5 Biological Resources – Terrestrial

Chapter 5 evaluates the potential impacts of the Program components on terrestrial resources. Results of the evaluation are provided at the programmatic level. Section 5.1, Environmental Setting, presents an overview of the environmental settings and contains federal regulations, state regulations, and local ordinances and regulations that are applicable to the Program. Section 5.2, Environmental Impacts and Mitigation Measures, presents the following:

> Environmental concerns and evaluation criteria

> Discussion of methods and assumptions, including findings from Appendix B, Ecological and Human Health Assessment Report

> Discussion of the impacts of the existing and future activities within the Program components, and recommendations for mitigation, if required, for those impacts

> A summary of terrestrial resources impacts

This chapter depends heavily on the information provided in Appendix A, Biological Resources Technical Report; Appendix B, Human and Ecological Health Assessment Report, and Chapter 6, Ecological Health. Aquatic resources are addressed in Chapter 4. The cumulative impact analysis is contained in Chapter 13, Section 13.3; and it focuses on the potential cumulative impacts associated with Vegetation Management and Chemical Control Components, including impacts on beneficial insect pollinators from chemical applications.

5.1 Environmental Setting

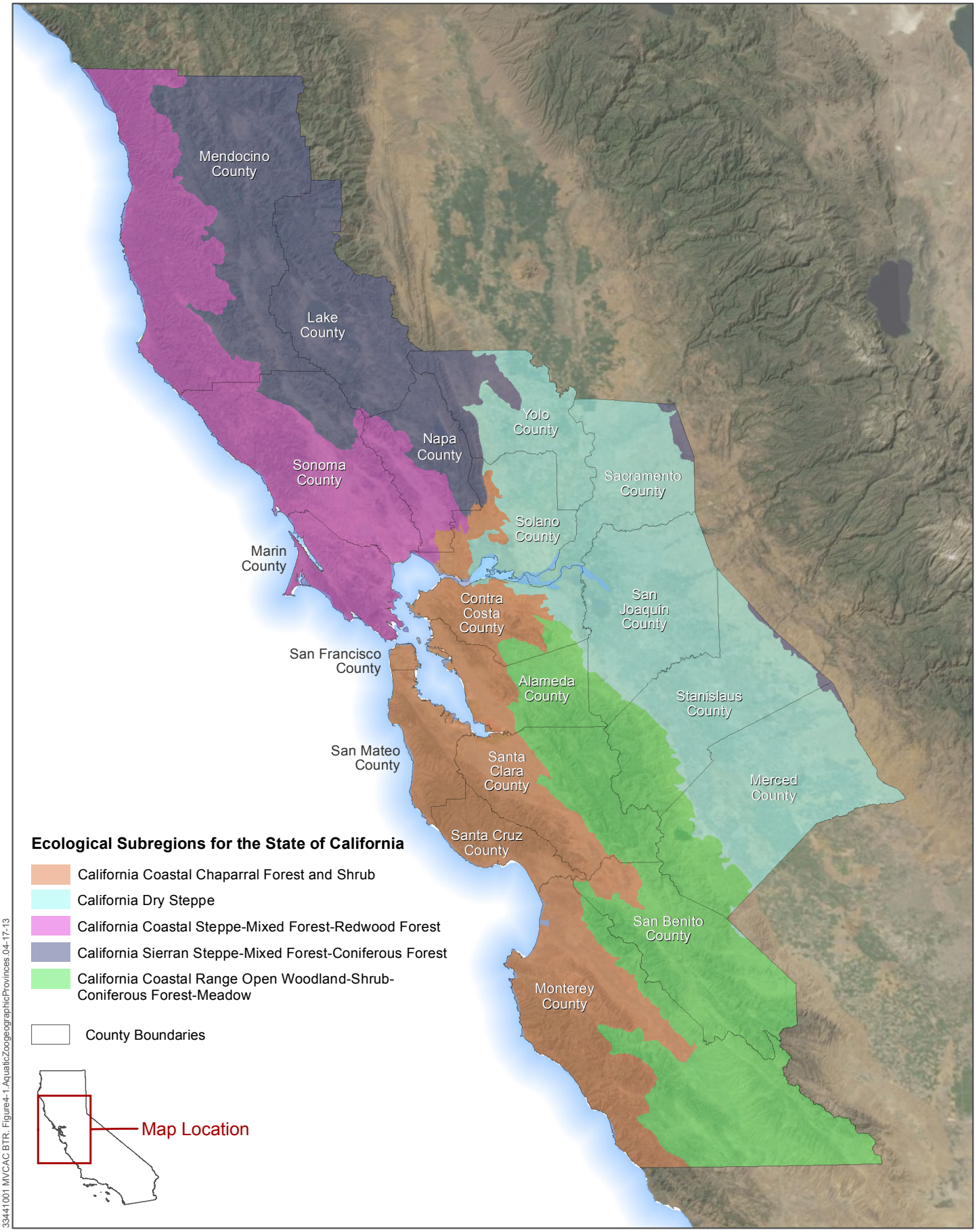
The Program Area is defined as the San Mateo County Mosquito and Vector Control District (SMCMVCD) Service Area (San Mateo County) and the adjacent counties where control activities may be provided upon request (which include San Francisco, Santa Clara, and Santa Cruz counties). The following section provides background information on the terrestrial resources that may be present and an overview of the regulatory setting with respect to management of terrestrial species.

Section 5.1.1 identifies the terrestrial resources in the District's Program Area, Section 5.1.2 describes the special-status terrestrial species that have the potential to occur within the Program Area, Section 5.1.3 provides an overview of federal, state, and local ordinances and regulations pertinent to these resources that are applicable to the Program. Section 5.1.4 identifies the Habitat Conservation Plans (HCPs) and Natural Community Conservation Plans (NCCPs) in the Program Area.

5.1.1 Terrestrial Resources within the Program Area

The Program Area addressed in this report includes San Mateo County and the three adjacent counties: Santa Clara, San Francisco, and Santa Cruz. Control activities may be provided in areas adjacent to the District's Service Area upon request of the adjacent jurisdictions to protect the health and safety of residents in adjacent jurisdictions. Actions that would be taken outside of the Service Area are the same types of actions undertaken within the Service Area and in similar types of habitats or sites. Any activities taken outside the District's immediate Service Area would be done under the auspice of the adjacent county or mosquito and vector control district.

This Program Area encompasses a range of terrestrial habitats and a diverse array of wildlife and plants. The ecoregion provinces (McNab and Avers 1996) have been used to describe the areas where the Program activities and treatments would be implemented and are shown on Figure 5-1. The ecoregion provinces are described in Appendix A, Biological Resources Technical Report.



33441001 MVCAC BTR. Figure4-1.AquaticZoogeographicProvinces.04-17-13

Source: US Forest Service, Pacific Southwest Region, Ecological Subregions for the State of California

INTEGRATED MOSQUITO & VECTOR MANAGEMENT PROGRAMS

Terrestrial Ecoregion Provinces

Figure 5-1

To facilitate the evaluation of impacts and impact avoidance measures by habitat type, a consistent set of habitat types was developed for terrestrial areas (Table 5-1). Terrestrial habitat types were based on those developed as part of the San Francisco Bay Area Upland Habitat Goals Project (Bay Area Open Space Council 2011). The aquatic and wetland habitats defined in Section 4.1.1 are also discussed in this section to address potential impacts to terrestrial species found in association with those aquatic habitats.

Table 5-1 Terrestrial Habitat Types

Coniferous Forests	Forests dominated by cone-bearing trees with needles including pines, firs, and redwoods
Deciduous Forest	Forests dominated by trees that drop leaves annually including buckeyes, oaks (including live oaks), and maples
Shrublands	Dense to moderate stands of coyote brush, ceanothus, poison oak, sage, sagebrush, chamise, and diverse other shrubs with grassy openings
Grasslands	Grasslands dominated by annual grasses, with varying amounts of native perennials
Serpentine	Shrublands or grasslands on serpentine rock
Coastal Dunes	Sandy soils with some active sand movement supporting low stands of diverse native perennials and beach grass
Treeholes	Cavities in branches and trunks of live trees or snags that can provide habitat for a variety of species

Source: Goals Project 1999

Each of these habitat types may be affected by one or more of the Program components, as indicated in Table 5-2. The Program components are described in Chapter 2, and the BMPs regulating District activities are provided in Table 4-5 in Chapter 4, Section 4.2.2.1). The components (comprised of existing and future activities) will be combined into the comprehensive Proposed Program.

