflation. This 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 HCP 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 team to ensure successful implementation and compliance of the HCP. 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 Bay Area O&M HCP. Management has the following responsibilities.

- Serving as the interface between USFWS and the HCP team to resolve program issues.
- Supervising staff to ensure successful implementation of the HCP program.
- Developing performance metrics and reports to illustrate the status of HCP implementation.
- Working with the HCP team to identify, document, and resolve noncompliance issues.
- Supporting and leading HCP 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 HCP. The HCP administrator's primary responsibilities will be:

- Serving as a point of contact for USFWS for HCP-covered activity issues.
- Overseeing the development and delivery of HCP 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 HCP.
- 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 HCP's biological goals and objectives are being met.

Land Planning Analysts (HCP analysts)

The land planning analysts (i.e., HCP analysts) will organize and manage the data to directly support implementation of and compliance with the HCP. The HCP 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 and HCP analysts 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 HCP.
- Consulting appropriate resource experts in planning and designing activities.
- Obtaining appropriate permits and authorizations before starting activities.
- Ensuring activities are compliant with any and all permits and authorizations.

6.1.1.4 Biologists

PG&E biologists or contractor 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 under the appropriate authorizations from 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 likely necessary for large activities (see Table 5-3 and Figure 5-2 in Chapter 5). Biological evaluation, including possible surveys and monitoring, will be necessary for activities in hot zones and Map Book zones. PG&E will report to USFWS positive survey results and monitoring detections 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 their day-to-day work activities.

6.2 Implementation Tasks

There is a variety of implementation tasks 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

Two types of training will be given to PG&E staff and contractors: annual training and project-specific training. Annual training is broad and will cover multiple aspects of the HCP, including the HCP as a program, covered activities, covered species, AMMs, compliance requirements, and the conservation strategy. The targeted audience that will receive HCP 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 (i.e., 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 zone areas.

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 HCP 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, *Purpose and Application of Habitat Models*.

6.2.3 Implement AMMs and Vegetation Management BMPs

As part of the initial HCP 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 if 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 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 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.

6.2.3.2 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, a biologist will develop a site-specific restoration plan that contains the following information: number of individual plants to be salvaged in advance of covered activities; 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 funding sources and responsible parties; and 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. For annuals, PG&E biologists will salvage 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, no further monitoring will be required and this information will be presented in the annual report. If monitoring efforts indicate that restoration is unsuccessful, a permanent impact would be included in the annual report for the restoration activity and mitigation would be acquired at the permanent impact ratio.

6.2.4 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 process. Additional information on tracking impacts and mitigation is provided in Section 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 HCP. The HCP administrator and HCP 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 HCP's biological goals and objectives. Management at PG&E 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 HCP's conservation measures are being implemented as required. This will include collecting information that:

- Confirms education and training is conducted.
- Demonstrates environmental review, planning and screening are occurring.
- Shows biological surveys and monitoring are conducted, when necessary.
- Confirms AMMs and vegetation management BMPs are being implemented.
- 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 HCP. As described earlier in the HCP, 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 accurately portrayed and have not changed over time, the HCP team will conduct a validation study by reviewing 25 to 50 activities in implementation years 5, 10, 15, 20 and 25. This study will assess small activities to verify that impacts are equal to or smaller than those indicated in the HCP, and will also verify that several key large activities' temporary impacts have not become permanent. The validation study will analyze activities shown in Table 5-3, specifically, activities G6, G7, G12, E6a, E8b, E15, G10, G12, E12, E13, G9, G11, G16, G18, E9a, and E10d. A combination of GIS-based desktop and in-the-field measurements will be used to evaluate the impact estimates from covered activities during HCP implementation. PG&E will compare these results with the impact estimates used during HCP 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) HCP effectiveness as related to the effectiveness of the AMMs, permit consistency, tracking, and reporting, and (2) mitigation effectiveness to benefit covered species.

6.3.3.1 HCP 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 instances where AMMs were unsuccessful or infeasible.
- Collect and analyze information from crews and the biologists as to why AMMs may have been ineffective or difficult to implement, and ask crews and biologists for 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 subsequently help the HCP team to develop modifications to existing measures for the purpose of minimizing habitat disturbance and take of covered species or other ways to make measures more effective and efficient. Further, additional AMMs measures 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 also 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. Mitigation properties will include regular management, monitoring, and reporting, and the results of these efforts will be summarized in PG&E's annual report (see Section 6.4, *Reporting*). As described in Chapter 5, there are 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 March 31 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 HCP successfully and in compliance with the Section 10 permit.
- Document problems with plan implementation that occurred during the reporting year and the steps taken to resolve the problems.
- Document foreseeable issues with implementation that may require coordination with USFWS to fix or otherwise address.
- Make recommendations for increasing 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 compliance reporting requirements 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 modeled 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 (See Appendix C, 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 HCP and issues the permit.
 - Total year over year impacts on modeled 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, 10, 15, 20, and 25 of the permit term.
- 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.
- 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 all plant species, PG&E will record all 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 as both. If planners or biologists determine restoration plans are ineffective and impacts are reclassified as permanent, these impacts will also be tracked and mitigated. To ensure that impacts on covered species are not disproportionately large in any 10-year period, PG&E will monitor impacts on covered wildlife closely to ensure that the authorized take is not exhausted unevenly throughout the permit term. The following impact parameters will be monitored.

- One-third of the take authorization will not be exceeded in a 10-year period for California tiger salamander (both the Central California and Sonoma County DPS).
- One-third of the take authorization will not be exceeded in a 10-year period for the California red-legged frog.
- For all other wildlife species, take will not exceed 50% of the total take authorization in a 10-year period.

These amounts are not intended to be firm 10-year caps because the amount of take will be limited by the overall permit. Rather, these amounts should be considered interim limitations that could be exceeded by up to 20% as long as the total take is not exceeded and PG&E can demonstrate that its impacts are dispersed and mitigation is provided ahead of impacts.

For example, for the Central California population of California tiger salamander, PG&E has requested take authorization for permanent impacts to 2 acres of breeding habitat and 298 acres of upland habitat. One-third of the take authorization for permanent impacts to this species is 0.67 acres of breeding habitat and 99.3 acres of upland habitat. Twenty percent of the total permitted take is 0.4 acres of breeding habitat and 59.6 acres of upland habitat. Therefore, summing these two values (the estimated 10-year take and the additional 20%), the maximum 10-year take amount of take for this species' habitat would be a total of 1.07 acre of breeding habitat and 158.9 acres of upland habitat.

6.4.2 Mitigation Accounting

The HCP team will use the estimated habitat loss acreages in Table 4-1 and actual impact determinations for projects reported from land planners and biologists (Table 5-3) 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 accordingly using: (1) the affected species modeled habitat and (2) the ratio of compensation for that species based on whether the impacts are temporary, and mitigated in advance, or permanent. 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. The USFWS 5-Point Policy describes adaptive management as an integrated method for addressing uncertainty in natural resource management. In the context of this HCP, 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 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.

Adaptive management measures will be implemented when management actions do not produce the desired outcome or when species or natural-community trends decrease. In these cases, new actions would be implemented to try to improve the outcome for species and their habitat. Such actions could include following.

- Alter the timing, location, intensity or type of grazing.
- Reduce, increase or otherwise change the pattern of management actions.
- Modify timing, location, or type of restoration.
- Modify approach to noxious weed control.
- Modify species-specific measures based on monitoring results (e.g., bullfrog eradication technique).

As described in Chapter 5, Section 5.6.5.3, *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, this HCP's conservation strategy focuses on providing conservation lands in multiple locations throughout the Bay Area appropriate to mitigate impacts on covered species. To this end, PG&E will work closely with the USFWS, regional conservation plans, 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 *Mitigation Approval Process*). Once a parcel is identified and targeted for acquisition, PG&E will develop a management plan to address the likely management issues that could arise on the proposed parcel. These site-specific management plans will identify the specific management issues that could arise (i.e., changed circumstances) for the individual parcel. The summary of changed and unforeseen circumstances below provides an overview of the types of issues and thresholds that could arise during management plan development.

For each management plan a non-wasting endowment is calculated based on a PAR-like funding analysis. Each endowment PG&E will include 4.5% of the total endowment to allow the land manager to address changed circumstances. In many 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 habitat quality and suitability is maintained for PG&E habitat.

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 that can be planned for. Specific factors analyzed in the HCP include vandalism, fire, floods, landslide and wind/water erosion, drought, climate change, and invasive species.

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 to 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 occurs within mitigation lands within the plan area as defined by these sections, the land manager will notify USFWS of this changed circumstance within thirty days after 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 until those projects meet its respective success criteria. If repeated damage occurs to a restoration or enhancement site, 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 plan developers and USFWS during the plan's 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 the 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 HCP; or
- 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 HCP to mitigate the effects of the covered activities or in response to unforeseen circumstances.

As described in the No Surprises Regulation, it is the USFWS's responsibility to demonstrate the existence of unforeseen circumstances using the best scientific and commercial data available. The federal No Surprises Regulation does not limit the 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 federal 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 following relates to the land manager's responsibility for changed circumstances that occur on mitigation properties acquired as part of the HCP. The endowment for each mitigation site's management plan will include money 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 endowment is intended to address a full suite of management actions including overall site management and changed circumstance management (i.e., remedial measures). In the categories below (except vandalism), PG&E has identified a percent range where management actions will be implemented. Below the lowest value, management actions are expected to be included in the management plan; within the percent range, management actions are included as changed circumstances; and anything above the percent range is 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 occurs and results in adverse impacts on covered species or associated habitat, the land manager will determine the extent of damage to the mitigation areas.

One truckload of illegal materials or one abandoned car per year will be addressed as part of ongoing management actions. If more than this occurs, this type of vandalism will be considered a changed circumstance. Similarly, small fence repairs of less than 100 feet that occur two times per year will be addressed as part of ongoing management actions, but more than this will be considered a changed circumstance. Illegal encampments 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 mitigation land manager will use a variety of management techniques 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 are natural events that 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 changed circumstance occurs, the mitigation area manager will assess the specific event and site condition and determine, in coordination with USFWS, whether a response is needed. Fire can be reasonably anticipated to occur during the next 30 years. 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 moderate-severity 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 that damage between 25 and 75% of a grassland mitigation parcel and between 10 and 50% of a shrub mitigation parcel are considered changed circumstances because this amount of disturbance will likely require additional resources to repair habitat conditions. For example, a fire that damages 15% of a grassland site will be addressed with existing management dollars; however, if 50% of the site burns, changed circumstance funding would also be used to address the management response. Burning greater than 75% would be considered an unforeseen circumstance.

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 circumstance funding and have the strategy approved by the USFWS.

Floods

Floods are natural events that 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 California freshwater shrimp or California red-legged frogs may experience flooding by virtue of their location in riparian areas. Floods can also damage stock ponds and result in pond dam failure.

Floods that cause stock ponds to fill with sediment, reducing California red-legged frog breeding success; that result in stock pond dam failure, eliminating breeding habitat; or that remove between 25 and 75% of vegetation within an acquired parcel, are considered a changed circumstance. When a changed circumstance occurs, the mitigation land manager will assess the specific event and site condition and determine, in coordination with USFWS, whether a response is needed.

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, and 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 enhancement projects,

restoration projects, creation projects, or in-stream conservation structures, so that success criteria can be met and compliance credit maintained.

Landslides and Wind/Water Erosion

Landslides and wind/water erosion are natural events that 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 erosion could occur in mitigation areas due to the erosive conditions in the Bay Area.

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 between 5 - 50% of a mitigation parcel are considered a changed circumstance. When a changed circumstance occurs, the mitigation area manager will assess the specific event and site condition and determine, in coordination with USFWS, whether a response is needed.

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 between 5 - 50% of a mitigation area is considered a changed circumstance. When a changed circumstance occurs, the mitigation area manager will assess the specific event and site condition and determine, in coordination with USFWS, whether a response is needed.

Remedial Measures for Landslides and Water/Wind Erosion

The mitigation 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 study area over the next 30 years. Hundreds of earthquakes occur annually on the numerous faults throughout the study 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 within 1 year; larger infrastructure may need longer 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 mitigation land manager will use changed circumstances funding to take corrective action to address the infrastructure needs and make the habitat suitable again. Changed circumstance 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 supply, whether atmospheric, surface, or ground water. Generally drought occurs when a region receives consistently below average precipitation. California is currently experiencing one of the worst droughts on record. The most recent research indicates that the current drought is possibly the most severe in the past 1,200 years (Griffin and Anchukaitis 2014). 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 10 consecutive years when the mean annual rainfall is less than 50% of normal have occurred multiple times in the past 100 years are considered changed circumstances. 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.

Remedial Measure for Drought

If habitat conditions become degraded because of drought, the land manager will work with the USFWS to identify implementable remedial measures such as augmented watering or vegetation planting prior to implementing these measures. The mitigation 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, as a result of human industrialization (Intergovernmental Panel on Climate Change 2007). 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 area lands. However, changes in climate in the region are difficult to forecast. 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 2007). Temperature projections for various California ecoregions range within this annual average.

The study area falls within the Sacramento Valley, Northwestern, San Joaquin Valley, and Central Western California ecoregions. Each is expected to experience mean annual 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 four California ecoregions will decrease in the future compared with current conditions (PRBO Conservation Science 2011). Consequently, climate in the study area will probably shift to be 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 study area is likely to influence the frequency and magnitude of climate-related events such as fires, storms, drought, and flooding.

A number of ecological responses to climate change could occur in the mitigation areas. First, the timing of seasonal events such as migration, flowering, and egg-laying may shift earlier or later (Root et al. 2005). Such shifts may affect the timing and synchrony of events that must occur together, such as butterfly emergence and nectar availability. Second, range and distribution of species and natural communities may shift (Walther et al. 2002). Third, the number or density of individuals found in a particular location may change. This outcome may be triggered by changes in resource availability associated with an increase or decrease in precipitation (Millar et al. 2006). Changes such as these may benefit one species at the expense of another. Fourth, over a longer time period, species may change in outward appearance and behavior. Changes in climate may favor different adaptive strategies or appearances that may lead to genetic shifts (Davis and Shaw 2001). An example would be a shift to smaller average body size of certain mammals to use limited food sources for maintenance rather than growth.

The possible ecological responses discussed above will be influenced by various environmental changes, depending on ecoregion. In the Sacramento Valley and San Joaquin Valley ecoregions, 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 Northwestern ecoregion, 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 Western California ecoregion, the predominant effect on wildlife populations is likely to result from changes in vegetation communities. Other likely environmental stressors in this ecoregion 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 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, and 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 5-50% 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 circumstance 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 HCP, 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 is detected or an existing disease or nonnative species 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 infestation or 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 mitigation 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, phytophthora) 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. 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 County-wide or region-wide basis), it would be considered an unforeseen circumstance beyond the scope of the HCP, 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 mitigation 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 HCP implementation, the USFWS may list as threatened or endangered under the ESA species that are not covered under the HCP. 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 HCP is amended to cover the species or PG&E complies with the ESA via other means (i.e., individual Section 7 consultations, etc.).

Should a species not covered by the HCP be listed, proposed, or petitioned for listing, PG&E may request that the USFWS add the species to the Section 10(a)(1)(B) permit. In determining whether or not to seek incidental take coverage for the species, PG&E will consider, among other things, whether the species is present in the Plan Area and if otherwise lawful activities could result in incidental take of the species. If incidental take coverage is desired, the HCP and permit could be amended. Alternatively, PG&E could apply for a new and separate permit. Procedures for amendments to the HCP are outlined below in Section 6.7.

6.6.2.2 Section 7 Consultations

An important goal of the HCP is to provide a framework for ESA compliance for all covered activities in the Plan Area. Whether a covered activity is implemented under Section 7 or 10 of the ESA, the HCP will provide the framework for future Section 7 consultations. For some future covered activities, ESA Section 7 consultation will still be required even after the HCP is complete (e.g., covered activities requiring Clean Water Act Section 404 authorization). The HCP does not alter the obligation of another federal agency to consult USFWS or NMFS pursuant to Section 7 of the ESA. Unless otherwise required by law or regulation, USFWS will ensure that biological opinions issued for projects that are defined as covered activities under the HCP are consistent with the biological opinion issued for the HCP and the federal permit. Unless otherwise required by law or regulation, USFWS will not impose measures on PG&E for HCP covered activities in excess of those measures that have been or will be required by the the HCP 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 HCP or the permit, 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.

6.6.3 Regulatory Assurances

PG&E has prepared this HCP anticipating a standard, 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 plan, will be required. PG&E requests regulatory assurances (No Surprises) for all covered species in the Plan. 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 HCP should they occur. PG&E understands that No Surprises assurances are contingent on the proper implementation of the permits and HCP.

6.7 Permit Renewal, Plan Amendments, Permit Suspension and Revocation

It may be necessary for USFWS or PG&E to clarify provisions of the Bay Area O&M HCP 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 requirements. The Bay Area O&M HCP and federal permit may be amended only with the written consent of PG&E and USFWS.

6.7.1 Clerical and Administrative Actions

Below are minor modifications (i.e., clerical and administrative actions or clarifications) that do not affect the impact assessment or conservation strategy described in the Bay Area O&M HCP and do not affect the ability of PG&E to achieve the HCP's biological goals and objectives. These changes do not require an amendment to the permit, but they do require preapproval by the USFWS before being implemented. Examples of minor modifications are listed below.

- Correction of typographical, grammatical, and similar editing errors in the Bay Area O&M HCP 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 Bay Area O&M HCP to reflect previously approved amendments to the HCP.

PG&E or USFWS may propose a minor modification to the federal permit, and the Bay Area O&M HCP by providing written notice to all other parties. 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 activities and on covered species, and any other information required by law. The parties will respond in writing to the proposed minor modification within 60 days of receipt of such notice.

PG&E may object to a proposed minor modification upon any reasonable basis. USFWS may object to a proposed minor modification if it believes the change is substantial in nature. 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 reasonably objects to a minor modification, and the objection is not resolved by any conditions or alterations, the proposed modification will be processed as an amendment of the HCP and permit.

USFWS may not propose or approve a minor modification that results in adverse effects on the environment that are new or significantly different from those analyzed in connection with the Bay Area O&M HCP, or that results in additional take not analyzed in connection with the Bay Area O&M HCP.

6.7.2 Amendment

All changes to the federal permit and the Bay Area O&M HCP 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, including its effects on covered 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.
- Increasing the allowable take limit of existing covered activities or adding new covered activities to the Bay Area O&M HCP 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 to the Bay Area O&M HCP

Advancement in construction techniques and technology during the permit term may result in new methods of performing the Bay Area O&M HCP 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 Bay Area O&M HCP and implementing them pursuant to the plan's conservation strategy will not likely result in adverse effects on the covered species different from effects resulting from those activities analyzed in connection with the Bay Area O&M HCP.

PG&E may seek authorization from USFWS to change the method of performing an approved covered activity or the covered activities itself pursuant to the modification or amendment process. Any such change that PG&E successfully obtains approval for under the federal permit through the

minor modification or amendment process thereafter will be deemed approved for use under the Bay Area O&M HCP. All subsequent references to the Bay Area O&M HCP will be deemed to include a reference to such construction methodology or new covered activity, the Bay Area O&M HCP and the federal permit that apply to the Plan Area will apply. 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 HCP 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 Section 10(a)(1)(B) permit, in whole or in part, by USFWS shall be in accordance with 50 CFR 13.27-29, 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 the USFWS.
- PG&E's actions are inconsistent with issuance criteria, and the inconsistency has not been rectified.

Typically the 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 Section 10(a)(1)(B) 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 HCP. 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 HCP and permit application, together with approved HCP amendments, are still true and correct, and a list of changes needed to clarify or revise the HCP.
- 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). PG&E conducted the impact analysis for a 50-year period, but under the direction of USFWS, a 30-year permit will be issued which assumes the worst-case scenario of all impacts under the 50-year scenario occurring over a 30-year period. Therefore, at the end of a 30-year permit, PG&E and USFWS expect that there will be some take authorization remaining, which will help facilitate permit renewal. 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 HCP. 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 the USFWS in Decisions Regarding Plan Implementation

Successful implementation of the Bay Area O&M HCP relies on the participation and feedback of staff from USFWS. USFWS will participate in discussions and meetings with PG&E to ensure that the Bay Area O&M HCP 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 Section 5.6.4, *Mitigation Approval Process*, and assist with other changes or modifications to the Bay Area O&M HCP as described in Section 6.7.1, *Clerical and Administrative Actions*. USFWS will assist with decisions regarding HCP implementation as expeditiously as possible.

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 O&M HCP.
- 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 Bay Area O&M HCP

The cost to implement the Bay Area O&M HCP is estimated at \$124.1 million, including a 2.5% inflation rate, over the next 30 years. These costs are reasonable estimates based on this financial analysis; however, the cost of implementing HCP 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 HCP will largely make use of PG&E's existing environmental review and biological assessment processes. The number of staff members needed to implement the HCP is not expected to change from current staffing levels because the future Bay Area O&M HCP program will be transitioned from Environmental Policy to the existing San Joaquin Valley O&M HCP team. PG&E assumes that one additional new full-time equivalent staff person may be needed to support the Bay Area O&M HCP program.

The HCP team will implement the validation study by reviewing activities in implementation years 5, 10, 15, 20 and 25 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 HCP.

These costs are summarized in detail in Table 6-1 and represent approximately 10% of the overall cost to implement the Bay Area O&M HCP. 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, 10, 15, 20 and 25)
Training materials	\$100,000	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 HCP.

Mitigation

Bay Area O&M HCP 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 Bay Area O&M HCP. 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

(CCAAFMRA), 2014 report *Trends in Agricultural Land and Lease Values – California and Nevada* indicate that rangeland values vary from \$500 to \$10,500 per acre depending on the county and overall supply. The overall trend is stable and prices are increasing. Regional mitigation bank varies 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, to more than \$150,000 per acre for California tiger salamander in the Santa Rosa Plain. The forecasted costs estimated in the HCP 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 for more specialized acquisitions.

Table 6-2. Mitigation Expenditure Estimate (without inflation)

Approach	Percentage of Total Estimated Mitigation ^a	Amount
Purchase habitat mitigation lands	68.1%	\$56,097,000
Secure conservation easements on PG&E lands		\$0 ^b
Purchase credits from mitigation banks	5.5%	\$4,500,000
Conservation organization donation	0.5%	\$400,000
Enhancement as mitigation	0.5%	\$400,000
Recovery plan contribution	0.5%	\$400,000
Partnerships for conservation		
Contributions to other HCPs/NCCPs	20%	\$16,500,000
Financial and in-kind contributions to restoration efforts (South Bay Restoration)		\$0 ^c
Contingency	5%	\$4,103,000
Total (without inflation)		\$82,400,000

^a Mix of mitigation likely to vary from these estimates based on opportunities and costs.

^b Costs are included in the above estimate.

^c PG&E has contributed to the first phase of the South Bay Restoration Project by relocating transmission lines, and USFWS has designated 5 acres of mitigation for impacts on salt marsh species as a result of the Bay Area O&M HCP.

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

Species/Species Grouping ^a	Acres ^b	Cost/Acre (Including Endowment) ^c	Estimated Cost (Including Endowment)
California freshwater shrimp	2.9	\$100,000	\$290,000
Longhorn fairy shrimp	1.3	\$75,000	\$97,500
Conservancy fairy shrimp	3.5	\$75,000	\$262,500
Vernal pool fairy shrimp, vernal pool tadpole shrimp, delta green ground beetle	40.0	\$125,000	\$5,000,000
Mission blue and San Bruno elfin butterflies	26.0	\$45,000	\$1,170,000
Callippe silver spot butterfly	145.0	\$10,000	\$1,450,000
Lange's metalmark butterfly	1.9	\$100,000	\$190,000
Bay checkerspot butterfly	74.0	\$20,000	\$1,480,000
California tiger salamander (Central CA DPS)	2,838.0	\$8,119	\$23,042,000
California tiger salamander (Sonoma County DPS)	119.3	\$75,000	\$8,925,000
California red-legged frog	1,790.0	\$12,000	\$21,480,000
Alameda whipsnake	346.0	\$12,000	\$4,152,000
San Francisco garter snake	38.0	\$20,000	\$760,000
Salt marsh harvest mouse, Ridgway's rail	46.0	\$50,000	\$2,300,000
San Joaquin kit fox	733.0	\$9,000	\$6,597,000
Plants ^d	50.0	\$20,000	\$1,000,000
Contingency			\$4,303,000
Total			\$82,400,000

^a Refer to Chapter 5 and Tables 5-4 and 5-5 for wildlife and plant species mitigation approach descriptions.

^b Acreages may vary depending on PG&E's ability to mitigate for impacts on multiple species at a given mitigation site.

^c Cost will vary based on available mitigation opportunities.

^d Acreage estimates for plants will vary based on impacts on plants. These numbers are provided for planning purposes.

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 Bay Area O&M HCP, including associated implementation, avoidance, survey, and mitigation costs. PG&E's costs for implementation of the Bay Area O&M HCP 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 HCP, PG&E has deposited \$15 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 assist with conservation objectives outlined in the HCP.

6.9.4 Adequacy of Funding

PG&E is solvent and able to meet its current financial obligations, including the conditions and obligations of the Bay Area O&M HCP. PG&E will provide adequate resources to fulfill commitments as described in the Bay Area O&M HCP. The HCP administrator will forecast anticipated program needs, ensuring that PG&E implements mitigation roughly proportional to the impacts and budgets accordingly. Because HCP funding is rate-based, the funding will be assured to keep pace with program expenditures.

Table 6-4. Implementation Costs (with 2.5% Inflation) (in Million)

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	\$0.4	\$0.4	\$0.4	\$0.4	\$0.4	\$0.4	\$0.4	\$0.4	\$0.4	\$0.4	\$0.5	\$0.5	\$0.5	\$0.5	\$0.5	\$0.5	\$0.5	\$0.5	\$0.6	\$0.6	\$12.3		
Validation Study	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.1	\$0.0	\$0.0	\$0.0	\$0.0	\$0.1	\$0.0	\$0.0	\$0.0	\$0.0	\$0.1	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.1	\$0.0	\$0.0	\$0.0	\$0.1	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.4		
Training Update and Materials	\$0.0	\$0.1	\$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	\$0.1		
Subtotal	\$0.0	\$0.4	\$0.3	\$0.3	\$0.3	\$0.4	\$0.3	\$0.3	\$0.3	\$0.3	\$0.4	\$0.4	\$0.4	\$0.4	\$0.4	\$0.5	\$0.4	\$0.4	\$0.4	\$0.4	\$0.4	\$0.5	\$0.5	\$0.5	\$0.5	\$0.5	\$0.6	\$0.5	\$0.5	\$0.5	\$0.6	\$0.6	\$12.8	10.3%
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	\$15.0	\$5.0	\$5.1	\$5.3	\$5.4	\$1.1	\$1.1	\$0.6	\$1.2	\$6.1	\$1.2	\$1.3	\$1.3	\$0.7	\$1.4	\$7.1	\$1.4	\$1.5	\$1.5	\$1.6	\$8.0	\$1.6	\$1.7	\$1.7	\$1.8	\$9.0	\$1.9	\$2.7	\$3.9	\$4.0	\$10.2	\$111.3		
Subtotal	\$15.0	\$5.0	\$5.1	\$5.3	\$5.4	\$1.1	\$1.1	\$0.6	\$1.2	\$6.1	\$1.2	\$1.3	\$1.3	\$0.7	\$1.4	\$7.1	\$1.4	\$1.5	\$1.5	\$1.6	\$8.0	\$1.6	\$1.7	\$1.7	\$1.8	\$9.0	\$1.9	\$2.7	\$3.9	\$4.0	\$10.2	\$111.3	89.7%	
Estimated HCP Costs	\$15.0	\$5.4	\$5.4	\$5.5	\$5.7	\$1.5	\$1.4	\$0.9	\$1.5	\$6.4	\$1.7	\$1.6	\$1.7	\$1.0	\$1.8	\$7.5	\$1.9	\$1.9	\$1.9	\$2.0	\$8.5	\$2.1	\$2.1	\$2.2	\$2.3	\$9.6	\$2.4	\$3.2	\$4.4	\$4.6	\$10.8	\$124.1	100.0%	
Total 30-Year Costs	\$124.1																																	

[Summary: This chapter discusses the alternatives to the Bay Area O&M HCP that were considered and the reasons for rejecting each one. Four alternatives to the proposed Bay Area O&M HCP were evaluated and rejected: seeking incidental take authorization on a project by project basis through either Section 7 or through low effects 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 federally 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 addressed in the Bay Area O&M HCP.

- 1) The no action alternative.
- 2) The changed practices alternative.
- 3) The reduced number of covered species alternative.
- 4) The *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 need to acquire incidental take authorizations under Section 7 or Section 10 of the ESA for each individual activity. PG&E would continue its environmental planning and screening processes to avoid and minimize impacts, but site-specific AMMs, such as those required under a Biological Opinion, may still be required for certain projects. Overall, the total reduction of impacts is often impossible because of the public safety, regulatory, and site-specific requirements. Permitting under either Section 7 or Section 10 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 be impractical and infeasible because of the sheer volume of activities and projects undertaken each year. PG&E has neither the staff nor the ability to work on a project-by-project approach that could potentially lead to numerous delays and schedule disruptions. Likewise, the agencies do not have

the staff to efficiently review and process multiple BAs or low-effect HCPs for a broad range of 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, often used 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 farther away from the landscape level planning to coordinate mitigation and manage long-term costs. 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 involved changing construction activities, modifying activities, restricting activities seasonally, and conducting pre-activity biological surveys for a majority of 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 reduction of impacts is often impossible due to the public safety, regulatory, and site-specific requirements that are necessary to complete 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 construction has evolved based on the regulatory requirements for public safety and environmental compliance. PG&E eliminated the prospect of changing its construction 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 construction and project staff to coordinate construction activities to avoid and minimize impacts associated with all aspects of construction.

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 correctly and safely. Some activities could result in a small amount of take, but modifying thousands of activities, or even a portion of these activities, might not substantially reduce the overall loss of habitat or take of listed species. 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 as some repairs must be corrected within twelve months from the time a deficiency is reported. Additionally, 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 times of year, could 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. Further, 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 insurmountable 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

This alternative proposes to 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 that would have at least 0.5 acre of habitat disturbed per year by covered activities (see Table 4-3). A 0.5-acre threshold was established because most small impacts are dispersed, decentralized, and difficult to monitor, and because these small impacts are less likely to result in take of species. Application of these criteria would result in a list of 10 wildlife species (Table 7-1). The species that would not be covered under this alternative would be California freshwater shrimp, Conservancy fairy shrimp, longhorn fairy shrimp, Delta green ground beetle, Lange's metalmark butterfly, mission blue butterfly, San Bruno elfin butterfly, and San Francisco garter snake. 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
Bay checkerspot butterfly
Callippe silverspot butterfly
Amphibians
California tiger salamander (Central California DPS)
California tiger salamander (Sonoma County DPS)
California red-legged frog
Reptiles
Alameda whipsnake
Birds
Ridgway's rail
Mammals
Saltmarsh harvest mouse
San Joaquin kit fox

Under a reduced species alternative, fewer AMMs would be implemented and several hot zones would be removed. This 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 determines that one of these species could be affected, a project-specific Section 7 consultation or a project-specific Section 10 permit would be needed. This would likely result in project delays and would undermine the intent the HCP to provide a regional approach to complying with the ESA in a timely manner to support reliable and safe utility infrastructure. Accordingly, this alternative was rejected.

7.2.4 Large Maintenance Projects Alternative

This alternative proposes to include only PG&E's larger maintenance projects that have historically needed take coverage, coordination with multiple stakeholders and are often considered as construction projects. These activities consist of most large gas transmission work (i.e., G9, G11, G13a, and G14 through G18), and large electric transmission work (i.e., E9a, and E12 through E14). By covering fewer activities, PG&E's take request would be reduced, as would PG&E's potential impacts on some species. However, there may still be instances when PG&E needs take coverage for smaller projects. PG&E would continue to screen its work, and if PG&E determines that one of these species could be affected, a project-specific Section 7 consultation or a project-specific Section 10 permit would be needed. This 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.

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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 salt water 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.

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 than 10 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 previous 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. Includes installing new or replacement structures to upgrade existing facilities or to extend service to new customers. These covered activities when in natural vegetation are limited to 2 miles or less of new electric or gas line extensions from an existing line, 1.0 acre or less of new gas pressure limiting stations, and 0.5 acre or less per electric substation expansion

modeled habitat. The characterization of the species-specific habitat based on known species’ ranges, species’ life history needs, and multiple datasets. A guiding tool for calculating effects less than 0.1 acre, and a general tool for screening of larger activities. Synonymous with habitat models.

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 for plants are defined as absence of the plant after it is affected.

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 nine-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.

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. The nine counties making up the San Francisco Bay Area: Marin, Sonoma, Napa, Solano, Contra Costa, Alameda, Santa Clara, San Mateo, and San Francisco.

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 perennial plants are defined as trimming and pruning.

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

A1. Wildlife

Table A-1. Evaluation of Special-Status Wildlife Species in the Nine San Francisco Bay Area Counties for Coverage in the PG&E Habitat Conservation Plan Page 1 of 8

Scientific Name	Common Name	Status ^a		Criteria ^b				Recommended Covered Status
		Federal	State	Occur	Status	Impact	Data	
Invertebrates								
<i>Adela oplerella</i>	Opler's longhorn moth	–	–	Y	Y	N	N/A	N
<i>Aegialia concinna</i>	Ciervo aegialian scarab beetle	–	–	Y	Y	N	N/A	N
<i>Anthicus antiochensis</i>	Antioch Dunes anthicid beetle	–	–	Y	N	N	N/A	N
<i>Anthicus sacramento</i>	Sacramento anthicid beetle	–	–	Y	Y	N	N/A	N
<i>Apodemia mormo langei</i>	Lange's metalmark butterfly	E	–	Y	Y	Y	Y	Y
<i>Branchinecta conservatio</i>	Conservancy fairy shrimp	E	–	Y	Y	N	N	Y
<i>Branchinecta longiantenna</i>	Longhorn fairy shrimp	E	–	Y	Y	N	Y	Y
<i>Branchinecta lynchi</i>	Vernal pool fairy shrimp	T	–	Y	Y	Y	Y	Y
<i>Branchinecta mesoallensis</i>	Midvalley fairy shrimp	–	–	Y	Y	N	N/A	N
<i>Caecidotea tomalensis</i>	Tomales isopod	–	–	Y	N	N	N/A	N
<i>Calicina diminua</i>	Marin blind harvestman	–	–	Y	Y	N	N/A	N
<i>Calicina minor</i>	Edgewood blind harvestman	–	–	Y	Y	N	N/A	N
<i>Carterocephalus palaemon</i> ssp.	Sonoma arctic skipper	–	–	Y	Y	N	N/A	N
<i>Cicindela hirticollis gravida</i>	Sandy beach tiger beetle	–	–	Y	Y	N	N/A	N
<i>Cicindela ohlone</i>	Ohlone tiger beetle	E	–	Y	Y	N	Y	N
<i>Coelus gracilis</i>	San Joaquin dune beetle	–	–	Y	Y	N	Y	N
<i>Cophura hurdi</i>	Antioch cophuran robberfly	–	–	Y	Y	N	N/A	N
<i>Danaus plexippus</i>	Monarch butterfly	–	–	Y	N	N	N/A	N
<i>Desmocerus californicus dimorphus</i>	Valley elderberry longhorn beetle	T	–	Y	Y	N	Y	N
<i>Dubiraphia brunnescens</i>	Brownish dubiraphian riffle beetle	–	–	Y	Y	N	N/A	N
<i>Efferia antiochi</i>	Antioch efferian robberfly	–	–	Y	Y	N	N/A	N
<i>Elaphrus viridis</i>	Delta green ground beetle	T	–	Y	Y	Y	Y	Y
<i>Euphydryas editha bayensis</i>	Bay checkerspot butterfly	T	–	Y	Y	Y	Y	Y
<i>Haliotis cracherodii</i>	Black abalone	E	–	Y	Y	N	Y	N
<i>Haliotis sorenseni</i>	White abalone	E	–	Y	Y	N	Y	N
<i>Helminthoglypta arrosa williamsi</i>	William's bronze shoulderband snail	–	–	Y	Y	N	N/A	N
<i>Helminthoglypta nickliniana awania</i>	Nicklin's Peninsula Coast Range snail	–	–	Y	Y	N	N/A	N
<i>Helminthoglypta nickliniana bridgesi</i>	Bridges' Coast Range shoulderband snail	–	–	Y	Y	N	N/A	N

Table A-1. Continued

Scientific Name	Common Name	Status ^a		Criteria ^b				Recommended Covered Status
		Federal	State	Occur	Status	Impact	Data	
<i>Hydrochara rickseckeri</i>	Ricksecker's water scavenger beetle	–	–	Y	Y	N	N/A	N
<i>Hydroporus leechi</i>	Leech's skyline diving beetle	–	–	Y	Y	N	N/A	N
<i>Hygrotus curvipes</i>	Curved-foot hygrotus diving beetle	–	–	Y	Y	N	Y	N
<i>Icaricia icarioides missionensis</i>	Mission blue butterfly	E	–	Y	Y	Y	Y	Y
<i>Icaricia icarioides parapheres</i>	Point Reyes blue butterfly	–	–	Y	Y	N	Y	N
<i>Idiostatus middlekaufi</i>	Middlekauf's shieldback katydid	–	–	Y	Y	N	N/A	N
<i>Incisalia mossii bayensis</i>	San Bruno elfin butterfly	E	–	Y	Y	Y	Y	Y
<i>Lepidurus packardi</i>	Vernal pool tadpole shrimp	E	–	Y	Y	Y	Y	Y
<i>Lichnanthe ursina</i>	Bumblebee scarab beetle	–	–	Y	Y	N	N/A	N
<i>Linderiella occidentalis</i>	California linderiella fairy shrimp	–	–	Y	Y	N	Y	N
<i>Lytta molesta</i>	Molestan blister beetle	–	–	Y	Y	N	N/A	N
<i>Metapogon hurdi</i>	Hurd's metapogon robberfly	–	–	Y	Y	N	N/A	N
<i>Microcina edgewoodensis</i>	Edgewood microblind harvestman	–	–	Y	Y	N	N/A	N
<i>Microcina homi</i>	Hom's microblind harvestman	–	–	Y	Y	N	N/A	N
<i>Microcina juni</i>	Jung's microblind harvestman	–	–	Y	Y	N	N/A	N
<i>Microcina lumi</i>	Fairmont (=Lum's) microblind harvestman	–	–	Y	Y	N	N/A	N
<i>Microcina tiburona</i>	Tiburon microblind harvestman	–	–	Y	Y	N	N/A	N
<i>Myrmosula pacifica</i>	Antioch mutillid wasp	–	–	Y	Y	N	N/A	N
<i>Nothochrysa californica</i>	San Francisco lacewing	–	–	Y	Y	N	N/A	N
<i>Perdita hirticeps luteocincta</i>	Yellow-banded andrenid bee	–	–	Y	Y	N	N/A	N
<i>Perdita scitula antiochensis</i>	Antioch andrenid bee	–	–	Y	Y	N	N/A	N
<i>Philanthus nasilis</i>	Antioch sphecid wasp	–	–	Y	Y	N	N/A	N
<i>Speyeria adaste adaste</i>	Unsilvered fritillary butterfly	–	–	Y	Y	N	N/A	N
<i>Speyeria callippe callippe</i>	Callippe silverspot butterfly	E	–	Y	Y	Y	Y	Y
<i>Speyeria zerene behrensii</i>	Behren's silverspot butterfly	E	–	Y	Y	N	N	N
<i>Speyeria zerene myrtleae</i>	Myrtle's silverspot butterfly	E	–	Y	Y	N	N	N
<i>Syncaris pacifica</i>	California freshwater shrimp	E	E	Y	Y	Y	Y	Y
<i>Tryonia imitator</i>	Mimic tryonia (=California brackishwater snail)	–	–	Y	N	N	N/A	N

Table A-1. Continued

Scientific Name	Common Name	Status ^a		Criteria ^b				Recommended Covered Status
		Federal	State	Occur	Status	Impact	Data	
Fish								
<i>Acipenser medirostris</i>	Green sturgeon	T	SSC	Y	Y	N	N/A	N
<i>Eucyclogobius newberryi</i>	Tidewater goby	E	SSC	N	Y	N	Y	N
<i>Hypomesus transpacificus</i>	Delta smelt	T	T	Y	Y	N	Y	N
<i>Hysterocarpus traski pomo</i>	Russian River tule perch	–	SSC	N	Y	N	N/A	N
<i>Lampetra ayresi</i>	River lamprey	–	SSC	Y	Y	N	Y	N
<i>Lampetra tridentate</i>	Pacific lamprey	–	–	Y	Y	N	Y	N
<i>Lavinia symmetricus navarroensis</i>	Navarro roach	–	SSC	Y	Y	N	Y	N
<i>Lavinia symmetricus parvipinnis</i>	Gualala roach	–	SSC	Y	Y	N	N/A	N
<i>Lavinia symmetricus ssp.</i>	Tomales roach	–	–	Y	N	N	N/A	N
<i>Oncorhynchus kisutch</i>	Coho salmon—central California coast	T	E	Y	Y	Y	Y	N
<i>Oncorhynchus mykiss</i>	Central California Coastal steelhead	T	SSC	N	Y	N	Y	N
<i>Oncorhynchus mykiss</i>	Central Valley steelhead	T	–	Y	Y	N	Y	N
<i>Oncorhynchus mykiss</i>	Northern California steelhead	T	SSC	Y	Y	Y	Y	N
<i>Oncorhynchus mykiss</i>	South Central California steelhead	T	SSC	N	Y	N	Y	N
<i>Oncorhynchus tshawytscha</i>	California coastal Chinook salmon	T	–	Y	Y	Y	Y	N
<i>Oncorhynchus tshawytscha</i>	Central Valley fall/late fall–run Chinook salmon	SC	SSC	Y	Y	N	Y	N
<i>Oncorhynchus tshawytscha</i>	Central Valley spring-run Chinook salmon	T	T	Y	Y	N	Y	N
<i>Oncorhynchus tshawytscha</i>	Winter-run Chinook salmon	E	E	Y	Y	N	Y	N
<i>Pogonichthys macrolepidotus</i>	Sacramento splittail	T	SSC	Y	N	N	Y	N
<i>Spirinchus thaleichthys</i>	Longfin smelt	–	SSC	Y	Y	N	Y	N
<i>Archoplites interruptus</i>	Sacramento perch	–	SSC	Y	Y	N	Y	N
Amphibians								
<i>Ambystoma californiense</i>	California tiger salamander (Central CA DPS)	T	T	Y	Y	Y	Y	Y
<i>Ambystoma californiense</i>	California tiger salamander (Sonoma County DPS)	E	T	Y	Y	Y	Y	Y
<i>Rana aurora aurora</i>	Northern red-legged frog	–	SSC	Y	N	N	Y	N
<i>Rana draytonii</i>	California red-legged frog	T	SSC	Y	Y	Y	Y	Y
<i>Rana boylei</i>	Foothill yellow-legged frog	–	SSC	Y	N	N	Y	N
<i>Spea hammondi</i>	Western spadefoot toad	–	SSC	Y	N	N	Y	N

Table A-1. Continued

Scientific Name	Common Name	Status ^a		Criteria ^b				Recommended Covered Status
		Federal	State	Occur	Status	Impact	Data	
Reptiles								
<i>Anniella pulchra pulchra</i>	Silvery legless lizard	–	SSC	Y	N	N	N/A	N
<i>Caretta caretta</i>	Loggerhead turtle	T	–	Y	Y	N	Y	N
<i>Chelonia mydas</i> (incl. <i>agassizi</i>)	Green turtle	T	–	Y	Y	N	Y	N
<i>Clemmys marmorata marmorata</i>	Northwestern pond turtle	–	SSC	Y	N	N	Y	N
<i>Clemmys marmorata pallida</i>	Southwestern pond turtle	–	SSC	Y	N	N	Y	N
<i>Dermochelys coriacea</i>	Leatherback turtle	E	–	N	Y	N	Y	N
<i>Emys</i> (=Clemmys) <i>marmorata</i>	Western pond turtle	–	SSC	Y	N	N	Y	N
<i>Lepidochelys olivacea</i>	Olive (=Pacific) ridley sea turtle	T	–	N	Y	N	Y	N
<i>Masticophis flagellum ruddocki</i>	San Joaquin coachwhip (=whipsnake)	–	SSC	Y	N	N	Y	N
<i>Masticophis lateralis euryxanthus</i>	Alameda whipsnake	T	T	Y	Y	Y	Y	Y
<i>Phrynosoma coronatum frontale</i>	California horned lizard	–	SSC	Y	N	N	Y	N
<i>Thamnophis gigas</i>	Giant garter snake	T	T	Y	Y	N	N	N
<i>Thamnophis sirtalis tetrataenia</i>	San Francisco garter snake	E	E; FP	Y	Y	Y	Y	Y
Birds								
<i>Accipiter cooperii</i>	Cooper’s hawk	–	SSC	Y	N	N	Y	N
<i>Accipiter striatus</i>	Sharp-shinned hawk	–	SSC	Y	N	N	Y	N
<i>Agelaius tricolor</i>	Tricolored blackbird	–	SSC 1 st priority	Y	N	N	Y	N
<i>Amphispiza belli belli</i>	Bell’s sage sparrow	–	SSC	Y	N	N	Y	N
<i>Aquila chrysaetos</i>	Golden eagle	–	FP, SSC	Y	N	Y	Y	N
<i>Ardea herodias</i>	Great blue heron	–	Sensitive	Y	N	N	Y	N
<i>Arenaria melanocephala</i>	Black turnstone	–	–	Y	N	N	Y	N
<i>Asio flammeus</i>	Short-eared owl	–	SSC	Y	N	N	Y	N
<i>Asio otus</i>	Long-eared owl	–	SSC	Y	N	N	Y	N
<i>Athene cunicularia</i>	Western burrowing owl	–	SSC	Y	Y	N	Y	N
<i>Baeolophus inornatus</i>	Oak titmouse	–	Local concern	Y	N	N	N/A	N
<i>Botaurus lentiginosus</i>	American bittern	–	–	Y	N	N	Y	N
<i>Brachyramphus marmoratus</i>	Marbled murrelet	T	T	Y	Y	N	Y	N
<i>Branta canadensis leucopareia</i>	Aleutian Canada goose	–	–	Y	N	N	Y	N

Table A-1. Continued

Scientific Name	Common Name	Status ^a		Criteria ^b				Recommended Covered Status
		Federal	State	Occur	Status	Impact	Data	
<i>Buteo regalis</i>	Ferruginous hawk	–	SSC	Y	N	N	Y	N
<i>Buteo swainsoni</i>	Swainson's hawk	–	T	Y	Y	N	Y	N
<i>Calidris canutus</i>	Red knot	–	–	Y	N	N	Y	N
<i>Calypte costae</i>	Costa's hummingbird	–	–	Y	N	N	N/A	N
<i>Carduelis lawrencei</i>	Lawrence's goldfinch	–	–	Y	N	N	N/A	N
<i>Chaetura vauxi</i>	Vaux's swift	–	SSC	Y	N	N	Y	N
<i>Charadrius alexandrinus nivosus</i>	Western snowy plover	T	SSC	Y	Y	N	Y	N
<i>Charadrius montanus</i>	Mountain plover	–	SSC	Y	Y	N	N/A	N
<i>Circus cyaneus</i>	Northern harrier	–	CSC	Y	Y	N	N/A	N
<i>Coccyzus americanus occidentalis</i>	Western yellow-billed cuckoo	T	E	N	Y	N	Y	N
<i>Contopus cooperi</i>	Olive-sided flycatcher	–	SSC	Y	N	N	N/A	N
<i>Cypseloides niger</i>	Black swift	–	SSC	Y	Y	N	N/A	N
<i>Dendroica petechia brewsteri</i>	Yellow warbler	–	Sonoma rare only	Y	N	N	N/A	N
<i>Diomedea albatrus</i>	Short-tailed albatross	E	–	Y	Y	N	Y	N
<i>Diomedea nigripes</i>	Black-footed albatross	–	–	Y	Y	N	N/A	N
<i>Egretta thula</i>	Snowy egret	–	Nesting colonies of "interest" to CDFG	Y	N	N	Y	N
<i>Elanus leucurus</i>	White-tailed kite	–	FP	Y	N	Y	Y	N
<i>Empidonax traillii brewsteri</i>	Little willow flycatcher (CA)	–	T—all CA sub-species	Y	Y	N	Y	N
<i>Eremophila alpestris actia</i>	California horned lark	–	CSC	Y	N	N	N/A	N
<i>Falco mexicanus</i>	Prairie falcon	–	CSC	Y	N	N	Y	N
<i>Falco peregrinus anatum</i>	American peregrine falcon	D	E, FP	Y	Y	N	Y	N
<i>Fratercula cirrhata</i>	Tufted puffin	–	CSC	Y	N	N	Y	N
<i>Geothlypis trichas sinuosa</i>	Saltmarsh common yellowthroat	–	SSC 1 st priority	Y	N	Y	Y	N
<i>Grus canadensis tabida</i>	Greater sandhill crane	–	T; FP	Y	Y	N	Y	N
<i>Haematopus bachmani</i>	Black oystercatcher	–	–	Y	N	N	N/A	N
<i>Haliaeetus leucocephalus</i>	Bald eagle	D	E; FP	Y	Y	N	Y	N
<i>Histrionicus histrionicus</i>	Harlequin duck	–	SSC	Y	Y	N	Y	N

Table A-1. Continued

Scientific Name	Common Name	Status ^a		Criteria ^b				Recommended Covered Status
		Federal	State	Occur	Status	Impact	Data	
<i>Icteria virens</i>	Yellow-breasted chat	–	CSC	Y	Y	N	Y	N
<i>Lanius ludovicianus</i>	Loggerhead shrike	–	SSC	Y	Y	N	N/A	N
<i>Laterallus jamaicensis coturniculus</i>	California black rail	–	T; FP	Y	Y	N	Y	N
<i>Limosa fedoa</i>	Marbled godwit	–	–	Y	Y	N	Y	N
<i>Melanerpes lewis</i>	Lewis' woodpecker	–	–	Y	Y	N	N/A	N
<i>Melospiza melodia maxillaris</i>	Suisun song sparrow	–	SSC	Y	Y	N	Y	N
<i>Melospiza melodia pusillula</i>	Alameda (South Bay) song sparrow	–	SSC 1 st priority	Y	N	Y	Y	N
<i>Melospiza melodia samuelis</i>	San Pablo song sparrow	–	SSC	Y	Y	N	Y	N
<i>Nycticorax nycticorax</i>	Black-crowned night heron	–	CSC— rookeries only	Y	N	N	Y	N
<i>Numenius americanus</i>	Long-billed curlew	–	SSC	Y	Y	N	N/A	N
<i>Numenius phaeopus</i>	Whimbrel	–	–	Y	Y	N	N/A	N
<i>Oceanodroma homochroa</i>	Ashy storm-petrel	–	SSC	Y	Y	N	N/A	N
<i>Otus flammeolus</i>	Flammulated owl	–	–	Y	Y	N	N/A	N
<i>Pandion haliaetus</i>	Osprey	–	CSC	Y	Y	N	N/A	N
<i>Pelecanus occidentalis californicus</i>	California brown pelican	E	E; FP	Y	Y	N	Y	N
<i>Phalacrocorax auritus</i>	Double-crested cormorant	–	CSC	Y	Y	N	N/A	N
<i>Plegadis chihi</i>	White-faced ibis	–	SSC	Y	Y	N	Y	N
<i>Progne subis</i>	Purple martin	–	SSC 1 st priority	Y	N	Y	Y	N
<i>Ptychoramphus aleuticus</i>	Cassin's auklet	–	–	Y	Y	N	N/A	N
<i>Rallus obsoletus obsoletus</i>	Ridgway's rail	E	E; FP	Y	Y	Y	Y	Y
<i>Riparia riparia</i>	Bank swallow		T	Y	Y	N	Y	N
<i>Rynchops niger</i>	Black skimmer	–	SSC	Y	Y	N	N/A	N
<i>Selasphorus rufus</i>	Rufous hummingbird	–	–	Y	y	N	N/A	N
<i>Selasphorus sasin</i>	Allen's hummingbird	–	–	Y	Y	N	Y	N
<i>Sphyrapicus ruber</i>	Red-breasted sapsucker	–	–	Y	Y	N	Y	N
<i>Sterna antillarum (=albifrons) browni</i>	California least tern	E	E; FP	Y	Y	N	Y	N
<i>Sterna caspia</i>	Caspian tern	–	CDFG— rookeries only	Y	N	N	Y	N
<i>Sterna elegans</i>	Elegant tern	–	SSC	Y	Y	N	N/A	N

Table A-1. Continued

Scientific Name	Common Name	Status ^a		Criteria ^b				Recommended Covered Status
		Federal	State	Occur	Status	Impact	Data	
<i>Strix occidentalis caurina</i>	Northern spotted owl	T	Candidate T	Y	Y	N	Y	N
<i>Synthliboramphus hypoleucus</i>	Xantus' murrelet	–	SSC; Candidate T	Y	Y	N	N/A	N
<i>Toxostoma redivivum</i>	California thrasher	–	–	Y	Y	N	Y	N
<i>Vireo bellii pusillus</i>	Least Bell's vireo	E	E	Y	Y	N	Y	N
Mammals								
<i>Antrozous pallidus</i>	Pallid bat	–	SSC	Y	Y	N	Y	N
<i>Aplodontia rufa phaea</i>	Point Reyes mountain beaver	–	SSC	Y	Y	N	Y	N
<i>Arborimus pomo</i>	California red tree vole	–	SSC	Y	Y	N	N/A	N
<i>Arctocephalus townsendi</i>	Guadalupe fur seal	T	T; FP	Y	Y	N	Y	N
<i>Balaenoptera borealis</i>	Sei whale	E	–	Y	Y	N	Y	N
<i>Balaenoptera musculus</i>	Blue whale	E	–	Y	Y	N	Y	N
<i>Balaenoptera physalus</i>	Finback (=fin) whale	E	–	Y	Y	N	Y	N
<i>Corynorhinus (=Plecotus) townsendii townsendii</i>	Pacific western big-eared bat	–	SSC	Y	Y	N	N/A	N
<i>Dipodomys heermanni berkeleyensis</i>	Berkeley kangaroo rat	–	–	Y	Y	N	N/A	N
<i>Enhydra lutris nereis</i>	Southern sea otter	T	FP	Y	Y	N	Y	N
<i>Eschrichtius robustus</i>	Gray whale	D	–	Y	N	N	Y	N
<i>Eubalaena glacialis</i>	Right whale	E	FP	Y	Y	N	Y	N
<i>Eumetopias jubatus</i>	Steller (=northern) sea-lion	T	–	Y	Y	N	Y	N
<i>Eumops perotis californicus</i>	Greater western mastiff-bat	–	SSC	Y	Y	N		N
<i>Megaptera novaeangliae</i>	Humpback whale	E	–	Y	Y	N	Y	N
<i>Microtus californicus sanpabloensis</i>	San Pablo vole	–	SSC	Y	Y	N	N/A	N
<i>Myotis ciliolabrum</i>	Small-footed myotis bat	–	–	Y	Y	N	N/A	N
<i>Myotis evotis</i>	Long-eared myotis bat	–	–	Y	Y	N	N/A	N
<i>Myotis thysanodes</i>	Fringed myotis bat	–	–	Y	Y	N	N/A	N
<i>Myotis volans</i>	Long-legged myotis bat	–	–	Y	Y	N	N/A	N
<i>Myotis yumanensis</i>	Yuma myotis bat	–	–	Y	Y	N	N/A	N
<i>Neotoma fuscipes annectens</i>	San Francisco dusky-footed woodrat	–	SSC	Y	Y	N	N/A	N
<i>Neotoma fuscipes riparia</i>	Riparian (San Joaquin Valley) woodrat	E	SSC	Y	Y	N	Y	N

Table A-1. Continued

Scientific Name	Common Name	Status ^a		Criteria ^b				Recommended Covered Status
		Federal	State	Occur	Status	Impact	Data	
<i>Perognathus inornatus</i>	San Joaquin pocket mouse	–	–	Y	Y	N		N
<i>Physeter catodon</i> (=macrocephalus)	Sperm whale	E	–	Y	Y	N	Y	N
<i>Reithrodontomys raviventris</i>	Salt marsh harvest mouse	E	E; FP	Y	Y	Y	Y	Y
<i>Scapanus latimanus insularis</i>	Angel Island mole	–	–	Y	N	N	N/A	N
<i>Scapanus latimanus parvus</i>	Alameda Island mole	–	SSC	Y	Y	N	N/A	N
<i>Sorex ornatus sinuosus</i>	Suisun ornate shrew	–	SSC	Y	Y	N	N/A	N
<i>Sorex vagrans halicoetes</i>	Salt marsh vagrant shrew	–	SSC	Y	Y	N	N/A	N
<i>Sylvilagus bachmani riparius</i>	Riparian brush rabbit	E	E	N	Y	N	Y	N
<i>Vulpes macrotis mutica</i>	San Joaquin kit fox	E	T	Y	Y	N	Y	Y
<i>Zapus trinotatus orarius</i>	Point Reyes jumping mouse	–	SSC	Y	Y	N	N/A	N

Mauve Highlighting = Species Recommended for Coverage

^a Status

Federal

- E = listed as endangered under the federal Endangered Species Act.
- T = listed as threatened under the federal Endangered Species Act.
- C = listed as a candidate species, which is a species for which the U.S. Fish and Wildlife Service has on file sufficient information to warrant a listing.
- PT = proposal for federal listing as threatened under the federal Endangered Species Act has been published in the Federal Register.
- FPD = federally proposed for delisting.
- D = delisted.
- SC = species of concern designated by the National Marine Fisheries Service.
- = no listing.

State

- E = listed as endangered under the California Endangered Species Act.
- T = listed as threatened under the California Endangered Species Act.
- FP = fully protected under the California Fish and Game Code.
- SSC = species of special concern in California.
- CSC = candidate species currently being considered for listing.
- = no listing.

^b Criteria

- Occur: The species is known to occur or likely to occur based on the extent, quality, and distribution of suitable habitats within the PG&E Bay Area HCP coverage area, based on credible evidence.
- Status: The species is currently listed under the federal Endangered Species Act (ESA) or the California Endangered Species Act (CESA).
- Impact: The species will likely be adversely affected by covered activities or projects as defined under ESA or CESA.
- Data: Sufficient data exist on the species' life history and habitat requirements to adequately evaluate impacts on the species and to develop conservation measures to mitigate these impacts to regulatory standards.

A2. Plants

Table A-2. Plants Initially Considered in the Nine San Francisco Bay Area Counties and Rationale for Inclusion and Exclusion

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Scientific Name	Common Name	Status ^a			Rationale	Recommended Covered Status
		Federal	State	CRPR		
<i>Abronia umbellata</i> subsp. <i>breviflora</i>	North Coast sand-verbena = Pink sand-verbena	–	–	1B.1	Not listed; no facilities/occurrences overlap identified	N
<i>Acanthomintha duttonii</i>	San Mateo thornmint	E	E	1B.1	No direct impacts, based on survey results	N
<i>Acanthomintha lanceolata</i>	Santa Clara thornmint	–	–	4.2	Not listed; listing unlikely	N
<i>Agrostis blasdalei</i> var. <i>blasdalei</i>	Blasdale's bent grass	–	–	1B.2	Not listed; no facilities/occurrences overlap identified	N
<i>Allium fimbriatum</i> var. <i>purdyi</i>	Purdy's onion	–	–	4.3	Not listed; listing unlikely	N
<i>Allium peninsulare</i> var. <i>franciscanum</i>	Franciscan onion	–	–	1B.2	Not listed; no facilities/occurrences overlap identified	N
<i>Allium sharsmithae</i>	Sharsmith's onion	–	–	1B.3	Not listed; no facilities/occurrences overlap identified	N
<i>Alopecurus aequalis</i> var. <i>sonomensis</i>	Sonoma alopecurus	E	–	1B.1	No direct impacts, based on survey results	N
<i>Amorpha californica</i> var. <i>napensis</i>	Napa false indigo	–	–	1B.2	Not listed; no facilities/occurrences overlap identified	N
<i>Amsinckia grandiflora</i>	Large flowered fiddleneck	E	E	1B.1	No direct impacts, based on aerial photo analysis	N
<i>Amsinckia lunaris</i>	Bent-flowered fiddleneck	–	–	1B.2	Not listed; no facilities/occurrences overlap identified	N
<i>Androsace elongata</i> subsp. <i>acuta</i>	California androsace	–	–	4.2	Not listed; listing unlikely	N
<i>Antirrhinum virga</i>	Tall snapdragon	–	–	4.3	Not listed; listing unlikely	N
<i>Arabis blepharophylla</i>	Coast rock cress	–	–	4.3	Not listed; listing unlikely	N
<i>Arabis modesta</i>	Modest rock cress	–	–	4.3	Not listed; listing unlikely	N
<i>Arabis oregana</i>	Oregon rock cress	–	–	4.3	Not listed; listing unlikely	N
<i>Arctostaphylos andersonii</i>	Santa Cruz manzanita	–	–	1B.2	Not listed; no facilities/occurrences overlap identified	N
<i>Arctostaphylos auriculata</i>	Mt. Diablo manzanita	–	–	1B.3	Not listed; no facilities/occurrences overlap identified	N
<i>Arctostaphylos bakeri</i> subsp. <i>bakeri</i>	Baker's manzanita	–	R	1B.1	Short-term impacts likely	N
<i>Arctostaphylos bakeri</i> subsp. <i>sublaevis</i>	The Cedars manzanita	–	R	1B.2	No facilities/occurrences overlap identified	N
<i>Arctostaphylos canescens</i> subsp. <i>sonomensis</i>	Sonoma manzanita	–	–	1B.2	Not listed; no facilities/occurrences overlap identified	N

Table A-2. Continued

Scientific Name	Common Name	Status ^a			Rationale	Recommended Covered Status
		Federal	State	CRPR		
<i>Arctostaphylos densiflora</i>	Vine Hill manzanita	–	E	1B.1	No facilities/occurrences overlap identified	N
<i>Arctostaphylos franciscana</i>	San Francisco manzanita= Franciscan manzanita	–	–	1A	Not listed; impacts unlikely because is extinct	N
<i>Arctostaphylos hispidula</i>	Howell's manzanita	–	–	4.2	Not listed; listing unlikely	N
<i>Arctostaphylos montana</i> subsp. <i>montana</i>	Mt. Tamalpais manzanita	–	–	1B.3	Not listed; listing unlikely	N
<i>Arctostaphylos montana</i> subsp. <i>ravenii</i>	Presidio manzanita	E	E	1B.1	Surveyed; no impacts would occur	N
<i>Arctostaphylos imbricata</i>	San Bruno Mountain manzanita	–	E	1B.1	Long-term impacts likely	N
<i>Arctostaphylos manzanita</i> subsp. <i>elegans</i>	Konocti manzanita	–	–	1B.3	Not listed; no facilities/occurrences overlap identified	N
<i>Arctostaphylos manzanita</i> subsp. <i>laevigata</i>	Contra Costa manzanita	–	–	1B.2	Not listed; no facilities/occurrences overlap identified	N
<i>Arctostaphylos montaraensis</i>	Montara manzanita	–	–	1B.2	Not listed; no facilities/occurrences overlap identified	N
<i>Arctostaphylos pacifica</i>	Pacific manzanita	–	E	1B.2	Surveyed; no impacts would occur	N
<i>Arctostaphylos pallida</i>	Pallid manzanita	T	E	1B.1	Potential impacts likely	Y
<i>Arctostaphylos regismontana</i>	King's Mountain manzanita	–	–	1B.2	Not listed; no facilities/occurrences overlap identified	N
<i>Arctostaphylos stanfordiana</i> subsp. <i>decumbens</i>	Rincon manzanita	–	–	1B.1	Not listed; no facilities/occurrences overlap identified	N
<i>Arctostaphylos virgata</i>	Marin manzanita			1B.2	Not listed; no facilities/occurrences overlap identified	N
<i>Arenaria paludicola</i>	Marsh sandwort	E	E	1B.1	No facilities/occurrences overlap identified	N
<i>Asclepias solanoana</i>	Serpentine milkweed	–	–	4.2	Not listed; listing unlikely	N
<i>Aspidotis carlotta-halliae</i>	Carlotta Hall's lace fern	–	–	4.2	Not listed; listing unlikely	N
<i>Symphyotrichum lentum</i>	Suisun Marsh aster	–	–	1B.2	Not listed; no facilities/occurrences overlap identified	N
<i>Astragalus breweri</i>	Brewer's milk-vetch	–	–	4.2	Not listed; listing unlikely	N
<i>Astragalus claranus</i>	Clara Hunt's milk-vetch	E	T	1B.1	Surveyed, direct impacts unlikely	N
<i>Astragalus clevelandii</i>	Cleveland's milk-vetch	–	–	4.3	Not listed; listing unlikely	N
<i>Astragalus nuttallii</i> var. <i>nuttallii</i>	Nuttall's milk-vetch	–	–	4.2	Not listed; listing unlikely	N
<i>Astragalus nuttallii</i> var. <i>virgatus</i>	Nuttall's (green) milk-vetch	–	–		Not listed; listing unlikely	N
<i>Astragalus pycnostachyus</i> var. <i>pycnostachyus</i>	Marsh milk-vetch = Coastal marsh milk-vetch	–	–	1B.2	Not listed; no facilities/occurrences overlap identified	N

Table A-2. Continued

Scientific Name	Common Name	Status ^a			Rationale	Recommended Covered Status
		Federal	State	CRPR		
<i>Astragalus rattanii</i> var. <i>jepsonianus</i>	Jepson's milk-vetch	–	–	1B.2	Not listed; no facilities/occurrences overlap identified	N
<i>Astragalus rattanii</i> var. <i>rattanii</i>	Rattan's milk-vetch	–	–	4.3	Not listed; listing unlikely	N
<i>Astragalus tener</i> var. <i>ferrisiae</i>	Ferris's milk-vetch	–	–	1B.1	Not listed; no facilities/occurrences overlap identified	N
<i>Astragalus tener</i> var. <i>tener</i>	Alkali milk-vetch	–	–	1B.2	Not listed; no facilities/occurrences overlap identified	N
<i>Atriplex cordulata</i>	Heartscale	–	–	1B.2	Not listed; no facilities/occurrences overlap identified	N
<i>Atriplex coronata</i> var. <i>coronata</i>	Crownscale	–	–	4.2	Not listed; listing unlikely	N
<i>Atriplex depressa</i>	Brittlescale	–	–	1B.2	Not listed; no facilities/occurrences overlap identified	N
<i>Atriplex joaquiniana</i>	San Joaquin spearscale = San Joaquin saltbush	–	–	1B.2	Not listed; no facilities/occurrences overlap identified	N
<i>Atriplex persistens</i>	Vernal pool saltbush = Vernal pool smallscale	–	–	1B.2	Not listed; no facilities/occurrences overlap identified	N
<i>Azolla mexicana</i>	Mexican mosquito fern	–	–	4.2	Not listed; listing unlikely	N
<i>Balsamorhiza macrolepis</i> var. <i>macrolepis</i>	Big-scale balsamroot	–	–	1B.2	Not listed; no facilities/occurrences overlap identified	N
<i>Blennosperma bakeri</i>	Baker's stickyseed = Sonoma sunshine	E	E	1B.1	Impacts localized, temporary	N
<i>Blennosperma nanum</i> var. <i>robustum</i>	Point Reyes stickyseed = Point Reyes blennosperma	–	R	1B.2	Impacts localized, temporary	N
<i>Blepharizonia plumosa</i>	Big tarplant	–	–	1B.1	Not listed; no facilities/occurrences overlap identified	N
<i>Boschniakia hookeri</i>	Small groundcone	–	–	2.3	Not listed; no facilities/occurrences overlap identified	N
<i>Brodiaea californica</i> var. <i>leptandra</i>	Narrow-anthered California brodiaea	–	–	1B.2	Not listed; no facilities/occurrences overlap identified	N
<i>Calamagrostis bolanderi</i>	Bolander's reed grass	–	–	4.2	Not listed; listing unlikely	N
<i>Calamagrostis crassiglumis</i>	Thurber's reed grass	–	–	2.1	Not listed; impacts unlikely	N
<i>Calamagrostis ophitidis</i>	Serpentine reed grass	–	–	4.3	Not listed; listing unlikely	N
<i>Calandrinia breweri</i>	Brewer's calandrinia	–	–	4.2	Not listed; listing unlikely	N
<i>California macrophylla</i>	Round-leaved filaree	–	–	1B.2	Not listed; no facilities/occurrences overlap identified	N

Table A-2. Continued

Scientific Name	Common Name	Status ^a			Rationale	Recommended Covered Status
		Federal	State	CRPR		
<i>Calochortus pulchellus</i>	Mt. Diablo fairy lantern	–	–	1B.2	Not listed; no facilities/occurrences overlap identified	N
<i>Calochortus raichei</i>	The Cedars globe-lily	–	–	1B.2	Not listed; impacts unlikely	N
<i>Calochortus umbellatus</i>	Oakland star-tulip	–	–	4.2	Not listed; listing unlikely	N
<i>Calochortus tiburonensis</i>	Tiburon mariposa lily	T	T	1B.1	No impacts, based on aerial photo analysis	N
<i>Calycadenia micrantha</i>	Small-flowered calycadenia	–	–	1B.2	Not listed; impacts unlikely	N
<i>Calyptridium parryi</i> var. <i>hesseae</i>	Santa Cruz Mountain pussypaws	–	–	1B.1	Not listed; may be temporary, highly localized impacts	N
<i>Calyptridium quadripetalum</i>	Four-petaled pussypaws	–	–	4.3	Not listed; listing unlikely	N
<i>Calystegia atriplicifolia</i> subsp. <i>buttensis</i>	Butte County morning-glory	–	–	4.2	Not listed; no facilities/occurrences overlap identified	N
<i>Calystegia collina</i> subsp. <i>oxyphylla</i>	Mt. Saint Helena morning-glory	–	–	4.2	Not listed; listing unlikely	N
<i>Calystegia purpurata</i> subsp. <i>saxicola</i>	Coastal bluff morning-glory	–	–	1B.2	Not listed; no facilities/occurrences overlap identified	N
<i>Campanula californica</i>	Swamp harebell	–	–	1B.2	Not listed; no facilities/occurrences overlap identified	N
<i>Campanula exigua</i>	Chaparral harebell	–	–	1B.2	Not listed; no facilities/occurrences overlap identified	N
<i>Campanula sharsmithiae</i>	Mt. Hamilton harebell	–	–	1B.2	Not listed; impacts unlikely	N
<i>Cardamine pachystigma</i> var. <i>dissectifolia</i>	Dissected-leaved toothwort	–	–	3	Not listed; listing unlikely	N
<i>Carex albida</i>	White sedge	E	E	1B.1	May no longer be a valid taxon	N
<i>Carex buxbaumii</i>	Buxbaum's sedge	–	–	4.2	Not listed; listing unlikely	N
<i>Carex californica</i>	California sedge	–	–	2.3	Not listed; not in the Plan Area	N
<i>Carex comosa</i>	Bristly sedge	–	–	2.1	Not listed; no facilities/occurrences overlap identified	N
<i>Carex leptalea</i>	Flaccid sedge	–	–	2.2	Not listed; only occurrence in Plan Area extirpated	N
<i>Carex lyngbyei</i>	Lyngbye's sedge	–	–	2.2	Not listed; no facilities/occurrences overlap identified	N
<i>Carex saliniformis</i>	Deceiving sedge	–	–	1B.2	Not listed; no facilities/occurrences overlap identified	N
<i>Castilleja affinis</i> subsp. <i>affinis</i>	Coast Indian paintbrush	–	–		Not listed; not a rare taxon	
<i>Castilleja affinis</i> subsp. <i>neglecta</i>	Tiburon paintbrush = Tiburon Indian paintbrush	E	T	1B.2	Potential impacts highly localized, temporary	N

Table A-2. Continued

Scientific Name	Common Name	Status ^a			Rationale	Recommended Covered Status
		Federal	State	CRPR		
<i>Castilleja ambigua</i> subsp. <i>humboldtiensis</i>	Humboldt Bay owl's-clover	–	–	1B.2	Not listed; no facilities/occurrences overlap identified	N
<i>Castilleja ambigua</i> subsp. <i>ambigua</i>	Salt marsh owl's-clover	–	–	4.2	Not listed; no facilities/occurrences overlap identified	N
<i>Castilleja mendocinensis</i>	Mendocino Coast Indian paintbrush	–	–	1B.2	Not listed; no facilities/occurrences overlap identified	N
<i>Castilleja rubicundula</i> subsp. <i>rubicundula</i>	Pink creamsacs	–	–	1B.2	Not listed; no facilities/occurrences overlap identified	N
<i>Castilleja uliginosa</i>	Pitkin Marsh Indian paintbrush	–	E	1A	Impacts unlikely; considered to be extinct	N
<i>Caulanthus coulteri</i> var. <i>lemmonii</i>	Lemmon's jewelflower	–	–	1B.2	Not listed; no facilities/occurrences overlap identified	N
<i>Ceanothus confusus</i>	Rincon Ridge ceanothus	–	–	1B.1	Not listed; no facilities/occurrences overlap identified	N
<i>Ceanothus divergens</i>	Calistoga ceanothus	–	–	1B.2	Not listed; no facilities/occurrences overlap identified	N
<i>Ceanothus ferrisiae</i>	Coyote ceanothus	E	–	1B.1	Potential impacts likely	Y
<i>Ceanothus foliosus</i> var. <i>vineatus</i>	Vine Hill ceanothus	–	–	1B.1	Not listed; no facilities/occurrences overlap identified	N
<i>Ceanothus gloriosus</i> var. <i>exaltatus</i>	Glory brush	–	–	4.3	Not listed; listing unlikely	N
<i>Ceanothus gloriosus</i> var. <i>gloriosus</i>	Point Reyes ceanothus	–	–	4.3	Not listed; listing unlikely	N
<i>Ceanothus gloriosus</i> var. <i>porrectus</i>	Mt. Vision ceanothus	–	–	1B.3	Not listed; no facilities/occurrences overlap identified	N
<i>Ceanothus masonii</i>	Mason's ceanothus	–	–	1B.2	Not listed; no impacts, based on survey	N
<i>Ceanothus purpureus</i>	Holly-leaved ceanothus	–	–	1B.2	Not listed; no facilities/occurrences overlap identified	N
<i>Ceanothus sonomensis</i>	Sonoma ceanothus	–	–	1B.2	Not listed; no facilities/occurrences overlap identified	N
<i>Centromadia parryi</i> subsp. <i>congdonii</i>	Congdon's spikeweed	–	–	1B.2	Not listed; no facilities/occurrences overlap identified	N
<i>Centromadia parryi</i> subsp. <i>parryi</i>	Parry's spikeweed	–	–	1B.2	Not listed; no facilities/occurrences overlap identified	N
<i>Centromadia parryi</i> subsp. <i>rudis</i>	Parry's red spikeweed	–	–	4.2	Not listed; listing unlikely	N
<i>Chlorogalum pomeridianum</i> var. <i>minus</i>	Dwarf soaproot	–	–	1B.2	Not listed; impacts unlikely	N
<i>Chorizanthe cuspidata</i> var. <i>cuspidata</i>	San Francisco Bay spineflower	–	–	1B.2	Not listed; no facilities/occurrences overlap identified	N