Table 5-2 Terrestrial Habitat Types Potentially Affected by Each Technical Program Component

	Surveillance	Physical Control	Vegetation Management	Biological Control	Chemical Control	Other Nonchemical Control / Trapping
Coniferous Forest	X		X		X	X
Deciduous Forest	X		X		X	X
Shrublands	X		X		X	X
Grasslands	X		X		X	X
Serpentine	X		X		X	X
Coastal Dunes	X		X		X	X
Treeholes	X	X	X		X	X

5.1.2 Special-Status Species

A number of special-status species are found in the Program Area and vicinity. Special-status species are those that are listed as endangered, threatened, or candidate species under the federal Endangered Species Act, endangered or threatened under the California Endangered Species Act, or listed as species of special concern by the state. Their presence or absence within the Program Area is presented in Appendix A, Attachments A-1 (plants) and A-2 (wildlife). The listings of special-status plants and animals (terrestrial) that are located within the District's Program Area have been updated (in June 2015) and are included in this chapter. The presence or absence of terrestrial plant and animal species of special status within the District's Service Area and adjacent counties (Program Area) is presented in Table 5-3 and Table 5-4, respectively. These tables show the habitat types each species is likely to use. Aquatic species (fish and amphibians) were included in a similar table in Chapter 4 (Table 4-3). However, a few of the species occur in both wetland and upland habitat types and are included in both chapters.

5.1.3 Regulatory Setting

The regulatory setting includes the federal, state, and local laws, statues, and regulations pertinent to the Program Area and vicinity and the terrestrial resources residing therein. These laws include the following:

5.1.3.1 Federal

5.1.3.1.1 Endangered Species Act of 1973 (16 USC Section 1531 et seq.; 50 CFR Parts 17 and 222)

This law includes provisions for protection and management of species that are federally listed as threatened or endangered and designated critical habitat for these species. This law prohibits "take" of federally listed species, except as authorized under an incidental take permit or incidental take statement. The term "take" means to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct (USFWS 2013 [http://www.fws.gov/endangered/laws-policies/section-3.html]). The USFWS is the administering agency for this authority for freshwater species. The NMFS is the administering agency for anadromous species.

5.1.3.1.2 Migratory Bird Treaty Act (16 USC Section(s) 703-711; 50 CFR Subchapter B)

This law includes provisions for protection of migratory birds, including basic prohibitions against any taking not authorized by federal regulation. The administering agency is the USFWS.

5.1.3.1.3 Bald and Golden Eagles Protection Act (16 USC Section(s) 668; 50 CFR Part 22)

This act makes it illegal to import, export, take (which includes molest or disturb[1]), sell, purchase, or barter any bald eagle or golden eagle or part thereof. The golden eagle, however, is accorded somewhat lighter protection under this act than the bald eagle. The administrating agency is the USFWS.

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

Table 5-3 California Natural Diversity Database Occurrences of Plant Species in the San Mateo County Mosquito and Vector Control District and its Adjacent Counties (Program Area)

Species Name	Status	Habitat description	SMCMVCD (San Mateo County)	Adjacent Counties	Conifer Forest	Deciduous Forest	Shrublands	Grasslands	Serpentine	Coastal Dunes	Tree Holes	Open Water (Marine/Brackish)	Tidal Flats	Tidal Marsh and Channels	Lagoon	Creeks and Rivers	Ponds and Lakes	Seasonal Wetlands (includes Vernal Pools)	FW Marsh/Seeps	Riparian Corridor	Temporary Standing Waters and Artificial Ponds	Water and Wastewater Management Facilities
adobe sanicle *Sanicula maritima*	SR, RPR 1B.1	Meadows and seeps, valley and foothill grassland, chaparral, coastal prairie. Moist clay or ultramafic soils. 30-240 m.		X			X	X											X			
alkali milk-vetch *Astragalus tener* var. *tener*	RPR 1B.2	Alkali playa, valley and foothill grassland, vernal pools. Low ground, alkali flats, and flooded lands; in annual grassland or in playas or vernal pools. 1-170 m.		X				X										X				
Anderson's manzanita *Arctostaphylos andersonii*	RPR 1B.2	Broadleaved upland forest, chaparral, north coast coniferous forest. Open sites, redwood forest. 60-760 m.	X	X	X	X	X															
arcuate bush-mallow *Malacothamnus arcuatus*	RPR 1B.2	Chaparral, cismontane woodland. Gravelly alluvium. 15-355 m.	X	X	X	X	X															
beach layia *Layia carnosa*	FE, SE, RPR 1B.1	Coastal dunes, coastal scrub. On sparsely vegetated, semi-stabilized dunes, usually behind foredunes. 0-60 m.	X	X			X			X												
Ben Lomond buckwheat *Eriogonum nudum* var. *decurrens*	RPR 1B.1	Chaparral, cismontane woodland, lower montane coniferous forest. Ponderosa pine sandhills in Santa Cruz County. 50-800 m.		X	X	X	X															
Ben Lomond spineflower *Chorizanthe pungens* var. *hartwegiana*	FE, RPR 1B.1	Lower montane coniferous forest. Zayante coarse sands in maritime ponderosa pine sandhills. 120-470 m.		X	X																	
bent-flowered fiddleneck *Amsinckia lunaris*	RPR 1B.2	Cismontane woodland, valley and foothill grassland. 50-500 m.	X	X	X	X		X														
big-scale balsamroot *Balsamorhiza macrolepis*	RPR 1B.2	Chaparral, valley and foothill grassland, cismontane woodland. Sometimes on serpentine. 90-1555 m.		X	X	X	X	X	X													
Blasdale's bent grass *Agrostis blasdalei*	RPR 1B.2	Coastal dunes, coastal bluff scrub, coastal prairie. Includes *Agrostis blasdalei* var. marinensis, which was formerly a sandy or gravelly soil close to rocks; often in nutrient-poor soil with sparse vegetation. 5-150 m.	X	X			X	X		X												
blue coast gilia *Gilia capitata* ssp. *chamissonis*	RPR 1B.1	Coastal dunes, coastal scrub. 2-200 m.		X			X			X												
Bonny Doon manzanita *Arctostaphylos silvicola*	RPR 1B.2	Chaparral, closed-cone coniferous forest, lower montane coniferous forest. Only known from Zayante (inland marine) sands in Santa Cruz County. 120-600 m.		X	X		X															
bristly sedge *Carex comosa*	RPR 2B.1	Marshes and swamps. Lake margins, wet places; site below sea level is on a delta island. -5-1005 m.	X	X													X		X			