Table A-2. Continued

Scientific Name	Common Name	Status ^a			Rationale	Recommended Covered Status
		Federal	State	CRPR		
<i>Chorizanthe cuspidata</i> var. <i>villosa</i>	Woolly-headed spineflower	–	–	1B.2	Not listed; no facilities/occurrences overlap identified	N
<i>Chorizanthe robusta</i> subsp. <i>robusta</i>	Robust spineflower	E	–	1B.1	No direct impacts, based on aerial photo analysis	N
<i>Chorizanthe valida</i>	Sonoma spineflower	E	E	1B.1	No direct impacts, based on aerial photo analysis	N
<i>Cicuta maculata</i> var. <i>bolanderi</i>	Bolander's water-hemlock	–	–	2.1	Not listed; impacts unlikely	N
<i>Cirsium andrewsii</i>	Franciscan thistle	–	–	1B.2	Not listed; no facilities/occurrences overlap identified	N
<i>Cirsium fontinale</i> var. <i>campylon</i>	Mt. Hamilton thistle	–	–	1B.2	Not listed; no facilities/occurrences overlap identified	N
<i>Cirsium fontinale</i> var. <i>fontinale</i>	Fountain thistle	E	E	1B.1	Potential impacts likely	Y
<i>Cirsium hydrophilum</i> var. <i>hydrophilum</i>	Suisun thistle	E	–	1B.1	No facilities/occurrences overlap identified	N
<i>Cirsium hydrophilum</i> var. <i>vaseyi</i>	Mt. Tamalpais thistle	–	–	1B.2	Not listed; impacts unlikely	N
<i>Cirsium occidentale</i> var. <i>compactum</i>	Compact cobwebby thistle	–	–	1B.2	Not listed; only occurrence in Plan Area extirpated	N
<i>Cirsium praeteriens</i>	Lost thistle	–	–	1A	Not listed; impacts unlikely; considered to be extirpated	N
<i>Clarkia breweri</i>	Brewer's clarkia	–	–	4.2	Not listed; listing unlikely	N
<i>Clarkia concinna</i> subsp. <i>raichei</i>	Raiche's red ribbon	–	–	1B.1	Not listed; no facilities/occurrences overlap identified	N
<i>Clarkia concinna</i> subsp. <i>automixa</i>	Santa Clara red-ribbons	–	–	4.3	Not listed; listing unlikely	N
<i>Clarkia franciscana</i>	Presidio clarkia	E	E	1B.1	No impacts, based on photo interpretation	N
<i>Clarkia gracilis</i> subsp. <i>tracyi</i>	Tracy's clarkia	–	–	4.2	Not listed; listing unlikely	N
<i>Clarkia imbricata</i>	Vine Hill clarkia	E	E	1B.1	No impacts, based on photo interpretation	N
<i>Collinsia corymbosa</i>	Round-headed Chinese houses	–	–	1B.2	Not listed; no facilities/occurrences overlap identified	N
<i>Collinsia multicolor</i>	San Francisco collinsia	–	–	1B.2	Not listed; no facilities/occurrences overlap identified	N
<i>Collomia diversifolia</i>	Serpentine collomia	–	–	4.3	Not listed; listing unlikely	N
<i>Convolvulus simulans</i>	Small-flowered morning-glory	–	–	4.2	Not listed; listing unlikely	N

Table A-2. Continued

Scientific Name	Common Name	Status ^a			Rationale	Recommended Covered Status
		Federal	State	CRPR		
<i>Cordylanthus maritimus</i> subsp. <i>palustris</i>	Point Reyes bird's-beak	–	–	1B.2	Not listed; no facilities/occurrences overlap identified	N
<i>Cordylanthus mollis</i> subsp. <i>hispidus</i>	Hispid bird's-beak	–	–	1B.1	Not listed; no facilities/occurrences overlap identified	N
<i>Cordylanthus mollis</i> subsp. <i>mollis</i>	Soft bird's-beak	E	R	1B.2	No direct impacts, based on photo interpretation	N
<i>Cordylanthus nidularis</i>	Mt. Diablo bird's-beak	–	R	1B.1	Impacts unlikely	N
<i>Cordylanthus palmatus</i>	Palmate-bracted bird's-beak	E	E	1B.1	No direct impacts, based on photo interpretation	N
<i>Cordylanthus tenius</i> subsp. <i>brunneus</i>	Serpentine bird's-beak	–	–	4.3	Not listed; listing unlikely	N
<i>Cordylanthus tenius</i> subsp. <i>capillaris</i>	Pennell's bird's-beak	E	R	1B.2	Potential impacts localized and temporary	N
<i>Corethrogyne leucophylla</i>	Branching beach aster	–	–	3.2	Not listed; impacts unlikely	N
<i>Croton californicus</i>	California croton	–	–		Not listed; not a rare taxon	N
<i>Cryptantha clevelandii</i> var. <i>dissita</i>	Serpentine cryptantha	–	–	1B.1	Not listed; no facilities/occurrences overlap identified	N
<i>Cryptantha hooveri</i>	Hoover's cryptantha	–	–	1A	Not listed; impacts unlikely; considered to be extinct	N
<i>Cupressus abramsiana</i>	Santa Cruz cypress	E	E	1B.2	Not in Plan Area	N
<i>Cupressus pygmaea</i>	Mendocino cypress	–	–	1B.2	Not listed; impacts unlikely	N
<i>Cypripedium californicum</i>	California lady's-slipper	–	–	4.2	Not listed; listing unlikely	N
<i>Cypripedium fasciculatum</i>	Clustered lady's-slipper	–	–	4.2	Not listed; listing unlikely	N
<i>Cypripedium montanum</i>	Mountain lady's-slipper	–	–	4.2	Not listed; listing unlikely	N
<i>Deinandra bacigalupii</i>	Livermore tarplant	–	–	1B.2	Not listed; no facilities/occurrences overlap identified	
<i>Delphinium bakeri</i>	Baker's larkspur	E	R	1B.1	No impacts, based on survey	N
<i>Delphinium californicum</i> subsp. <i>interius</i>	Hospital Canyon larkspur	–	–	1B.2	Not listed; no facilities/occurrences overlap identified	N
<i>Delphinium gypsophilum</i> subsp. <i>gypsophilum</i>	Gypsum-loving larkspur	–	–	4.2	Not listed; listing unlikely	N
<i>Delphinium luteum</i>	Yellow larkspur	E	R	1B.1	No impacts, based on surveys	N
<i>Delphinium recurvatum</i>	Recurved larkspur	–	–	1B.2	Not listed; no facilities/occurrences overlap identified	N
<i>Delphinium uliginosum</i>	Swamp larkspur	–	–	4.2	Not listed; listing unlikely	N

Table A-2. Continued

Scientific Name	Common Name	Status ^a			Rationale	Recommended Covered Status
		Federal	State	CRPR		
<i>Dichanthelium lanuginosum</i> var. <i>thermale</i>	Geyser's dichanthelium	–	E	1B.1	No direct impacts, based on photo interpretation	N
<i>Dichondra occidentalis</i>	Western dichondra	–	–	4.2	Not listed; listing unlikely	N
<i>Dirca occidentalis</i>	Western leatherwood	–	–	1B.2	Not listed; no facilities/occurrences overlap identified	N
<i>Downingia pusilla</i>	Dwarf downingia	–	–	2.2	Not listed; no facilities/occurrences overlap identified	N
<i>Dudleya abramsii</i> subsp. <i>setchellii</i>	Santa Clara Valley dudleya	E	–	1B.1	Potential impacts likely	Y
<i>Eleocharis parvula</i>	Small spikerush	–	–	4.3	Not listed; listing unlikely	N
<i>Elymus californicus</i>	California bottle-brush grass	–	–	4.3	Not listed; listing unlikely	N
<i>Equisetum palustre</i>	Marsh horsetail	–	–	3	Not listed; impacts unlikely	N
<i>Eriastrum brandegeae</i>	Brandegee's eriastrum	–	–	1B.2	Not listed; no facilities/occurrences overlap identified	N
<i>Eriastrum tracyi</i>	Tracy's eriastrum	–	R	1B.2	No direct impacts, based on photo interpretation	N
<i>Erigeron greenei</i>	Greene's narrow-leaved daisy	–	–	1B	Not listed; impacts unlikely	N
<i>Erigeron biolettii</i>	Streamside daisy	–	–	3	Not listed; impacts unlikely	N
<i>Erigeron serpentinus</i>	Serpentine daisy	–	–	1B.3	Not listed; impacts unlikely	N
<i>Erigeron supplex</i>	Supple daisy	–	–	1B.2	Not listed; no facilities/occurrences overlap identified	N
<i>Eriogonum argillosum</i>	Clay-loving buckwheat	–	–	4.3	Not listed; listing unlikely	N
<i>Eriogonum cedrorum</i>	The Cedars buckwheat	–	–	1B.3	Not listed; listing unlikely	N
<i>Eriogonum luteolum</i> var. <i>caninum</i>	Tiburon buckwheat	–	–	1B.2	Not listed; impacts unlikely	N
<i>Eriogonum nervulosum</i>	Snow Mountain buckwheat	–	–	1B.2	Not listed; no facilities/occurrences overlap identified	N
<i>Eriogonum nudum</i> var. <i>decurrens</i>	Ben Lomond buckwheat	–	–	1B.1	Not listed; no facilities/occurrences overlap identified	N
<i>Eriogonum nudum</i> var. <i>psychicola</i>	Antioch Dunes buckwheat	–	–	1B.1	Not listed; impacts unlikely	N
<i>Eriogonum ternatum</i>	Ternate buckwheat	–	–	4.3	Not listed; listing unlikely	N
<i>Eriogonum tripodum</i>	Tripod buckwheat	–	–	4.2	Not listed; listing unlikely	N
<i>Eriogonum truncatum</i>	Mt. Diablo buckwheat	–	–	1B.1	Not listed; no facilities/occurrences overlap identified	N
<i>Eriogonum umbellatum</i> var. <i>bahiiforme</i>	Bay buckwheat	–	–	4.2	Not listed; listing unlikely	N
<i>Eriophyllum jepsonii</i>	Jepson's woolly sunflower	–	–	4.3	Not listed; listing unlikely	N

Table A-2. Continued

Scientific Name	Common Name	Status ^a			Rationale	Recommended Covered Status
		Federal	State	CRPR		
<i>Eriophyllum latilobum</i>	San Mateo woolly sunflower	E	E	1B	Potential impacts temporary, localized	N
<i>Eryngium aristulatum</i> var. <i>hooveri</i>	Hoover's button-celery	-		1B.1	Not listed; no facilities/occurrences overlap identified	N
<i>Eryngium constancei</i>	Loch Lomond coyote-thistle	E	E	1B.1	No facilities/occurrences overlap identified	N
<i>Eryngium racemosum</i>	Delta coyote-thistle	-	E	1B.1	No facilities/occurrences overlap identified	N
<i>Erysimum ammophilum</i>	Coast wallflower	-		1B.2	Not listed; no facilities/occurrences overlap identified	N
<i>Erysimum capitatum</i> subsp. <i>angustatum</i>	Contra Costa wallflower	E	E	1B.1	Potential impacts likely	Y
<i>Erysimum franciscanum</i>	San Francisco wallflower	-	-	4.2	Not listed; listing unlikely	N
<i>Erythronium revolutum</i>	Coast fawn lily	-	-	2.2	Not listed; impacts unlikely	N
<i>Erythronium helenae</i>	St. Helena fawn lily	-	-	4.2	Not listed; listing unlikely	N
<i>Eschscholzia rhombipetala</i>	Diamond-petaled California poppy	-	-	1B.1	Not listed; no facilities/extant occurrences overlap	N
<i>Fissidens pauperculus</i>	Minute pocket-moss	-	-	1B.2	Not listed; no facilities/occurrences overlap identified	N
<i>Fritillaria agrestis</i>	Stinkbells	-	-	4.2	Not listed; listing unlikely	N
<i>Fritillaria biflora</i> var. <i>ineziana</i>	Hillsborough chocolate lily	-	-	1B.1	Not listed; no facilities/occurrences overlap identified	N
<i>Fritillaria falcata</i>	Talus fritillary	-	-	1B.2	Not listed; impacts unlikely	N
<i>Fritillaria lanceolata</i> var. <i>tristulis</i>	Marin checker lily	-	-	1B.1	Not listed; no facilities/occurrences overlap identified	N
<i>Fritillaria liliacea</i>	Fragrant fritillary	-	-	1B.2	Not listed; no facilities/occurrences overlap identified	N
<i>Fritillaria pluriflora</i>	Adobe lily	-	-	1B.2	Not listed; no facilities/occurrences overlap identified	N
<i>Fritillaria purdyi</i>	Purdy's fritillary	-	-	4.3	Not listed; listing unlikely	N
<i>Fritillaria roderickii</i>	Roderick's fritillary	-	-	1B.1	Not listed; only occurrence in Plan Area transplanted	N
<i>Galium andrewsii</i> subsp. <i>gatense</i>	Serpentine bedstraw	-	-	4.2	Not listed; listing unlikely	N
<i>Gilia capitata</i> subsp. <i>chamissonis</i>	San Francisco gilia	-	-	1B.1	Not listed; no facilities/occurrences overlap identified	N
<i>Gilia capitata</i> subsp. <i>tomentosa</i>	Woolly-headed gilia	-	-	1B.1	Not listed; no facilities/occurrences overlap identified	N

Table A-2. Continued

Scientific Name	Common Name	Status ^a			Rationale	Recommended Covered Status
		Federal	State	CRPR		
<i>Gilia millefoliata</i>	Dark-eyed gilia	–	–	1B.2	Not listed; no facilities/occurrences overlap identified	N
<i>Gratiola heterosepala</i>	Boggs Lake hedge-hyssop	–	E	1B.2	No facilities/occurrences overlap identified	N
<i>Grindelia hirsutula</i> var. <i>maritima</i>	San Francisco gumplant	–	–	1B.2	Not listed; no facilities/occurrences overlap identified	N
<i>Harmonia hallii</i>	Hall's harmonia	–	–	1B.2	Not listed; no facilities/occurrences overlap identified	N
<i>Harmonia nutans</i>	Nodding harmonia	–	–	4.3	Not listed; listing unlikely	N
<i>Helianthella castanea</i>	Diablo helianthella	–	–	1B.2	Not listed; no facilities/occurrences overlap identified	N
<i>Helianthus exilis</i>	Serpentine sunflower	–	–	4.2	Not listed; listing unlikely	N
<i>Hemizonia congesta</i> subsp. <i>congesta</i>	Seaside tarplant	–	–	1B.2	Not listed; impacts unlikely	N
<i>Hesperervax caulescens</i>	Hogwallow starfish	–	–	4.2	Not listed; listing unlikely	N
<i>Hesperervax sparsiflora</i> var. <i>brevifolia</i>	Short-leaved evax	–	–	1B.2	Not listed; no facilities/occurrences overlap identified	N
<i>Hesperolinon bicarpellatum</i>	Two-carpelled dwarf-flax	–	–	1B.2	Not listed; no facilities/occurrences overlap identified	N
<i>Hesperolinon breweri</i>	Brewer's dwarf flax	–	–	1B.2	Not listed; no facilities/occurrences overlap identified	N
<i>Hesperolinon congestum</i>	Marin dwarf-flax	T	T	1B.1	Potential impacts likely	Y
<i>Hesperolinon drymarioides</i>	Drymaria dwarf-flax	–	–	1B.2	Not listed; impacts unlikely	N
<i>Hibiscus lasiocarpus</i> var. <i>occidentalis</i>	Rose-mallow	–	–	1B.2	Not listed; no facilities/occurrences overlap identified	N
<i>Hoita strobilina</i>	Loma Prieta hoita	–	–	1B.1	Not listed; no facilities/occurrences overlap identified	N
<i>Holocarpha macradenia</i>	Santa Cruz tarplant	T	E	1B.1	No facilities/occurrences overlap identified	N
<i>Hordeum intercedens</i>	Vernal barley	–	–	3.2	Not listed; impacts unlikely	N
<i>Horkelia cuneata</i> subsp. <i>sericea</i>	Kellogg's horkelia	–	–	1B.1	Not listed; no facilities/occurrences overlap identified	N
<i>Horkelia marinensis</i>	Point Reyes horkelia	–	–	1B.2	Not listed; no facilities/occurrences overlap identified	N
<i>Horkelia tenuiloba</i>	Thin-lobed horkelia	–	–	1B.2	Not listed; no facilities/occurrences overlap identified	N

Table A-2. Continued

Scientific Name	Common Name	Status ^a			Rationale	Recommended Covered Status
		Federal	State	CRPR		
<i>Iris longipetala</i>	Coast iris	–	–	4.2	Not listed; listing unlikely	N
<i>Isocoma arguta</i>	Carquinez goldenbush	–	–	1B.1	Not listed; no facilities/occurrences overlap identified	N
<i>Isocoma menziesii</i> var. <i>diabolica</i>	Satan's goldenbush	–	–	4.2	Not listed; listing unlikely	N
<i>Juglans hindsii</i>	Northern California black walnut	–	–	1B.1	Not listed; no facilities/occurrences overlap identified	N
<i>Lasthenia burkei</i>	Burke's goldfields	E	E	1B.1	Potential impacts likely	Y
<i>Lasthenia californica</i> subsp. <i>bakeri</i>	Baker's goldfields	–	–	1B.2	Not listed; no facilities/occurrences overlap identified	N
<i>Lasthenia californica</i> subsp. <i>macrantha</i>	Perennial goldfields	–	–	1B.2	Not listed; no facilities/occurrences overlap identified	N
<i>Lasthenia conjugens</i>	Contra Costa goldfields	E	–	1B.1	Potential impacts likely	Y
<i>Lasthenia ferrisiae</i>	Ferris's goldfields	–	–	4.2	Not listed; listing unlikely	N
<i>Lathyrus jepsonii</i> var. <i>jepsonii</i>	Delta tule pea	–	–	1B.2	Not listed; no facilities/occurrences overlap identified	N
<i>Layia carnosa</i>	Beach layia	E	E	1B.1	No facilities/occurrences overlap identified	N
<i>Layia septentrionalis</i>	Colusa layia	–	–	1B.2	Not listed; no facilities/occurrences overlap identified	N
<i>Legenere limosa</i>	Legenere	–	–	1B.1	Not listed; no facilities/occurrences overlap identified	N
<i>Lepidium latipes</i> var. <i>heckardii</i>	Heckard's pepper-grass	–	–	1B.2	Not listed; no facilities/occurrences overlap identified	N
<i>Leptosyne hamiltonii</i>	Mt. Hamilton coreopsis	–	–	1B.2	Not listed; no facilities/occurrences overlap identified	N
<i>Leptosiphon acicularis</i>	Bristly linanthus	–	–	4.2	Not listed; listing unlikely	N
<i>Leptosiphon ambiguus</i>	Serpentine linanthus	–	–	4.2	Not listed; listing unlikely	N
<i>Leptosiphon croceus</i>	Coast yellow linanthus	–	–	1B.1	Not listed; no facilities/occurrences overlap identified	N
<i>Leptosiphon grandiflorus</i>	Large-flowered linanthus	–	–	4.2	Not listed; listing unlikely	N
<i>Leptosiphon jepsonii</i>	Jepson's linanthus	–	–	1B.2	Not listed; no facilities/occurrences overlap identified	N
<i>Leptosiphon latisectus</i>	Broad-lobed linanthus	–	–	4.3	Not listed; listing unlikely	N
<i>Leptosiphon rosaceus</i>	Rose linanthus	–	–	1B.1	Not listed; no facilities/occurrences overlap identified	N

Table A-2. Continued

Scientific Name	Common Name	Status ^a			Rationale	Recommended Covered Status
		Federal	State	CRPR		
<i>Lessingia arachnoidea</i>	Crystal Springs lessingia	–	–	1B.2	Not listed; no facilities/occurrences overlap identified	N
<i>Lessingia germanorum</i>	San Francisco lessingia	E	E	1B.1	Potential impacts temporary, localized	N
<i>Lessingia hololeuca</i>	Wooly-headed lessingia	–	–	3	Not listed; impacts unlikely	N
<i>Lessingia micradenia</i> var. <i>glabrata</i>	Smooth lessingia	–	–	1B.2	Not listed; no facilities/occurrences overlap identified	N
<i>Lessingia micradenia</i> var. <i>micradenia</i>	Tamalpais lessingia	–	–	1B.2	Not listed; no facilities/occurrences overlap identified	N
<i>Lessingia tenuis</i>	Spring lessingia	–	–	4.3	Not listed; listing unlikely	N
<i>Lilaeopsis masonii</i>	Mason's lilaeopsis	–	R	1B.1	Potential impacts, but species status under question	N
<i>Lilium maritimum</i>	Coast lily	–		1B.1	Not listed; no facilities/occurrences overlap identified	N
<i>Lilium pardalinum</i> subsp. <i>pitkinense</i>	Pitkin Marsh lily	E	E	1B.1	No direct impacts, based on photo interpretation	N
<i>Lilium rubescens</i>	Redwood lily	–		4.2	Not listed; listing unlikely	N
<i>Limnanthes douglasii</i> subsp. <i>sulphurea</i>	Point Reyes meadowfoam	–	E	1B.2	Potential impacts temporary, localized, based on surveys	N
<i>Limnanthes floccosa</i> subsp. <i>floccosa</i>	Woolly meadowfoam	–		4.2	Not listed; listing unlikely	N
<i>Limnanthes vinculans</i>	Sebastopol meadowfoam	E	E	1B.1	Potential impacts likely	Y
<i>Limosella subulata</i>	Delta mudwort			2.1	Not listed; no facilities/occurrences overlap identified	N
<i>Lomatium hooveri</i>	Hoover's lomatium	–	–	4.3	Not listed; listing unlikely	N
<i>Lomatium observatorium</i>	Mt. Hamilton lomatium	–	–	1B.2	Not listed; no facilities/occurrences overlap identified	N
<i>Lomatium parvifolium</i>	Small-leaved lomatium	–	–	4.2	Not listed; listing unlikely	N
<i>Lomatium repostum</i>	Napa lomatium	–	–	4.3	Not listed; listing unlikely	N
<i>Lotus formosissimus</i>	harlequin lotus	–	–	4.2	Not listed; listing unlikely	N
<i>Lupinus arboreus</i> var. <i>eximius</i>	San Mateo tree lupine	–	–	3.2	Not listed; impacts unlikely	N
<i>Lupinus sericatus</i>	Cobb Mountain lupine	–	–	1B.2	Not listed; no facilities/occurrences overlap identified	N
<i>Lupinus tidestromii</i>	Tidestrom's lupine	E	E	1B.1	No direct impacts, based on photo interpretation and surveys	N
<i>Lycopodium clavatum</i>	Running-pine	–	–	4.1	Not listed; listing unlikely	N

Table A-2. Continued

Scientific Name	Common Name	Status ^a			Rationale	Recommended Covered Status
		Federal	State	CRPR		
<i>Madia radiata</i>	Showy madia	–	–	1B.1	Not listed; no facilities/occurrences overlap identified	N
<i>Malacothamnus arcuatus</i>	Arcuate bush mallow	–	–	1B.2	Not listed; no facilities/occurrences overlap identified	N
<i>Malacothamnus davidsonii</i>	Davidson's bush mallow	–	–	1B.2	Not listed; no facilities/occurrences overlap identified	N
<i>Malacothamnus hallii</i>	Hall's bush mallow	–	–	1B.2	Not listed; no facilities/occurrences overlap identified	N
<i>Malacothamnus helleri</i>	Heller's bush mallow	–	–	4.3	Not listed; listing unlikely	N
<i>Malacothrix phaeocarpa</i>	Dusky-fruited malacothrix	–	–	4.3	Not listed; listing unlikely	N
<i>Meconella oregona</i>	Oregon meconella	–	–	1B.1	Not listed; no facilities/occurrences overlap identified	N
<i>Micropus amphibolus</i>	Mt. Diablo cottonweed	–	–	3.2	Not listed; impacts unlikely	N
<i>Microseris paludosa</i>	Marsh microseris	–	–	1B.2	Not listed; no facilities/occurrences overlap identified	N
<i>Microseris sylvatica</i>	Sylvan microseris	–	–	4.2	Not listed; listing unlikely	N
<i>Mimulus nudatus</i>	Bare monkeyflower	–	–	4.3	Not listed; listing unlikely	N
<i>Monardella antonina</i> subsp. <i>antonina</i>	San Antonio Hills monardella	–	–	3	Not listed; impacts unlikely	N
<i>Monardella undulata</i>	Curly-leaved monardella	–	–	4.2	Not listed; listing unlikely	N
<i>Monardella villosa</i> subsp. <i>globosa</i>	Robust monardella	–	–	1B.2	Not listed; no facilities/occurrences overlap identified	N
<i>Monardella viridis</i> subsp. <i>viridis</i>	Green monardella	–	–	4.3	Not listed; listing unlikely	N
<i>Monolopia gracilens</i>	woodland woollythreads	–	–	1B.2	Not listed; impacts unlikely	N
<i>Myosurus minimus</i> subsp. <i>apus</i>	Little mousetails	–	–	3.1	Not listed; impacts unlikely	N
<i>Navarretia cotulifolia</i>	Cotula navarretia	–	–	4.2	Not listed; listing unlikely	N
<i>Navarretia gowenii</i>	Lime ridge navarretia	–	–	1B.1	Not listed; potential impacts temporary, localized, based on surveys	N
<i>Navarretia jepsonii</i>	Jepson's navarretia	–	–	4.3	Not listed; listing unlikely	N
<i>Navarretia leucocephala</i> subsp. <i>pauciflora</i>	Few-flowered navarretia	E	T	1B.1	No facilities/occurrences overlap identified	N
<i>Navarretia leucocephala</i> subsp. <i>bakeri</i>	Baker's navarretia	–	–	1B.1	Not listed; no facilities/occurrences overlap identified	N
<i>Navarretia leucocephala</i> subsp. <i>plieantha</i>	Many-flowered navarretia	E	E	1B.2	Potential impacts temporary, localized	N

Table A-2. Continued

Scientific Name	Common Name	Status ^a			Rationale	Recommended Covered Status
		Federal	State	CRPR		
<i>Navarretia prostrata</i>	Prostrate navarretia	–	–	1B.1	Not listed; no facilities/occurrences overlap identified	N
<i>Navarretia rosulata</i>	Marin County navarretia	–	–	1B.2	Not listed; no facilities/occurrences overlap identified	N
<i>Navarretia sinistra</i> subsp. <i>pinnatisecta</i>	Pinnate-leaved navarretia	–	–	4.3	Not listed; listing unlikely	N
<i>Navarretia subuligera</i>	Awl-leaved navarretia	–	–	4.3	Not listed; listing unlikely	N
<i>Neostapfia colusana</i>	Colusa grass	T	E	1B.1	No facilities/occurrences overlap identified	N
<i>Oenothera deltooides</i> subsp. <i>howellii</i>	Antioch Dunes evening primrose	E	E	1B.1	Potential impacts likely	Y
<i>Orcuttia inaequalis</i>	San Joaquin Orcutt grass	T	E	1B.1	No facilities/occurrences overlap identified	N
<i>Orobanche valida</i> subsp. <i>howellii</i>	Howell's broomrape	–	–	4.3	Not listed; listing unlikely	N
<i>Pedicularis dudleyi</i>	Dudley's lousewort	–	R	1B.2	Potential impacts temporary, localized, based on aerial photo interpretation	N
<i>Penstemon newberryi</i> var. <i>sonomensis</i>	Sonoma beardtongue	–	–	1B.3	Not listed; no facilities/occurrences overlap identified	N
<i>Penstemon rattanii</i> var. <i>kleei</i>	Santa Cruz Mts. beardtongue	–	–	1B.2	Not listed; no facilities/occurrences overlap identified	N
<i>Pentachaeta bellidiflora</i>	White-rayed pentachaeta	E	E	1B.1	Potential impacts likely	Y
<i>Perideridia gairdneri</i> subsp. <i>gairdneri</i>	Gairdner's yampah	–	–	4.2	Not listed; listing unlikely	N
<i>Phacelia insularis</i> var. <i>continentis</i>	North Coast phacelia	–	–	1B.2	Not listed; no facilities/occurrences overlap identified	N
<i>Phacelia phacelioides</i>	Mt. Diablo phacelia	–	–	1B.2	Not listed; no facilities/occurrences overlap identified	N
<i>Pinus radiata</i>	Monterey pine	–	–	1B.1	Not listed; no facilities/occurrences overlap identified	N
<i>Piperia candida</i>	White-flowered rein orchid	–	–	4.2	Not listed; listing unlikely	N
<i>Piperia elegans</i> subsp. <i>decurtata</i>	Pt. Reyes rein orchid	–	–	1B.1	Not listed; no facilities/occurrences overlap identified	N
<i>Piperia leptopetala</i>	Narrow-petaled rein orchid	–	–	4.3	Not listed; listing unlikely	N
<i>Piperia michaelii</i>	Michael's rein orchid	–	–	4.2	Not listed; listing unlikely	N
<i>Pityopus californicus</i>	California pinefoot	–	–	4.2	Not listed; listing unlikely	N
<i>Plagiobothrys chorisianus</i> var. <i>chorisianus</i>	Choris's popcornflower	–	–	1B.2	Not listed; no facilities/occurrences overlap identified	N

Table A-2. Continued

Scientific Name	Common Name	Status ^a			Rationale	Recommended Covered Status
		Federal	State	CRPR		
<i>Plagiobothrys chorisianus</i> var. <i>hickmanii</i>	Hickman's popcornflower	–	–	4.2	Not listed; listing unlikely	N
<i>Plagiobothrys diffusus</i>	San Francisco popcornflower	–	E	1B.1	No impacts, based on aerial photo interpretation and survey	N
<i>Plagiobothrys glaber</i>	Hairless popcornflower	–	–	1A	Not listed; considered to be extinct	N
<i>Plagiobothrys hystriculus</i>	Bearded popcornflower	–	–	1B.1	Not listed; no facilities/occurrences overlap identified	N
<i>Plagiobothrys mollis</i> var. <i>vestitus</i>	Petaluma popcornflower	–	–	1A	Not listed; considered to be extinct	N
<i>Plagiobothrys myosotoides</i>	Forget-me-not popcornflower	–	–	4.3	Not listed; listing unlikely	N
<i>Plagiobothrys strictus</i>	Calistoga popcornflower	E	T	1B.1	Potential indirect effects only, based on survey	N
<i>Plagiobothrys uncinatus</i>	Salinas Valley popcornflower	–	–	1B.2	Not listed; no facilities/occurrences overlap identified	N
<i>Pleuropogon hooverianus</i>	North Coast semaphore grass	–	T	1B.1	Potential temporary, localized impacts, based on survey	N
<i>Pleuropogon refractus</i>	Nodding semaphore grass	–	–	4.2	Not listed; listing unlikely	N
<i>Poa napensis</i>	Napa bluegrass	E	E	1B.1	Potential indirect effects only, based on survey	N
<i>Polygonum marinense</i>	Marin knotweed	–	–	3.1	Not listed; no facilities/occurrences overlap identified	N
<i>Potamogeton zosteriformis</i>	Eel-grass pondweed	–	–	2.2	Not listed; no facilities/occurrences overlap identified	N
<i>Potentilla hickmanii</i>	Hickman's cinquefoil	E	E	1B.1	Potential impacts temporary, localized, based on aerial photo interpretation	N
<i>Potentilla uliginosa</i>	Cunningham Marsh cinquefoil	–	–		Not listed; considered to be extinct	N
<i>Psilocarphus brevissimus</i> var. <i>multiflorus</i>	Delta wooly-marbles	–	–	4.2	Not listed; listing unlikely	N
<i>Quercus parvula</i> var. <i>tamalpaisensis</i>	Tamalpais oak	–	–	1B.3	Not listed; no facilities/occurrences overlap identified	N
<i>Ranunculus lobbii</i>	Lobb's aquatic buttercup	–	–	4.2	Not listed; listing unlikely	N
<i>Rhynchospora alba</i>	White beaked-rush	–	–	2.2	Not listed; impacts unlikely	N
<i>Rhynchospora californica</i>	California beaked-rush	–	–	1B.1	Not listed; no facilities/occurrences overlap identified	N
<i>Rhynchospora capitellata</i>	Brownish beaked-rush	–	–	2.2	Not listed; impacts unlikely	N
<i>Rhynchospora globularis</i> var. <i>globularis</i>	Round-headed beaked-rush	–	–	2.1	Not listed; no facilities/occurrences overlap identified	N
<i>Ribes victoris</i>	Victor's gooseberry	–	–	4.3	Not listed; listing unlikely	N

Table A-2. Continued

Scientific Name	Common Name	Status ^a			Rationale	Recommended Covered Status
		Federal	State	CRPR		
<i>Rosa pinetorum</i>	Pine rose	–	–	1B.2	Not listed; impacts unlikely	N
<i>Sagittaria sanfordii</i>	Sanford's arrowhead	–	–	1B.2	Not listed; not in Plan Area	N
<i>Sanicula hoffmannii</i>	Hoffmann's sanicle	–	–	4.3	Not listed; listing unlikely	N
<i>Sanicula maritima</i>	Adobe sanicle	–	R	1B.1	Impacts unlikely; no facilities/occurrences overlap identified	N
<i>Sanicula saxatilis</i>	Rock sanicle	–	R	1B.2	Potential impacts temporary, localized, based on aerial photo interpretation	N
<i>Scutellaria galericulata</i>	Marsh skullcap	–	–	2.2	Not listed; Not in Plan Area	N
<i>Scutellaria lateriflora</i>	Blue skullcap	–	–	2.2	Not listed; no facilities/occurrences overlap identified	N
<i>Senecio aphanactis</i>	Rayless ragwort	–	–	2.2	Not listed; no facilities/occurrences overlap identified	N
<i>Senecio clevelandii</i> var. <i>viridis</i>	Marin checkerbloom	–	–	4.3	Not listed; listing unlikely	N
<i>Sidalcea calycosa</i> subsp. <i>rhizomata</i>	Point Reyes checkerbloom	–	–	1B.2	Not listed; no facilities/occurrences overlap identified	N
<i>Sidalcea hickmanii</i> subsp. <i>napensis</i>	Napa checkerbloom	–	–	1B.1	Not listed; potential impacts temporary, localized, based on survey, aerial photo interpretation	N
<i>Sidalcea hickmanii</i> subsp. <i>viridis</i>	Marin checkermallow	–	–	1B.3	Not listed; no facilities/occurrences overlap identified	N
<i>Sidalcea malachroides</i>	Maple-leaved checkerbloom	–	–	4.2	Not listed; listing unlikely	N
<i>Sidalcea malviflora</i> subsp. <i>purpurea</i>	Purple-stemmed checkerbloom	–	–	1B.2	Not listed; no facilities/occurrences overlap identified	N
<i>Sidalcea oregana</i> subsp. <i>hydrophila</i>	Marsh checkerbloom	–	–	1B.2	Not listed; no facilities/occurrences overlap identified	N
<i>Sidalcea oregana</i> subsp. <i>valida</i>	Kenwood Marsh checkermallow	E	E	1B.1	Potential impacts temporary, localized, based on aerial photo interpretation	N
<i>Silene verecunda</i> subsp. <i>verecunda</i>	San Francisco campion	–	–	1B.2	Not listed; no facilities/occurrences overlap identified	N
<i>Stebbinsoseris decipiens</i>	Santa Cruz silverpuffs	–	–	1B.2	Not listed; no facilities/occurrences overlap identified	N
<i>Stellaria littoralis</i>	Beach starwort	–	–	4.2	Not listed; listing unlikely	N
<i>Streptanthus glandulosus</i> subsp. <i>albidus</i>	Metcalfe Canyon jewelflower	E	–	1B.1	Potential impacts likely	Y
<i>Streptanthus glandulosus</i> subsp. <i>glandulosus</i>	Most beautiful jewelflower	–	–	1B.2	Not listed; no facilities/occurrences overlap identified	N

Table A-2. Continued

Scientific Name	Common Name	Status ^a			Rationale	Recommended Covered Status
		Federal	State	CRPR		
<i>Streptanthus barbiger</i>	Bearded jewelflower	–	–	4.2	Not listed; listing unlikely	N
<i>Streptanthus batrachopus</i>	Tamalpais jewelflower	–	–	1B.3	Not listed; no facilities/occurrences overlap identified	N
<i>Streptanthus brachiatus</i> subsp. <i>brachiatus</i>	Socrates Mine jewelflower	–	–	1B.2	Not listed; no facilities/occurrences overlap identified	N
<i>Streptanthus brachiatus</i> subsp. <i>hoffmanii</i>	Freed's jewelflower	–	–	1B.2	Not listed; no facilities/occurrences overlap identified	N
<i>Streptanthus hesperidis</i>	Green jewelflower	–	–	1B.2	Not listed; no facilities/occurrences overlap identified	N
<i>Streptanthus callistus</i>	Mt. Hamilton jewelflower	–	–	1B.3	Not listed; no facilities/occurrences overlap identified	N
<i>Streptanthus glandulosus</i> subsp. <i>pulchellus</i>	Mount Tamalpais jewelflower	–	–	1B.2	Not listed; no facilities/occurrences overlap identified	N
<i>Streptanthus glandulosus</i> subsp. <i>hoffmanii</i>	Secund jewelflower	–	–	1B.3	Not listed; no facilities/occurrences overlap identified	N
<i>Streptanthus hispidus</i>	Mt. Diablo jewelflower	–	–	1B.3	Not listed; no facilities/occurrences overlap identified	N
<i>Streptanthus morrisonii</i> subsp. <i>elatus</i>	Three Peaks jewelflower	–	–	1B.2	Not listed; no facilities/occurrences overlap identified	N
<i>Streptanthus morrisonii</i> subsp. <i>kruckebergii</i>	Kruckeberg's jewelflower	–	–	1B.2	Not listed; no facilities/occurrences overlap identified	N
<i>Streptanthus morrisonii</i> subsp. <i>hirtiflorus</i>	Dorr's Cabin jewelflower	–	–	1B.2	Not listed; no facilities/occurrences overlap identified	N
<i>Streptanthus morrisonii</i> subsp. <i>morrisonii</i>	Morrison's jewelflower	–	–	1B.2	Not listed; no facilities/occurrences overlap identified	N
<i>Streptanthus glandulosus</i> subsp. <i>niger</i>	Tiburon jewelflower	E	E	1B.1	No direct impacts, based on aerial photo interpretation	N
<i>Stuckenia filiformis</i>	Slender-leaved pondweed	–	–	2.2	Not listed; no facilities/occurrences overlap identified	N
<i>Suaeda californica</i>	California seablight	E	–	1B.1	No impacts, based on surveys	N
<i>Thelypodium brachycarpum</i>	Short-podded thelypodium	–	–	4.2	Not listed; listing unlikely	N
<i>Tracyina rostrata</i>	Beaked tracyina	–	–	1B.2	Not listed; impacts unlikely	N
<i>Trichostema ruygtii</i>	Napa bluecurls	–	–	1B.2	Not listed; impacts unlikely	N
<i>Trifolium amoenum</i>	Showy Indian clover	E	–	1B.1	Impacts unlikely, based on surveys and aerial photo interpretation	N

Table A-2. Continued

Scientific Name	Common Name	Status ^a			Rationale	Recommended Covered Status
		Federal	State	CRPR		
<i>Trifolium buckwestiorum</i>	Santa Cruz clover	–	–	1B.1	Not listed; impacts unlikely	N
<i>Trifolium depauperatum</i> var. <i>hydrophilum</i>	Saline clover	–	–	1B.2	Not listed; no facilities/occurrences overlap identified	N
<i>Triphysaria floribunda</i>	San Francisco owl's-clover	–	–	1B.2	Not listed; no facilities/occurrences overlap identified	N
<i>Triquetrella californica</i>	California triquetrella moss	–	–	1B.2	Not listed; no facilities/occurrences overlap identified	N
<i>Triteleia lugens</i>	Dark-mouthed triteleia	–	–	4.2	Not listed; listing unlikely	N
<i>Tropidocarpum capparideum</i>	Caper-fruited tropidocarpum	–	–	1A	Not listed; no facilities/occurrences overlap identified	N
<i>Tuctoria mucronata</i>	Solano grass	E	E	1B.1	Does not occur in Plan Area	N
<i>Veratrum fimbriatum</i>	Fringed false-hellebore	–	–	4.3	Not listed; listing unlikely	N
<i>Viburnum ellipticum</i>	Oval-leaved viburnum	–	–	2.3	Not listed; no facilities/occurrences overlap identified	N
<i>Zigadenus micranthus</i> var. <i>fontanus</i>	Marsh zigadenus	–	–	4.2	Not listed; listing unlikely	N

Mauve Highlighting = Species Recommended for Coverage

^a Status

Federal

- E = listed as endangered under the federal Endangered Species Act.
- T = listed as threatened under the federal Endangered Species Act.
- = no listing.

State

- E = listed as endangered under the California Endangered Species Act.
- T = listed as threatened under the California Endangered Species Act.
- R = listed as rare under the California Native Plant Protection Act. This category is no longer used for newly listed plants, but some plants previously listed as rare retain this designation.
- = no listing.

California Rare Plant Rank

- 1A = List 1A species: plants presumed extinct in California.
- 1B = List 1B species: rare, threatened or endangered in California and elsewhere.
- 2 = List 2 species: rare and endangered in California, more common elsewhere.
- 3 = List 3 species: need more information.
- 4 = List 4 species: plants of limited distribution.
- .1 = Seriously endangered in California.
- .2 = Fairly endangered in California.
- .3 = Not very threatened in California (low degree/immediacy of threats or no current threats known).

Appendix B

Species Accounts

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Acronyms and Abbreviations

Bay Area O&M HCP	Bay Area Operations and Maintenance Habitat Conservation Plan
CNDDB	California Natural Diversity Database
CNPS	California Native Plant Society
DPS	distinct population segment
FR	Federal Register
GGNRA	Golden Gate National Recreation Area
MSL	mean sea level
PG&E	Pacific Gas and Electric Company
ppm	parts per million
SFPUC	San Francisco Public Utilities Commission

Introduction

The species accounts provided in this appendix are intended to provide species information relevant to Pacific Gas and Electric Company's (PG&E) Bay Area Operations and Maintenance Habitat Conservation Plan (Bay Area O&M HCP) for each covered wildlife and plant species. The accounts are organized according to taxonomic group: invertebrates, amphibians, reptiles, birds, mammals, and plants. For all species, the account describes the species' listing status, range, natural history, population trend and threats, and species management.

Listing Status

The status of all covered species is provided in this section, as are anticipated changes to the species listing status. For species with a critical habitat designation, additional information is included on the location and size of the critical habitat and primary constituent elements.

Range

This section of the species account provides a brief summary of occurrences of the species based on the California Natural Diversity Database (CNDDB). Additionally, for invertebrates, amphibians, reptiles, birds, and mammals, documented occurrences of the species in the study area are summarized according to total existing occurrences, extant occurrences, occurrences on public and private land, as well as documented occurrences in the Bay Area. Some recorded occurrences are in more than one property type: — public, private, and/or unknown property ownership, — which is noted in the table.

Natural History

The natural history section of the species account provides data on the following.

- Habitat associations, habitat designation, habitat parameters, and rationale.
- Movement distances, such as information on home ranges for males and females, dispersal, and migration, and the location of study where data were collected.
- Information on reproduction.

Natural history information was also used as the basis for determining the range and potential occurrence of covered wildlife species in the Plan Area., Population Trend and Threats

The species accounts include information on key locations for the species and the overall population trends toward recovery or extirpation. This portion of the account also includes information on threats such as impact mechanisms (e.g., habitat loss), threat types, and threat impacts. Threat discussions address activities contributing to the decline of the species.

Species Management

This section of the species account is meant to give an overview of the types of management activities that are being undertaken to aid in species recovery. This is not an exhaustive list, but it is meant to provide examples of mitigation and recovery actions that might benefit the species.

Invertebrates

California Freshwater Shrimp (*Syncaris pacifica*)

Status

State: Endangered

Federal: Endangered

Critical Habitat: None

Recovery Planning: *Recovery Plan for California Freshwater Shrimp (Syncaris pacifica)* (U.S. Fish and Wildlife Service 1998)

Critical Habitat

No critical habitat has been designated for California freshwater shrimp.

Range

California freshwater shrimp is assumed to have been historically common in low-elevation, perennial freshwater streams within Marin, Sonoma, and Napa Counties. The current understanding of the historical distribution of this species is based on the current distribution, local topography and watershed boundaries, and patterns in geologic activity and climatic changes.

This species is currently known from 17 stream segments in Napa, Marin, and Sonoma Counties that can be separated into four general drainage units. The first drainage unit includes several tributary streams in the lower Russian River drainage (Austin Creek). The second drainage unit is composed of the coastal streams that flow westward directly into the Pacific Ocean (Salmon Creek and Stemple Creek). The third drainage unit consists of the coastal streams that flow into Tomales Bay (Lagunitas Creek and Walker Creek). The fourth drainage unit is made up of the southward flowing streams that empty into northern San Pablo Bay (Napa River and Sonoma Creek). California freshwater shrimp has only been found in perennial coastal streams at elevations of less than 380 feet (116 meters) with an average gradient of 1% or less.

Table B-1. Occurrences of California Freshwater Shrimp Documented in the Bay Area O&M HCP Study Area

County	Total Existing Occurrences	Extant Occurrences	Public	Private	Unknown
Alameda	0	0	0	0	0
Contra Costa	0	0	0	0	0
Marin	4	4	2	2	1
Napa	2	2	0	2	0
San Francisco	0	0	0	0	0
San Mateo	0	0	0	0	0
Santa Clara	0	0	0	0	0
Solano	0	0	0	0	0
Sonoma	12	12	2	5	5

Source: California Department of Fish and Wildlife 2015.

Note: One Marin County record indicates occurrence on both public land and private land.

Habitat Requirements

Within the low elevation–low gradient streams inhabited by the California freshwater shrimp, the most suitable reaches are characterized by submerged undercut banks with overhanging plants such as blackberry, woody debris, and the exposed live root systems of willow or alder. The shrimp uses microhabitat variations depending on the season. In the winter rainy season, when stream flow is high and fast and laden with suspended sediment, California freshwater shrimp find protection beneath the undercut bank amidst exposed roots or dense, overhanging vegetation. In the summer when flow is low, they retreat to isolated pools with leafy submerged branches. Historically, debris dams may have been important feeding and resting places. These dams would have gathered the detritus (shrimp food) and leaf litter that would become more detritus, and would have sheltered the shrimp during high flows. The optimal stream depth for California freshwater shrimp is 1 to 3 feet (0.3 to 0.9 meters).

Movement

California freshwater shrimp are relatively sedentary, moving very slowly when not disturbed (Li 1981). Downstream migration of less than 9 miles (15 kilometers) has been observed. Upstream migration presumably occurs, but this has not been documented (Serpa 1996, 1991).

Reproduction

While studies focusing on the reproduction of California freshwater shrimp have been limited, insight from the ecology of other freshwater and marine shrimp and observations suggests that they breed once per year in late summer, immediately following the last molt of the female. Egg-bearing female California freshwater shrimp have been noted in autumn (September to November). Between 50 and 120 eggs adhere to the swimming legs on the abdomen (pleopods) and are cared for and protected there through the winter high-water season. The young are released in May or early June, the most favorable time of the hydrological cycle.

Newly hatched young are only about 0.2 inch (0.5 centimeter) long but grow rapidly to 0.8 inch (2 centimeters) by early autumn. Growth slows through autumn, winter, and spring but resumes during their second summer. At this time, the size difference between males and females is apparent, and both are sexually mature. They may live more than 3 years.

Population Trend and Threats

Threats to California freshwater shrimp are degradation and loss of habitat as a result of increased urbanization, agricultural development and inappropriate grazing practices, pollutants and contaminants, and salmonid restoration activities (U.S. Fish and Wildlife Service 2011). California freshwater shrimp likely are prey for a number of native fish as well as introduced fish such as the mosquito fish and green sunfish (U.S. Environmental Protection Agency 2010).

Species Management

According to the *Recovery Plan for California Freshwater Shrimp (Syncaris pacifica)* (U.S. Fish and Wildlife Service 1998), the strategy for recovery of the California freshwater shrimp involves the following.

- Recover and delist the California freshwater shrimp when numbers increase sufficiently and suitable habitat is secured and managed within 17 watersheds harboring shrimp.
- Enhance habitat conditions for native aquatic organisms that currently coexist or have occurred historically with the California freshwater shrimp.

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Vernal Pool Fairy Shrimp (*Branchinecta lynchi*)

Status

State: None

Federal: Threatened

Critical Habitat: Yes

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

Critical Habitat

Critical habitat for vernal pool fairy shrimp is designated 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 (70 Federal Register [FR] 46924 and 71 FR 7118). There are 597,821 total acres (241,929 hectares) of critical habitat designated in California for vernal pool fairy shrimp (Table B-2). These units contain primary constituent elements of critical habitat characterized by mounds and swales, and depressions within a matrix of surrounding uplands, depressional features, and sources of food that consist of organic and inorganic materials (70 FR 46936).

Table B-2. Critical Habitat Designated for Vernal Pool Fairy Shrimp in the Plan Area (February 10, 2006)

Unit Number	County	General Location	Size (acres [hectares])
16	Solano	Jepson Prairie Unit: Southeast of Interstate 80 and the cities of Fairfield and Vacaville, north of Grizzly Bay and Montezuma Slough, west of the Sacramento River and Solano and Sacramento County line, and south of Midway Road and the city of Dixon.	12,576 (5,090)
17	Napa and Sonoma	Napa River Unit: South of the city of Napa, west of State Route 29, south of State Route 12, and east of State Route 121.	655 (265)
19 (A-C)	Contra Costa and Alameda	Altamont Hills Unit: East of Danville, south of Antioch, west of Clifton Court Forebay, and north of Corral Hollow Road.	7,892 (3,194)

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. Disjunct populations occur in Monterey County, San Luis Obispo County, Santa Barbara County, Ventura County, Los Angeles County, and Riverside County. This species has also been observed in Napa County and the eastern portions of Alameda and Contra Costa Counties (Table B-3) (U.S. Fish and Wildlife Service 2005).

Table B-3. Occurrences of Vernal Pool Fairy Shrimp Documented in the Bay Area O&M HCP Study Area

County	Total Existing Occurrences	Extant Occurrences	Public	Private	Unknown
Alameda	4	4	1	3	0
Contra Costa	19	19	4	14	1
Marin	0	0	0	0	0
Napa	1	1	1	0	0
San Francisco	0	0	0	0	0
San Mateo	0	0	0	0	0
Santa Clara	0	0	0	0	0
Solano	32	32	4	18	10
Sonoma	0	0	0	0	0

Source: California Department of Fish and Wildlife 2015.

Note: A total of 56 of 752 recorded occurrences are within the study area.

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 (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 (6 to 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 to 274 parts per million [ppm]), total dissolved solids (48 to 481 ppm), and pH (6.3 to 8.5) (59 FR 48136; Eriksen and Belk 1999). Water in pools occupied by vernal pool fairy shrimp typically has low conductivity and chloride levels (59 FR 48136). Vernal pool fairy shrimp have been found in pools ranging from 0.05 acre to 0.1 acre (0.02 to 0.04 hectare), but occur more frequently in small, deep pools. 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 flood events. (U.S. Fish and Wildlife Service 2007).

Reproduction

Individuals hatch from cysts during cold-weather winter storms, as they require water temperatures of 50°F 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 Trend and Threats

Vernal pool fairy shrimp are threatened by the same activities as other vernal pool invertebrates. These threats 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 1994). The limited and disjunct distribution of vernal pools, coupled with the even more limited distribution of the vernal pool fairy shrimp, means that any reduction in vernal pool habitat quantity could adversely affect this species.

Recolonization opportunities are diminished when physical barriers, such as development or lack of vernal pool habitat, isolate populations from one another or inhibit the transportation of cysts. Isolated populations could be more susceptible to inbreeding depression, which can result in local extinction or reduced fitness (Gilpin and Soule 1986; Goodman 1987). However, this has never been demonstrated for branchiopod crustaceans.

Species Management

Conservation of the vernal pool fairy shrimp is directly tied to conservation of suitable vernal pool habitat. The 2005 recovery plan (U.S. Fish and Wildlife Service 2005) and the 2007 5-year review (U.S. Fish and Wildlife Service 2007) identify recommendations for vernal pool fairy shrimp management and conservation. These measures include the following.

- 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.
- Developing management indicators for managing vernal pool landscapes.

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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 final designation in the August 2005 ruling (70 FR 46924) from the U.S. Fish and Wildlife Service of critical habitat for conservancy fairy shrimp designated 161,786 acres (65,473 hectares) of critical habitat. Eight critical habitat units have been delineated for Butte, Mariposa, Merced, Solano, Stanislaus, Tehama, and Ventura Counties, California (Table B-4). These units contain primary constituent elements of critical habitat characterized by depressions or pools connected by continuously or intermittently flowing water which 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).

Table B-4. Critical Habitat Designated for Conservancy Fairy Shrimp in the Plan Area (August 11, 2005)

Unit Number	County	General Location	Size (acres [hectares])
3	Solano County	Jepson Prairie Unit: South of Travis Air Force Base, extending along Rio Vista Road from about 6 to 11 miles east of Interstate 80.	4,414 (1,786)

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. The U.S. Fish and Wildlife Service is aware of ten populations of conservancy fairy shrimp, all located in California, which include the following: Vina Plains in Butte and Tehama Counties; Mariner Ranch in Placer County, Sacramento National Wildlife Refuge in Glenn County, Yolo Bypass Wildlife Area in Yolo County, Jepson Prairie in Solano County, Mapes Ranch in Stanislaus County, University of California–Merced area and Sandy Mush Road in Merced County, Grasslands Ecological Area in Merced County, and Los Padres National Forest in Ventura County (Table B-5) (U.S. Fish and Wildlife Service 2012).

Table B-5. Occurrences of Conservancy Fairy Shrimp Documented in the Bay Area O&M HCP Study Area

County	Total Existing Occurrences	Extant Occurrences	Public	Private	Unknown
Alameda	0	0	0	0	0
Contra Costa	0	0	0	0	0
Marin	0	0	0	0	0
Napa	0	0	0	0	0
San Francisco	0	0	0	0	0
San Mateo	0	0	0	0	0
Santa Clara	0	0	0	0	0
Solano	12	12	0	10	2
Sonoma	0	0	0	0	0

Source: California Department of Fish and Wildlife 2015.

Habitat Requirements

Conservancy fairy shrimp are found in vernal pools that form in depressions in grassland habitats (Eng et al. 1990). 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 and often have turbid water. These pools are known to occur on a range of different soil and geologic formations. Occupied habitats range in size from claypan vernal pools as small as 36 square yards (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 to 48 centimeters) (California Department of Fish and Wildlife 2015; Eriksen and Belk 1999; Helm 1998; U.S. Fish and Wildlife Service 2007).

Movement

Conservancy fairy shrimp are dispersed locally between pools when individual pools overflow with water and become connected with adjacent pools. 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).

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 median of 39.7 days (Helm 1998).

Population Trend and Threats

As of 2012, the U.S. Fish and Wildlife Service had not implemented the monitoring program (as described in its 2005 vernal pool ecosystem recovery plan) for the conservancy fairy shrimp; consequently, 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 over-arching recovery strategy for conservancy fairy shrimp is habitat protection and management. As of 2007, species surveys and monitoring efforts that would provide data to evaluate progress towards recovery had yet to be implemented, and the majority of the management criteria had neither been met nor initiated. However, some criteria of the 2005 vernal pool ecosystem recovery plan have been met or partially met, including implementation of habitat management and monitoring plans for certain areas and provisions for management in perpetuity for a majority of the identified habitat locations (U.S. Fish and Wildlife Service 2007). Other management actions, as defined by the 2005 recovery plan for vernal pool ecosystems (U.S. Fish and Wildlife Service 2005), which would beneficially impact the conservancy fairy shrimp include the following.

- Establishing a range-wide recovery implementation team and working groups for each vernal pool region.
- Developing and implementing adaptive management plans, habitat conservation plans, and land use protection measures, and landowner agreements.
- Acquiring and protecting habitat, 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.

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Vernal Pool Tadpole Shrimp (*Lepidurus packardii*)

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

Critical habitat for vernal pool tadpole shrimp has been designated in Alameda, Amador, Butte, Colusa, Fresno, Mariposa, Merced, Sacramento, Shasta, Solano, Stanislaus, Tehama, Tulare, Yolo, and Yuba Counties in California (71 FR 7117). There are 228,785 total acres of critical habitat designated for vernal pool tadpole shrimp in California (Table B-6). These units contain primary constituent elements of critical habitat characterized by mounds and swales, and depressions that result in complexes of continuously, or intermittently, flowing surface water in the swale providing for dispersal and features that hold water for at least 41 days. Organic detritus in the pools is required for feeding, and inorganic detritus is required to provide shelter (70 FR 46936).

Table B-6. Critical Habitat Designated for Vernal Pool Tadpole Shrimp in the Plan Area (February 10, 2006)

Unit Number	County	General location	Size (acres [hectares])
11 (A–D)	Solano	Jepson Prairie Unit: Southern Solano County, southeast of Interstate 80 and the cities of Fairfield and Vacaville, north of Grizzly Bay and Montezuma Slough, west of the Sacramento River and the Solano and Sacramento County line, and south of Midway Road and the city of Dixon.	12,571 (5,087)
14	Alameda,	San Francisco Bay Unit: South of the cities of Fremont and Newark, west of Interstate 880, and north of Mud Slough.	92 (37)

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 (Table B-7) (U.S. Fish and Wildlife Service 2007).

Table B-7. Occurrences of Vernal Pool Tadpole Shrimp Documented in the Bay Area O&M HCP Study Area

County	Total Existing Occurrences	Extant Occurrences	Public	Private	Unknown
Alameda	3	3	2	1	0
Contra Costa	1	1	0	1	0
Marin	0	0	0	0	0
Napa	0	0	0	0	0
San Francisco	0	0	0	0	0
San Mateo	0	0	0	0	0
Santa Clara	0	0	0	0	0
Solano	25	25	2	13	10
Sonoma	0	0	0	0	0

Source: California Department of Fish and Wildlife 2015.

Note: Occurrence #26 (Solano County) is reported as “presumed extant” but in fact was extirpated by road construction.

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 in U.S. Fish and Wildlife Service 2007). These habitats typically contain clear to highly turbid water, with temperatures ranging from 50°F to 84°F 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 rain water during the following fall. Vernal pool tadpole shrimp generally take between 3 and 4 weeks to mature. Reproduction begins after individuals reach 0.4 inch or more in carapace length. Large females, greater than 0.8 inch carapace length, can deposit as many as six 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 Trend and Threats

Vernal pool tadpole shrimp are threatened by the same activities as other vernal pool invertebrates. These threats include the conversion of vernal pool habitat to agricultural lands and urban

development and stochastic extirpation because of the small and isolated nature of remaining populations (FR 59 48136). The limited and disjunct distribution of vernal pools, coupled with the even more limited distribution of the vernal pool tadpole shrimp, means that any reduction in vernal pool habitat quantity could adversely affect this species.

Habitat fragmentation can isolate and reduce population size, resulting in a process of progressive population extirpations. Small or isolated populations are more susceptible to extinction from random environmental disturbance. Recolonization opportunities are also diminished when physical barriers, such as development or lack of vernal pool habitat, isolate populations from one another or inhibit the transportation of cysts. Isolated populations are potentially more susceptible to inbreeding depression, which can result in local extinction or reduced fitness (Gilpin and Soule 1986; Goodman 1987a, 1987b). However, this has never been demonstrated for branchiopod crustaceans.

Species Management

Conservation of the vernal pool tadpole shrimp is directly tied to conservation of suitable vernal pool habitat. The 2005 recovery plan (U.S. Fish and Wildlife Service 2005) and the 2007 5-Year review (U.S. Fish and Wildlife Service 2007) identify recommendations for vernal pool tadpole management and conservation. These measures include the following.

- 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.

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Longhorn Fairy Shrimp (*Branchinecta longiantenna*)

Status

State: None

Federal: Endangered

Critical Habitat: Yes

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

Critical Habitat

The final designation in the August 2005 ruling (70 FR 46924) from the U.S. Fish and Wildlife Service of critical habitat for the longhorn fairy shrimp designated 13,557 acres (5,486 hectares); three critical habitat units have been delineated for Alameda, Contra Costa, Madera, Merced, San Luis Obispo, and Stanislaus Counties, California. (Table B-8) These units contain primary constituent elements of critical habitat characterized by depressions or pools connected by continuously or intermittently flowing water which 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).

Table B-8. Critical Habitat Designated for Longhorn Fairy Shrimp in the Plan Area (August 11, 2005)

Unit Number	County	General Location	Size (acres [hectares])
1 (A, B)	Contra Costa, Alameda	Altamont Hills Unit: Subunit A is located in the Altamont Hills north of the county line, near the Vasco Caves; subunit B is located in the Altamont Hills south of the county line, near Brushy Peak.	791 (320)

Range

Longhorn fairy shrimp are known from only five widely separated populations. 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 National Wildlife Refuge Complex, Merced County; 3) areas within the Brushy Peak Preserve, Alameda County; and 4) areas within the Vasco Caves Preserve, near the town of Byron in Contra Costa County and 5) areas within the proposed Alkali Sink Conservation Bank east of Mendota, Fresno County. Only the Fresno population has been discovered since the listing of longhorn fairy shrimp in 1994, but additional localities have been detected within the other four populations since 1994 (U.S. Fish and Wildlife Service 2005). There are three CNDDDB occurrences for longhorn fairy shrimp in the HCP Study Area (California Department of Fish and Wildlife 2015) (Table B-9).

Table B-9. Occurrences of Longhorn Fairy Shrimp Documented in the Bay Area O&M HCP Study Area

County	Total Existing Occurrences	Extant Occurrences	Public	Private	Unknown
Alameda	2	2	?	?	?
Contra Costa	1	1	?	?	?
Marin	0	0	0	0	0
Napa	0	0	0	0	0
San Francisco	0	0	0	0	0
San Mateo	0	0	0	0	0
Santa Clara	0	0	0	0	0
Solano	0	0	0	0	0
Sonoma	0	0	0	0	0

Source: California Department of Fish and Wildlife 2015.

Note: Specific location and ownership information is suppressed in all records due to the sensitive nature of these populations.

Habitat Requirements

Typical habitat for listed fairy shrimp in California includes vernal pools, seasonally ponded areas, and ephemeral freshwater habitat (U.S. Fish and Wildlife Service 2003). 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 the longhorn fairy shrimp have been observed are either sandy loam pools or shallow, alkaline pools (U.S. Fish and Wildlife Service 1994). The longhorn fairy shrimp can potentially live in vernal pools that exist for fairly short durations (6 to 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. Cysts can be carried on the wind and on the bodies or in the intestines of larger animals resulting in long distance dispersal. Since the cysts are passed undamaged through the intestinal tracts of most animals, fecal matter deposited as the animal moves can spread 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).

Reproduction

Longhorn fairy shrimp adults occur 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, as they require water temperatures of 50°F (10°C) or lower to hatch (Eriksen and Belk 1999; Helm 1998).

Population Trend and Threats

Longhorn fairy shrimp are known from only five widely separated populations (U.S. Fish and Wildlife Service 2012). As of 2007, the U.S. Fish and Wildlife Service had not implemented the monitoring program (as described in its 2005 recovery plan) for longhorn fairy shrimp; consequently, 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 the longhorn fairy shrimp, means that any reduction in vernal pool habitat quantity could adversely affect this species.

Species Management

The over-arching recovery strategy for longhorn fairy shrimp is habitat protection and management. As of 2007, species surveys and monitoring efforts that would provide data to evaluate progress towards recovery had yet to be implemented, and the majority of the management criteria had neither been met nor initiated. However, some criteria of the 2005 vernal pool ecosystem recovery plan have been met or partially met including implementation of habitat management and monitoring plans for certain areas and provisions for management in perpetuity for a majority of the identified habitat locations (U.S. Fish and Wildlife Service 2007). Other management actions, as defined by the 2005 recovery plan for vernal pool ecosystems, which would beneficially impact the conservancy fairy shrimp include the following (U.S. Fish and Wildlife Service 2005).

- Establishing a range-wide recovery implementation team and working groups for each vernal pool region.
- Developing and implementing adaptive management plans, habitat conservation plans, and land use protection measures, and landowner agreements.
- Acquiring and protecting habitat, 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.

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Mission Blue Butterfly (*Plebejus icarioides missionensis*)

Status

State: None

Federal: Endangered

Critical Habitat: None

Recovery Planning: *Recovery Plan for the San Bruno Elfin and Mission Blue Butterflies* (U.S. Fish and Wildlife Service 1984)

Critical Habitat

No critical habitat has been designated for mission blue butterfly.

Range

Historically, mission blue butterfly was present in Twin Peaks in the Mission District in San Francisco, Fort Baker in Marin County, and San Bruno Mountain (U.S. Fish and Wildlife Service 1984). The current known range of the mission blue butterfly include southern Marin, San Francisco, and San Mateo counties in California (Table B-10) (U.S. Fish and Wildlife Service 2010).

Table B-10. Occurrences of Mission Blue Butterfly Documented in the Bay Area O&M HCP Study Area

County	Total Existing Occurrences	Extant Occurrences	Public	Private	Unknown
Alameda	0	0	0	0	0
Contra Costa	0	0	0	0	0
Marin	1	1	1	0	0
Napa	0	0	0	0	0
San Francisco	3	3	3	0	0
San Mateo	10	10	6	5	0
Santa Clara	0	0	0	0	0
Solano	0	0	0	0	0
Sonoma	0	0	0	0	0

Source: California Department of Fish and Wildlife 2015.

Note: One occurrence in San Mateo County is recorded on both public and private land.

Habitat Requirements

Protection from wind appears to be an important habitat quality, and often mission blue butterfly is detected on the leeward side of slopes or within protected road cut areas where host plants are present in suitable densities. Its distribution corresponds closely to the distribution where its host plants and nectar plants are concentrated. The host plants for the mission blue butterfly are three

perennial lupines: silver lupine (*Lupinus albifrons* var. *collinus*), summer lupine (*L. formosus* var. *formosus*), and varied lupine (*L. variicolor*). Mission blues use a variety of native and nonnative species for nectaring (especially thistles), which are found throughout the grassland and coastal scrub plant communities (TRA Environmental Sciences 2010).

Movement

Mission blues have been found to move up to approximately 0.25 miles between habitat patches (Thomas Reid Associates 1982), although the species is likely to move farther when dispersing between habitat areas. It is unlikely that mission blue butterflies are capable of immigrating to, or emigrating from, San Bruno Mountain due to the urbanization barriers surrounding the mountain (U.S. Fish and Wildlife Service 2010).

Typically, mission blue butterflies begin adult flight in March and are most abundant in April. Observations begin to drop off by late May or early June. The timing and duration of the flight season is also influenced by overall seasonal climate as well as microclimate within separate regions of San Bruno Mountain. Late spring rains can delay the onset of the flight season on the mountain while hot spring conditions can shorten it. Mission blue colonies on the warmer, drier south-facing slopes of the mountain begin and end their flight season earlier than colonies on the cooler north-facing slopes (U.S. Fish and Wildlife Service 2010).

Reproduction

The complete life cycle of the Mission blue lasts 1 year. The adult flight period lasts from mid-March to June (Arnold et al. 1994). Oviposition occurs throughout the adult lifespan; adults live for approximately 1 week and females lay eggs at a rate of several dozen a day. Eggs are deposited on leaves, stems, flowers and seed pods of the host plant *Lupinus*. Eggs hatch in approximately 6 to 10 days (Downey 1957).

Population Trend and Threats

The ability to formulate and compare population trend data and the overall abundance of the mission blue butterfly from year to year and from site to site is not possible because the survey methodology was not consistent for each of the years the surveys were completed (U.S. Fish and Wildlife Service 2010).

Recent surveys at the Twin Peaks Natural Area suggest the mission blue butterfly population is critically low, with only one larvae and zero adults observed during surveys conducted from 2005 to 2007. According to the recovery action plan for Twin Peaks, this decline is believed to have been caused largely by massive die-offs of the larval host plants during the warm and wet El Nino year of 1998. In 2009, a reintroduction effort was attempted at Twin Peaks (San Francisco Parks and Recreation Department 2009). The reintroduction effort included habitat restoration and the release of female mission blue butterflies captured at San Bruno Mountain (U.S. Fish and Wildlife Service 2010).

According to surveys in the Marin Headlands from 1998 to 2002, butterfly observations declined along transects, and seasonal totals of fewer than 30 butterflies were recorded in 4 of the 5 years. Between 2003 and 2008, there was a slight increase in mission blue butterfly observations when totals ranged from 40 to 67 (U.S. Fish and Wildlife Service 2010).

The most notable threats to mission blue butterflies are grassland succession to chaparral, host plant competition with exotic invasive plant species, recreational impacts, and infrastructure repair and enhancement projects (U.S. Fish and Wildlife Service 2010).

Although the large majority of remaining mission blue butterfly habitat is found on publicly owned lands, unoccupied suitable habitat may exist on private lands. All mission blue butterfly populations found on Golden Gate National Recreation Area (GGNRA) properties are relatively safe from development activities that would destroy, modify, or curtail habitat (U.S. Fish and Wildlife Service 2010).

The outbreak of an unknown fungal pathogen that infected lupine host plants during the El Nino year of 1998 at Milagra Ridge and Twin Peaks represents a threat to the mission blue butterfly throughout its range. Although many of the lupine host plant patches, and the mission blue butterfly population along with them, have reestablished at both Milagra Ridge and Twin Peaks, the fungus remains present in the soil. The potential spread and outbreaks of this pathogen poses a greater threat to small and isolated populations. Careful attention should be paid to the health and condition of lupine host plants during the next El Nino event. Surveyors should also be aware of this pathogen and precautions should be taken to ensure it is not spread to currently uninfected sites. The overgrowth of exotic invasive plants was recognized as a threat at the time of listing, when the recovery plan was written, and remains one of the most serious present-day threats to mission blue butterfly (U.S. Fish and Wildlife Service 2010).

Species Management

From 2003 to 2007, approximately 6% of the annual San Bruno Mountain Habitat Conservation Plan budget has been used to create and manage habitat restoration islands and additional development-funded and grant-funded restoration projects have been conducted. The GGNRA organizes volunteer groups and school programs to restore habitat and teach the local communities about the mission blue butterfly. Restoration work on San Bruno Mountain and on GGNRA lands has consisted of manual removal, herbicide, and/or mowing to protect native plant communities from exotic invasive plants and to mimic successional processes (U.S. Fish and Wildlife Service 2010).

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Callippe Silverspot Butterfly (*Speyeria callippe callippe*)

Status

State: None

Federal: Endangered

Critical Habitat: None

Recovery Planning: No recovery plan is available for Callippe silverspot butterfly.

Critical Habitat

Critical habitat has not been designated for Callippe silverspot butterfly.

Range

The Callippe silverspot butterfly (*Speyeria callippe callippe*) is endemic to the San Francisco Bay area, and the core populations are in the San Bruno Mountain preserve in San Mateo County and Cordelia Hills in Solano County (U.S. Fish and Wildlife Service 2009). Historically, populations occurred on the west side of San Francisco Bay from Twin Peaks in San Francisco to the vicinity of La Honda in San Mateo County. In the East Bay, populations were known from northwestern Contra Costa County southward to the Castro Valley area of Alameda County (Howe 1975; BUGGY Data Base 2004) (Table B-11). Recently, the species was also observed on the King, Vallejo Swett, and Eastern Swett Ranches in the Sky Valley–Cordelia Hills Area of Solano County (Solano County Water Agency 2006).

Table B-11. Occurrences of Callippe Silverspot Butterfly Documented in the Bay Area O&M HCP Study Area

County	Total Existing Occurrences	Extant Occurrences	Public	Private	Unknown
Alameda	0	0	0	0	0
Contra Costa	0	0	0	0	0
Marin	0	0	0	0	0
Napa	0	0	0	0	0
San Francisco	1	0	1	0	0
San Mateo	5	5	3	2	0
Santa Clara	0	0	0	0	0
Solano	1	1	0	0	1
Sonoma	0	0	0	0	0

Source: California Department of Fish and Wildlife 2015.

Habitat Requirements

The Callippe silverspot occurs in grasslands where its sole larval food plant, johnny jump-up or violet (*Viola pedunculata*) (*Violaceae*), grows. The adult callippe silverspot butterfly nectars on several native and nonnative flowering plants, including nonnative thistles (*Carduus* spp.), Alameda County thistle (*Cirsium quercetorum*), coyote wildmint (*Monardella villosa*), coast buckwheat (*Eriogonum latifolium*), and California buckeye (*Aesculus californica*) (U.S. Fish and Wildlife Service 2009). It has been observed in grazed and ungrazed grasslands. The silverspot occurs in hilly terrain with a mixture of topographic relief. Adults will visit the margins of oak woodlands and riparian areas in search of nectar, as well as disturbed areas if favored nectar plants grow there. The three primary habitat requirements of the Callippe silverspot are listed below.

- Grasslands supporting its larval food plants.
- Hilltops for mate location.
- Nectar plants in the grasslands or nearby oak woodlands, riparian areas, or disturbed areas.

Because the butterfly has been observed flying distances of approximately 1 mile (Thomas Reid Associates 1981), these three habitat features do not necessarily have to coincide.

Movement

During a capture–recapture study on San Bruno Mountain, approximately 5% of recaptured adults moved between 4,800 and 7,400 feet (Thomas Reid Associates 1981). While tracking adult silverspots, Dick Arnold observed them flying distances of about 1 mile to nectar at *Aesculus* blossoms (PG&E file information).