Species Name	Status	Habitat description	SMCMVCD (San Mateo County)	Adjacent Counties	Conifer Forest	Deciduous Forest	Shrublands	Grasslands	Serpentine	Coastal Dunes	Tree Holes	Open Water (Marine/Brackish)	Tidal Flats	Tidal Marsh and Channels	Lagoon	Creeks and Rivers	Ponds and Lakes	Seasonal Wetlands (includes Vernal Pools)	FW Marsh/Seeps	Riparian Corridor	Temporary Standing Waters and Artificial Ponds	Water and Wastewater Management Facilities
Butano Ridge cypress *Hesperocyparis abramsiana* var. *butanoensis*	FE, SE, RPR 1B.2	Closed-cone coniferous forest, lower montane coniferous forest, chaparral. Sandstone. 400-490 m.	X		X		X															
California seablite *Suaeda Californica*	FE, RPR 1B.1	Marshes and swamps. Margins of coastal salt marshes. 0-15 m.		X									X	X			X		X			
chaparral harebell *Campanula exigua*	RPR 1B.2	Chaparral. Rocky sites, usually on serpentine in chaparral. 275-1250 m.		X			X		X													
chaparral ragwort *Senecio aphanactis*	RPR 2B.2	Chaparral, cismontane woodland, coastal scrub. Drying alkaline flats. 15-800 m.		X		X	X															
Choris' popcornflower *Plagiobothrys chorisianus* var. *chorisianus*	RPR 1B.2	Chaparral, coastal scrub, coastal prairie. Mesic sites. 15-160 m.	X	X			X											X	X			
coast yellow leptosiphon *Leptosiphon croceus*	RPR 1B.1	Coastal bluff scrub, coastal prairie. 10-150 m.	X				X															
coastal marsh milk-vetch *Astragalus pycnostachyus* var. *pycnostachyus*	RPR 1B.2	Coastal dunes, coastal salt marshes, coastal scrub. Mesic sites in dunes or along streams or coastal salt marshes. 0-30 m.	X				X			X				X		X		X	X			
coastal triquetrella *Triquetrella californica*	RPR 1B.2	Coastal bluff scrub, coastal scrub. Grows within 30 m from the coast in coastal scrub, grasslands and in open gravels on roadsides, hillsides and rocky slopes.	X	X			X	X														
compact cobwebby thistle *Cirsium occidentale* var. *compactum*	RPR 1B.2	Chaparral, coastal dunes, coastal prairie, coastal scrub. On dunes and on clay in chaparral; also in grassland. 5-150 m.	X	X			X	X		X												
Congdon's tarplant *Centromadia parryi* ssp. *congdonii*	RPR 1B.1	Valley and foothill grassland. Alkaline soils, sometimes described as heavy white clay. 1-230 m.	X	X				X														
congested-headed hayfield tarplant *Hemizonia congesta* ssp. *congesta*	RPR 1B.2	Valley and foothill grassland. Grassy valleys and hills, often in fallow fields; sometimes along roadsides. 20-560 m.	X	X				X														
Contra Costa goldfields *Lasthenia conjugens*	FE, RPR 1B.1	Valley and foothill grassland, vernal pools, alkaline playas, cismontane woodland. Vernal pools, swales, low depressions, in open grassy areas. 1-470 m.		X		X		X										X				
Coyote ceanothus *Ceanothus ferrisiae*	FE, RPR 1B.1	Chaparral, valley and foothill grassland, coastal scrub. Serpentine sites in the Mt. Hamilton range. 120-455 m.		X			X	X	X													
Crystal Springs fountain thistle *Cirsium fontinale* var. *fontinale*	FE, SE, RPR 1B.1	Valley and foothill grassland, chaparral. Serpentine seeps and grassland. 90-180 m.	X				X	X	X													

Species Name	Status	Habitat description	SMCMVCD (San Mateo County)	Adjacent Counties	Conifer Forest	Deciduous Forest	Shrublands	Grasslands	Serpentine	Coastal Dunes	Tree Holes	Open Water (Marine/Brackish)	Tidal Flats	Tidal Marsh and Channels	Lagoon	Creeks and Rivers	Ponds and Lakes	Seasonal Wetlands (includes Vernal Pools)	FW Marsh/Seeps	Riparian Corridor	Temporary Standing Waters and Artificial Ponds	Water and Wastewater Management Facilities
Crystal Springs lessingia *Lessingia arachnoidea*	RPR 1B.2	Coastal sage scrub, valley and foothill grassland, cismontane woodland. Grassy slopes on serpentine; sometimes on roadsides. 60-200 m.	X			X	X	X	X													
dark-eyed gilia *Gilia millefoliata*	RPR 1B.2	Coastal dunes. 2-30 m.		X						X												
deceiving sedge *Carex saliniformis*	RPR 1B.2	Coastal prairie, coastal scrub, meadows and seeps, marshes and swamps (coastal salt). Mesic sites. 3-230 m.		X			X						X	X				X	X			
Diablo helianthella *castanea*	RPR 1B.2	Broadleaved upland forest, chaparral, cismontane woodland, coastal scrub, riparian woodland, valley & foothill grassland. Usually in chaparral/oak woodland interface in rocky, a-zonal soils. Often in partial shade. 25-1150 m.	X	X		X	X	X														
Dudley's lousewort *Pedicularis dudleyi*	SR, RPR 1B.2	Chaparral, north coast coniferous forest, valley and foothill grassland. Deep shady woods of older coast redwood forests; also in maritime chaparral. 60-900 m.	X	X	X		X	X														
elongate copper moss *Mielichhoferia elongata*	RPR 2B.2	Cismontane woodland. Commonly called "copper mosses". Moss growing on very acidic, metamorphic rock or substrate; usually in higher portions in fens.		X		X												X	X			
fragrant fritillary *Fritillaria liliacea*	RPR 1B.2	Coastal scrub, valley and foothill grassland, coastal prairie. Often on serpentine; various soils reported though usually clay, in grassland. 3-410 m.	X	X			X	X	X													
Franciscan manzanita *Arctostaphylos franciscana*	FE, RPR 1B.1	Chaparral. Serpentine outcrops in chaparral. 60-300 m.		X			X	X	X													
Franciscan onion *Allium peninsulare* var. *franciscanum*	RPR 1B.2	Cismontane woodland, valley and foothill grassland. Clay soils; often on serpentine. Dry hillsides. 50-300 m.	X	X		X		X	X													
Franciscan thistle *Cirsium andrewsii*	RPR 1B.2	Coastal bluff scrub, broadleaved upland forest, coastal scrub, coastal prairie. Sometimes serpentine seeps. 0-150 m.	X	X		X	X	X	X													
hairless popcornflower *Plagiobothrys glaber*	RPR 1A	Meadows and seeps, marshes and swamps. Coastal salt marshes and alkaline meadows. 5-180 m.		X									X	X					X			
Hall's bush-mallow *Malacothamnus hallii*	RPR 1B.2	Chaparral. Some populations on serpentine. 10-550 m.		X			X		X													
Hickman's cinquefoil *Potentilla hickmanii*	FE, SE, RPR 1B.1	Coastal bluff scrub, closed-cone coniferous forest, meadows and seeps, marshes and swamps. Freshwater marshes, seeps, and small streams in open or forested areas along the coast. 10-150 m.	X		X	X										X		X	X			

Species Name	Status	Habitat description	SMCMVCD (San Mateo County)	Adjacent Counties	Conifer Forest	Deciduous Forest	Shrublands	Grasslands	Serpentine	Coastal Dunes	Tree Holes	Open Water (Marine/Brackish)	Tidal Flats	Tidal Marsh and Channels	Lagoon	Creeks and Rivers	Ponds and Lakes	Seasonal Wetlands (includes Vernal Pools)	FW Marsh/Seeps	Riparian Corridor	Temporary Standing Waters and Artificial Ponds	Water and Wastewater Management Facilities
Hillsborough chocolate lily *Fritillaria biflora* var. *ineziana*	RPR 1B.1	Cismontane woodland, valley and foothill grassland. Probably on serpentine; most recent site is in serpentine grassland. 90-160 m.	X		X	X		X	X													
Hooker's manzanita *Arctostaphylos hookeri* ssp. *hookeri*	RPR 1B.2	Chaparral, coastal scrub, closed-cone coniferous forest, cismontane woodland. Sandy soils, sandy shales, sandstone outcrops. 60-535 m.		X	X	X	X			X												
Hoover's button-celery *Eryngium aristulatum* var. *hooveri*	RPR 1B.1	Vernal pools. Alkaline depressions, vernal pools, roadside ditches and other wet places near the coast. 3-45 m.	X	X														X	X			
Hospital Canyon larkspur *Delphinium Californicum* ssp. *interius*	RPR 1B.2	Cismontane woodland, chaparral, coastal scrub. In wet, boggy meadows, openings in chaparral and in canyons. 195-1095 m.		X	X	X	X											X	X			
Kellman's bristle moss *Orthotrichum kellmanii*	RPR 1B.2	Chaparral, cismontane woodland. Sandstone outcrops with high calcium concentrations from eroded boulders out of non-calcareous sandstone bedrock.	X	X	X	X	X															
Kellogg's horkelia *Horkelia cuneata* var. *sericea*	RPR 1B.1	Closed-cone coniferous forest, coastal scrub, coastal dunes, chaparral. Old dunes, coastal sandhills; openings. 10-200 m.	X	X	X	X	X			X												
Kings Mountain manzanita *Arctostaphylos regismontana*	RPR 1B.2	Broadleaved upland forest, chaparral, north coast coniferous forest. Granitic or sandstone outcrops. 305-730 m.	X	X	X	X	X															
Legenere *Legenere limosa*	RPR 1B.1	Vernal pools. In beds of vernal pools. 1-880 m.	X	X														X	X			
Loma Prieta hoita *strobilina*	RPR 1B.1	Chaparral, cismontane woodland, riparian woodland. Serpentine; mesic sites.		X		X	X		X											X		
lost thistle *Cirsium praeteriens*	RPR 1A	Little information exists on this plant; it was collected from the Palo Alto area at the turn of the 20th century. Although not seen since 1901, this Cirsium is thought to be quite distinct from other Cirsiums acc. to D. Keil. 0-100 m	X	X																		
maple-leaved checkerbloom *Sidalcea malachroides*	RPR 4.2	Broadleafed upland forest, coastal prairie, coastal scrub, north coast coniferous forest, riparian forest. Woodlands and clearings near coast; often in disturbed areas. 0-730 m.		X	X	X	X													X	X	X
Marin knotweed *Polygonum marinense*	RPR 3.1	Marshes and swamps. Coastal salt marshes and brackish marshes. 0-10 m.		X									X	X								
Marin western flax *Hesperolinon congestum*	FT, ST, RPR 1B.1	Chaparral, valley and foothill grassland. In serpentine barrens and in serpentine grassland and chaparral. 30-370 m.	X	X			X	X	X													
marsh microseris *Microseris paludosa*	RPR 1B.2	Closed-cone coniferous forest, cismontane woodland, coastal scrub, valley and foothill grassland. 5-300 m.	X	X	X	X	X	X														