Reproduction

The larval food plant is *Viola pedunculata*. Although this food plant is a perennial, the above ground growth dies back annually. It is often associated with soils characterized by clay deposits in grazed and ungrazed grasslands of the San Francisco Bay Area.

The sequence of life history events for the Callippe silverspot can be described as follows. The butterfly has one generation per year (univoltine). There are four stages in the butterfly's life cycle: egg, larva (i.e., caterpillar), pupa, and adult. Upon hatching from the egg, newly emerged larvae search for a suitable hiding place such as under a rock, where they enter a physiological resting stage, referred to as diapause. Many of the young die during this stage. During the following rainy season, larvae begin feeding on the food plant once it sprouts new foliage, typically in late January or early February. They continue to feed as weather conditions allow them to be active during the next 4 months. Then they pupate and transform into the adult silverspot.

The adult flight season is about 6 to 8 weeks in length, starting in mid-May and terminating in mid-July. Actual starting and ending times can vary by a few weeks from year-to-year and in different locations within the same year. Results of a capture–recapture study indicate that average adult life span is about 5 to 7 days, but individuals have lived in the lab for as long as 10 to 14 days (Arnold 1981).

Population Trends and Threats

Loss and alteration of habitat, primarily through urbanization and habitat degradation by nonnative plants, are some of the factors contributing to the decline of the Callippe silverspot. Overgrazing can be detrimental, but properly managed grazing can enhance Callippe silverspot's grassland habitat by preventing other plant species from outcompeting the butterfly's host plant. Increased frequency of fire may also be detrimental, but this impact would require further study. The population at Joaquin Miller Park–Redwood Regional Park in Oakland (Alameda County) may have gone extinct as no adults have been seen there for approximately 20 years. Because of its shrinking geographic range and threats from poaching, the U.S. Fish and Wildlife Service recognized the Callippe silverspot from the two aforementioned localities as an endangered species. There is no public record of the populations at King, Vallejo Swett, and Eastern Swett Ranches in Solano County and no information is known about their sizes (Solano County Water Agency 2006). The U.S. Fish and Wildlife Service has also recognized dust from quarrying operations as a potential threat to the species, because abundant dust could clog the spiracles of larvae and adults, interfering with their respiration. Callippe silverspot butterflies are also very sensitive to pesticide use. (62 FR 64306–64320).

Species Management

Callippe silverspot butterfly management is outlined in the 5-year review (U.S. Fish and Wildlife Service 2009) that includes the following objectives.

- Review, update, and publish the draft recovery plan as a final draft.
- Determine genetic differences between Comstock's, Liliانا's and Callippe silverspot butterflies, and the morphological differences between them to be used in field identification.

Conduct surveys and purchase properties in historic ranges including locations in Solano, Contra Costa, Alameda, Santa Clara, and San Mateo Counties and develop individual management plans which focus on host and nectar plants. **References**

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Lange's Metalmark Butterfly (*Apodemia mormo langei*)

Status

State: None

Federal: Endangered

Critical Habitat: None

Recovery Planning: *Revised Recovery Plan for Three Endangered Species [Lange's Metalmark Butterfly (Apodemia mormo langei), Antioch Dunes Evening-Primrose (Oenothera deltoids ssp. howellii), and Contra Costa Wallflower (Erysimum capitatum var. angustatum)] Endemic to Antioch Dunes, California* (U.S. Fish and Wildlife Service 1984)

Critical Habitat

Critical habitat for Lange's metalmark butterfly was proposed but never finalized (42 FR 7972). Critical habitat was finalized for Contra Costa wallflower and Antioch Dunes evening-primrose, two co-occurring endangered plant species (42 FR 17910). Critical habitat for the two co-occurring plant species includes the same geographic boundaries as the critical habitat proposed for Lange's metalmark butterfly. Critical habitat for Antioch Dunes evening-primrose and Contra Costa wallflower is located within the northern portion of Antioch, north of Wilbur Avenue, adjacent to the San Joaquin River and bounded by the Fulton Shipyard on the east and developed areas associated with a tank farm on the west (U.S. Fish and Wildlife Service 2009).

Range

The species is only found within the Antioch Dunes in Contra Costa County, specifically within the Stamm and Sardis Units of the Antioch Dunes National Wildlife Refuge and two privately held parcels owned by PG&E. Historically, the species may have used the dunes near Oakley as well (U.S. Fish and Wildlife Service 2009).

Table B-12. Occurrences of Lange's Metalmark Butterfly Documented in the Bay Area O&M HCP Study Area

County	Total Existing Occurrences	Extant Occurrences	Public	Private	Unknown
Alameda	0	0	0	0	0
Contra Costa	1	1	0	0	1
Marin	0	0	0	0	0
Napa	0	0	0	0	0
San Francisco	0	0	0	0	0
San Mateo	0	0	0	0	0
Santa Clara	0	0	0	0	0
Solano	0	0	0	0	0
Sonoma	0	0	0	0	0

Source: California Department of Fish and Wildlife 2015.

Notes: Species only known from the Antioch Dunes in Contra Costa County. Detailed information on the location of this population is suppressed due to the sensitive nature of the occurrence.

Habitat Requirements

Lange's metalmark butterfly is restricted to dune habitat that supports naked stemmed buckwheat (*Erogonum nudum* var. *auriculum*), the sole food source of larval butterflies and the primary nectar plant of adults (U.S. Fish and Wildlife Service 2009).

Movement

Two populations of the species exist within the Antioch Dune National Wildlife Refuge and PG&E's parcels. These populations are relatively close to one another (less than 1 mile), but individuals very rarely interbreed. This species does not move outside of the Antioch Dunes National Wildlife Refuge (U.S. Fish and Wildlife Service 2009).

Reproduction

Adult metalmark butterflies are sexually mature when they emerge from their pupa in August and September and produce one generation per year. Mate location typically occurs on or near naked stemmed buckwheat. Individual adults may mate multiple times within their lifespan, which can last up to two weeks (Xerces Society 2008).

Population Trend and Threats

Lange's metalmark butterfly population levels have undergone high fluctuations, ranging from 2,342 individuals in 1999 to 89 in 2007, but have consistently declined since the peak in 1999. Population trends are highly associated with the abundance and health of Lange's metalmark butterfly's host plant naked stemmed buckwheat, which has been displaced by habitat loss, habitat alteration, and invasion of nonnative grasses and plants [namely winter vetch (*Vicia villosa*)] (U.S. Fish and Wildlife Service 2009). Wildfire has also played a significant role in the reduction of host plants and butterfly larvae within the Antioch Dunes NWR between 1999 and 2006 (Prose 2015).

Species Management

As mentioned, Lange's metalmark butterfly occurs within the Antioch Dunes National Wildlife Refuge, which is managed by the U.S. Fish and Wildlife Service. Annual censuses to determine the total number of individuals are conducted by Antioch Dunes National Wildlife Refuge staff and professional lepidopterists. Removal of nonnative invasive plant species that displace the butterfly's host plant is also carried out under national wildlife refuge management (U.S. Fish and Wildlife Service 2009). A Safe Harbor Agreement for PG&E's privately held parcels has been in place since 2010 and these lands are managed through invasive weed control and host plant propagation to facilitate recovery efforts with the USFWS.

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Bay Checkerspot Butterfly (*Euphydryas editha bayensis*)

Status

State: None

Federal: Threatened

Critical Habitat: Yes

Recovery Planning: *Recovery Plan for Serpentine Soil Species in the San Francisco Bay Area* (U.S. Fish and Wildlife Service 1998)

Critical Habitat

Fifteen units of critical habitat for the bay checkerspot butterfly were designated by the U.S. Fish and Wildlife Service in 2008. The designated critical habitat includes 1,692 acres (685 hectares) in San Mateo County and 16,601 acres (6,718 hectares) in Santa Clara County (Table B-13). These units contain primary constituent elements of critical habitat characterized by the presence of annual or perennial grasslands with little to no overstory, the presence of the primary larval host plant, dwarf plantain (*Plantago erecta*), and at least one of the secondary host plants, and the presence of adult nectar sources for feeding (73 FR 50420).

Table B-13. Critical Habitat Designated for Bay Checkerspot Butterfly in the Plan Area (August 26, 2008)

Unit Number	County	General Location	Size (acres [hectares])
1	San Mateo	San Bruno Mountain Unit: San Bruno Mountain east of the western PG&E transmission corridor and above 500 feet (152 meters) in elevation.	775 (314)
2	San Mateo	Pulgas Ridge Unit: Located along Pulgas Ridge.	179 (72)
3	San Mateo	Edgewood Park Unit	409 (166)
4	San Mateo	Jasper Ridge Unit: Jasper Ridge Biological Preserve, Stanford University.	329 (133)
5	Santa Clara	Metcalf Unit: Lands east of U.S. Route 101, south of Silver Creek Valley Road, north of Metcalf Canyon, and west of Silver Creek.	4,503 (1,822)
6	Santa Clara	Tulare Hill Corridor Unit: Tulare Hill from southern San Jose to west of the crossing of Metcalf Road and U.S. Route 101 in Santa Clara Valley. Connects the Coyote Ridge population (Kirby, Metcalf, San Felipe, and Silver Creek Units) with Santa Teresa Unit.	348 (141)
7	Santa Clara	Santa Teresa Hills Unit: Undeveloped lands north of Bailey Avenue, McKean Road, and Almaden Road, south of developed areas of the city of Santa Clara, and west of Santa Teresa Boulevard.	3,278 (1,327)
8	Santa Clara	Calero Reservoir Unit: Lands within and to the west of Calero County Park.	1,543 (624)

Table B-13. Continued

Unit Number	County	General Location	Size (acres [hectares])
9 (A, B)	Santa Clara	Kalana Hills Unit: Kalana Hills on the southwest side of the Santa Clara Valley between Laguna Avenue and San Bruno Avenue.	170 (69) 56 (22)
10	Santa Clara	Hale Unit: Northwest of the city of Morgan Hill including Murphy Springs Park and private lands within the City of Morgan Hill and unincorporated Santa Clara County.	507 (205)
11	Santa Clara	Bear Ranch Unit: Bear Ranch and surrounding lands west of Coyote Lake in the eastern hills of the Santa Clara Valley.	283 (114)
12	Santa Clara	San Martin Unit: West of San Martin, in the western foothills of the Santa Clara Valley.	467 (189)
13	Santa Clara	Kirby Unit: Southern portion of Coyote Ridge, parallel to U.S. Route 101 from Yerba Buena to Anderson Reservoir, along the eastern slope of the Santa Clara Valley.	5,446 (2,204)

Range

The Bay checkerspot butterfly is known from the southern and eastern portion of the greater San Francisco Bay area. Populations, most of which have been extirpated, were known from San Francisco (Twin Peaks and Mount Davidson), San Mateo County (San Bruno Mountain south to Woodside), Santa Clara County (numerous locations), Alameda County (Oakland hills), and Contra Costa County (Franklin Canyon and Morgan Territory). The subspecies is not known from areas north of San Francisco Bay. To the south, starting in San Benito County, an unnamed form of Edith's checkerspot butterfly replaces the Bay checkerspot butterfly in the area's serpentine grasslands (U.S. Fish and Wildlife Service 2009).

As of 2005, all populations of the Bay checkerspot butterfly on the San Francisco Peninsula were extirpated, including all populations in San Francisco, San Mateo, and northern Santa Clara Counties. Bay checkerspot butterflies were reintroduced to Edgewood County Park and Natural Preserve in April 2007, 2011, and most recently February 2013 (InMenlo 2013). In the East Bay, the Bay checkerspot butterfly has been extirpated from most of its range, but may still exist in Contra Costa County in the general vicinity of Mt. Diablo. Unfortunately, records from Contra Costa County are often confounded by the presence of the relatively common Luesther's checkerspot butterfly. In south-central Santa Clara County, the Bay checkerspot butterfly is still abundant at multiple locations. Most butterflies are found along the ridge that forms the eastern boundary of the Coyote and southern Santa Clara Valleys. This ridge consists of extensive serpentine grasslands, and extends from the Silver Creek Hills, through the Edenvale Hills (sometimes called the East Hills or Coyote Hills) to Pigeon Point just north of Anderson Reservoir Dam. There are multiple populations of the butterfly along this ridge. There are smaller, scattered populations of the butterfly along the eastern foothills south of the Anderson Reservoir dam and along the western foothills of the Coyote Valley (U.S. Fish and Wildlife Service 2009). (Table B-14).

Table B-14. Occurrences of Bay Checkerspot Butterfly Documented in the Bay Area O&M HCP Study Area

County	Total Existing Occurrences	Extant Occurrences	Public	Private	Unknown
Alameda	2	0	1	0	1
Contra Costa	0	0	0	0	0
Marin	0	0	0	0	0
Napa	0	0	0	0	0
San Francisco	2	0	1	0	1
San Mateo	6	1	3	3	1
Santa Clara	11	11	2	7	2
Solano	0	0	0	0	0
Sonoma	0	0	0	0	0

Source: California Department of Fish and Wildlife 2015.

Note: One duplicate recorded occurrence falls within Alameda and Contra Costa Counties.

Habitat Requirements

At the present time, the Bay checkerspot butterfly reproduces only in serpentine grasslands. These grasslands support numerous native plant species including the larval host plants, dwarf plantain (*Plantago erecta*), purple owl's clover (*Castilleja exserta*), and exerted Indian paintbrush (*Castilleja exserta* spp. *venusta*), at densities that are high enough to sustain butterfly larvae (U.S. Fish and Wildlife Service 2009). All currently occupied habitats of the species occur on serpentine or serpentine-like grassland that support at least two of the larval host plants, although the range of all host plants is larger (i.e., are found outside of serpentine-grasslands and distributed more widely outside of the study area) than that of the Bay checkerspot butterfly. Within the study area these nutrient-poor serpentine habitats likely allow these host plants to compete with other nonnative grassland species that would typically out-compete them. These grasslands also tend to support many additional species that can provide nectar to the adult butterflies.

Topography is an additional factor determining habitat quality and a variety of microclimates are needed for Bay checkerspot butterflies to persist (Singer and Ehrlich 1979; Fleishman et al. 2000). Relatively cool and moderate microclimates are critical to a butterfly population's ability to survive drought (Weiss and Murphy 1993) while warm slopes appear to be important during wet/cool years (Weiss et al. 1988). Sites lacking cool and moderate slope exposures are unable to continuously support populations of Bay checkerspot butterflies.

Patch size and proximity to other sites supporting butterflies are also factors in determining suitability of particular serpentine grasslands for Bay checkerspot butterfly populations. In general, as patch size drops below several hectares it becomes increasingly unlikely that the grassland can support a viable population. However, given the dispersal capabilities of the butterfly, small patches of serpentine grassland located a few hundred meters from groups of other small patches can support butterflies. Additionally, many relative small patches of serpentine grassland located within several kilometers of the region's large checkerspot butterfly populations are frequently occupied (U.S. Fish and Wildlife Service. 2009).

Weather is an important determinant of habitat quality (Dobkin et al. 1987; Hellmann 2002). Growing season rainfall, which delays senescence of larval host plants, is favorable for the butterfly. During periods of favorable weather, Bay checkerspot butterfly populations expand in extent and abundance. During these periods, grasslands generally considered too warm, too small, or too distant can be occupied by the butterfly.

Conversely, during periods in which there is relatively little growing season rainfall, the larval host plants senesce earlier in the year, and larvae in many locations cannot obtain sufficient food. This results in extensive contractions of the large populations as the distribution of butterflies shifts to cooler microclimates (Weiss et al. 1988). Many of the smaller and flatter patches of serpentine grassland tend to lose butterflies during these periods.

Movement

Adult Bay checkerspot butterflies are relatively agile, and can easily fly several kilometers (Harrison 1989). Bay checkerspot butterflies have a general propensity to remain associated with serpentine grasslands, and most movements are within a single patch of serpentine grassland (Ehrlich et al. 1980; Ehrlich and Murphy 1981). Within a given patch, butterflies will frequently fly from one area to another, looking for potential mates, feeding on nectar on scattered groups of flowers, avoiding wind, avoiding other butterflies (mated females in particular tend to avoid males), and looking for oviposition sites. In smaller habitat patches, this means that individual butterflies often fly from one end of the patch to the other. In large habitat patches, those several kilometers in length or width, individual butterflies will generally stay in a portion of the overall site, usually moving much less than a kilometer from the point where they eclosed. It is assumed that butterflies may use any land-cover type as a movement corridor if the land cover is adjacent to serpentine grassland. Harrison (1989) documented colonization up to 2.8 miles (4.5 kilometers) from Coyote Ride, and one individual moved 3.5 miles (5.6 kilometers). Another marked individual was documented to have flown 4.7 miles (7.6 kilometers) (U.S. Fish and Wildlife Service 1998).

Reproduction

The adult flight season is typically about 4 to 6 weeks in length, generally starts in March, and terminates in late April to early May. Actual starting and ending times can vary by several weeks from year to year. The majority of female butterflies are mated soon after eclosion, occasionally before their wings have hardened fully. Although the Bay checkerspot butterfly is considered an annual univoltine species, it is possible that under some conditions, the butterfly can extend its life cycle for several years.

Eggs generally are laid in masses of 50 to 200, typically on the base of the larval host plants (Labine 1968; Singer 1972). Egg masses are occasionally laid on other plants or substrate such as rocks or dirt. The primary larval host plant species is the annual dwarf plantain (*Plantago erecta*). Two annual species of owl's-clover (*Castilleja* sp.) and purple owl's-clover (*C. exserta* ssp. *exserta*) are also used as larval host plants (Hickman 1993). Eggs hatch in approximately 10 days.

Population Trend and Threats

Regional population dynamics of the Bay checkerspot butterfly tend to be complex. The abundance of individual populations increases or decreases in response to site-specific characteristics (topography, patch size, management regime, etc.) and weather. Likewise, in expansive patches of

serpentine grassland, particularly those with considerable topographic diversity, shifts in butterfly density across the landscape are common. Most of these shifts in density across the landscape are expansions and contractions, with the butterfly population shifting from cool and moderate microclimates during dry years, to warmer microclimates during rainy years, and then back to the cool and moderate microclimates during the next drought (Weiss et al. 1988).

Factors implicated in these multiple extinctions on the Peninsula and in the East Bay include direct habitat loss through development, habitat degradation due to nonnative species (likely exacerbated by nitrogen-containing pollutants), successional changes from grasslands to scrub and chaparral, periods of unfavorable or highly variable weather, and disruption of regional metapopulation dynamics. The detrimental impacts of these factors are more problematic for the butterflies because the extent of the serpentine grasslands of the Peninsula and East Bay is limited.

Species Management

The U.S. Fish and Wildlife Service published a recovery plan for serpentine plants and animals of the San Francisco Bay area in 1998; this plan includes the Bay checkerspot butterfly. The primary recovery tasks identified for the butterfly are protection of existing habitats, along with their habitat restoration and management, plus population monitoring and further research.

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San Bruno Elfin Butterfly (*Incisalia mossii bayensis*)

Status

State: None

Federal: Endangered

Critical Habitat: None

Recovery Planning: *Recovery Plan for the San Bruno Elfin and Mission Blue Butterflies* dated October 1984 (U.S. Fish and Wildlife Service 1984)

Critical Habitat

No critical habitat has been designated for San Bruno elfin butterfly.

Range

All known locations are restricted to San Mateo, Contra Costa, and Marin Counties, California, where several populations are known from San Bruno Mountain, Milagra Ridge, the San Francisco Peninsula Watershed, and Montara Mountain (Entomological Consulting Services 2007) (Table B-15).

Table B-15. Occurrences of San Bruno Elfin Butterfly Documented in the Bay Area O&M HCP Study Area

County	Total Existing Occurrences	Extant Occurrences	Public	Private	Unknown
Alameda	0	0	0	0	0
Contra Costa	1	1	1	0	0
Marin	2	2	2	0	0
Napa	0	0	0	0	0
San Francisco	0	0	0	0	0
San Mateo	7	7	5	2	1
Santa Clara	0	0	0	0	0
Solano	0	0	0	0	0
Sonoma	0	0	0	0	0

Source: California Department of Fish and Wildlife 2015.

Note: One recorded occurrence from San Mateo County is on public and private lands.

Habitat Requirements

The San Bruno elfin butterfly is found in coastal chaparral, on steep north facing slopes, and in the fog-belt of the mountains near San Francisco Bay. It closely follows the narrow, fragmented distribution of its larval host plant, stonecrop, (*Sedum spathulifolium*) (Brown 1969). Stonecrop is a

low growing succulent that tends to be found in the shallow weathered soils associated with rocky substrates that occur at 902 to 1,066 feet (275 to 325 meters) elevation that occurs in both short-statured coastal scrub and grassland vegetation, and readily invades roadcuts and old quarry faces provided the aspect is correct. According to Weiss (1993), habitat topography may be limiting for San Bruno elfin butterfly populations in certain cases. Because of low winter sun angles, the steepest habitat areas may be in the deep shade for much of the day, limiting access by adults (Weiss and Murphy 1991). Steep, northeast-facing slopes receive direct morning light and, when winds are calm, provide excellent habitat (Weiss 1993).

Movement

Local populations of the San Bruno elfin butterfly correspond closely to patches of the larval host plant, which range from a hundred square meters to several hectares in extent (U.S. Fish and Wildlife Service 2010). Adults are highly sedentary, typically moving less than 100 meters (Arnold 1983), with a maximum recorded movement of 800 meters (U.S. Fish and Wildlife Service 1984).

Reproduction

The adult flight season extends from late-February to mid-April, during the later part of the rainy season in northern California, but before the onset of persistent summer fog. Courtship, mating, and reproduction are all carried out in the immediate space around, stonecrop. Females oviposit throughout the flight season; laying eggs in small clusters or strings, at a rate of several dozen a day, on the foliage of stonecrop. Eggs hatch in about a week, depending on weather conditions and microclimate (U.S. Fish and Wildlife Service 2010).

Population Trend and Threats

According to Weiss (1993), this butterfly was probably never common, because of specialized habitat requirements. It exists in local discrete populations of ten to several hundred adults on steep, north-facing slopes in the fog belt from 200 to 5,000 feet elevation (Black and Vaughan 2005). A thousand or more adults may exist in about 15 total subpopulations on San Bruno Mountain in a good year. Montara Mountain supports about 10 local populations, and Milagra Ridge supports about four. Based on the survey reports for San Bruno Mountain and the San Francisco Peninsular Watershed, the overall abundance of the San Bruno elfin butterfly at these sites appears to have remained stable. The abundance and stability of this species at sites on Montara Mountain and nearby peaks is unknown, but it is believed viable populations persist (U.S. Fish and Wildlife Service 2010).

Current threats include public infrastructure development (except on San Bruno Mountain where take as a result of development is not permitted), poaching, small population size, the effects of reduced host and nectar plant density due to exotic invasive plants and forbs, and climate change. Although the number of known colonies and the known distribution has increased and the threat of suburban and urban development no longer pose as high of a threat, the amount of area occupied by the host plant has not been noted to be increasing and the sustainability of the Milagra Ridge population calls into question the ability of any of the smaller and isolated populations to sustain themselves in perpetuity without reintroduction efforts in the event of extirpation (U.S. Fish and Wildlife Service 2010).

Species Management

All of the following species management activities listed below are from the recovery plan (U.S. Fish and Wildlife Service 2010).

- Protect in perpetuity San Bruno elfin habitat on properties near Montara Mountain.
- Create a San Bruno elfin butterfly working group to develop a consistent monitoring and surveying scheme and map all currently known habitat locations, including size and extent of host plant cover.
- Develop measureable recovery criterion, including colony sizes and dynamics necessary for a population to be self-sustaining in perpetuity.
- Search for new locations on SFPUC lands.
- Develop management plans for all habitat locations based on the findings of the working group and create local captive propagation facility if determined necessary along with a plan for population augmentation and reintroduction if determined necessary by the working group.

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Delta Green Ground Beetle (*Elaphrus viridis*)

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

Critical habitat for delta green ground beetle is located in Solano County within the western portion of section 12 and the southeast quadrant of section 14, the southwest quadrant of section 13, the northeast quadrant of section 23, and northwest quadrant of section 24 of the U.S. Geological Survey 7.5-minute Dozier Quadrangle (U.S. Fish and Wildlife Service 1980). Primary constituent elements of critical habitat for this species have not been characterized.

Table B-16. Critical Habitat Designated for Delta Green Ground Beetle in the Plan Area (August 8, 1980)

Unit Number	County	General location	Size (acres [hectares])
1	Solano	Dozier Unit: Between Ulatis Creek and Banker Slough, north and east of State Route 113 and west of old railroad right-of-way.	350 (141)
2	Solano	Jepson Prairie Unit: Jepson Prairie Preserve (University of California–Davis) including Olcott Lake, south and west of State Route 113.	650 (263)

Range

The species is known to occur in the greater Jepson Prairie area in south Solano County, California.

Table B-17. Occurrences of Delta Green Ground Beetle Documented in the Bay Area O&M HCP Study Area

County	Total Existing Occurrences	Extant Occurrences	Public	Private	Unknown
Alameda	0	0	0	0	0
Contra Costa	0	0	0	0	0
Marin	0	0	0	0	0
Napa	0	0	0	0	0
San Francisco	0	0	0	0	0
San Mateo	0	0	0	0	0
Santa Clara	0	0	0	0	0
Solano	7	6	1	1	5
Sonoma	0	0	0	0	0

Source: California Department of Fish and Wildlife 2015.

Habitat Requirements

Delta green ground beetle is associated with vernal pool complexes and areas adjacent to other seasonal wetlands in the grassland land cover type. The beetle is only known to occur in areas with high clay-content soils. It is believed that the deep fissures that form in these soils with high clay content provide refugia in which the beetle pupates. Delta green ground beetles feed on springtails and other invertebrates (U.S. Fish and Wildlife Service 2005).

Movement

Adult delta green ground beetles emerge from pupation after the onset of rain during the winter season. Adults are active during the winter and spring wet season, as most observations of the species have been made in February, March, and April. Adults disperse by flying, but no large migratory movements of the beetle are known (U.S. Fish and Wildlife Service 2005).

Reproduction

Male beetles are believed to use olfactory cues to locate females and, once located through direct visual contact, the beetles mate. Delta green ground beetle is believed to generate one brood per year, with females laying eggs during early winter (U.S. Fish and Wildlife Service 2005).

Population Trend and Threats

Very little data exists regarding delta green ground beetle population numbers, but the delta green ground beetle's highly limited habitat indicates that the species is vulnerable to impacts on its habitat. Changes in vegetation structure near vernal pools, specifically the removal of native grasslands, and increased densities of nonnative plants have likely adversely affected the species by reducing the types and abundance of its prey. Cattle grazing is not compatible with delta green ground beetle populations. Cattle tend to convert gentle muddy slopes, the beetle's preferred microhabitat, to a steeper slope that may adversely affect beetles. Additionally, exploratory drilling

for natural gas reserves and ditch operation may have negatively affected the species habitat and associated hydroperiod of vernal pools (U.S. Fish and Wildlife Service 2005).

Species Management

Because of the limited amount of delta green ground beetle habitat remaining and the threat to much of the habitat, the most important recovery strategy is to protect the remaining suitable grassland and vernal pool habitat in the greater Jepson Prairie area. The majority of critical habitat is within the Jepson Prairie Preserve managed by the Solano County Land Trust. This land is actively grazed by sheep and managed for the special-status species that occur there (U.S. Fish and Wildlife Service 2005).

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Amphibians

California Tiger Salamander (*Ambystoma californiense*)

Status

State: Threatened

Federal: Threatened (Central California distinct population segment [DPS]);
Endangered (Santa Barbara County DPS and Sonoma County DPS)

Critical Habitat: Yes

Recovery Planning: Draft Recovery Plan for the Santa Rosa Plain (U.S. Fish and Wildlife Service 2014)

Critical Habitat

Critical habitat for California tiger salamander was established by the U.S. Fish and Wildlife Service in a final rule on August 23, 2005 (70 FR 49379) where 199,109 acres (80,577 hectares) of critical habitat in 19 counties for the Central California DPS population were designated. In a final decision on critical habitat on December 14, 2005 (70 FR 74137), the U.S. Fish and Wildlife Service excluded approximately 17,418 acres (7,049 hectares) of critical habitat for the Sonoma County DPS of California tiger salamander in 2005, but then re-proposed the same critical habitat in Sonoma County in May 2009 totaling 74,223 acres (30,037 hectares) (U.S. Fish and Wildlife Service 2009). In a final rule on August 31, 2011 (76 FR 54346 54372), the U.S. Fish and Wildlife Service adjusted critical habitat for the Sonoma County DPS to cover only 47,383 acres (19,175 hectares) of the Santa Rosa Plain, within Sonoma County. There are a total 246,492 acres (99,752 hectares) of critical habitat are designated for California tiger salamander in California (Table B-18). These units contain primary constituent elements of critical habitat characterized by standing bodies of fresh water that remain inundated for a minimum of 12 consecutive weeks, and upland habitat adjacent to breeding ponds that provide refugia and allow for movement between sites (76 FR 54355).

Table B-18. Critical Habitat Designated for California Tiger Salamander in the Plan Area (Central California DPS and Sonoma County DPS)

Unit Number	County	General Location	Size (acres [hectares])
Central California DPS			
2	Solano	Jepson Prairie Unit: South of Dixon, west of State Route 113, north of Creed Road, and east of Travis Air Force Base.	5,699 (2,306)
18	Alameda	Doolan Canyon Unit: South of the Contra Costa County line near Collier Canyon Road on the east and the south, and the City of Dublin on the west.	1,178 (476)
Central California DPS continued			
3	Santa Clara	Alameda Creek Unit: North of Calaveras Reservoir, east of Sugar Butte, west of Fremont, and south of Livermore.	619 (250)
5	Santa Clara	Poverty Ridge Unit: West of Alum Rock, south of the Alameda and Contra Costa County line, west of Kincaid Road, and north of Master Hill.	2,814 (1,138)
6	Santa Clara	Smith Creek Unit: West of Sugarloaf Mountain, south of Packard Ridge, east of Masters Hill, and north of Panochita Hill.	7,976 (3,227)
7	Santa Clara	San Felipe Creek Unit: West of Silver Creek, south of Panochita Hill, east of Bollinger Mountain, and north of Morgan Hill.	9,080 (3,674)
8	Santa Clara	Laurel Hill Unit: East of Morgan Hill, south of San Jose, west of the Santa Cruz Mountains, and north of Croy Ridge.	2,535 (1,026)
9	Santa Clara	Cebata Flat Unit: Generally west of Gilroy, south of Henry Coe State Park, east of Lake Mountain, and north of Canada Road.	2,934 (1,187)
10a, 10b	Santa Clara	Lions Peak Unit: Generally east of U.S. Route 101, south of Morgan Hill, north of Hecker Pass Highway, and west of Uvas Reservoir.	892 (361) Unit 10a: 194 (79) Unit 10b: 698 (282)
11	Santa Clara	Braen Canyon Unit: Southern Santa Clara County generally west of Gilroy, south of Kelly Lake, east of Pacheco Lake, and north of Jamison Road.	6,991 (2,829)
12	Santa Clara and San Benito	San Felipe Unit: Generally west of Camadero, south of Kickham Peak, east of San Joaquin Peak, and north of Dunneville.	6,642 (2,687)
Sonoma County DPS			
Santa Rosa Plain	Sonoma	Santa Rosa Plain	47,383 (19,175)

Range

California tiger salamander 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 1985). Currently, California tiger salamander

occurs in six populations in the Central Valley and Sierra Nevada foothills from Yolo County south to Tulare County, and in the coastal valleys and foothills from Sonoma County south to Santa Barbara County (Zeiner et al. 1988).

The six populations of California tiger salamander are found in Sonoma County, Santa Barbara County, the San Francisco Bay Area (central and southern Alameda County and Santa Clara County), western Stanislaus County, Merced County, San Benito County, the Central Valley (Solano County, Yolo County, Sacramento County, east Contra Costa County, northeast Alameda County, San Joaquin County, Stanislaus County, Merced County, and northwest Madera County), southern San Joaquin Valley (Madera County, central Fresno County, northern Tulare County, and Kings County), and the Central Coast Range (south Santa Cruz County, Monterey County, northern San Luis Obispo County, western San Benito County, Fresno County, and Kern County) (68 FR 28648–28670). Isolated populations are found at the Gray's Lodge Wildlife Area in Butte County and at Grass Lake in Siskiyou County (Zeiner et al. 1988).

Table B-19. Occurrences of California Tiger Salamander Documented in the Bay Area O&M HCP Study Area

County	Total Existing Occurrences	Extant Occurrences	Public	Private	Unknown
Alameda	187	170	81	53	36
Contra Costa	175	165	75	56	44
Marin	0	0	0	0	0
Napa	0	0	0	0	0
San Francisco	0	0	0	0	0
San Mateo	1	0	0	0	1
Santa Clara	158	137	70	68	20
Solano	28	27	3	12	13
Sonoma	79	77	21	34	21

Source: California Department of Fish and Wildlife 2015.

Note: Some recorded occurrences are in more than one property type: public, private, and/or unknown.

Habitat Requirements

California tiger salamander requires two major habitat components: aquatic breeding sites and terrestrial aestivation or refuge sites. California tiger salamander inhabits valley and foothill grasslands and the grassy understory of open woodlands, usually within 1.3 miles (2.1 kilometers) of water (Jennings and Hayes 1994). California tiger salamander is terrestrial as an adult and spends most of its time underground in subterranean refuge sites, or *refugia*. Adults emerge from underground refuge areas 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 that do not support predatory fish or bullfrogs (Stebbins 1972; Zeiner et al. 1988). 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

require small-mammal burrows (e.g., California ground squirrel) for cover during the nonbreeding season and during migration to and from aquatic breeding sites (Zeiner et al. 1988). Petranks (1998) estimated that 83% of California tiger salamanders utilize rodent burrows for upland refugia (68 FR 28648–28670). Tiger salamanders also use logs, piles of lumber, and shrink-swell cracks in the ground for cover (Holland et al. 1990). California tiger salamander can overwinter in burrows up to 1.3 miles from their breeding sites (Jennings and Hayes 1994; Trenham et al. 2001).

Movement

The proximity of refuge sites to aquatic breeding sites is strongly correlated with habitat occupancy with more distant refugia less likely to be occupied than closer refugia. Adult tiger salamanders have been observed up to 1.3 miles (2.1 kilometers) from breeding ponds (69 FR 47212–47248). A trapping effort in Contra Costa County captured California tiger salamanders at distances ranging from 2,641 feet (805 meters) to 3,960 feet (1,207 meters) from the nearest breeding/aquatic site (69 FR 47212–47248). Trenham (2001) observed California tiger salamanders moving up to 2,200 feet 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, Lored 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 1 mile (1.6 kilometers), 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 California tiger salamander 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). Just like adults, juveniles have been observed to migrate up to 1 mile from breeding pools to upland areas (69 FR 47212–47248). Dispersal distances vary depending on the availability of suitable habitat and may increase with an increase in precipitation (65 FR 57241).

Table B-20. Documented California Tiger Salamander Movement

Type	Distance/Area	Location of Study	Source
Adult dispersal	2,040 feet (620 meters)	Jepson Prairie Preserve, Solano County	Trenham and Schaffer 2005
Adult dispersal	2,641 to 3,960 feet (805 to 1,207 meters)	Contra Costa County	69 Federal Register 47212–47248
Adult dispersal	2,200 feet (670 meters)	Monterey County	Trenham 2001
Adult dispersal	6,864 feet (2.1 kilometers)	Not reported	69 Federal Register 47212–47248
Adult dispersal	26–423 feet (8 to 129 meters)	Contra Costa County	Lored et al. 1996
Juvenile dispersal	20 to 187 feet (6 to 57 meters)	Contra Costa County	Lored et al. 1996
Juvenile dispersal	2,066 feet (630 meters)	Jepson Prairie Preserve, Solano County	Trenham and Schaffer 2005

Reproduction

Adult California tiger salamanders congregate at aquatic breeding sites during warm rains, primarily between November and February (Shaffer and Fisher 1991; 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 with winter and 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 (Stebbins 1972; Shaffer and Fisher 1991; 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 57241). Juveniles disperse from aquatic breeding sites to upland habitats after metamorphosis (Storer 1925; Holland et al. 1990).

Population Trend and Threats

Available data suggest that most California tiger salamander 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 California tiger salamanders 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). California tiger salamander populations have experienced dramatic declines throughout the historical range of the species, particularly in the Central Valley. California tiger salamander 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 1985). Other threats to California tiger salamander 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 strikes; 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 California tiger salamander: control nonnative tiger salamanders and manage, restore, or create California tiger salamander

habitat. Listed below are specific management activities proposed for the protection of California tiger salamander populations.

- Retain broad, contiguous sections of undeveloped shoreline (30% of total perimeter) around California tiger salamander breeding sites to minimize straying of migrating individuals into unsuitable habitats (per Trenham and Cook 2008).
- Encourage additional emphasis on California tiger salamander habitats in California Rangeland Coalition Conservation Focus Areas.
- Translocate/relocate California tiger salamanders to establish new populations, remediate for lost or compromised habitat, and/or prevent further loss of individuals, following the guidelines authored by Shaffer et al. (2008).
- Encourage public and private stock pond management practices consistent with California tiger salamander conservation as described in the *Special Rule Exempting Routine Ranching Activities* (69 FR 47212–47248).
- Control rodents and mosquitoes on grazing lands in accordance with the *Special Rule Exempting Routine Ranching Activities* (69 FR 47212–47248). On non-grazing lands, avoid introductions of mosquitofish into California tiger salamander breeding ponds.
- Consider establishment of a California tiger salamander target population and mitigation goals within the California tiger salamander distinct population segments identified by the U.S. Fish and Wildlife Service (California Department of Fish and Game 2010).