Species Name	Status	Habitat description	SMCMVCD (San Mateo County)	Adjacent Counties	Conifer Forest	Deciduous Forest	Shrublands	Grasslands	Serpentine	Coastal Dunes	Tree Holes	Open Water (Marine/Brackish)	Tidal Flats	Tidal Marsh and Channels	Lagoon	Creeks and Rivers	Ponds and Lakes	Seasonal Wetlands (includes Vernal Pools)	FW Marsh/Seeps	Riparian Corridor	Temporary Standing Waters and Artificial Ponds	Water and Wastewater Management Facilities
marsh sandwort *Arenaria paludicola*	FE, SE, RPR 1B.1	Marshes and swamps. Growing up through dense mats of Typha, Juncus, Scirpus, etc. In freshwater marsh. Sandy soil. 3-170 m.		X													X	X	X	X	X	X
Metcalf Canyon jewelflower *Streptanthus albidus* ssp. *albidus*	FE, RPR 1B.1	Valley and foothill grassland. Relatively open areas in dry grassy meadows on serpentine soils; also on serpentine balds. 45-800 m.		X				X	X													
Methuselah's beard lichen *Usnea longissima*	RPR 4.2	North coast coniferous forest, broadleafed upland forest. Grows in the "redwood zone" on a variety of trees including big leaf maple, oaks, ash, Douglas-fir, and bay. 50-1460 m	X	X	X	X																
minute pocket moss *Fissidens pauperculus*	RPR 1B.2	North coast coniferous forest. Moss growing on damp soil along the coast. In dry streambeds and on stream banks. 10-100 m.	X	X	X											X				X		
Montara manzanita *Arctostaphylos montaraensis*	RPR 1B.2	Chaparral, coastal scrub. Slopes and ridges. 150-500 m.	X				X															
Monterey gilia *Gilia tenuiflora* ssp. *arenaria*	FE, ST, RPR 1B.2	Coastal dunes, coastal scrub, chaparral (maritime), cismontane woodland. Bare, wind-sheltered areas often near dune summit or in the hind dunes; 2 records from Pleistocene inland dunes. 0-45 m.		X		X	X			X												
Monterey pine *Pinus radiata*	RPR 1B.1	Closed-cone coniferous forest, cismontane woodland. Three primary stands are native to California. Dry bluffs and slopes. 25-185 m.	X	X	X	X																
Monterey spineflower *Chorizanthe pungens* var. *pungens*	FT, RPR 1B.2	Coastal dunes, chaparral, cismontane woodland, coastal scrub. Sandy soils in coastal dunes or more inland within chaparral or other habitats. 0-150 m.		X	X	X	X			X												
most beautiful jewelflower *Streptanthus albidus* ssp. *peramoenus*	RPR 1B.2	Chaparral, valley and foothill grassland, cismontane woodland. Serpentine outcrops, on ridges and slopes. 95-1000 m.		X	X	X			X													
Mt. Day rockcress *Boechera rubicundula*	RPR 1B.1	Chaparral. Rocky slopes. 1200 m.		X			X															
Mt. Diablo phacelia *Phacelia phacelioides*	RPR 1B.2	Chaparral, cismontane woodland. Adjacent to trails, on rock outcrops and talus slopes; sometimes on serpentine. 500-1370 m.		X	X	X	X		X													
Mt. Hamilton coreopsis *Leptosyne hamiltonii*	RPR 1B.2	Cismontane woodland. On steep shale talus with open southwestern exposure. 530-1300 m.		X	X	X																
Mt. Hamilton fountain thistle *Cirsium fontinale* var. *campylon*	RPR 1B.2	Cismontane woodland, chaparral, valley and foothill grassland. In seasonal and perennial drainages on serpentine. 100-890 m.		X	X	X	X	X	X									X				
Mt. Hamilton jewelflower *Streptanthus callistus*	RPR 1B.3	Chaparral, cismontane woodland. Open talus slopes on shale with grey pine and/or black oak. 600-790 m.		X	X	X	X															

Species Name	Status	Habitat description	SMCMVCD (San Mateo County)	Adjacent Counties	Conifer Forest	Deciduous Forest	Shrublands	Grasslands	Serpentine	Coastal Dunes	Tree Holes	Open Water (Marine/Brackish)	Tidal Flats	Tidal Marsh and Channels	Lagoon	Creeks and Rivers	Ponds and Lakes	Seasonal Wetlands (includes Vernal Pools)	FW Marsh/Seeps	Riparian Corridor	Temporary Standing Waters and Artificial Ponds	Water and Wastewater Management Facilities
Mt. Hamilton lomatium *Lomatium observatorium*	RPR 1B.2	Cismontane woodland. Open to partially shaded openings in Pinus coulteri-oak woodland. Sedimentary Franciscan rocks & volcanics. 1219-1330 m.		X	X	X	X															
northern curly-leaved monardella *Monardella sinuata* ssp. *nigrescens*	RPR 1B.2	Coastal dunes, coastal scrub, chaparral, lower montane coniferous forest. Sandy soils. 0-300 m.		X	X		X			X												
Ohlone manzanita *Arctostaphylos ohloneana*	RPR 1B.1	Coastal scrub, closed cone coniferous forests. Monterey shale. 450-530 m.		X	X		X															
Oregon meconella *oregana*	RPR 1B.1	Coastal prairie, coastal scrub. Open, moist places. 250-620 m.		X			X	X											X			
Oregon polemonium *carneum*	RPR 2B.2	Coastal prairie, coastal scrub, lower montane coniferous forest. 0-1830 m.	X	X	X		X	X														
Ornduff's meadowfoam *Limnanthes douglasii* ssp. *ornduffii*	RPR 1B.1	Meadows and seeps, agricultural fields. 10-20 m.	X																X			
Pacific manzanita *Arctostaphylos pacifica*	SE, RPR 1B.2	Coastal scrub, chaparral.	X				X															
Pajaro manzanita *Arctostaphylos pajaroensis*	RPR 1B.1	Chaparral. Sandy soils. 30-760 m.		X			X			X												
pappose tarplant *Centromadia parryi* ssp. *parryi*	RPR 1B.2	Coastal prairie, meadows and seeps, coastal salt marsh, valley and foothill grassland. Vernally mesic, often alkaline sites. 2-420 m.	X					X					X	X					X			
perennial goldfields *Lasthenia Californica* ssp. *macrantha*	RPR 1B.2	Coastal bluff scrub, coastal dunes, coastal scrub. 5-520 m.	X				X			X												
pine rose *Rosa pinetorum*	RPR 1B.2	Closed-cone coniferous forest. 2-300 m.		X		X																
pink creamsacs *Castilleja rubicundula* var. *rubicundula*	RPR 1B.2	Chaparral, meadows and seeps, valley and foothill grassland. Openings in chaparral or grasslands. On serpentine. 20-900 m.		X			X	X	X									X	X			
Point Reyes horkelia *Horkelia marinensis*	RPR 1B.2	Coastal dunes, coastal prairie, coastal scrub. Sandy flats and dunes near coast; in grassland or scrub plant communities. 5-30 m.	X	X			X	X		X												
Point Reyes meadowfoam *Limnanthes douglasii* ssp. *sulphurea*	SE, RPR 1B.2	Fresh. Marsh, vernal pools, coastal prairie, meadows & seeps, cismontane woodland. Vernally wet depressions in open rolling, coastal prairies & meadows; typically in dark clay soil. 10-120 m.	X		X	X	X	X										X	X			
Point Reyes salty bird's-beak *Chloropyron maritimum* ssp. *palustre*	RPR 1B.2	Coastal salt marsh. Usually in coastal salt marsh with Salicornia, Distichlis, Jaumea, Spartina, etc. 0-10 m.	X	X									X	X								