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California Red-Legged Frog (*Rana draytonii*)

Status

State: Species of Special Concern

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 19243). Revised critical habitat was designated March 2010 (75 FR 12816). There are 1,636,609 total acres (662,312 hectares) of critical habitat designated for California red-legged frog in California (Table B-21). These units contain primary constituent elements of critical habitat characterized by bodies of fresh water which must be inundated for at least 20 weeks for aquatic breeding habitat or that provide shelter and dispersal benefits, and upland habitat adjacent to or surrounding habitat up to a distance of 1 mile for dispersal (75 FR 12836).

Table B-21. Critical Habitat Designated for California Red-Legged Frog in the Plan Area (March 17, 2010)

Unit Number	County	General Location	Size (acres [hectares])
NAP-1	Napa	Wragg Creek: East-central Napa County, the unit is bisected by State Route 128, and lies largely to the west of State Route 121.	2,524 (1,022)
MRN-1	Marin	Northwestern Marin County, west of State Route 1 along the Estero de San Antonio.	7,840 (3,173)
MRN-2	Marin	North-central Marin County, east of State Route 1 and north of Point Reyes Petaluma Road.	22,559 (9,129)
MRN-3	Marin	Point Reyes Peninsula: Western Marin County, west of State Route 1.	33,600 (13,598)
SOL-1	Solano	Sky Valley: Southwestern Solano County and a portion of extreme southeastern Napa County, south of Interstate 80 and west of Interstate 680.	11,971 (4,845)
SOL-2	Solano	Jameson Canyon: Southwestern Solano County and a portion of extreme southeastern Napa County, south of Interstate 80 and west of Interstate 680	3,360 (1,360)
SOL-3	Solano	American Canyon: Southwestern Solano County and a portion of extreme southeastern Napa County, north of Interstate 80 and south of Highway 12	4,597 (1,861)
CCS-1	Contra Costa	Berkeley Hills: Western Contra Costa County, south of Alhambra Valley Road and north of Bear Creek Road.	13,845 (5,603)

Table B-21. Continued

Unit Number	County	General Location	Size (acres [hectares])
CCS-2A	Contra Costa	Mount Diablo: Eastern Contra Costa County and northeastern Alameda County, north of Highway 580	4,227 (1,711)
CCS-2B	Contra Costa	Mount Diablo: Eastern Contra Costa County and northeastern Alameda County, north of Highway 580	44,470 (17,996)
ALA-1A	Alameda	Dublin Canyon: Northwestern Alameda County and southern Contra Costa County, north of Highway 580, and west of Dublin, CA.	3,650 (1,477)
ALA-1B	Alameda	Cook Canyon: Northwestern Alameda County, south of Highway 580.	10,159 (4,111)
ALA-2	Alameda	Arroyo Valle: Southwestern Alameda County, south of Highway 580 at Altamont Pass southeast into San Joaquin County and southwest into Santa Clara County near Arroyo Hondo and Calaveras Reservoir	153,624 (62,169)
SNM-1	San Mateo	Cahill Ridge: North central San Mateo County, west of Interstate 280 and south of Pacifica CA.	34,952 (14,145)
SNM-2	San Mateo	Pescadero: Southwestern San Mateo County, south of Tunitas Creek, west of State Route 35, south into Santa Cruz County near big Basin Redwoods State Park.	96,138 (38,906)
STC-1	Santa Clara	Cañada de Pala: North-central Santa Clara County, south of Calaveras Reservoir near Los Buellis Hills south along the ridgeline east of Santa Clara Valley to Anderson Lake and Henry Coe State Park.	52,283 (21,158)
STC-2	Santa Clara	Wilson Peak: Southeastern Santa Clara County, to western Stanislaus County down to northern San Benito County from Henry Coe State Park south to Mount Ararat (Merced County) and Mariposa Peak (San Benito County) to San Felipe (Santa Clara County).	204,718 (82,846)

Range

The historic range of the California red-legged frog extended along the coast from the vicinity of Point Reyes National Seashore, Marin County, California, and inland from the vicinity of Redding, Shasta County, California, southward to northwestern Baja California, Mexico. Their habitat once encompassed 46 counties in California, but now remains in only 238 streams or drainages in 31 counties (U.S. Fish and Wildlife Service 2007). Recent findings show that the northern coastal distribution of the species extends into southern Mendocino County (73 FR 53492).. They occur in wetlands at elevations of up to 4,000 feet (1,219 meters), west of the Cascade crest.

California red-legged frogs are still locally abundant within portions of the San Francisco Bay Area and the central coast of California. Within the remaining distribution of the species, only isolated populations occur in the Sierra Nevada, northern Coast Ranges, and northern Transverse Ranges. The species is probably extirpated from the southern Transverse and Peninsular Ranges but is still present in Baja California, Mexico (U.S. Fish and Wildlife Service 2007).

Table B-22. Occurrences of California Red-Legged Frog Documented in the Bay Area O&M HCP Study Area

County	Total Existing Occurrences	Extant Occurrences	Public	Private	Unknown
Alameda	156	153	72	61	23
Contra Costa	187	186	38	63	40
Marin	157	157	144	10	3
Napa	6	5	1	4	1
San Francisco	8	8	8	0	0
San Mateo	97	97	34	44	19
Santa Clara	140	140	90	46	4
Solano	13	13	6	6	1
Sonoma	38	38	9	22	7

Source: California Department of Fish and Wildlife 2015.

Note: Some recorded occurrences are in more than one property type: public, private, and/or unknown.

Habitat Requirements

Within their range, California red-legged frogs occur from sea level to about 4,000 feet (1,219 meters) above sea level (U.S. Fish and Wildlife Service 2002). Almost all of the documented occurrences of this species, however, are located below 3,500 feet (1,067 meters) (California Department of Fish and Wildlife 2015). Aquatic sites include a variety of habitats such as streams and creeks, deep pools, backwaters, ponds, marshes, sag ponds, dune ponds, and lagoons. Breeding adults are commonly found in deep (more than 2 feet [0.6 meter]) still or slow-moving water with dense, shrubby riparian or emergent vegetation (Hayes and Jennings 1989). 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 disperse from 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, California red-legged frogs use a variety of upland habitats (U.S. Fish and Wildlife Service 2002). Generally, these include riparian, grassland, humid conifer forest, shrubland, and oak woodland (U.S. Fish and Wildlife Service 2002). Suitable upland refugia includes riparian habitat consisting of riparian thickets, shrubby riparian growth (arroyo willow), and emergent plants (cattails, bulrushes) (U.S. Fish and Wildlife Service 2002). Small mammal burrows, coarse woody debris, and moist leaf litter in conifer forests, shrublands, and oak woodlands offer important cover for California red-legged frogs when they temporarily move out of aquatic habitat (Jennings and Hayes 1994; U.S. Fish and Wildlife Service 2002). Grasslands and oak woodlands that surround aquatic sites (up to 300 feet [91 meters]) provide humid woods and meadows as habitat; dispersal corridors between riparian/aquatic areas and grasslands may also be present if corridors are sufficient in width (300 feet [91 meters]) (59 FR 4888–4895; 61 FR 25813–25833).

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 habitats a median distance of 500 feet (152 meters) from the water's edge (U.S. Fish and Wildlife Service 2002; Fellers and Kleeman 2007). Movement distances for the species are listed below in Table B-23. Adult California red-legged frogs have been observed using large cracks in the bottom of dried ponds as refugia (Alvarez 2004). Although California red-legged frogs typically remain near streams or ponds, marked and radio-tagged frogs have been observed to move more than 2 miles (3.2 kilometers) through upland habitat (Bulger et al. 2003). These movements are typically made during wet weather and at night (U.S. Fish and Wildlife Service 2002). Additionally, California red-legged frogs sometimes disperse in response to receding water, which often occurs during the driest time of the year (U.S. Fish and Wildlife Service 2005).

Table B-23. Documented California Red-Legged Frog Movement

Location of Study	Distance	Source
Santa Cruz County	0.25 to 2 miles (402 to 3,219 meters)	Bulger et al. 2003
Marin County	100 to 4,600 feet (30 to 1,402 meters)	Fellers and Kleeman 2007
Ventura County	9 to 48 feet (3 to 15 meters)	Rathbun et al. 1993; U.S. Fish and Wildlife Service 2005
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 April (Storer 1925; U.S. Fish and Wildlife Service 2002). Males usually appear at the breeding sites 2 to 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 to 14 days, depending on water temperatures (U.S. Fish and Wildlife Service 2002). Those eggs develop into tadpoles in 20 to 22 days. Larvae metamorphose in approximately 3 to 7 months, typically between July and September (Storer 1925; Wright and Wright 1949; U.S. Fish and Wildlife Service 2002). Males usually attain sexual maturity at 2 years of age and females at 3 years of age.

Population Trend and Threats

Although population numbers are not precisely known, the U.S. Fish and Wildlife Service estimates that California red-legged frog populations are declining at a rapid rate (U.S. Fish and Wildlife Service 2002). A 70% reduction in the geographic range of this species occurred in the early to mid-1990s (U.S. Fish and Wildlife Service 2002). This decline was primarily a result of habitat loss and 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 2009, only six populations, discovered after 1997, are known in the Sierra Nevada. South of Santa Barbara, there are only two known extant populations, located on the Santa Rosa Plateau in Riverside County, and in Ventura County. 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 2010).

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 will involve protecting existing populations by reducing threats to habitat, restoring and creating habitat that will be protected and managed in perpetuity, surveying and monitoring populations and conducting research on the biology of these populations, and reestablishing populations within its historic range. This plan also identifies these additional management policies.

- Enhance water flow and quality.
- Control or eliminate nonnative species and predators such as plants, vertebrates, and invertebrates. Implement watershed management and protection plans.

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Reptiles

Alameda Whipsnake (*Masticophis lateralis euryxanthus*)

Status

State: Threatened

Federal: Threatened

Critical Habitat: Yes

Recovery Planning: *Draft Recovery Plan for Chaparral and Scrub Community Species East of San Francisco Bay, California* (U.S. Fish and Wildlife Service 2002)

Critical Habitat

Critical habitat for Alameda whipsnake is designated in the following counties in California: Alameda, Contra Costa, and San Joaquin (71 FR 58176–58231). There are 62,680 total acres of critical habitat designated for Alameda whipsnake in California. These units contain primary constituent elements of critical habitat are in areas that support scrub communities, grasslands and various oak woodlands that are linked to scrub habitats by substantial rock outcrops or riparian corridors (65 FR 58949).

Table B-24. Critical Habitat Designated for Alameda Whipsnake in the Plan Area (October 2, 2006)

Unit Number	County	General Location	Size (acres [hectares])
1	Contra Costa	Tilden Briones Unit: Between State Route 4 and State Route 24 to the north and south and Interstate 80 and Interstate 580 to the east and west.	13,808 (34,119)
2	Alameda and Contra Costa	Oakland–Las Trampas Unit: South of Tilden-Briones.	9,889 (24,436)
3	Alameda	Hayward–Pleasanton Ridge Unit: Between Interstate 580 and Niles Canyon Road to the north and south and Hayward and Interstate 680 to the west and east.	10,508 (25,966)
4	Contra Costa and Alameda	Mount Diablo–Black Hills Unit: Mt. Diablo State Park and surrounding lands.	9,399 (23,225)
5A	Alameda and San Joaquin	Cedar Mountain Unit: East of Lake Del Valle along Cedar Mountain Ridge and Crane Ridge to Corral Hollow west of Interstate 580.	10,005 (24,723)
5B Alameda Creek	Alameda and Santa Clara	Alameda Creek Unit: Northeast of Calaveras Reservoir, south of the town of Sunol, including the area along Wauhab Ridge in Alameda County and Oak Ridge in Santa Clara County.	7,371 (18,214)
6	Alameda and Contra Costa	Caldecott Tunnel Unit: Between Units 1 and 2 at the Caldecott Tunnel along the Alameda and Contra Costa County line.	1,680 (4,151)

Range

Historically, Alameda whipsnake occupied suitable habitat in Alameda, Contra Costa, and possibly western San Joaquin and northern Santa Clara Counties (U.S. Fish and Wildlife Service 2002). The current distribution of the Alameda whipsnake has been described as five populations within a fragmented regional metapopulation in Alameda, Contra Costa Counties, small portions of northern Santa Clara County and western San Joaquin County (U.S. Fish and Wildlife Service 2011).

- Sobrante Ridge, Tilden/Wildcat Regional Parks to the Briones Hills, in Contra Costa County (Tilden–Briones population).
- Oakland Hills, Anthony Chabot area to Las Trampas Ridge, in Contra Costa County (Oakland–Las Trampas population).
- Hayward Hills, Palomares area to Pleasanton Ridge, in Alameda County (Hayward–Pleasanton Ridge population).
- Mount Diablo vicinity and the Black Hills, in Contra Costa County (Mount Diablo–Black Hills population).
- Wauhab Ridge, Del Valle area to the Cedar Mountain Ridge, in Alameda County (Sunol–Cedar Mountain population).

The Sunol–Cedar Mountain area was previously thought to be the southern portion of the range of the Alameda whipsnake and an area of intergradation between the Alameda whipsnake and the chaparral whipsnake (*Masticophis lateralis lateralis*) (Jennings 1983; Riemer 1954). A recent report providing an analysis of the genetics of the California whipsnake (Richmond et al. 2011) now indicates that the California whipsnake can be divided into four clades, with three clades occurring in California and one in Baja California, Mexico. Within California, the three clades consist of the northern California clade (considered *Masticophis lateralis euryxanthus*), the northern/southern California clade (considered the “transitional” *Masticophis lateralis lateralis*/*Masticophis lateralis euryxanthus* complex), and the southern California clade (*Masticophis lateralis lateralis*). The genetic analysis indicates the northern California clade of *M. lateralis* that occurs in Alameda and Contra Costa Counties also occurs in Santa Clara County and as far south as San Benito County, with the general boundary for this clade being somewhere near the northern most reach of the Diablo Range, which is the area where *Masticophis lateralis lateralis* and *Masticophis lateralis euryxanthus* complex are presumed to intergrade.

Table B-25. Occurrences of Alameda Whipsnake Documented in the Bay Area O&M HCP Study Area^a

County	Total Existing Occurrences	Extant Occurrences	Public	Private	Unknown
Alameda	53	53	?	?	?
Contra Costa	88	87	?	?	?
Marin	0	0	0	0	0
Napa	0	0	0	0	0
San Francisco	0	0	0	0	0
San Mateo	0	0	0	0	0
Santa Clara	2	2	?	?	?
Solano	0	0	0	0	0
Sonoma	0	0	0	0	0

Source: California Department of Fish and Wildlife .

Note: Location and land ownership information is suppressed for all occurrences of this species within CNDDDB.

^a Many of these sightings were recorded as Alameda whipsnake, intergrades, or unknown (California Department of Fish and Wildlife 2015), but would be considered part of the clade that includes *M. lateralis euryxanthus* under the previously cited recent genetic analysis.

Habitat Requirements

The Alameda whipsnake occurs primarily in coastal scrub and chaparral communities, but also forages in a variety of other communities in the inner Coast Range, including grasslands and open woodlands (Swaim 1994). Rock outcrops with deep crevices or abundant rodent burrows are important habitat components for overnight dens, refuges from predators and excessive heat, foraging, egg laying, and winter hibernacula (winter residence where snakes hibernate) (Swaim 1994; U.S. Fish and Wildlife Service 2000). Suitable habitat for this species includes communities that support mixed chaparral, coastal scrub, and annual grassland and oak woodlands that are adjacent to scrub habitats (U.S. Fish and Wildlife Service 2000).

Whipsnake habitat consists of a mix of sunny and shady sites in order to provide a range of temperatures for the snake's activities (Swaim 1994; U.S. Fish and Wildlife Service 2000). A sparse shrub canopy is ideal because it also provides a visual barrier from avian predators (Swaim 1994).. Alameda whipsnakes spend November through March in a winter hibernaculum (U.S. Fish and Wildlife Service 2000).

Movement

Telemetry data indicate that, although home ranges of Alameda whipsnakes are centered on shrub communities, they move up to 500 feet (152 meters) into adjacent habitats, including grassland, oak savanna, and occasionally oak-bay woodland (U.S. Fish and Wildlife Service 2005). Based on a 1994 trapping and radio telemetry study by Karen Swaim, snakes were found to have one or more core areas (areas of concentrated use) within their home range with large areas of the home range receiving little use (U.S. Fish and Wildlife Service 2002). Long-range dispersal is not known to occur in this species.

Table B-26. Documented Alameda Whipsnake Movement

Distance	Location of Study (Surface Area)	Source
170 to 500 feet (52 to 152 meters) (from scrub habitats)	Tilden Regional Park, Berkeley, California	U.S. Fish and Wildlife Service 2002
>1,000 feet (305 meters) (from scrub habitats only when rock outcrops present)	Tilden Regional Park, Berkeley, California	U.S. Fish and Wildlife Service 2002

Reproduction

Mating occurs from late March through mid-June (U.S. Fish and Wildlife Service 2000). Whipsnakes lay a clutch of 6 to 11 eggs (Stebbins 1985), probably in loose soil or under logs or rocks (Zeiner et al. 1988). Female whipsnakes use grassland areas most extensively after mating, possibly in their search for suitable egg-laying sites (Swaim 1994).

Population Trends and Threats

Alameda whipsnake populations have declined from loss of habitat resulting from urban expansion (U.S. Fish and Wildlife Service 2000). Urban development, particularly road and highway construction, has also fragmented Alameda whipsnake populations and made them more vulnerable to extinction (U.S. Fish and Wildlife Service 1997). Urban development adjacent to whipsnake habitat increases the likelihood of predation from feral cats and injury or death from public recreational use. Other significant threats to this species' recovery include inappropriate grazing practices, which remove shrub cover and reduce grass cover and alteration of habitat through fire suppression (U.S. Fish and Wildlife Service 1997). Nonnative invasive tree and shrub species can reduce habitat and is one of the primary threats to Alameda whipsnake (U.S. Fish and Wildlife Service 2011).

Fire suppression alters suitable Alameda whipsnake habitat by increasing the likelihood of large catastrophic fires occurring in areas where vegetation has become overgrown or by creating a closed scrub canopy which tends to reduce the diversity of microhabitats that whipsnakes require (Swaim 1994). Incompatible land uses include fire suppression, off-road vehicle use, some grazing practices, unauthorized collecting, and mining.

Species Management

According to the *Draft Recovery Plan for Chaparral and Scrub Community Species East of San Francisco Bay, California* (U.S. Fish and Wildlife Service 2002), the recovery strategy for the Alameda whipsnake combines long-term protection of large blocks of habitat; protection in perpetuity of habitat harboring population centers or areas needed for connectivity of populations; development of fire management, grazing regimes, and control of destructive nonnative species plans; and research that focuses on management objectives and recovery of the species.

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San Francisco Garter Snake (*Thamnophis sirtalis tetrataenia*)

Status

State: Endangered/fully protected

Federal: Endangered

Critical Habitat: None

Recovery Planning: *Recovery Plan for San Francisco Garter Snake* (U.S. Fish and Wildlife Service 1985)

Critical Habitat

No critical habitat has been designated for San Francisco garter snake.

Range

Historically, San Francisco garter snakes occurred in scattered wetland areas on the San Francisco Peninsula from approximately the San Francisco County line south along the eastern and western bases of the Santa Cruz Mountains, at least to the Upper Crystal Springs Reservoir and along the coast south to Año Nuevo Point, San Mateo County, and Waddell Creek, Santa Cruz County. Currently, although the geographical distribution may remain the same, reliable information regarding specific locations and populations status is not available. Much of the remaining suitable habitat is located on private property, and no surveys for the presence of the snake have occurred. U.S. Fish and Wildlife Service is aware that many locations that previously had healthy populations of garter snakes are now in decline (U.S. Fish and Wildlife Service 2007).

Table B-27. Occurrences of San Francisco Garter Snake Documented in the Bay Area O&M HCP Study Area

County	Total Existing Occurrences	Extant Occurrences	Public	Private	Unknown
Alameda	0	0	0	0	0
Contra Costa	0	0	0	0	0
Marin	0	0	0	0	0
Napa	0	0	0	0	0
San Francisco	0	0	0	0	0
San Mateo	66	62	?	?	?
Santa Clara	0	0	0	0	0
Sonoma	0	0	0	0	0
Solano	0	0	0	0	0

Source: California Department of Fish and Wildlife 2015.

Note: Location and land ownership information is suppressed for all occurrences of this species within CNDDb.

Habitat Requirements

The snakes' preferred habitat is a densely vegetated pond near an open hillside where they can sun themselves, feed, and find cover in rodent burrows; however, considerably less ideal habitats can be successfully occupied. Temporary ponds and other seasonal freshwater bodies are also used. The snakes avoid brackish marsh areas because their preferred prey (California red-legged frogs, *Rana draytonii*) cannot survive in saline water. Emergent and bankside vegetation, such as cattails (*Typha* spp.), bulrushes (*Scirpus* spp.) and spike rushes (*Juncus* spp. and *Eleocharis* spp.), apparently are preferred and used for cover. The area between stream and pond habitats and grasslands or bank sides is used for basking, while nearby dense vegetation or water often provide escape cover. Snakes also use floating algal or rush mats, if available (U.S. Fish and Wildlife Service 2007.).

Adult snakes sometimes estivate in rodent burrows during summer months when ponds dry. On the coast, snakes hibernate during the winter, but further inland, if the weather is suitable, snakes may be active year-round. Although primarily active during the day, captive snakes housed in an outside enclosure were observed foraging after dark on warm evenings (U.S. Fish and Wildlife Service 2007.).

San Francisco garter snakes forage extensively in aquatic habitats, feeding primarily on California red-legged frogs. They may also feed on juvenile bullfrogs (*Rana catesbeiana*), but they are unable to feed on the larger adults that may actually prey on smaller San Francisco garter snakes and be a contributing factor in their decline. Newborn and juvenile San Francisco garter snakes depend heavily upon Pacific treefrogs (*Pseudacris regilla*) as prey. If newly metamorphosed Pacific treefrogs are not available, the young may not survive. San Francisco garter snakes are also one of the few animals able to eat the toxic California newt (*Taricha torosa*) without suffering serious side effects (U.S. Fish and Wildlife Service 2007.).

Movement

Recent studies have documented San Francisco garter snake movement over several hundred yards away from wetlands to hibernate in upland small mammal burrows (U.S. Fish and Wildlife Service 2007). However, little recent information is available about this species' movements likely due to the fact that much of the remaining suitable habitat is located on private property preventing extensive studies of these populations.

Table B-28. Documented San Francisco Garter Snake Movement

	Distance	Location of Study	Source
Dispersal	590 feet (180 meters)		California Department of Fish and Game 1990
Migration	2,201 feet (671 meters)	West of Bayshore (Millbrae)	Larsen 1994

Reproduction

Females give live birth from June through September, with litters averaging 16 newborn (U.S. Fish and Wildlife Service 2007.).

Population Trends and Threats

Many of the threats that led to the listing of the San Francisco garter snake in 1967 continue to impact the species. These included loss of habitat from agricultural, commercial, and urban development and collection by reptile enthusiasts. These historical threats to the species remain, but there are now additional threats to the species, such as the documented decline of the California red-legged frog (an essential prey species) and the introduction of bullfrogs into San Francisco garter snake habitat. Bullfrogs are capable of preying on both San Francisco garter snakes and California red-legged frogs. Extirpation of California red-legged frogs in San Francisco garter snake habitat is likely to cause concomitant extirpation of the snake (U.S. Fish and Wildlife Service 2007.).

Species Management

Based on the major threats to this species listed above the following conservation/management actions would best protect the long-term survival of this subspecies.

- Long-term protection of existing occupied and other suitable habitats.
- Research/surveys of historical and current population sites.
- Efforts to conserve and protect existing California red-legged frog populations.
- Bullfrog eradication efforts.

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Birds

Ridgway's Rail (formerly California Clapper Rail) (*Rallus obsoletus obsoletus*) (formerly *R. longirostris obsoletus*)

NOTE:

Based on recent phylogenetic work by Maley and Brumfield (2013), the "California" (*Rallus longirostris obsoletus*), "Yuma" (*R. l. yumanensis*), and "light-footed" (*R. l. levipes*) subspecies of clapper rail are now recognized by the American Ornithologists' Union as a separate species: Ridgway's rail (*Rallus obsoletus*) (Chesser et al. 2014). As such, the subspecies formerly known as California clapper rail (*R. l. obsoletus*) is now Ridgway's rail (*R. o. obsoletus*).

Status

State: Endangered, Fully protected

Federal: Endangered, Protected under the Migratory Bird Treaty Act

Critical Habitat: None

Recovery Planning: *Recovery Plan for Tidal Marsh Ecosystems of Northern and Central California dated February 2014* (U.S. Fish and Wildlife Service 2014)

Critical Habitat

No critical habitat has been designated for Ridgway's rail.

Range

Historically, Ridgway's rail were abundant in all tidal salt and brackish marshes in the San Francisco Bay vicinity, with their range extending northward to coastal tidal marshes in Humboldt Bay and southward to Morro Bay. The largest populations of Ridgway's rail could be found in the salt marshes of south San Francisco Bay, including portions of San Mateo, Santa Clara, and Alameda Counties (U.S. Fish and Wildlife Service 2010). The current distribution of this species is restricted almost entirely to the tidal marshes of San Francisco estuary, including San Francisco Bay, San Pablo Bay, Suisun Bay, and associated tidal marshes; the only known breeding populations occur in these areas (California Department of Fish and Game 2000).

Table B-29. Occurrences of California Clapper Rail Documented in the Bay Area O&M HCP Study Area

County	Total Existing Occurrences	Extant Occurrences	Public	Private	Unknown
Alameda	16	16	11	1	4
Contra Costa	12	12	6	2	4
Marin	12	11	7	0	5
Napa	7	7	4	0	3
San Francisco	1	1	1	0	0
San Mateo	11	10	7	0	4
Santa Clara	7	7	3	0	4
Solano	23	23	16	4	3
Sonoma	10	10	7	0	3

Source: California Department of Fish and Wildlife 2015.

Note: Some recorded occurrences are in more than one property type: public, private, and/or unknown.

Habitat Requirements

Ridgway's rail occurs in salt and brackish marshes throughout their range and has only rarely been recorded in nontidal marsh areas (U.S. Fish and Wildlife Service 2010). The vegetation dominating the marshes this species uses includes pickleweed (*Salicornia* spp.), Pacific swampfire (*Sarcocornia pacifica*), Pacific cordgrass (*Spartina foliosa*), gumplant (*Grindelia* spp.), saltgrass (*Distichlis spicata*), alkali heath (*Frankenia grandifolia*), and jaumea (*Jaumea carnosa*). Ridgway's rail prefers areas that receive direct tidal circulation; its preferred foraging habitat includes areas of shallow water and mudflats with abundant invertebrate populations (Foerster et al. 1990). Small tidal channels with banks covered by dense vegetation are important habitat features for this species, providing foraging habitat as well as covered travel routes (Keldsen 1997; Garcia 1995). Foraging mainly occurs in the lower and middle marsh zones at low tide, while higher marsh and transitional zones with dense vegetation are used for nesting and high-tide refugia (Harvey 1988; Foerster et al. 1990; Evens and Collins 1992; Collins et al. 1994).

Additional factors that influence the quality of marsh habitat for this species includes marsh size, location relative to other marshes, presence of buffers or transitional zones between marshes and upland areas, marsh elevation, and hydrology (Collins et al. 1994; Albertson 1995). Population density is highest on habitat patches greater than 100 hectares (247 acres) (Collins et al. 1994).

Movement

Ridgway's rails are not migratory and exhibit strong site fidelity; 78% of resightings were within 1,640 feet (500 meters) of the original capture site in a U.S. Fish and Wildlife Service banding study conducted in the mid-1980s (U.S. Fish and Wildlife Service 2010). The average home range of this species was found to be 11.6 acres (4.7 hectares) in a 1991–1992 radiotelemetry study conducted in south San Francisco Bay. Additionally, the average core use area was 2.2 acres (0.9 hectare) in this study (Albertson 1995). In general, average home ranges expanded during the breeding season.

Table B-30. Documented Ridgway's rail Home Range and Movement

Area or movement	Distance	Location of Study	Source
Home range	11.6 acres (4.7 hectares)	South San Francisco Bay	Albertson 1995
Dispersal	Minimum 14.6 miles (23.5 kilometers) 20 and 8 miles (32.2 and 12.9 kilometers) (n=3); 13.5 miles (21.7 kilometers) (n=1)	Southern California Upper Newport Bay, California to Seal Beach National Wildlife Refuge	Zemba et al. 1985 Eddleman and Conway 1998
Migration	Mostly considered nonmigratory		Meanly 1985; Eddleman 1989

Reproduction

In this species, pair bonding and nest building are generally initiated in mid-February with nesting beginning in late February or early March and extending through July or August (Evens and Page 1983; U.S. Fish and Wildlife Service 2010). Nest site selection is important, as nests must be built at an elevation that protects the nest bowl from inundation during high tides to prevent failure and abandonment (Evens and Collins 1992; Collins et al. 1994). Nesting generally occurs in the upper-middle to high tidal marsh zones, with vegetation (20 inches [50 centimeters] high or greater near mean high water to allow for nest concealment and prevent inundation (U.S. Fish and Wildlife Service 2010). Estimates of clutch size range from 5 to 14 eggs (DeGroot 1927; Gill 1972), with both sexes taking part in incubation, which lasts 18 to 29 days (Taylor 1996). The reproductive success of Ridgway's rail is below the natural potential, and this species experiences a low hatching success rate, when compared to other species of clapper rails (Schwarzbach et al. 2006; U.S. Fish and Wildlife Service 2010).

Population Trend and Threats

Gill (1979) estimated the Ridgway's rail population at 4,200 to 6,000 birds in the years 1971 to 1975. Harvey (1988) then estimated the population at 1,500 birds between 1981 and 1987; the disparity between these results has been attributed to differences in survey intensity (U.S. Fish and Wildlife Service 2010). An estimated all-time low of 500 birds was reached in 1991 (Harding et al. 1998). Surveys in the late 1990s indicated that the North and South Bay populations contained approximately 500 to 600 birds each (California Department of Fish and Game 2000). Subsequent surveys by PRBO Conservation Science have indicated a slight increase in population numbers, with 938 individuals detected in 2007, 543 in 2008, 500 in 2009, and 601 detected in 2010 (PRBO Conservation Science 2009; PRBO Conservation Science 2010; PRBO Conservation Science 2011).

There are a number of factors that threaten this species' survival. California—and the San Francisco Bay Area specifically—has lost a large portion of coastal wetland habitat to urban and industrial development. Remaining habitat continues to be disturbed and degraded. Much of the remaining marsh habitat has been fragmented by levee systems that reduce and isolate patches of habitat and reduce high marsh and refugial habitat, while increasing human and predator accessibility to patches of remaining habitat. Many areas of marsh habitat have been exposed to contaminants, land subsidence, and the spread of nonnative saltmarsh vegetation, all of which degrade habitat for this species. Additionally, some areas of salt marsh have been converted to less-suitable brackish-fresh

marsh by urban fresh wastewater discharges. Other threats include increased predation by avian and mammalian predators due to the availability of human-made structures for roosting and access routes and disturbance from recreational access, including humans and dogs (U.S. Fish and Wildlife Service 2010).

Species Management

Ridgway's rail management and conservation generally includes protection of existing habitat, control of invasive marsh plants and hybrids, and reduction of recreation-based human disturbance. According to the *Draft Recovery Plan for Tidal Marsh Ecosystems of Northern and Central California* (U.S. Fish and Wildlife Service 2010), the strategy for recovery of the Ridgway's rail involves the following.

- Protection and management of marsh complexes where core populations exist in the Central/Southern San Francisco Bay, San Pablo Bay and Suisun Bay Area Recovery Units.
- Protection and management of 800 acres of contiguous high-quality marsh habitat for this species at Tomales Bay.
- Development of management plans that include control of invasive *Spartina alterniflora* and its hybrids, reduction of recreation-based human disturbance to rails, and a predator management plan for all areas with significant predation issues.

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Mammals

Salt Marsh Harvest Mouse (*Reithrodontomys raviventris*)

Status

State: Endangered, Fully Protected

Federal: Endangered (35 FR 16047)

Critical Habitat: None

Recovery Planning: *Recovery Plan for Tidal Marsh Ecosystems of Northern and Central California* dated February 2014 (U.S. Fish and Wildlife Service 2014)

Critical Habitat

No critical habitat has been designated for salt marsh harvest mouse.

Range

Salt marsh harvest mouse is restricted to wetlands in the San Francisco Bay and its tributaries. This species consists of two subspecies. The northern subspecies (*R. r. halicoetes*) is found in the marshes of San Pablo and Suisun Bays (U.S. Fish and Wildlife Service 2014). The southern subspecies (*R. r. raviventris*) is found in the marshes of Corte Madera, Richmond, and South San Francisco Bay (U.S. Fish and Wildlife Service 2014).

Table B-31. Occurrences of Salt Marsh Harvest Mouse Documented in the Bay Area O&M HCP Study Area

County	Total Existing Occurrences	Extant Occurrences	Public	Private	Unknown
Alameda	29	29	12	13	6
Contra Costa	11	11	4	5	2
Napa	6	6	3	3	0
Marin	9	8	4	2	4
San Francisco	0	0	0	0	0
San Mateo	7	7	3	2	2
Santa Clara	13	12	6	3	5
Solano	55	55	28	18	9
Sonoma	8	8	7	0	1

Source: California Department of Fish and Wildlife 2015.

Note: Some recorded occurrences are in more than one property type: public, private, and/or unknown.

Habitat Requirements

Salt marsh harvest mice are dependent on dense cover of native salt tolerant plants, preferring pickleweed-dominated (*Salicornia pacifica*) saline emergent wetland habitats (Shellhammer 1977). Suitable habitat is deep (23 to 29 inches [58 to 73 centimeters] tall), dense pickleweed, intermixed with fat hen (*Atriplex patula*) and alkali heath (*Frankenia grandifolia*) (Shellhammer 1982). Recent research has documented the species in dense stands of three-square bulrush (*Schoenoplectus americanus*) (U.S. Fish and Wildlife Service 2010a). The species also needs non-submerged, salt-tolerant vegetation to escape high tide events (Shellhammer et al. 1982). During these periods of high tides, populations of salt marsh harvest mice tend to concentrate in high marsh level areas of the high marsh zone (Fisler 1965). The salt marsh harvest mouse has also been found in the top zone and transitional zones of tidal marshes, which are less likely to flood. Salt marsh harvest mouse may be found in cordgrass, alkali bulrush, or pure stands of salt grass, although much more infrequently (Shellhammer et al. 1982). The species will also move into adjoining grasslands during the highest winter tides but only when new grass growth affords suitable cover in spring and summer months (Fisler 1965; Shellhammer 1982). Sustaita et al. (2011) found salt marsh harvest mouse populations in Suisun Marsh managed wetlands in equal or higher abundance than in adjacent tidal brackish marsh. In Suisun Marsh, salt marsh harvest mice apparently respond well to managed diked wetlands, where they have been observed in densities equal to those found in tidal wetlands (Sustaita et al. 2011).

Movement

Young salt marsh harvest mice are known to disperse considerable distances from their birth sites in search of suitable habitats (Geissel et al. 1988). A narrow corridor of vegetation is likely needed for dispersal between adjacent, isolated habitats. Though this species is not known to disperse to adjacent areas that are bare or developed, it has been found to quickly colonize disturbed areas that have been subject to flooding. Salt marsh harvest mice will often move from pickleweed marsh to upland grasslands in the spring and summer. These movements are likely to occur daily and do not represent complete shifts in habitats (Shellhammer 1977).

Table B-32. Documented Salt Marsh Harvest Mouse Home Range

Type	Distance/Area	Location of Study	Source
Home range	22,949 square feet (2,132 square meters) (n=44)	Solano County	Bias and Morrison 1999

Reproduction

Breeding occurs from spring through autumn with slightly different breeding seasons between the two subspecies. The breeding season for the southern subspecies begins in March, while the northern subspecies breeding season starts 2 months later in May (Fisler 1965). Females of both subspecies have an average of four young per litter. The southern subspecies may produce two litters each year, while the northern subspecies usually have only one litter per year due to the shorter breeding season (Fisler 1965). Nests are usually small and built of grass and sedge over old birds' nests. The southern subspecies rarely build nests, but may construct loosely organized structures of dry grasses (Fisler 1965; Shellhammer 1982).

Population Trend and Threats

Historically, the salt marsh harvest mouse was found throughout the San Francisco Bay. Destruction and modification of required habitat by human activities has highly reduced the populations of this species. Only 30,100 acres (12,181 hectares) of the 193,800 acres (78,428 hectares) of tidal marsh that bordered San Francisco Bay in 1850 currently remain. This amount represents an 84% reduction from historical conditions (U.S. Fish and Wildlife Service 2010b).