Species Name	Status	Habitat description	SMCMVCD (San Mateo County)	Adjacent Counties	Conifer Forest	Deciduous Forest	Shrublands	Grasslands	Serpentine	Coastal Dunes	Tree Holes	Open Water (Marine/Brackish)	Tidal Flats	Tidal Marsh and Channels	Lagoon	Creeks and Rivers	Ponds and Lakes	Seasonal Wetlands (includes Vernal Pools)	FW Marsh/Seeps	Riparian Corridor	Temporary Standing Waters and Artificial Ponds	Water and Wastewater Management Facilities
Presidio clarkia *Clarkia franciscana*	FE, SE, RPR 1B.1	Coastal scrub, valley and foothill grassland. Serpentine outcrops in grassland or scrub. 25-335 m.		X			X	X	X													
Presidio manzanita *Arctostaphylos montana* ssp. *ravenii*	FE, SE, RPR 1B.1	Chaparral, coastal prairie, coastal scrub. Open, rocky serpentine slopes. 45-215 m.		X			X	X	X													
prostrate vernal pool navarretia *Navarretia prostrata*	RPR 1B.1	Coastal scrub, valley and foothill grassland, vernal pools. Alkaline soils in grassland, or in vernal pools. Mesic, alkaline sites. 15-700 m.		X			X	X										X	X			
robust spineflower *Chorizanthe robusta* var. *robusta*	FE, RPR 1B.1	Cismontane woodland, coastal dunes, coastal scrub. Sandy terraces and bluffs or in loose sand. 3-120 m.	X	X	X	X	X			X												
rock sanicle *Sanicula saxatilis*	SR, RPR 1B.2	Broadleafed upland forest, chaparral, valley and foothill grassland. Bedrock outcrops and talus slopes in chaparral or oak woodland habitat. 615-1215 m.		X		X	X	X														
rose leptosiphon *Leptosiphon rosaceus*	RPR 1B.1	Coastal bluff scrub. 0-100 m.	X	X			X			X												
round-headed Chinese-houses *Collinsia corymbosa*	RPR 1B.2	Coastal dunes. 0-20 m.		X						X												
round-leaved filaree *California macrophylla*	RPR 1B.1	Cismontane woodland, valley and foothill grassland. Clay soils. 15-1200 m.	X	X	X	X	X	X														
saline clover *Trifolium hydrophilum*	RPR 1B.2	Marshes and swamps, valley and foothill grassland, vernal pools. Mesic, alkaline sites. 0-300 m.	X	X				X										X	X			
San Benito pentachaeta *Pentachaeta exilis* ssp. *aeolica*	RPR 1B.2	Cismontane woodland, valley and foothill grassland. Grassy areas. 640-855 m.		X	X	X	X	X														
San Bruno Mountain manzanita *Arctostaphylos imbricata*	SE, RPR 1B.1	Chaparral, coastal scrub. Mostly known from a few sandstone outcrops in chaparral. 275-370 m.	X				X															
San Francisco Bay spineflower *Chorizanthe cuspidata* var. *cuspidata*	RPR 1B.2	Coastal bluff scrub, coastal dunes, coastal prairie, coastal scrub. Closely related to *C. pungens*. Sandy soil on terraces and slopes. 3-215 m.	X	X			X			X												
San Francisco campion *Silene verecunda* ssp. *verecunda*	RPR 1B.2	Coastal scrub, valley and foothill grassland, coastal bluff scrub, chaparral, coastal prairie. Often on mudstone or shale; one site on serpentine. 30-645 m.	X	X			X	X	X													
San Francisco collinsia *Collinsia multicolor*	RPR 1B.2	Closed-cone coniferous forest, coastal scrub. On decomposed shale (mudstone) mixed with humus; sometimes on serpentine. 30-250 m.	X	X	X		X		X													

Species Name	Status	Habitat description	SMCMVCD (San Mateo County)	Adjacent Counties	Conifer Forest	Deciduous Forest	Shrublands	Grasslands	Serpentine	Coastal Dunes	Tree Holes	Open Water (Marine/Brackish)	Tidal Flats	Tidal Marsh and Channels	Lagoon	Creeks and Rivers	Ponds and Lakes	Seasonal Wetlands (includes Vernal Pools)	FW Marsh/Seeps	Riparian Corridor	Temporary Standing Waters and Artificial Ponds	Water and Wastewater Management Facilities
San Francisco gumplant *Grindelia hirsutula* var. *maritima*	RPR 3.2	Coastal scrub, coastal bluff scrub, valley and foothill grassland. Sandy or serpentine slopes, sea bluffs. 15-400 m.	X	X			X	X	X	X												
San Francisco lessingia *Lessingia germanorum*	FE, SE, RPR 1B.1	Coastal scrub. On remnant dunes. Open sandy soils relatively free of competing plants. 20-110 m.	X	X			X			X												
San Francisco owl's-clover *Triphysaria floribunda*	RPR 1B.2	Coastal prairie, coastal scrub, valley and foothill grassland. On serpentine and nonserpentine substrate (such as at Pt. Reyes). 10-160 m.	X	X			X	X	X													
San Francisco popcornflower *Plagiobothrys diffusus*	SE, RPR 1B.1	Valley and foothill grassland, coastal prairie. Historically from grassy slopes with marine influence. 60-485 m.	X	X				X														
San Mateo thorn-mint *Acanthomintha duttonii*	FE, SE, RPR 1B.1	Chaparral, valley and foothill grassland. Uncommon serpentinite vertisol clays; in relatively open areas. 50-300 m.	X				X	X	X													
San Mateo woolly sunflower *Eriophyllum latilobum*	FE, SE, RPR 1B.1	Cismontane woodland. Often on roadcuts; found on and off of serpentine. 45-150 m.	X		X	X			X													
sand-loving wallflower *Erysimum ammophilum*	RPR 1B.2	Chaparral (maritime), coastal dunes, coastal scrub. Sandy openings. 0-60 m.	X	X			X			X												
Santa Clara red ribbons *Clarkia concinna* ssp. *automixa*	RPR 4.3	Cismontane woodland, chaparral. On slopes and near drainages. 90-1500 m.	X	X	X	X	X												X			
Santa Clara Valley dudleya *Dudleya abramsii* ssp. *setchellii*	FE, RPR 1B.1	Valley and foothill grassland, cismontane woodland. On rocky serpentine outcrops and on rocks within grassland or woodland. 60-455 m.		X	X	X	X	X	X													
Santa Cruz clover *Trifolium buckwestiorum*	RPR 1B.1	Coastal prairie, broadleafed upland forest, cismontane woodland. Moist grassland. Gravelly margins. 105-610 m.		X		X	X	X														
Santa Cruz cypress *Hesperocyparis abramsiana* var. *abramsiana*	FE, SE, RPR 1B.2	Chaparral, closed-cone coniferous forest, lower montane coniferous forest. Restricted to the Santa Cruz mountains, on sandstone & granitic-derived soils; often w/p. Attenuata, redwoods. 280-800 m		X	X		X															
Santa Cruz microseris *Stebbinsoseris decipiens*	RPR 1B.2	Broadleafed upland forest, closed-cone coniferous forest, chaparral, coastal prairie, coastal scrub, valley and foothill open areas in loose or disturbed soil, usually derived from sandstone, shale or serpentine, on seaward slopes. 10-500 m	X	X	X	X	X		X													
Santa Cruz Mountains beardtongue *Penstemon rattanii* var. *kleei*	RPR 1B.2	Chaparral, lower montane coniferous forest, north coast coniferous forest. Sandy shale slopes; sometimes in the transition between forest and chaparral. 400-1100 m.		X	X		X															

Species Name	Status	Habitat description	SMCMVCD (San Mateo County)	Adjacent Counties	Conifer Forest	Deciduous Forest	Shrublands	Grasslands	Serpentine	Coastal Dunes	Tree Holes	Open Water (Marine/Brackish)	Tidal Flats	Tidal Marsh and Channels	Lagoon	Creeks and Rivers	Ponds and Lakes	Seasonal Wetlands (includes Vernal Pools)	FW Marsh/Seeps	Riparian Corridor	Temporary Standing Waters and Artificial Ponds	Water and Wastewater Management Facilities
Santa Cruz Mountains pussypaws *Calyptridium parryi* var. *hesseae*	RPR 1B.1	Chaparral, cismontane woodland. Sandy or gravelly openings. 305-1530 m.		X	X	X	X															
Santa Cruz tarplant *Holocarpha macradenia*	FT, SE, RPR 1B.1	Coastal prairie, coastal scrub, valley and foothill grassland. Light, sandy soil or sandy clay; often with nonnatives. 10-220 m.		X			X	X														
Santa Cruz wallflower *Erysimum teretifolium*	FE, SE, RPR 1B.1	Lower montane coniferous forest, chaparral. Inland marine sands (Zayante coarse sand). 120-610 m.		X	X		X															
Schreiber's manzanita *Arctostaphylos glutinosa*	RPR 1B.2	Closed-cone coniferous forest, chaparral. Mudstone or diatomaceous shale outcrops; often with Pinus attenuata. 170-685 m.		X	X		X															
Scotts Valley polygonum *Polygonum hickmanii*	FE, SE, RPR 1B.1	Valley and foothill grassland. Purisima sandstone or mudstone with a thin soil layer, vernally moist due to runoff. 210-250 m.		X				X														
Scotts Valley spineflower *Chorizanthe robusta* var. *hartwegii*	FE, RPR 1B.1	Meadows, valley and foothill grassland. In grasslands with mudstone and sandstone outcrops. 230-245 m.		X				X														
Sharsmith's harebell *Campanula sharsmithiae*	RPR 1B.2	Chaparral. Serpentine barrens. 490-855 m.		X			X		X													
Sharsmith's onion *Allium sharsmithiae*	RPR 1B.3	Cismontane woodland, chaparral. Rocky, serpentine slopes. 400-1200 m.		X	X	X	X		X													
short-leaved evax *Hesperevax sparsiflora* var. *brevifolia*	RPR 1B.2	Coastal bluff scrub, coastal dunes, coastal prairie. Sandy bluffs and flats. 0-215 m.	X	X			X	X		X												
showy golden madia *radiata*	RPR 1B.1	Valley and foothill grassland, cismontane woodland, chenopod scrub. Mostly on adobe clay in grassland or among shrubs. 25-1125 m.		X	X	X		X														
showy rancheria clover *Trifolium amoenum*	FE, RPR 1B.1	Valley and foothill grassland, coastal bluff scrub. Sometimes on serpentine soil, open sunny sites, swales. Most recently cited on roadside and eroding cliff face. 5-415 m.	X				X	X	X													
slender silver moss *Anomobryum julaceum*	RPR 4.2	Broadleafed upland forest, lower montane coniferous forest, north coast coniferous forest. Moss, which grows on damp rocks and soil; acidic substrates. Usually seen on roadcuts. 100-1000 m.		X	X	X																
slender-leaved pondweed *Stuckenia filiformis* ssp. *alpina*	RPR 2B.2	Marshes and swamps. Shallow, clear water of lakes and drainage channels. 300-2150 m.	X	X													X		X			
smooth lessingia *Lessingia micradenia* var. *glabrata*	RPR 1B.2	Chaparral, cismontane woodland. Serpentine; often on roadsides. 120-420 m.		X	X	X	X		X													

Species Name	Status	Habitat description	SMCMVCD (San Mateo County)	Adjacent Counties	Conifer Forest	Deciduous Forest	Shrublands	Grasslands	Serpentine	Coastal Dunes	Tree Holes	Open Water (Marine/Brackish)	Tidal Flats	Tidal Marsh and Channels	Lagoon	Creeks and Rivers	Ponds and Lakes	Seasonal Wetlands (includes Vernal Pools)	FW Marsh/Seeps	Riparian Corridor	Temporary Standing Waters and Artificial Ponds	Water and Wastewater Management Facilities
stinkbells *Fritillaria agrestis*	RPR 4.2	Cismontane woodland, chaparral, valley and foothill grassland. Sometimes on serpentine; mostly found in nonnative grassland or in grassy openings in clay soil. 10-1555 m.	X		X	X	X	X	X													
swamp harebell *Campanula Californica*	RPR 1B.2	Bogs and fens, closed-cone coniferous forest, coastal prairie, meadows and seeps, freshwater marsh, north coast conifero bogs and marshes in a variety of habitats; uncommon where it occurs. 1-405 m.		X	X			X										X	X			
talus fritillary *Fritillaria falcata*	RPR 1B.2	Chaparral, cismontane woodland, lower montane coniferous forest. On shale, granite, or serpentine talus. 300-1525 m.		X	X	X	X		X													
tear drop moss *Dacryophyllum falcifolium*	RPR 1B.3	Coast redwood forest, north coast coniferous forest. Limestone substrates and rock outcrops. 50-520 m.		X	X																	
Tiburon paintbrush *Castilleja affinis* var. *neglecta*	FE, ST, RPR 1B.2	Valley and foothill grassland. Rocky serpentine sites. 75-400 m.		X				X	X													
Toren's grimmia *Torenii*	RPR 1B.3	Cismontane woodland, lower montane coniferous forest, chaparral. Openings, rocky, boulder and rock walls, carbonate, volcanic. 325-1160 m.	X	X	X	X	X															
Tracy's eriastrum *Eriastrum tracyi*	SR, RPR 3.2	Chaparral, cismontane woodland. Gravelly shale or clay; often in open areas. 315-760 m.		X	X	X	X															
vaginulate grimmia *Grimmia vaginulata*	RPR 1B.1	Chaparral. Openings; rocky, boulder and rock walls, carbonate. 685-1135 m.		X			X															
warty popcorn-flower *Plagiobothrys verrucosus*	RPR 2B.1	Chaparral. Shale substrate. 610-760 m.		X			X															
water star-grass *Heteranthera dubia*	RPR 2B.2	Marshes and swamps. Alkaline, still or slow-moving water. Requires a pH of 7 or higher, usually in slightly eutrophic waters. 30-1495 m.	X	X														X		X	X	
western leatherwood *Dirca occidentalis*	RPR 1B.2	Broadleafed upland forest, chaparral, closed-cone coniferous forest, cismontane woodland, north coast coniferous forest, on brushy slopes, mesic sites; mostly in mixed evergreen & foothill woodland communities. 25-425 m.	X	X	X	X	X															
white-flowered rein orchid *Piperia candida*	RPR 1B.2	North coast coniferous forest, lower montane coniferous forest, broadleafed upland forest. Coast ranges from Santa Cruz County north; on serpentine. Forest duff, mossy banks, rock outcrops & muskeg. 0-1200 m.	X	X	X	X			X										X			

Species Name	Status	Habitat description	SMCMVCD (San Mateo County)	Adjacent Counties	Conifer Forest	Deciduous Forest	Shrublands	Grasslands	Serpentine	Coastal Dunes	Tree Holes	Open Water (Marine/Brackish)	Tidal Flats	Tidal Marsh and Channels	Lagoon	Creeks and Rivers	Ponds and Lakes	Seasonal Wetlands (includes Vernal Pools)	FW Marsh/Seeps	Riparian Corridor	Temporary Standing Waters and Artificial Ponds	Water and Wastewater Management Facilities
white-rayed pentachaeta *Pentachaeta bellidiflora*	FE, SE, RPR 1B.1	Valley and foothill grassland, cismontane woodland. Open dry rocky slopes and grassy areas, often on soils derived from serpentine bedrock. 35-620 m.	X	X	X	X		X	X													
woodland woollythreads *Monolopia gracilens*	RPR 1B.2	Chaparral, valley and foothill grasslands (serpentine), cismontane woodland, broadleafed upland forests, north coast con grassy sites, in openings; sandy to rocky soils. Often seen on serpentine after burns but may have only weak affinity to	X	X	X	X	X	X	X													