About 30% of the historic tidal marshes of San Francisco Bay remain as diked marshes, with only small, isolated patches supporting populations of salt marsh harvest mice. The loss of pickleweed habitat due to commercial and residential development has been the main cause to the decline of the salt marsh harvest mouse. Past and current threats to the species include the filling and diking of marshes to allow development; changes in salinity; introduction of nonnative cordgrass, bulrush, saltgrass and other plant species; predation by nonnative red foxes and feral cats; and pollution from urban runoff, industrial discharges, and sewage effluent (Shellhammer 1982; California Department of Fish and Game 2000).

Additionally, an estimated 600 acres of former salt marsh and pickleweed habitat along Coyote Creek, Alviso Slough, and Guadalupe Slough, has been converted to fresh- and brackish-water vegetation, dominated by bulrush and saltgrass. This change in vegetation is largely due to changes in salinity of the marshes brought about by increasing volumes of sewage and freshwater discharge from South Bay wastewater facilities and subsidence-related causes (Wondolleck et al. 1976; Shellhammer 1977; U.S. Fish and Wildlife Service 2010b). In addition, many of the marshes in the South Bay are completely submerged during the high tide and lack sufficient upland and escape habitat, likely resulting in population crashes due to nesting failures and high rates of predation (U.S. Fish and Wildlife Service 2010b).

In general, the primary threats to all listed tidal marsh species include the following.

- Historical and current habitat loss and fragmentation due to urban development, agriculture, and diking related to duck hunting.
- Altered hydrology and salinity.
- Nonnative invasive species.
- Inadequate regulatory mechanisms.
- Disturbance.
- Contamination.
- Sea level rise due to climate change.
- Risk of extinction due to vulnerability of small populations in the face of random naturally occurring events.

Species Management

According to the *Draft Recovery Plan for Tidal Marsh Ecosystems of Northern and Central California* (U.S. Fish and Wildlife Service 2009) the strategy for recovery of the salt marsh harvest mouse involves the following actions.

- Acquire, protect, manage, and restore tidal marsh habitat to promote the recovery of listed species and the long-term conservation of species of concern and other tidal marsh species. Conduct range-wide species status surveys, monitoring, research, and improve coordination, participation, and outreach activities to achieve recovery of the species.

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San Joaquin Kit Fox

(*Vulpes macrotis mutica*)

Status

State: Threatened

Federal: Endangered

Critical Habitat: None

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

Critical Habitat

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

Range

Although the precise historical range of San Joaquin kit fox is unknown, it is believed to have extended from Contra Costa and San Joaquin Counties in the north 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).

The current range of the species is believed to extend from southern Kern County north to Contra Costa, Alameda, and San Joaquin counties on the west and to the La Grange area of Stanislaus County on the east side of the Valley (U.S. Fish and Wildlife Service 2010). Recent studies suggest that the northern part of the species range is restricted to a narrow band of habitat on the west side of the Valley between Interstate 5 and the Coast Range and that since 1967 there have been approximately two dozen unequivocal occurrences in the northern range (Constable et al. 2009). An extensive survey effort conducted throughout the northern range between 2001 and 2003 using trained scat-detection dogs failed to detect kit fox scat. Constable et al. (2009) suggest that the northern range may consist primarily of occasional dispersing animals from populations south of Santa Nella. Cypher et al. (2013) characterize the northern range, which includes the plan area, as being highly fragmented medium suitability habitat consisting primarily of dense grasslands dominated by wild oats, which may not be sufficient to sustain persistent kit fox populations.

Table B-33. Occurrences of Joaquin Kit Fox Documented in the Bay Area O&M HCP Study Area

County	Total Existing Occurrences	Extant Occurrences	Public	Private	Unknown
Alameda	16	16	2	2	12
Contra Costa	24	24	6	4	16
Marin	0	0	0	0	0
Napa	0	0	0	0	0
San Francisco	0	0	0	0	0
San Mateo	0	0	0	0	0
Santa Clara	4	4	1	0	3
Solano	0	0	0	0	0
Sonoma	0	0	0	0	0

Source: California Department of Fish and Wildlife 2015.

Notes: San Joaquin kit foxes have not historically or currently been described or known to occur in Solano, Sonoma, Napa, Marin, San Mateo, and San Francisco Counties. Some recorded occurrences are in more than one property type: public, private, and/or unknown.

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 prime habitat for the species (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, nonirrigated 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 foxes usually prefer areas with loose-textured soils suitable for den excavation (U.S. Fish and Wildlife Service 1983) but are 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 taxon's 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 to 6 feet (1 to 2 meters) long in front and are located on slopes of less than 40 degrees (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 degrees). 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 B-34).

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 B-34).

Table B-34. Documented San Joaquin Kit Fox Movement

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

Reproduction

Kit foxes are believed to be monogamous and can, but generally do not, breed during their 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 to 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).

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 younger 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 to have been between 8,667 and 12,134 animals. By 1975, the estimated population had fallen to only 6,961 adults, a 20 to 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, and the San Luis National Wildlife Refuge 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 foxes 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 foxes 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 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' abilities 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 Wildlife, 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 of suitable kit fox habitat in western Merced, Stanislaus, and eastern Santa Clara Counties are under way through a multiagency cooperative effort. The 5-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 in size) 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).

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Plants

Antioch Dunes Evening-Primrose (*Oenothera deltoides howellii*.)

Status

Federal: Endangered

State: Endangered

Critical Habitat: Yes

Recovery Planning: *Recovery Plan for Three Endangered Species Endemic to Antioch Dunes, California* (U.S. Fish and Wildlife Service 1980); *Revised Recovery Plan for Three Endangered Species Endemic to Antioch Dunes, California* (U.S. Fish and Wildlife Service 1984)

Critical Habitat

Critical habitat for Antioch Dunes evening-primrose was designated by the U.S. Fish and Wildlife Service in 1978 (43 FR 39042–39044). The critical habitat, located in the Antioch Dunes National Wildlife Refuge in Contra Costa County, consists of two units, the 30-acre (12.1-hectare) Stamms unit and the 11-acre (4.4-hectare) Sardis unit.

Range

Antioch dunes evening-primrose's range is restricted to the northeastern portion of the San Francisco Bay Area region. This range includes portions of Contra Costa County, where nine occurrences have been documented, and all but one of these are presumed to be extant (California Department of Fish and Wildlife 2015).

Table B-35. Occurrences of Antioch Dunes Evening-primrose Documented in the Bay Area O&M HCP Study Area

County	Total Existing Occurrences	Extant Occurrences	Public	Private	Unknown
Alameda	0	0	0	0	0
Contra Costa	9	8	6	2	1
Marin	0	0	0	0	0
Napa	0	0	0	0	0
San Francisco	0	0	0	0	0
San Mateo	0	0	0	0	0
Santa Clara	0	0	0	0	0
Solano	0	0	0	0	0
Sonoma	0	0	0	0	0

Source: California Department of Fish and Wildlife 2015.

Natural History

Habitat Requirements

Antioch dunes evening-primrose grows in sandy bluffs and dunes, at elevations up to 100 feet MSL (California Department of Fish and Wildlife 2015). Associated species include bush lupine (*Lupinus arboreus*), deerweed (*Acmispon glaber*), California poppy (*Eschscholzia californica*), and California croton (*Croton californicus*) (Pavlik and Manning 1993, California Department of Fish and Wildlife 2015). Roof (1969) stated that the species appears to be restricted to sandy soils, although Pavlik and Manning (1993) found that seed germination, seedling establishment, and reproduction were also successful on clay soils.

Population Ecology

Antioch Dunes evening-primrose is a short-lived perennial herb that blooms during its second year and lives for 5 to 7 years (Roof 1969, Pavlik and Manning 1993). The plants bloom between March and September, with peak bloom in May (Pavlik and Manning 1993, Wagner 2012). The plants require pollinators to set seed; the primary pollinator of evening-primrose species are night-flying hawkmoths, although the main floral visitors to the plants at Antioch Dunes appear to be nonspecialist bees (Pavlik et al. 1993). The soil seed bank appears to be relatively short-lived, with seeds remaining viable in the soil for at least four years (Thomson 2005).

Population Trend and Threats

Population sizes of Antioch Dunes evening-primrose vary annually and among occurrences, and overall population numbers have been in decline. The population of Antioch Dunes evening primrose at the Antioch Dunes National Wildlife Refuge has been monitored since the mid-1980s. The population steadily declined from around 5,000 to 6,000 plants to less than 500 in 2007 (U.S. Fish and Wildlife Service 2008). The primary factor leading to the listing of this species was habitat loss. The populations are currently threatened by invasive nonnative grasses, which inhibit germination and establishment of Antioch Dunes evening-primrose seeds and seedlings (Thompson 2005) and provide habitat for insect herbivores that feed on the plants (Pavlik and Manning 1993). Other factors may also play a role in the downward population trend, such as pollinator limitation (Pavlik et al 1993).

Species Management

The *Revised Recovery Plan for Three Endangered Species Endemic to Antioch Dunes, California* (U.S. Fish and Wildlife Service 1984) focuses on three aspects of managing the remaining habitat.

- Acquiring and managing the Sardis and Stamm-Starr properties.
- Protecting the Antioch Dunes ecosystem, increasing the population numbers, and improving the habitat function.
- Informing and educating the public about the Antioch Dunes.

The Sardis and Stamm-Starr properties were purchased in 1980 and now form the Antioch Dunes National Wildlife Refuge. A conservation plan was drafted in 2001 to guide natural resource management and public use of the Refuge (U.S. Fish and Wildlife Service 2001). In addition, PG&E has entered into a Safe Harbor Agreement with the U.S. Fish and Wildlife Service to monitor and

manage the plants on PG&E's property in the Antioch Dunes (currently there are two six acre parcels that straddle the Sardis portion of the Antioch Dunes National Wildlife Refuge)..

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Burke's Goldfields (*Lasthenia burkei*)

Status

Federal: Endangered

State: Endangered

Critical Habitat: None

Recovery Planning: Draft Recovery Plan for the Santa Rosa Plain: *Blennosperma bakeri* (Sonoma sunshine); *Lasthenia burkei* (Burke's goldfields); *Limnanthes vincularis* (Sebastopol meadowfoam); Sonoma County Distinct Population Segment of the California Tiger Salamander (*Ambystoma californiense*) (U.S. Fish and Wildlife Service 2014)

Range

Burke's goldfields is restricted to the Inner North Coast Ranges region, including portions of Sonoma and Napa Counties. In these counties, 28 occurrences have been documented, and, of these, 24 are presumed to be extant (California Department of Fish and Wildlife 2015).

Table B-36. Occurrences of Burke's Goldfields Documented in the Bay Area O&M HCP Study Area

County	Total Existing Occurrences	Extant Occurrences	Public	Private	Unknown
Alameda	0	0	0	0	0
Contra Costa	0	0	0	0	0
Marin	0	0	0	0	0
Napa	1	1	0	0	1
San Francisco	0	0	0	0	0
San Mateo	0	0	0	0	0
Santa Clara	0	0	0	0	0
Solano	0	0	0	0	0
Sonoma	27	23	6	25	0

Source: California Department of Fish and Wildlife 2015.

Note: Four occurrences are partially on public lands and partially on private lands.

Natural History

Habitat Requirements

Burke's goldfields grows in seasonal wetlands, including natural and created vernal pools, vernal swales, and wet meadows, at elevations from 50 to 1,970 feet (15 to 600 meters) above MSL (California Department of Fish and Wildlife 2015). Burke's goldfields sometimes occurs along with the state and federal endangered Sonoma sunshine (*Blennosperma bakeri*) and Sebastopol meadowfoam (*Limnanthes vincularis*).

Population Ecology

Burke's goldfields is an annual species. The seeds germinate in autumn following the first heavy seasonal rains, and the young plants develop during the winter months, spending periods of time submerged, after the pools have become inundated (Ornduff 1969). The plants bloom from April to June, generally after the pools have dried, but mature plants can bloom even when partially submerged (Ornduff 1966, 1969).

It is a strong outcrosser, requiring pollinators for maximum set seed (Ornduff 1966, Sloop et al 2012). The primary floral visitors are bee-flies, which are presumably the main pollinators (Sloop et al 2012).

Population Trend and Threats

Population sizes of Burke's goldfields vary annually and among occurrences, but overall population numbers have been in decline since the species was listed (U.S. Fish and Wildlife Service 2008). The primary threats are continuing habitat loss from urbanization and agriculture, altered hydrology, and invasive nonnative plants.

Species Management

The *Draft Recovery Plan for the Santa Rosa Plain* (U.S. Fish and Wildlife Service 2014) proposes the following actions for the recovery of Burke's goldfields.

- Protect extant occurrences and potential habitat for Burkes' goldfields.
- Develop a central database for survey data from all natural and created occurrences.
- Collect and store seed from all occurrences.
- Survey historical locations and other potential habitat where Burke's goldfields may occur.
- Conduct research necessary to develop a population viability analysis for Burkes' goldfields.
- Conduct necessary biological research on Burke's goldfields and use results to guide recovery efforts.
- Implement habitat management for Burke's goldfields.
- Restore or create vernal wetlands and reintroduce or introduce Burke's goldfields.
- Monitor all protected occurrences.
- Engage and educate the public about Burke's goldfields.

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Contra Costa Goldfields (*Lasthenia conjugens*)

Status

Federal: Endangered

State: None

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

Critical habitat for Contra Costa goldfields was designated by the U.S. Fish and Wildlife Service in 2006 (62 FR 7118–7316). The critical habitat consists of eight units comprising 14,730 acres (5,961 hectares), primarily located in Napa, Sonoma, and Contra Costa Counties.

Table B-37. Critical Habitat Designated for Contra Cost Goldfields in the Plan Area

Unit Number	County	General Location	Size (acres [hectares])
2	Napa	Yountville and Capell valley quadrangles Napa and Cuttings Wharf quadrangles	1,106 (411)
3	Napa	Napa and Cuttings Wharf quadrangles	534 (216)
4A-C	Solano	Fairfield South, Elmira, and Denverton quadrangles	5,929 (2,399)
5A-C	Solano	Elmira and Denverton quadrangles	839 (339)
6	Contra Costa	Benicia quadrangle	398 (161)
7	Contra Costa	Byron Hot Springs and Clifton Court Forebay quadrangles	3,286 (1,330)
8A-B	Alameda	Milpitas and Niles quadrangles	92 (37)

Range

Contra Costa goldfields is restricted to coastal California between Mendocino County and Monterey County, although historically it ranged as far south as Santa Barbara County (California Department of Fish and Wildlife 2015). The range includes portions of Alameda, Contra Costa, Marin, Napa, Santa Clara, and Solano counties. In these counties, 28 occurrences have been documented, 19 of which are presumed to be extant.

Table B-38. Occurrences of Contra Costa Goldfields Documented in the Bay Area O&M HCP Study Area

County	Total Existing Occurrences	Extant Occurrences	Public	Private	Unknown
Alameda	4	3	1	1	2
Contra Costa	4	1	2	3	1
Marin	1	1	0	0	1
Napa	4	2	0	3	1
San Francisco	0	0	0	0	0
San Mateo	0	0	0	0	0
Santa Clara	1	0	0	1	0
Solano	14	12	1	11	2
Sonoma	0	0	0	0	0

Source: California Department of Fish and Wildlife 2015.

Note: Two occurrences in Contra Costa County are partially on public lands and partially on private lands.

Natural History

Habitat Requirements

Contra Costa goldfields is an annual species that grows in seasonal wetlands, primarily in vernal pools and swales, **mostly at** elevations below 350 feet above MSL (California Department of Fish and Wildlife 2015). It is found in several types of vernal pools, including alkali vernal pools and volcanic mudflow vernal pools, in association with other common vernal pool endemics such as coyote thistle (*Eryngium* spp.), calicoflowers (*Downingia* spp.), goldfields (*Lasthenia* spp.), popcornflowers (*Plagiobothrys* spp.), and California semaphore grass (*Pleuropogon californicus*) (California Department of Fish and Wildlife 2015). Other rare plants found with Contra Costa goldfields include alkali milk-vetch (*Astragalus tener* var. *tener*), few-flowered navarretia (*Navarretia leucocephala* ssp. *pauciflora*), and Greene's legumere (*Legenere limosa*) (California Department of Fish and Wildlife 2015).

Population Ecology

Contra Costa goldfields is an annual species. The seeds germinate in autumn following the first heavy seasonal rains, and the young plants develop during the winter months, spending periods of time submerged, after the pools have become inundated (Ornduff 1969, Collinge et al. 2003). Germination and growth appears to be favored by a relatively long inundation regime (Collinge et al. 2003, Tannourji 2009). The plants bloom from March to June, generally after the pools have dried, but mature plants can bloom even when partially submerged (Ornduff 1966, 1969). The flowers are insect-pollinated (Ornduff 1966).

Population Trend and Threats

On a year-to-year basis, Contra Costa goldfields populations vary considerably in density and size (Ornduff 1966). However, population trends are mostly unknown because long-term monitoring of populations has not been done (California Department of Fish and Wildlife 2015; U.S. Fish and Wildlife Service 2008). The primary threats at the time the species was listed were habitat loss from

urbanization and agriculture and altered hydrology, and these threats are still evident (U.S. Fish and Wildlife Service 2008).

Species Management

The *Recovery Plan for Vernal Pool Ecosystems of California and Southern Oregon* (U.S. Fish and Wildlife Service 2005) outlines five strategies for recovery of Contra Costa goldfields and other vernal pool species.

- Preserving remaining occupied habitat.
- Adaptive management, restoration, creation, and monitoring of vernal pool habitat.
- Status surveys to determine population status and trends.
- Research on threats, habitat management, and the reproduction biology.
- Stakeholder outreach and participation.

In addition, strategies in the recovery plan specific to plant species include researching the pollination biology to determine whether management of the pollinators and their nesting habitat is needed, and seed banking. Attempts to establish Contra Costa goldfields in created vernal pools appear to have been initially successful, although cover of the species in created pools was substantially lower than in reference pools (Ramp et al. 2006, Collinge et al. 2013).

References

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Contra Costa Wallflower (*Erysimum capitatum* var. *angustatum*)

Status

Federal: Endangered

State: Endangered

Critical Habitat: Yes

Recovery Planning: *Recovery Plan for Three Endangered Species Endemic to Antioch Dunes, California* (U.S. Fish and Wildlife Service 1980); *Revised Recovery Plan for Three Endangered Species Endemic to Antioch Dunes, California* (U.S. Fish and Wildlife Service 1984)

Critical Habitat

Critical habitat for Contra Costa wallflower was designated by the U.S. Fish and Wildlife Service in 1978 (43 FR 39042–39044). The critical habitat, located in the Antioch Dunes National Wildlife Refuge in Contra Costa County, consists of two units, the 30-acre (12.1-hectare) Stamm unit and the 11-acre (4.4-hectare) Sardis unit.

Range

Contra Costa wallflower's range is restricted to the eastern portion of the San Francisco Bay Area region, in Contra Costa County. Four occurrences have been documented, and all of these are presumed to be extant (California Department of Fish and Wildlife 2015).

Table B-39. Occurrences of Contra Costa Wallflower Documented in the Bay Area O&M HCP Study Area

County	Total Existing Occurrences	Extant Occurrences	Public	Private	Unknown
Alameda	0	0	0	0	0
Contra Costa	4	4	2	1	1
Marin	0	0	0	0	0
Napa	0	0	0	0	0
San Francisco	0	0	0	0	0
San Mateo	0	0	0	0	0
Santa Clara	0	0	0	0	0
Solano	0	0	0	0	0
Sonoma	0	0	0	0	0

Source: California Department of Fish and Wildlife 2015.

Natural History

Habitat Requirements

Contra Costa wallflower grows in inland dunes at elevations from 9 to 65 feet (3 to 20 meters) above MSL and is associated with bush lupine (*Lupinus albifrons*), deerweed (*Acmispon glaber*), California poppy (*Eschscholzia californica*), and California croton (*Croton californicus*) (Pavlik and Manning 1993, California Department of Fish and Wildlife 2015). Contra Costa wallflower appears to have greatest seed germination and seedling establishment on sandy soils (Pavlik and Manning 1993), although Roof (1969) found that plants readily established in other soil types, under cultivation.

Population Ecology

Contra Costa wallflower is a biennial or short-lived herbaceous perennial (Pavlik and Manning 1993). It blooms in March and April (Roof 1969). The flowers are visited and apparently pollinated by a diverse array of insects (Pavlik et al. 1993). Seed production appears to be limited somewhat by pollinator limitation and seed predation by beetle and moth larvae (Pavlik et al. 1993). The seeds are gravity dispersed and appear to be viable in the seed bank for only 1 or 2 years (Pavlik and Manning 1993, Pavlik et al. 1993).

Population Trend and Threats

Population sizes of Contra Costa wallflower vary annually, but overall the population trend appears to be stable. The population of Contra Costa wallflower at the Antioch Dunes National Wildlife Refuge, which has been monitored since the mid-1980s, has varied from a low of 787 plants in 1985 to a high of 11,564 plants in 1999, averaging about 4,800 plants per year (U.S. Fish and Wildlife Service 2012).

Species Management

The *Revised Recovery Plan for Three Endangered Species Endemic to Antioch Dunes, California* (U.S. Fish and Wildlife Service 1984) focuses on three aspects of managing the remaining habitat.

- Acquiring and managing the Sardis and Stamm-Starr properties.
- Protecting the Antioch Dunes ecosystem, increasing the population numbers, and improving the habitat function.
- Informing and educating the public about the Antioch Dunes.

The Sardis and Stamm-Starr properties were purchased in 1980 and now form the Antioch Dunes National Wildlife Refuge. A conservation plan was drafted in 2001 to guide natural resource management and public use of the Refuge (U.S. Fish and Wildlife Service 2001). In addition, PG&E has entered into a Safe Harbor Agreement with the U.S. Fish and Wildlife Service to monitor and manage the plants on PG&E's property in the Antioch Dunes.

References

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- . 2012. *2012 Antioch Dunes Evening Primrose Survey*. San Francisco Bay National Wildlife Refuge Complex, Fremont, CA.

Coyote Ceanothus (*Ceanothus ferrisiae*)

Status

Federal: Endangered

State: None

Critical Habitat: None

Recovery Planning: *Recovery Plan for Serpentine Soil Species of the San Francisco Bay Area* (U.S. Fish and Wildlife Service 1998); *Ceanothus ferrisiae (Coyote ceanothus) 5-Year Review: Summary and Evaluation* (U.S. Fish and Wildlife Service 2011)

Range

Coyote ceanothus's range is restricted to the southeastern portion of the San Francisco Bay Area within portions of Santa Clara County. Four occurrences of coyote ceanothus that are presumed extant have been reported (California Department of Fish and Wildlife 2015).

Table B-40. Occurrences of Coyote Ceanothus Documented in the Bay Area O&M HCP Study Area

County	Total Existing Occurrences	Extant Occurrences	Public	Private	Unknown
Alameda	0	0	0	0	0
Contra Costa	0	0	0	0	0
Marin	0	0	0	0	0
Napa	0	0	0	0	0
San Francisco	0	0	0	0	0
San Mateo	0	0	0	0	0
Santa Clara	4	4	3	3	1
Solano	0	0	0	0	0
Sonoma	0	0	0	0	0

Source: California Department of Fish and Wildlife 2015.

Note: Three occurrences are partially on public lands and partially on private lands.

Natural History

Habitat Requirements

Coyote ceanothus is generally found growing on dry slopes in chaparral, grassland, and coastal scrub on serpentine soils, from approximately 400 to 1,500 feet (U.S. Fish and Wildlife Service 1998; California Department of Fish and Wildlife 2015). Species commonly associated with Coyote ceanothus are California sagebrush (*Artemisia californica*), foothill pine (*Pinus sabiniana*), bigberry manzanita (*Arctostaphylos glauca*), toyon (*Heteromeles arbutifolia*), California coffeeberry (*Frangula*

[*Rhamnus*] *californica*), and leather oak (*Quercus durata*) (U.S. Fish and Wildlife Service 1998). Some occurrences of Coyote ceanothus are almost pure stands of this species (U.S. Fish and Wildlife Service 2011).

Population Ecology

Recent research and observation strongly suggest that periodic fire may be crucial for germination and regeneration of senescent stands of this plant (U.S. Fish and Wildlife Service 2011). The only known observations of seedlings in nature occurred after fires in Kirby Canyon (U.S. Fish and Wildlife Service 1998) and at Anderson Dam (U.S. Fish and Wildlife Service 2011). The latter population burned in 2003 and significant recruitment was observed in 2004. Many young shrubs of the same size and age class were also observed at that site in 2006. In surveys conducted in the 1980s, there were few young shrubs and no signs of reproduction present in the Anderson Dam populations (U.S. Fish and Wildlife Service 1998). At least one ceanothus expert states that Coyote ceanothus may require some frequency of burning in order to maintain healthy populations that include young shrubs.

The lack of seedling recruitment seen in natural populations may also be due to seed or seedling mortality caused by factors such as seed predation, grazing and browsing, lack of sufficient precipitation to maintain young plants through dry summer following germination, or several of these together.

Population Trend and Threats

The four documented occurrences include approximately 189,475 plants in total based on estimates from the *Recovery Plan for Serpentine Soil Species of the San Francisco Bay Area* (U.S. Fish and Wildlife Service 1998) and a field survey conducted in 2009 by the Santa Clara Valley Water District of the population near Anderson Dam. The largest population by far, approximately 188,475 individuals, is near Anderson Dam. The majority of the plants in the larger of the two subpopulations near the dam emerged following a fire in 2003 (U.S. Fish and Wildlife Service 2011). The two occurrences located there may have been continuous prior to construction of the dam (U.S. Fish and Wildlife Service 1998). The smallest population burned during the Kirby Canyon fire in 1992. Although only 5% of the individuals survived, around 2,000 seedlings were seen in the spring of 1993. Approximately 100 seedlings were individually caged to ward off grazers and seemed to be doing well when observed the following year (U.S. Fish and Wildlife Service 1998). Approximately 150 plants were observed during a survey of the Kirby Canyon population in the fall of 2010 (U.S. Fish and Wildlife Service 2011). Approximately 500 individuals, all of the same age class, were observed in the third population at Llagas Avenue north of Morgan Hill in 1997 (U.S. Fish and Wildlife Service 1998). During surveys in the fall of 2010, approximately 600 to 650 plants were observed in this same location (U.S. Fish and Wildlife Service 2011).

Documented threats to Coyote ceanothus include habitat loss and fragmentation, residential development, illegal trash dumping, recreation, landfill activities, lack of natural recruitment, altered fire regimes, grazing, and genetic isolation and limited insect-mediated gene flow (U.S. Fish and Wildlife Service 1998; 2011). One population could also be threatened by reservoir and dam maintenance.

Species Management

The *Recovery Plan for Serpentine Soil Species of the San Francisco Bay Area* (U.S. Fish and Wildlife Service 1998) proposes four criteria for the downlisting of Coyote ceanothus.

- Securing and protecting nine populations, including a 500-foot buffer around each population.
- Implementing a management plan for the populations and additional unoccupied habitat deemed necessary for the survival of the species.
- Monitoring demographic trends in the populations for at least 30 years.
- Seed banking.

In addition, the *Santa Clara Valley Habitat Conservation Plan* (ICF International 2012) proposes to acquire the unprotected portions of the three unprotected occurrences, to protect and enhance the largest population on the west side of the Santa Clara Valley, and to establish and protect two new populations. Waste Management, Inc. and The Nature Conservancy funded research on Coyote ceanothus (U.S. Fish and Wildlife Service 1998). In the summer of 1992, the Kirby Canyon population burned. The following spring, 2,000 seedlings were observed and were fenced to protect them from grazing. Additional caging on some plants was added to protect against deer and rabbit grazing (K. Freas pers. comm. 1996 in U.S. Fish and Wildlife Service 1998). The Santa Clara Valley Water District was involved in mitigating for impacts on Coyote ceanothus resulting from the enlargement of the spillway to Anderson Dam (Santa Clara Valley Water District 1993 in U.S. Fish and Wildlife Service 1998). Two shrubs were successfully transplanted in 1997 (C. Roessler pers. comm. 1996 in U.S. Fish and Wildlife Service 1998); however, they did not survive. Waste Management, Inc. and Santa Clara Valley Water District have done some revegetation work with Coyote ceanothus that has not affected the status of the species (K. Freas pers. comm. 1996 and D. Amshoff pers. comm. 1997 in U.S. Fish and Wildlife Service 1998). A Santa Clara Valley Water District spillway modification project in 1992 planted approximately 175 seedlings; their current status is not known.

References

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Fountain Thistle

(*Cirsium fontinale* var. *fontinale*)

Status

Federal: Endangered

State: Endangered

Critical Habitat: None

Recovery Planning: *Recovery Plan for Serpentine Soil Species of the San Francisco Bay Area* (U.S. Fish and Wildlife Service 1998)

Range

Fountain thistle's range is restricted to portions of San Mateo County in the Western California floristic region. Five occurrences have been documented, and, of these, only four are presumed to be extant (California Department of Fish and Wildlife 2015).

Table B-41. Occurrences of Fountain Thistle Documented in the Bay Area O&M HCP Study Area

County	Total Existing Occurrences	Extant Occurrences	Public	Private	Unknown
Alameda	0	0	0	0	0
Contra Costa	0	0	0	0	0
Marin	0	0	0	0	0
Napa	0	0	0	0	0
San Francisco	0	0	0	0	0
San Mateo	5	4	5	1	1
Santa Clara	0	0	0	0	0
Solano	0	0	0	0	0
Sonoma	0	0	0	0	0

Source: California Department of Fish and Wildlife 2015.

Note: One occurrence is partially on public land, partially on private land, and partially on land of unknown ownership.

Natural History

Habitat Requirements

Fountain thistle grows in serpentine seeps and streams, at elevations from 295 to 590 feet (30 to 180 meters) above MSL (California Department of Fish and Wildlife 2015). It is associated with willows (*Salix* spp.), sedges (*Carex* spp.), and other wetland species, including seep-spring monkeyflower (*Mimulus guttatus*), hedge-nettle (*Stachys ajugoides*), and creeping wildrye (*Elymus triticoides*).

Population Ecology

Fountain thistle is a perennial herb that blooms from May to August (Keil 2012). The seeds germinate with the winter rains, and the plants persist as leafy rosettes until flowering. The flowers require pollinators for full seed set, and the primary floral visitors, and presumed primary pollinators, are bumblebees, although honeybees, solitary bees, and flies also visit the flowers (Powell et al. 2011).

Population Trend and Threats

Of the four extant occurrences, one is reported to be increasing, one is reported to be decreasing, and the trends for two other occurrences are unknown (California Department of Fish and Wildlife 2015). However, the U.S. Fish and Wildlife Service (2010) reported that the decreasing occurrence has been extirpated. Also, the number of plants known to occur at the Crystal Springs Reservoir occurrence expanded considerably with the discovery of nearly 20,000 plants in a single patch adjacent to Lower Crystal Springs, which means that about 97% of fountain thistle plants are encompassed by this occurrence (U.S. Fish and Wildlife Service 2010).

Threats include highway projects that may alter surface water hydrology and flooding of habitat by the Crystal Springs Dam Improvement Project (U.S. Fish and Wildlife Service 2010). Encroachment of large, invasive plants that can overtop and shade out thistle plants, such as pampas grass (*Cortaderia selloana*), giant reed (*Arundo donax*), Himalaya blackberry (*Rubus armeniacus*), and French broom (*Genista monspessulana*), are also a threat to fountain thistle (Winzler and Kelly 2010; California Department of Fish and Wildlife 2015).

Species Management

The *Recovery Plan for Serpentine Soil Species of the San Francisco Bay Area* (U.S. Fish and Wildlife Service 1998) proposes four criteria for the downlisting of fountain thistle.

- Securing and protecting occupied habitat and known former habitat along with adjacent unoccupied habitat and a 150-meter (500-foot) buffer at the three extant occurrences.
- Implementing a management plan for the populations and a suitable habitat buffer.
- Monitoring demographic trends in the populations for at least 20 years.
- Seed banking.

Among other management actions to benefit the species would be to remove two nonnative invasive plants, giant reed and jubata grass (*Cortaderia jubata*), which are competing with fountain thistle at Stulsaft Park in Redwood City (U.S. Fish and Wildlife Service 2010).

References

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- Winzler and Kelly. 2010. *Mitigation and Monitoring Plan: Boat Ramp Wetland and Fountain Thistle Sites, San Mateo County, California*. October. Eureka, CA. Prepared for San Francisco Public Utilities Commission, San Francisco, CA.

Marin Dwarf-Flax (*Hesperolinon congestum*)

Status

Federal: Threatened (60 FR 6684, February 3, 1995)

State: Threatened (June 1992)

California Rare Plant Rank: 1B.1

Critical Habitat: None

Recovery Planning: *Recovery Plan for Serpentine Soil Species of the San Francisco Bay Area* (U.S. Fish and Wildlife Service 1998)

Range

Marin dwarf-flax's range is restricted to the northwestern portion of the San Francisco Bay Area region. The range includes portions of Marin, San Francisco, and San Mateo counties. In these counties, 26 occurrences have been documented, and of these, 23 are presumed to be extant (California Department of Fish and Wildlife 2015).

Table B-42. Occurrences of Marin Dwarf-flax Documented in the Bay Area O&M HCP Study Area

County	Total Existing Occurrences	Extant Occurrences	Public	Private	Unknown
Alameda	0	0	0	0	0
Contra Costa	0	0	0	0	0
Marin	12	12	10	4	1
Napa	0	0	0	0	0
San Francisco	3	2	2	1	0
San Mateo	11	9	8	3	0
Santa Clara	0	0	0	0	0
Solano	0	0	0	0	0
Sonoma	0	0	0	0	0

Source: California Department of Fish and Wildlife 2015.

Note: Three occurrences in Marin County are partially on public lands and partially on private lands.

Natural History

Habitat Requirements

Marin dwarf-flax grows on serpentine barrens, in serpentine grassland, and in open grassy areas in serpentine chaparral at elevations from 100 to 1,215 feet (30 to 370 meters) above MSL (California

Department of Fish and Wildlife 2015). At Ring Mountain, in Marin County, Marin dwarf flax grows in a serpentine bunchgrass community with six other rare species (Fiedler and Leidy 1987).

Population Ecology

Marin dwarf flax is an annual species that flowers from April through August (McDill 2012). Populations are known to fluctuate greatly from year to year in both number of individuals and area of occupied habitat, in response to rainfall patterns (U.S. Fish and Wildlife Service 1998). Otherwise, very little has been reported about the population biology.

Population Trend and Threats

Population trends are unknown for most populations (California Department of Fish and Wildlife 2015). One population is reported to be declining, although the U.S. Fish and Wildlife Service (2011) reported that this same population appears to be stable.

The primary threat to Marin dwarf flax has been habitat loss, which remains a current threat (U.S. Fish and Wildlife Service 2011).

Species Management

The *Recovery Plan for Serpentine Soil Species of the San Francisco Bay Area* (U.S. Fish and Wildlife Service 1998) proposes four criteria for the downlisting of Marin dwarf flax.

- Securing and protecting occupied habitat or 21 populations representing the range of the species along with adjacent unoccupied habitat and a 150-meter (500-foot) buffer;
- Implementing a management plan for the populations and additional unoccupied habitat deemed necessary for the survival of the species.
- Monitoring demographic trends in the populations for at least 20 years.

The 5-Year Review (U.S. Fish and Wildlife Service 2011) also recommends assessing the effects of one or more weed control measures in Marin dwarf flax habitat. In addition, the 5-Year Review recommends that research be conducted to determine other key needs for the recovery of the species.

References

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- U.S. Fish and Wildlife Service. 1998. *Recovery Plan for Serpentine Soil Species of the San Francisco Bay Area*. Portland, OR.

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Metcalfe Canyon Jewelflower (*Streptanthus albidus* subsp. *albidus*)

Status

Federal: Endangered

State: None

Critical Habitat: None

Recovery Planning: *Recovery Plan for Serpentine Soil Species of the San Francisco Bay Area* (U.S. Fish and Wildlife Service 1998)

Range

Metcalfe Canyon jewelflower's range is restricted to the southeastern portion of the San Francisco Bay Area region in Santa Clara County. Twelve occurrences of Metcalfe Canyon jewelflower have been reported in the study area; eleven of these occurrences are presumed extant, and one is extirpated (California Department of Fish and Wildlife 2015).

Table B-43. Occurrences of Metcalfe Canyon Jewelflower Documented in the Bay Area O&M HCP Study Area

County	Total Existing Occurrences	Extant Occurrences	Public	Private	Unknown
Alameda	0	0	0	0	0
Contra Costa	0	0	0	0	0
Marin	0	0	0	0	0
Napa	0	0	0	0	0
San Francisco	0	0	0	0	0
San Mateo	0	0	0	0	0
Santa Clara	12	11	3	9	1
Solano	0	0	0	0	0
Sonoma	0	0	0	0	0

Source: California Department of Fish and Wildlife 2015.

Note: One occurrence is partially on public land and partially on private land.

Natural History

Habitat Requirements

Metcalfe Canyon jewelflower is a serpentine endemic that can be found between 200 and 1,200 feet in elevation. It grows in serpentine grasslands and on serpentine outcrops and road cuts that have little soil development and are surrounded by grasslands (California Department of Fish and Wildlife 2015; U.S. Fish and Wildlife Service 1998). Commonly associated species are California sage (*Artemisia californica*), California poppy (*Eschscholzia californica*), foothill deer vetch (*Acmispon*

brachycarpus), wild oats (*Avena fatua*), and various other rare plants such as most beautiful jewelflower (*Streptanthus albidus* subsp. *peramoenus*) and Santa Clara Valley dudleya (*Dudleya abramsii* subsp. *setchellii*) (U.S. Fish and Wildlife Service 1998).