California Rare Plant Ranking System (CNPS) Key

Extent of rarity:

1 = Rare in California and elsewhere

2 **=** Rare in California, but not elsewhere

3 = Plants about which more information is needed

4 = Plants of limited distribution or infrequent throughout a broader area in California

Qualifiers of extirpation and/or rarity:

A = Presumed extirpated or extinct

B = Rare, threatened, or endangered

Threat Ranks

0.1- Seriously threatened in California (over 80 percent of occurrences threatened / high degree and immediacy of threat)

0.2- Moderately threatened in California (20 to 80 percent occurrences threatened / moderate degree and immediacy of threat)

0.3- Not very threatened in California (less than 20 percent of occurrences threatened / low degree and immediacy of threat or no current threats known)

Designations

SE = State listed endangered

ST = State listed threatened

SR = State listed rare

SC= State candidate for listing

FE = Federally listed endangered

FT = Federally listed threatened

FC = Federal candidate for listing

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Table 5-4 California Natural Diversity Database Occurrences of Terrestrial Animal Species in San Mateo County Mosquito and Vector Control District and its Adjacent Counties (Program Area)

Species Name	Status	Habitat description	SMCMVCD (San Mateo County)	Adjacent Counties	Conifer Forest	Deciduous Forest	Shrublands	Grasslands	Serpentine	Coastal Dunes	Tree Holes	Open Water (Marine/Brackish)	Tidal Flats	Tidal Marsh and Channels	Lagoon	Creeks and Rivers	Ponds and Lakes	Seasonal Wetlands (includes Vernal Pools)	FW Marsh/Seeps	Riparian Corridor	Temporary Standing Waters and Artificial Ponds	Water and Wastewater Management Facilities
Invertebrates																						
Bay checkerspot butterfly *Euphydryas editha bayensis*	FT	Restricted to native grasslands on outcrops of serpentine soil in the vicinity of San Francisco Bay. *Plantago erecta* is the primary host plant; *Orthocarpus Densiflorus* & *O. Purpurascens* are the secondary host plants.	X	X				X	X													
callippe silverspot butterfly *Speyeria callippe*	FE	Restricted to the northern coastal scrub of the San Francisco Peninsula. Hostplant is Viola pedunculata. Most adults found on e-facing slopes; males congregate on hilltops in search of females.	X	X			X															
Mission blue butterfly *Plebejus icarioides missionensis*	FE	Inhabits grasslands of the San Francisco Peninsula. Three larval host plants: *Lupinus albifrons*, *L. variicolor*, and *L. formosus*, of which *L. albifrons* is favored.	X	X			X	X														
Mount Hermon (=barbate) June beetle *Polyphylla barbata*	FE	Known only from sand hills in vicinity of Mt. Hermon, Santa Cruz County.		X	X		X															
Myrtle's silverspot butterfly *Speyeria zerene myrtleae*	FE	Restricted to the foggy, coastal dunes/hills of the Point Reyes peninsula; extirpated from coastal San Mateo County. Larval foodplant thought to be *Viola adunca*.	X							X												
Ohlone tiger beetle *Cicindela ohlone*	FE	Remnant native grasslands with California oatgrass & purple needlegrass in Santa Cruz County. Substrate is poorly-drained clay or sandy clay soil over bedrock of Santa Cruz mudstone.		X				X														
San Bruno elfin butterfly *Callophrys mossii bayensis*	FE	Coastal, mountainous areas with grassy ground cover, mainly in the vicinity of San Bruno Mountain, San Mateo County. Colonies are located on steep, north-facing slopes within the fog belt. Larval host plant is *Sedum spathulifolium*.	X					X														
Smith's blue butterfly *Euphilotes enoptes smithi*	FE	Most commonly associated with coastal dunes & coastal sage scrub plant communities in Monterey & Santa Cruz counties. Hostplant: *Eriogonum latifolium* and *Eriogonum parvifolium* are utilized as both larval and adult foodplants.		X			X			X												
Zayante band-winged grasshopper *Trimerotropis infantilis*	FE	Isolated sandstone deposits in the Santa Cruz mountains (the Zayante sand hills ecosystem) mostly on sand parkland habitat but also in areas with well-developed ground cover & in sparse chaparral with grass.		X			X	X														

Species Name	Status	Habitat description	SMCMVCD (San Mateo County)	Adjacent Counties	Conifer Forest	Deciduous Forest	Shrublands	Grasslands	Serpentine	Coastal Dunes	Tree Holes	Open Water (Marine/Brackish)	Tidal Flats	Tidal Marsh and Channels	Lagoon	Creeks and Rivers	Ponds and Lakes	Seasonal Wetlands (includes Vernal Pools)	FW Marsh/Seeps	Riparian Corridor	Temporary Standing Waters and Artificial Ponds	Water and Wastewater Management Facilities
Reptiles																						
Alameda whipsnake *Masticophis lateralis euryxanthus*	FT, ST	Typically found in chaparral and scrub habitats but will also use adjacent grassland, oak savanna and woodland habitats. Mostly south-facing slopes & ravines, with rock outcrops, deep crevices or abundant rodent burrows.		X			X	X														
black legless lizard *Anniella pulchra nigra*	SSC	Sand dunes and sandy soils in the Monterey Bay and Morro Bay regions. Inhabit sandy soil/dune areas with bush lupine and mock heather as dominant plants. Moist soil is essential.		X						X												
coast horned lizard *Phrynosoma blainvillii*	SSC	Frequents a wide variety of habitats, most common in lowlands along sandy washes with scattered low bushes. Open areas for sunning, bushes for cover, patches of loose soil for burial, & abundant supply of ants & other insects.		X			X	X		X												
San Francisco garter snake *Thamnophis sirtalis tetrataenia*	FE, SE, FP	Vicinity of freshwater marshes, ponds and slow-moving streams in San Mateo County & extreme northern Santa Cruz County. Prefers dense cover & water depths of at least 1 foot. Upland areas near water are also very important.	X	X												X	X	X	X	X		
western pond turtle *Emys marmorata*	SSC	A thoroughly aquatic turtle of ponds, marshes, rivers, streams & irrigation ditches, usually with aquatic vegetation, be need basking sites and suitable (sandy banks or grassy open fields) upland habitat up to 0.5 km from water for egg-laying	X	X												X	X	X	X	X	X	X
Birds																						
Alameda song sparrow *Melospiza melodia pusillula*	SSC	Resident of salt marshes bordering south arm of San Francisco Bay. Inhabits Salicornia marshes; nests low in grindelia bushes (high enough to escape high tides) and in Salicornia.	X	X									X	X								
American peregrine falcon *Falco peregrinus anatum*	SCT, FP	Near wetlands, lakes, rivers, or other water; on cliffs, banks, dunes, mounds; also, human-made structures. Nest consists of a scrape or a depression or ledge in an open site.	X	X						X						X	X			X		
bank swallow *Riparia*	ST	Colonial nester; nests primarily in riparian and other lowland habitats west of the desert. Requires vertical banks/cliffs with fine-textured/sandy soils near streams, rivers, lakes, ocean to dig nesting hole.	X	X												X	X			X		
black swift *Cypseloides niger*	SSC	Coastal belt of Santa Cruz & Monterey counties; central & southern Sierra Nevada; San Bernardino & San Jacinto Mountains. Breeds in small colonies on cliffs behind or adjacent to waterfalls in deep canyons and sea-bluffs above the surf.	X	X												X				X		