Population Ecology

Seeds of jewelflower species germinate after the first substantial autumn rains, and the young plants initially form leafy rosettes. Flowering stems develop in late spring, and the plants bloom between April and July (Al-Shehbaz 2012).

Metcalf Canyon jewelflower appears to be insect pollinated. Kruckeberg (1957) reported that members of the *Streptanthus glandulosus* complex, including Metcalf Canyon jewelflower, were incapable of self-pollination, and he had observed bees, butterflies, and beetles visiting the flowers. Bees have been observed to be the primary floral visitors in other outcrossing *Streptanthus* species (Dieringer 1991; Preston 1994), although flies and butterflies also visit *Streptanthus* flowers (Moldenke 1976). Observations at one Metcalf Canyon jewelflower population found most visits to flowers were by bumblebees, although honeybees and flies also visited the flowers (U.S. Fish and Wildlife Service 2015). *Streptanthus* flowers appear to be self-fertile, but a combination of spatial and temporal separation of the stamens and receptive stigmas prevents self-pollination (Preston 1991).

No information on herbivory of Metcalf Canyon jewelflower was available; however, other jewelflower species are eaten by herbivorous insects. The larvae of pierid butterflies commonly eat jewelflower leaves, flowers, and developing fruit (Shapiro 1981a, 1981b, 1984, Karban and Courtney 1987). The flowers are also eaten by sap beetles and flea beetles (Shapiro 1981a; Karban and Courtney 1987; Preston 1991). Some species of serpentine-endemic jewelflowers appear to have “egg-mimics” on the leaves, which inhibit some butterfly species from laying eggs there (Shapiro 1981a).

Following pollination and seed set, the plants dry up, and, after being released from the dried fruits, the seeds are dispersed by gravity or wind.

Population Trend and Threats

Population trends for most occurrences are unknown. However, population numbers are known to fluctuate substantially from year to year (U.S. Fish and Wildlife Service 2013) and at least one occurrence appears to be decreasing (California Department of Fish and Wildlife 2015).

Species Management

The *Recovery Plan for Serpentine Soil Species of the San Francisco Bay Area* (U.S. Fish and Wildlife Service 1998) proposes four criteria for the downlisting of Metcalf Canyon jewelflower.

- Securing and protecting nine populations, including a 500-foot buffer around each population.
- Implementing a management plan for the populations and additional unoccupied habitat deemed necessary for the survival of the species.
- Monitoring demographic trends in the populations for at least 20 years.
- Seed banking.

In addition, the *Santa Clara Valley Habitat Conservation Plan* (ICF International 2012) proposes to protect 13 occurrences in the permit area, including acquiring and enhancing at least three known occurrences in the permit area. In addition, ten new occurrences are proposed to be protected.

References

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- U.S. Fish and Wildlife Service. 1998. *Recovery Plan for Serpentine Soil Species of the San Francisco Bay Area*. Portland, OR.
- . 2013. *Dudleya setchellii* (Santa Clara Valley Dudleya), *Streptanthus albidus* ssp. *albidus* (Metcalf Canyon Jewelflower), 5-Year Review: Summary and Evaluation. Sacramento Fish and Wildlife Field Office, Sacramento, CA. January 2013.

Pallid Manzanita (*Arctostaphylos pallida*)

Status

Federal: Threatened

State: Endangered

Critical Habitat: None

Recovery Planning: *Draft Recovery Plan for Arctostaphylos pallida* (pallid manzanita) (U.S. Fish and Wildlife Service 2014)

Range

A member of the manzanita chaparral community, pallid manzanita is endemic to Huckleberry Ridge in the East Bay Hills of Contra Costa and Alameda Counties (Amme and Havlik 1987). In these counties, nine occurrences have been documented and eight are presumed extant (California Department of Fish and Wildlife 2015).

Table B-44. Occurrences of Pallid Manzanita Documented in the Bay Area O&M HCP Study Area

County	Total Existing Occurrences	Extant Occurrences	Public	Private	Unknown
Alameda	5	4	4	1	0
Contra Costa	7	7	7	1	0
Marin	0	0	0	0	0
Napa	0	0	0	0	0
San Francisco	0	0	0	0	0
San Mateo	0	0	0	0	0
Santa Clara	0	0	0	0	0
Solano	0	0	0	0	0
Sonoma	0	0	0	0	0

Source: California Department of Fish and Wildlife 2015.

Note: Three occurrences are partially in Alameda County and partially in Contra Costa County; one occurrence in Contra Costa County is partially on public land and partially on private land.

Natural History

Habitat Requirements

Pallid manzanita occurs on east- or south-facing slopes in pure stands on somewhat nutrient-deficient soils derived from sedimentary rock, including sandstone and shale (Amme and Havlim 1987). The stands are found at elevations ranging from 605 to 1,525 feet (185 to 465 meters) above MSL (California Department of Fish and Wildlife 2015). The plants are found in manzanita chaparral habitat that is frequently surrounded by oak woodlands and coastal shrub. Associated species

include brittleleaf manzanita (*Arctostaphylos crustacea*), scrub interior live oak (*Quercus wislizeni* var. *frutescens*), bracken fern (*Pteridium aquilinum*), and bush monkeyflower (*Diplacus aurantiacus*) (Amme and Pavlik 1987).

Population Ecology

Pallid manzanita reproduces by seed and vegetatively. Seeds require an open canopy to germinate, so that disturbance from fire or vegetation clearing is needed for regeneration by seedlings (Amme and Pavlik 1987). Although pallid manzanita does not form burls and does not resprout after fires, vegetative reproduction occurs via layering, when branches growing prostrate along the ground root at the nodes (Amme and Pavlik 1987).

Population Trend and Threats

One occurrence has been extirpated, five occurrences are decreasing, and three occurrences have an unknown trend (California Department of Fish and Wildlife 2015). Pallid manzanita declined historically because of habitat loss due to urbanization. Most of the plants are currently on public lands. Current threats include the loss of plants from fungal infection, fuel reduction activities, right-of-way clearance, shading by native and landscaping trees, and trail maintenance (California Department of Fish and Wildlife 2015, U.S. Fish and Wildlife Service 2010, 2014).

Species Management

The Draft Recovery Plan for Arctostaphylos pallida (U.S. Fish and Wildlife Service 2010) proposes several management measures to promote the recovery of pallid manzanita.

- Control the infestation of the root fungus *Phytophthora cinnamomi* currently affecting the populations.
- Minimize the spread of *Phytophthora cinnamomi* within and among populations.
- Manage and expand the existing stands of pallid manzanita and establish new stands.

In addition, there have been local conservation efforts to reduce the effects of overshadowing through vegetation management and to promote the establishment of new plants (U.S. Fish and Wildlife Service 2010).

References

- Amme, D. and N. Havlik. 1987. An ecological assessment of *Arctostaphylos pallida* Eastw., Alameda and Contra Costa Counties. *Four Seasons* 7(4): 28–46.
- California Department of Fish and Wildlife. 2015. California Natural Diversity Database, RareFind 3, Version 3.1.0. (May 1, 2015). Occurrence records for *Arctostaphylos pallida*. Sacramento CA.
- U.S. Fish and Wildlife Service. 2010. *Arctostaphylos pallida* (pallid manzanita), 5-Year Review: Summary and Evaluation. Sacramento Fish and Wildlife Office, Sacramento, CA. November.
- U.S. Fish and Wildlife Service. 2014. *Draft Recovery Plan for Arctostaphylos pallida (pallid manzanita)*. Pacific Southwest Region, Sacramento, CA.

Santa Clara Valley Dudleya (*Dudleya setchellii*)

Status

Federal: Endangered

State: None

Critical Habitat: None

Recovery Planning: *Recovery Plan for Serpentine Soil Species of the San Francisco Bay Area* (U.S. Fish and Wildlife Service 1998)

Range

Santa Clara Valley dudleya's range is restricted to the southeastern portion of the San Francisco Bay Area region in Santa Clara County. In this county, 55 occurrences have been documented, and all of these are presumed to be extant (California Department of Fish and Wildlife 2015).

Table B-45. Occurrences of Santa Clara Valley Dudleya Documented in the Bay Area O&M HCP Study Area

County	Total Existing Occurrences	Extant Occurrences	Public	Private	Unknown
Alameda	0	0	0	0	0
Contra Costa	0	0	0	0	0
Marin	0	0	0	0	0
Napa	0	0	0	0	0
San Francisco	0	0	0	0	0
San Mateo	0	0	0	0	0
Santa Clara	55	55	33	22	6
Solano	0	0	0	0	0
Sonoma	0	0	0	0	0

Source: California Department of Fish and Wildlife 2015.

Note: Seven populations are partially on public lands and partially on private lands, and one occurrence is partially on public land and partially on lands of unknown ownership.

Natural History

Habitat Requirements

Santa Clara Valley dudleya is restricted to rocky outcrops in serpentine grassland and oak woodland at elevations between 195 and 1,495 feet (60 to 455 meters) above MSL in elevation. The rock outcrops where this species is found are otherwise largely unvegetated. However, adjacent serpentine grasslands typically are dominated by a mixture of native grasses, such as purple

needlegrass (*Stipa pulchra*), and nonnative grasses, such as wild oats (*Avena* spp.) and soft chess (*Bromus hordeaceus*). Native forbs are also common associates of this species, including bitterroot (*Lewisia rediviva*), lomatium (*Lomatium* spp.), soap plant (*Chlorogalum pomeridianum*), dwarf plantain (*Plantago erecta*), California poppy (*Eschscholzia californica*), and naked buckwheat (*Eriogonum nudum*) (California Department of Fish and Wildlife 2015). Santa Clara Valley dudleya may also occur on serpentine rock outcrops in oak woodland or savanna, where coast live oak (*Quercus agrifolia*) and valley oak (*Quercus lobata*) have been reported as associates (California Department of Fish and Wildlife 2015).

Population Ecology

Information on the demography of Santa Clara dudleya is not available from published sources. However, the *Recovery Plan for Serpentine Soil Species of the San Francisco Bay Area* (U.S. Fish and Wildlife Service 1998) and the 5-year Review for Santa Clara Valley dudleya (U.S. Fish and Wildlife Service 2013) both provide information on the population ecology. Santa Clara Valley dudleya is a perennial herb, and individual plants live for up to 10 years. The plants bloom between April and July, subsequently producing wind-dispersed seeds. The plants also reproduce vegetatively by forming rosettes that either remain attached to the parent plant or separate from it. Seedling germination is high in wet years, but seedling survival is low, often less than 5%. The highest seedling survival rates are on east- and north-facing slopes, suggesting that desiccation may be a major source of seedling mortality. Suitable microhabitats on rock outcrops (crevices with enough soil to retain moisture) may greatly limit the population size of this species.

Population Trend and Threats

Population trends for most occurrences are unknown, although four occurrences are reported to be declining in numbers (California Department of Fish and Wildlife 2015). The primary threat to the species has been habitat loss to urbanization, although multiple other threats continue, including disturbances from quarry expansion, landfill activity, and road and utility maintenance; competition from invasive plants; impacts from off-road vehicles; impacts of cattle grazing; and rooting by feral pigs (California Department of Fish and Wildlife 2015; U.S. Fish and Wildlife Service 1998, 2013).

Species Management

The *Recovery Plan for Serpentine Soil Species of the San Francisco Bay Area* (U.S. Fish and Wildlife Service 1998) proposes four criteria for the downlisting of Santa Clara Valley dudleya.

- Securing and protecting 20 populations, including a 500-foot buffer around each population.
- Implementing a management plan for the populations and additional unoccupied habitat deemed necessary for the survival of the species.
- Monitoring demographic trends in the populations for at least 20 years.
- Seed banking.

In addition, the *Santa Clara Valley Habitat Conservation Plan* (ICF International 2012) proposes to acquire through acquisition or conservation easement lands that support 55 extant occurrences of Santa Clara Valley dudleya.

References

- California Department of Fish and Wildlife. 2015. California Natural Diversity Database, RareFind 3, Version 3.1.0. (May 1, 2015). Occurrence records for *Dudleya setchellii*. Sacramento CA.
- ICF International. 2012. *Santa Clara Valley Habitat Plan*. Final. August. Prepared for City of Gilroy, City of Morgan Hill, City of San José, County of Santa Clara, Santa Clara Valley Transportation Authority, and Santa Clara Valley Water District.
- U.S. Fish and Wildlife Service. 1998. Recovery Plan for Serpentine Soil Species of the San Francisco Bay Area. Portland, Oregon.
- U.S. Fish and Wildlife Service. 2013. *Dudleya setchellii* (Santa Clara Valley Dudleya), *Streptanthus albidus* ssp. *albidus* (Metcalf Canyon Jewelflower), 5-Year Review: Summary and Evaluation. Sacramento Fish and Wildlife Field Office, Sacramento, California. January 2013.

Sebastopol Meadowfoam (*Limnanthus vicularis*)

Status

Federal: Endangered

State: Endangered

Critical Habitat: None

Recovery Planning: *Draft Recovery Plan for the Santa Rosa Plain: Blennosperma bakeri (Sonoma sunshine); Lasthenia burkei (Burke's goldfields); Limnanthus vicularis (Sebastopol meadowfoam); Sonoma County Distinct Population Segment of the California Tiger Salamander (Ambystoma californiense)* (U.S. Fish and Wildlife Service 2014)

Range

Sebastopol meadowfoam mostly is restricted to southern Sonoma County in the vicinity of Sebastopol, with one occurrence reported from Napa County (Sloop et al. 2012a, California Department of Fish and Wildlife 2015). Forty-five occurrences have been documented, and 38 of these are presumed to be extant (California Department of Fish and Wildlife 2015).

Table B-46. Occurrences of Sebastopol Meadowfoam Documented in the Bay Area O&M HCP Study Area

County	Total Existing Occurrences	Extant Occurrences	Public	Private	Unknown
Alameda	0	0	0	0	0
Contra Costa	0	0	0	0	0
Marin	0	0	0	0	0
Napa	1	1	0	1	0
San Francisco	0	0	0	0	0
San Mateo	0	0	0	0	0
Santa Clara	0	0	0	0	0
Solano	0	0	0	0	0
Sonoma	44	37	15	30	4

Source: California Department of Fish and Wildlife 2015.

Note: Four populations are partially on public lands and partially on private lands, and one occurrence is partially on public land and partially on land of unknown ownership.

Natural History

Habitat Requirements

Sebastopol meadowfoam grows in vernal pools and other seasonal wetlands in both shallow and deep areas, but is more frequent in pools 10 to 20 inches (25 to 30 centimeters) deep. This species is

known to grow between elevations of 50 and 1,000 feet (15 and 305 meters) above MSL (California Department of Fish and Wildlife 2015).

Population Ecology

Sebastopol meadowfoam is an annual species that blooms in April and May (Ornduff and Morin 2012). It is strongly outcrossing, requiring pollinators for maximum set seed (Ornduff 1969, Sloop et al. 2012b). The primary floral visitors are specialist bee pollinators, which are the presumed pollinators (Ornduff 1969, Sloop et al. 2012b). The seed dispersal mechanism is unknown (Sloop et al. 2012a).

Population Trend and Threats

The population trends are unknown for most occurrences, although two occurrences appear to be decreasing. Population numbers vary substantially from year to year in response to annual variation in rainfall amounts and timing (California Department of Fish and Wildlife 2015).

The primary threat to Sebastopol meadowfoam has been and continues to be habitat loss to urban development and agriculture (U.S. Fish and Wildlife Service 2008). Other threats include alterations to the wetland hydrology and competition from invasive nonnative plants (U.S. Fish and Wildlife Service 2008, California Department of Fish and Wildlife 2015).

Species Management

The Draft Recovery Plan for the Santa Rosa Plain (U.S. Fish and Wildlife Service 2014) proposes the following actions for the recovery of Sebastopol meadowfoam.

- Protect extant occurrences and potential habitat for Sebastopol meadowfoam.
- Develop a central database for survey data from all natural and created occurrences.
- Collect and store seed from all occurrences.
- Survey historical locations and other potential habitat where Sebastopol meadowfoam may occur.
- Conduct research necessary to develop a population viability analysis for Sebastopol meadowfoam.
- Conduct necessary biological research on Sebastopol meadowfoam and use results to guide recovery efforts.
- Implement habitat management for Sebastopol meadowfoam.
- Restore or create vernal wetlands and reintroduce or introduce Sebastopol meadowfoam.
- Monitor all protected occurrences.
- Engage and educate the public about Sebastopol meadowfoam.

References

California Department of Fish and Wildlife. 2015. California Natural Diversity Database, RareFind 3, Version 3.1.0. (May 1, 2015). Occurrence records for *Limnanthes vinculans*. Sacramento CA.

- Ornduff, R. 1969. *Limnanthes vinculans*, a new California endemic. *Brittonia* 21: 11–14.
- Ornduff, R., and N. R. Morin. 2012. *Limnanthes*. Page 863–865 in B. G. Baldwin, D. H. Goldman, D. J. Keil, R. Patterson, T. J. Rosatti, and D. H. Wilken (eds.), *The Jepson Manual: Vascular Plants of California. Second edition*. Berkeley, CA: University of California Press.
- Sloop, C. M., R. Eberl, and D. R. Ayres. 2012a. Genetic diversity and structure in the annual vernal pool endemic *Limnanthes vinculans* Ornduff (Limnanthaceae): implications of breeding system and restoration practices. *Conservation Genetics* 13: 1365–1379.
- Sloop, C. M., K. Gilmore, H. Brown, and N. E. Rank. 2012b. *An Investigation of the Reproductive Ecology and Seed Bank Dynamics of Burke's Goldfields (Lasthenia burkei), Sonoma Sunshine (Blennosperma bakeri), and Sebastopol Meadowfoam (Limnanthes vinculans) in Natural and Constructed Vernal Pools*. Final Project Report E-2-P-35, for California Department of Fish & Game, U.S. Fish and Wildlife Service: Endangered Species Act (Section-6) Grant-in-Aid Program.
- U.S. Fish and Wildlife Service. 2008. *Blennosperma bakeri* (Sonoma Sunshine); *Lasthenia burkei* (Burke's Goldfields); *Limnanthes vinculans* (Sebastopol Meadowfoam); 5-Year Review: Summary and Evaluation. Sacramento Fish and Wildlife Field Office, Sacramento, CA. September.
- . 2014. *Draft Recovery Plan for the Santa Rosa Plain: Blennosperma bakeri (Sonoma sunshine); Lasthenia burkei (Burke's goldfields); Limnanthes vinculans (Sebastopol meadowfoam); Sonoma County Distinct Population Segment of the California Tiger Salamander (Ambystoma californiense)*. U.S. Fish and Wildlife Service, Pacific Southwest Region, Sacramento, California.

Sonoma Sunshine (*Blennosperma bakeri*)

Status

Federal: Endangered

State: Endangered

Critical Habitat: None

Recovery Planning: *Draft Recovery Plan for the Santa Rosa Plain: Blennosperma bakeri (Sonoma sunshine); Lasthenia burkei (Burke's goldfields); Limnanthes vinculans (Sebastopol meadowfoam); Sonoma County Distinct Population Segment of the California Tiger Salamander (Ambystoma californiense)* (U.S. Fish and Wildlife Service 2014)

Range

Sonoma sunshine is known only from 25 occurrences in Sonoma County, 20 of which are presumed to be extant (California Department of Fish and Wildlife 2015).

Table B-47. Occurrences of Sonoma Sunshine Documented in the Bay Area O&M HCP Study Area

County	Total Existing Occurrences	Extant Occurrences	Public	Private	Unknown
Alameda	0	0	0	0	0
Contra Costa	0	0	0	0	0
Marin	0	0	0	0	0
Napa	0	0	0	0	0
San Francisco	0	0	0	0	0
San Mateo	0	0	0	0	0
Santa Clara	0	0	0	0	0
Solano	0	0	0	0	0
Sonoma	25	20	10	19	0

Source: California Department of Fish and Wildlife 2015.

Note: Four populations are partially on public lands and partially on private lands.

Natural History

Habitat Requirements

Sonoma sunshine grows in vernal pools and mesic valley and foothill grasslands between 30 and 360 feet (185 to 760 meters) above MSL (California Department of Fish and Wildlife 2015).

Population Ecology

Sonoma sunshine is an annual species that blooms from February through April (Baldwin 2012). It is strongly outcrossing, requiring pollinators for maximum set seed (Ornduff 1963, Sloop et al 2012). The primary floral visitors are bees, which are the presumed pollinators, but other insects also visit the flowers (Sloop et al 2012).

Population Trend and Threats

The population trends are unknown for most occurrences, although four occurrences appear to be decreasing. Population numbers vary substantially from year to year in response to annual variation in rainfall amounts and timing (California Department of Fish and Wildlife 2015).

The primary threat to Sonoma sunshine has been and continues to be habitat loss to urban development and agriculture (U.S. Fish and Wildlife Service 2008). Other threats include alterations to the wetland hydrology and competition from invasive nonnative plants (U.S. Fish and Wildlife Service 2008, California Department of Fish and Wildlife 2015).

Species Management

The Draft Recovery Plan for the Santa Rosa Plain (U.S. Fish and Wildlife Service 2014) proposes the following actions for the recovery of Sonoma sunshine.

- Protect extant occurrences and potential habitat for Sonoma sunshine.
- Develop a central database for survey data from all natural and created occurrences.
- Collect and store seed from all occurrences.
- Survey historical locations and other potential habitat where Sonoma sunshine may occur.
- Conduct research necessary to develop a population viability analysis for Sonoma sunshine.
- Conduct necessary biological research on Sonoma sunshine and use results to guide recovery efforts.
- Implement habitat management for Sonoma sunshine.
- Restore or create vernal wetlands and reintroduce or introduce Sonoma sunshine.
- Monitor all protected occurrences.
- Engage and educate the public about Sonoma sunshine.

References

- Baldwin, B. G. 2012. *Blennosperma*. Page 261 in B. G. Baldwin, D. H. Goldman, D. J. Keil, R. Patterson, T. J. Rosatti, and D. H. Wilken (eds.), *The Jepson Manual: Vascular Plants of California. Second edition*. Berkeley, CA: University of California Press.
- California Department of Fish and Wildlife. 2015. California Natural Diversity Database, RareFind 3, Version 3.1.0. (May 1, 2015). Occurrence records for *Blennosperma bakeri*. Sacramento CA.
- Sloop, C. M., K. Gilmore, H. Brown, and N. E. Rank. 2012. *An Investigation of the Reproductive Ecology and Seed Bank Dynamics of Burke's Goldfields (Lasthenia burkei), Sonoma Sunshine*

(*Blennosperma bakeri*), and *Sebastopol Meadowfoam* (*Limnanthes vinculans*) in *Natural and Constructed Vernal Pools*. Final Project Report E-2-P-35, for California Department of Fish & Game, U.S. Fish and Wildlife Service: Endangered Species Act (Section-6) Grant-in-Aid Program.

Ornduff, R. 1963. Experimental studies in two genera of Helenieae (compositae): *Blennosperma* and *Lasthenia*. *The Quarterly Review of Biology* 38: 141–150.

U.S. Fish and Wildlife Service. 2008. *Blennosperma bakeri* (Sonoma Sunshine); *Lasthenia burkei* (Burke's Goldfields); *Limnanthes vinculans* (Sebastopol Meadowfoam); 5-Year Review: Summary and Evaluation. Sacramento Fish and Wildlife Field Office, Sacramento, CA. September 2008.

———. 2014. *Draft Recovery Plan for the Santa Rosa Plain: Blennosperma bakeri* (Sonoma sunshine); *Lasthenia burkei* (Burke's goldfields); *Limnanthes vinculans* (Sebastopol meadowfoam); *Sonoma County Distinct Population Segment of the California Tiger Salamander* (*Ambystoma californiense*). U.S. Fish and Wildlife Service, Pacific Southwest Region, Sacramento, CA.

White-Rayed Pentachaeta (*Pentachaeta bellidiflora*)

Status

Federal: Endangered

State: Endangered

Critical Habitat: None

Recovery Planning: *Recovery Plan for Serpentine Soil Species of the San Francisco Bay Area* (U.S. Fish and Wildlife Service 1998)

Range

White-rayed pentachaeta's range is restricted to the San Francisco Bay Area region. The range includes portions of Marin and San Mateo counties. In these counties, 10 occurrences have been documented, and, of these, three are presumed to be extant (California Department of Fish and Wildlife 2015). However, only one of the extant occurrences has been observed recently, and two occurrences have not been relocated for more than 100 years.

Table B-48. Occurrences of White-rayed Pentachaeta Documented in the Bay Area O&M HCP Study Area

County	Total Existing Occurrences	Extant Occurrences	Public	Private	Unknown
Alameda	0	0	0	0	0
Contra Costa	0	0	0	0	0
Marin	6	1	0	2	4
Napa	0	0	0	0	0
San Francisco	0	0	0	0	0
San Mateo	4	2	2	0	2
Santa Clara	0	0	0	0	0
Solano	0	0	0	0	0
Sonoma	0	0	0	0	0

Source: California Department of Fish and Wildlife 2015.

Natural History

Habitat Requirements

White-rayed pentachaeta grows in grassy or rocky areas in grasslands and open areas in chaparral, at elevations from 110 to 2,035 feet (35 to 620 meters) above MSL (California Department of Fish and Wildlife 2015). The extant San Mateo occurrences are on serpentine soils.

Population Ecology

White-rayed pentachaeta is a spring-flowering (March to May) annual species, but little else is known about its pollination or reproductive biology (U.S. Fish and Wildlife Service 1998).

Population Trend and Threats

The primary threat to white-rayed pentachaeta has been habitat loss through urbanization (U.S. Fish and Wildlife Service 1998, 2010). The extant occurrence on public land faces no known threats, although limitation of the species to a single population places it at risk to catastrophic events (U.S. Fish and Wildlife Service 2010). The population size fluctuates dramatically from year to year, ranging from thousands to many millions of plants (California Department of Fish and Wildlife 2015).

Species Management

The *Recovery Plan for Serpentine Soil Species of the San Francisco Bay Area* (U.S. Fish and Wildlife Service 1998) proposes four criteria for the downlisting of white-rayed pentachaeta.

- Securing and protecting five populations, which will include establishing several new populations.
- Implementing a management plan for the populations and a suitable habitat buffer.
- Monitoring demographic trends in the populations for at least 20 years.
- Seed banking.

References

- California Department of Fish and Wildlife. 2015. California Natural Diversity Database, RareFind 3, Version 3.1.0. (May 1, 2015). Occurrence records for *Pentachaeta bellidiflora*. Sacramento CA.
- U.S. Fish and Wildlife Service. 1998. *Recovery Plan for Serpentine Soil Species of the San Francisco Bay Area*. Portland, OR.
- U.S. Fish and Wildlife Service. 2010. *Acanthomintha obovata* ssp. *duttonii* (San Mateo thornmint), *Cirsium fontinale* var. *fontinale* (fountain thistle), *Pentachaeta bellidiflora* (white-rayed pentachaeta), 5-Year Review: Summary and Evaluation. Sacramento Fish and Wildlife Office Sacramento, CA.

Appendix C

Implementation Tools

Implementation tools are subject to modification by USFWS and PG&E over time, but these documents provide the basis for assuring mitigation lands are perpetually protected.

C1. Conservation Easement Deed 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: _____

C2. 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 ~~for mitigation banks.~~ Objectives and tasks are provided for illustrative purposes only and may not represent management requirements for a specific ~~bank~~ parcel.
(Template Version Date: May 2008 February 2016 updates for PG&E's O&M HCP)

**Long-term Management Plan
For
The _____ ~~Mitigation Bank~~ _____ for PG&E's Bay Area O&M
HCP**

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Long-Term Management Plan

I. Introduction

A. Purpose of Establishment

The _____ (“~~Bank~~Parcel”) was established by the ~~Bank~~ Enabling Instrument (“BEI”) to compensate for unavoidable impacts to, and to conserve and to protect waters of the U.S., covered species and covered habitat. The ~~Bank~~Parcel property includes _____ acres of waters of the U.S. including _____ acres [*insert as applicable: of /all of which are*] preserved wetlands, _____ acres of created wetlands, _____ acres of covered species for [*specify threatened/endangered species*], and _____ acres of covered habitat for [*specify threatened/endangered species habitat*]. The ~~BEI~~Parcel Signatory Agencies are the _____ District of the U.S. Army Corps of Engineers, Region 9 of the U.S. Environmental Protection Agency, the _____ Office of the U.S. Fish and Wildlife Service, and the California Department of Fish and Game (“~~CDFG~~Wildlife (“~~CDF~~CDFWW”)) _____ Region. These agencies comprise and are referred to jointly as the Interagency Review Team (“IRT”). ~~Terms used in this management plan have the same meaning as defined in the BEI.~~

B. Purpose of this Long-term Management Plan

The purpose of this long-term management plan is to ensure the ~~Bank~~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 ~~Bank~~Parcel. This management plan is a binding and enforceable instrument, implemented by the conservation easement covering the ~~Bank~~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 ~~bank~~Parcel property in perpetuity to preserve its habitat and conservation values in accordance with the ~~Bank's~~Parcel's BEI, 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 IRT 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 IRT and the necessary permits, such as a Section 404 permit, must be

obtained if required.

II. Property Description

A. Setting and Location

The BankParcel 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 BankParcel property map (Figure 2). The general vicinity map shows the BankParcel location in relation to cities, towns, or major roads, and other distinguishable landmarks. The BankParcel property map shows the BankParcel 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 BankParcel site is currently _____ [Describe adjacent land and local area land uses.]

C. Cultural Resources – (if applicable, refers to Cultural Resources Survey, Exhibit J in the BEI)

[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 BankParcel 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 BankParcel 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 BankParcel

[The Biological Resources Survey, Exhibit H in the BEI, 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 known 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 BankParcel Development Plan (if applicable)

[Describe all created and/or enhanced waters of the U.S., covered species and covered habitat. Include acreages and describe plant and animal species that occur within the waters of the U.S. 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 BankParcel 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 ~~Bank~~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 ~~Bank~~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 ~~Bank~~Parcel site in perpetuity.

A. Biological Resources

The approach to the long-term management of the ~~Bank~~Parcel site's biological resources is to conduct annual site examinations and monitoring of selected characteristics to determine stability and ongoing trends of the preserved and created waters of the U.S., including wetlands, *[list covered species and covered habitats]*. Annual monitoring will assess the ~~Bank's~~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 IRT 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 IRT will consider whether such actions will help ensure the continued viability of ~~Bank's~~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 ~~Bank~~Parcel site shall implement the following:

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

Objective: Monitor, conserve and maintain the ~~Bank~~Parcel site's waters of the U.S., including wetlands. 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 ~~Bank~~Parcel file. Alternatively, utilize photographic reference sites, if any, developed during interim ~~bank~~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 ~~Bank~~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 ~~Bank~~Parcel site's covered habitat.

Task: As part of the annual site walk-through, the ~~Bank~~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 vincularis 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 IRT 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 IRT 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 ~~bank~~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 ~~bank~~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 IRT'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 IRT.

B. Security, Safety, and Public Access

The ~~Bank~~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 ~~Bank~~Parcel site as deemed appropriate by the IRT, 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 IRT.

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

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 IRT, 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 IRT and any other appropriate parties.

Task: Prepare annual report and any other additional documentation. Include a summary. Complete and circulate to the IRT 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 IRT, shall require written approval by the IRT, 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 IRT.

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 IRT, 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 IRT to resolve the failure. Such meeting shall occur within 30 days or a longer period if approved by the IRT. Based on the outcome of the meeting, or if no meeting is requested, the IRT 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 IRT may enter onto the ~~Bank~~Parcel property in order to fulfill the purposes of this long-term management plan.

C. Amendments

The land manager, property owner, and the IRT 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 ~~Bank~~Parcel property. Any proposed changes to the long-term management plan shall be discussed with the IRT 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 IRT in writing shall be required management components and shall be implemented by the land manager.

If the ~~CDFG~~CDFW or USFWS 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)

IRT, BEI Signatory Agencies:

U.S. Army Corps of Engineers

_____ District

[DISTRICT ADDRESS]

Attn: Chief, Regulatory Branch

Telephone:

Fax:

U.S. Fish and Wildlife Service

_____ Office

[FIELD OFFICE ADDRESS]

Attn: Field Supervisor

Telephone:

Fax:

U.S. Environmental Protection Agency

Region IX

75 Hawthorne Street

San Francisco, CA 94105

Attn: Director, Water Division

Telephone: 415-947-8707

Fax: 415-947-3549

California Department of Fish and ~~Game~~Wildlife

_____ Region

[REGION ADDRESS]

Attn: Regional Manager

Telephone:

Fax:

California Department of Fish and ~~Game~~Wildlife

Habitat Conservation Branch

1416 Ninth Street, 12th Floor

Sacramento, CA 95814

Attn: Branch Chief

Telephone: 916-653-4875

Fax: 916-653-2588

VI. Funding and Task Prioritization

Long-Term Management Plan Template for _____ ~~Mitigation Bank~~for PG&E's Bay Area O&M HCP

revised ~~May 2008~~February 2016

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 ~~bank~~Parcel.]

Table 1 summarizes the anticipated costs of long-term management for the ~~Bank~~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 \$_____.

~~CDFG~~CDFW shall hold the endowment principal and interest monies as required by law in the Special Deposit Fund, or a subsequent state 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.

[If ~~CDFG~~CDFW is not the land manager and/or property owner insert: Land manager shall consult with ~~CDFG~~CDFW 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 ~~CDFG~~CDFW for management activities following the invoicing instructions provided by ~~CDFG~~CDFW.]

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 BEI IRT 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 BEI IRT and as authorized by the BEI IRT in writing.

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

General BankParcel 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							
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	\$
Grazing research and management	Research and coordination	No. of hours	\$/hour	\$	as appropriate	as needed	\$

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

General ~~Bank~~Parcel Management & Monitoring Activities	Description	Level of Effort	Cost per Unit	Cost	Frequency	Schedule	Annual Cost
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							\$

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%)							
Adaptive Management (4.5% of contingency)							
Change Circumstances (0.5% of contingency)							
						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.

C3. Checklist for Mitigation Site Annual and Monitoring Reports

Sacramento Fish and Wildlife Office
Checklist for Mitigation Site Annual and Monitoring Reports

Please include the following information in the report, as applicable. Biological Monitoring Reports may be included as a subpart of the Annual Report, in those years where biological monitoring is required. **The checklist does not replace the report.** Reports should be submitted in bound hard copy, with a copy of this checklist.

☐ **Site Management**

- ☐ Photos documenting condition of the site
- ☐ Grazing (include supporting data and photographs, RDM monitoring, etc.)
- ☐ Other Vegetation/Thatch Management (include details of all actions taken or explain why no action was taken)
 - ☐ Mowing
 - ☐ Prescribed Burn
 - ☐ Herbicide Application
 - ☐ Exotic/Invasive/Non-Native Species Management (including amount of such species, maps indicating where the species are present, and actions taken/to be taken- if no action is to be taken explain and include supporting data)
- ☐ Fencing/Signage/Unauthorized Access (include description of actions taken and a description and photos of current fencing and signage condition and any evidence noted of unauthorized access)
- ☐ Trash Removal
- ☐ Authorized Visitation/Use of the Site (Please include an explanation of authorized visitation/usage of the site including dates, description of visit/usage, effect on the Bank)
 - ☐ Hunting/Fishing
 - ☐ Education
 - ☐ Easement Holder/Agency Visits
 - ☐ Agricultural (non-grazing)
 - ☐ Mining/Drilling
 - ☐ Recreation
 - ☐ Other Authorized Tours
- ☐ Discussion/schedule of actions/tasks to be undertaken in the coming year.
- ☐ If site is in the Interim Management Period: Expenses incurred in carrying out management plan and monitoring activities.

- ☐ **Species and Performance Monitoring- Methodologies, Results, and Photos – Check all that apply** (if this report is for a year requiring performance monitoring please include success criteria and discussion relating observations to achievement of performance standards)

Sacramento Fish and Wildlife Office
Checklist for Mitigation Site Annual and Monitoring Reports

For mitigation sites with Vernal Pools (check all that apply):

- ☐ Large Branchiopod Surveys
- ☐ California Tiger Salamander Surveys
- ☐ Vernal Pool Floristics
- ☐ Vernal Pool Hydrology

Non-Vernal Pool Species Requirements (check all that apply):

- ☐ San Joaquin Kit Fox
- ☐ Giant Garter Snake
- ☐ California Tiger Salamander
- ☐ CA Red-legged Frog
- ☐ Alameda Whipsnake
- ☐ Callippe Silverspot Butterfly
- ☐ Plant Species (please list species)

- ☐ Other (Please List- if not enough space attach separate page)

☐ If no species monitoring was required please indicate if:

- ☐ Monitoring is not required at this site ☐ this year ☐ at all
- ☐ What years monitoring has been/will be done: _____

☐ **Endowment Fund**

Is endowment fully funded? ☐ Yes ☐ No

- ☐ Current Balance (as of submittal)
- ☐ Deposits and/or withdrawals made to/from the Endowment Account
- ☐ Expenses and Reimbursements
- ☐ Interest Earned by Endowment Account

☐ **Documentation**

- ☐ Photo Point Photos, with a map of the photo points
- ☐ Copies of completed data sheets and/or copies of field notes for all surveys



Photo credit: Tyson Read, Steve Willoughby, and Bill Stagnaro/Wikimedia.org