Species Name	Status	Habitat description	SMCMVCD (San Mateo County)	Adjacent Counties	Conifer Forest	Deciduous Forest	Shrublands	Grasslands	Serpentine	Coastal Dunes	Tree Holes	Open Water (Marine/Brackish)	Tidal Flats	Tidal Marsh and Channels	Lagoon	Creeks and Rivers	Ponds and Lakes	Seasonal Wetlands (includes Vernal Pools)	FW Marsh/Seeps	Riparian Corridor	Temporary Standing Waters and Artificial Ponds	Water and Wastewater Management Facilities
burrowing owl *Athene cunicularia*	SSC	Open, dry annual or perennial grasslands, deserts & scrublands characterized by low-growing vegetation. Subterranean nester, dependent upon burrowing mammals, most notably, the California ground squirrel.	X	X			X	X														
California black rail *Laterallus jamaicensis coturniculus*	ST, FP	Inhabits freshwater marshes, wet meadows & shallow margins of saltwater marshes bordering larger bays. Needs water depths of about 1 inch that do not fluctuate during the year & dense vegetation for nesting habitat.	X	X				X						X					X			
California least tern *Sternula antillarum browni*	FE, SE, FP	Nests along the coast from San Francisco Bay south to northern Baja California. Colonial breeder on bare or sparsely vegetated, flat substrates: sand beaches, alkali flats, landfills, or paved areas.	X	X						X												
least Bell's vireo *Vireo bellii pusillus*	FE, SE	Summer resident of southern California in low riparian in vicinity of water or in dry river bottoms; below 2000 ft. Nests placed along margins of bushes or on twigs projecting into pathways, usually willow, Baccharis, mesquite.		X												X				X		
long-eared owl *Asio otus*	SSC	Riparian bottomlands grown to tall willows & cottonwoods; also, belts of live oak paralleling stream courses. Require adjacent open land productive of mice and the presence of old nests of crows, hawks, or magpies for breeding.	X	X																X		
marbled murrelet *Brachyramphus marmoratus*	FT, SE	Feeds near-shore; nests inland along coast from eureka to Oregon border & from Half Moon Bay to Santa Cruz. Nests in old-growth redwood-dominated forests, up to 6 miles inland, often in Douglas-fir.	X	X	X																	
northern harrier *Circus cyaneus*	SSC	Coastal salt & fresh-water marsh. Nest & forage in grasslands, from salt grass in desert sink to Mountain Cienagas. Nests on ground in shrubby vegetation, usually at marsh edge; nest built of a large mound of sticks in wet areas.	X	X			X	X					X	X					X			
purple martin *Progne subis*	SSC	Inhabits woodlands, low elevation coniferous forest of Douglas-fir, ponderosa pine, & Monterey pine. Nests in old woodpecker cavities mostly, also in human-made structures. Nest often located in tall, isolated tree/snag.		X	X						X											
Ridgway's rail *Rallus longirostris obsoletus*	FE, SE, FP	Salt-water & brackish marshes traversed by tidal sloughs in the vicinity of San Francisco Bay. Associated with abundant growths of pickleweed, but feeds away from cover on invertebrates from mud-bottomed sloughs.	X	X									X	X								

Species Name	Status	Habitat description	SMCMVCD (San Mateo County)	Adjacent Counties	Conifer Forest	Deciduous Forest	Shrublands	Grasslands	Serpentine	Coastal Dunes	Tree Holes	Open Water (Marine/Brackish)	Tidal Flats	Tidal Marsh and Channels	Lagoon	Creeks and Rivers	Ponds and Lakes	Seasonal Wetlands (includes Vernal Pools)	FW Marsh/Seeps	Riparian Corridor	Temporary Standing Waters and Artificial Ponds	Water and Wastewater Management Facilities
saltmarsh common yellowthroat *Geothlypis trichas sinuosa*	SSC	Resident of the San Francisco Bay region, in fresh and salt water marshes. Requires thick, continuous cover down to water surface for foraging; tall grasses, tule patches, willows for nesting.	X	X										X					X			
short-eared owl *Asio flammeus*	SSC	Found in swamp lands, both fresh and salt; lowland meadows; irrigated alfalfa fields. Tule patches/tall grass needed for nesting/daytime seclusion. Nests on dry ground in depression concealed in vegetation.	X					X						X				X				
Swainson's hawk *Buteo swainsoni*	ST	Breeds in grasslands with scattered trees, juniper-sage flats, riparian areas, savannahs, & agricultural or ranch lands requires adjacent suitable foraging areas such as grasslands, or alfalfa or grain fields supporting rodent populations.		X				X												X		
tricolored blackbird *Agelaius tricolor*	SE, SSC	Highly colonial species, most numerous in central valley & vicinity. Largely endemic to California. Requires open water, protected nesting substrate, & foraging area with insect prey within a few km of the colony.		X													X	X		X		
western snowy plover *Charadrius alexandrinus nivosus*	FT, SSC	Sandy beaches, salt pond levees & shores of large alkali lakes. Needs sandy, gravelly or friable soils for nesting.	X	X													X					
white-tailed kite *Elanus leucurus*	FP	Rolling foothills and valley margins with scattered oaks & river bottomlands or marshes next to deciduous woodland.	X	X		X										X			X			
Mammals																						
American badger *Taxidea taxus*	SSC	Most abundant in drier open stages of most shrub, forest, and herbaceous habitats, with friable soils. Needs sufficient food, friable soils & open, uncultivated ground. Preys on burrowing rodents. Digs burrows.	X	X	X	X	X	X														
big free-tailed bat *Nyctinomops macrotis*	SSC	Low-lying arid areas in Southern California. Need high cliffs or rocky outcrops for roosting sites. Feeds principally on large moths.	X				X	X														
pallid bat *Antrozous pallidus*	SSC	Deserts, grasslands, shrublands, woodlands & forests. Most common in open, dry habitats with rocky areas for roosting. Roosts must protect bats from high temperatures. Very sensitive to disturbance of roosting sites.	X	X	X	X	X	X			X											
salt-marsh harvest mouse *Reithrodontomys raviventris*	FE, SE, FP	Only in the saline emergent wetlands of San Francisco Bay and its tributaries. Pickleweed is primary habitat. Do not burrow, build loosely organized nests. Require higher areas for flood escape.	X	X									X	X								

Species Name	Status	Habitat description	SMCMVCD (San Mateo County)	Adjacent Counties	Conifer Forest	Deciduous Forest	Shrublands	Grasslands	Serpentine	Coastal Dunes	Tree Holes	Open Water (Marine/Brackish)	Tidal Flats	Tidal Marsh and Channels	Lagoon	Creeks and Rivers	Ponds and Lakes	Seasonal Wetlands (includes Vernal Pools)	FW Marsh/Seeps	Riparian Corridor	Temporary Standing Waters and Artificial Ponds	Water and Wastewater Management Facilities
salt-marsh wandering shrew *Sorex vagrans halicoetes*	SSC	Salt marshes of the south arm of San Francisco Bay. Medium high marsh 6-8 ft above sea level where abundant driftwood is scattered among Salicornia.	X	X									X	X								
San Francisco dusky-footed woodrat *Neotoma fuscipes annectens*	SSC	Forest habitats of moderate canopy & moderate to dense understory. May prefer chaparral & redwood habitats. Constructs nests of shredded grass, leaves & other material. May be limited by availability of nest-building materials.	X	X	X	X	X				X											
San Joaquin kit fox *Vulpes macrotis mutica*	FE, ST	Annual grasslands or grassy open stages with scattered shrubby vegetation. Need loose-textured sandy soils for burrowing, and suitable prey base.		X			X	X														
Townsend's big-eared bat *Corynorhinus townsendii*	SCT, SSC	Throughout California in a wide variety of habitats. Most common in mesic sites. Roosts in the open, hanging from walls & ceilings. Roosting sites limiting. Extremely sensitive to human disturbance.	X	X	X	X																
western red bat *Lasiurus blossevillii*	SSC	Roosts primarily in trees, 2-40 feet above ground, from sea level up through mixed conifer forests. Prefers habitat edges & mosaics with trees that are protected from above & open below with open areas for foraging.		X	X	X		X														

FC = federal candidate species
FE = federally listed as endangered
FP = California Fully Protected species
FT = federally listed as threatened
SC = state candidate species
SE = listed by California as endangered
SSC = California species of special concern
ST = listed by California as threatened

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5.1.3.1.4 Clean Water Act of 1977 [33 USC Section(s) 1251-1376; 30 CFR Section(s) 330.5 (a)(26)]

These sections provide for the protection of wetlands. The administering agency for the above authority is the USACE. Under CWA Sections 301 and 502, any discharge of dredged or fill materials into "waters of the United States," including wetlands, is forbidden unless authorized by a permit issued by the USACE pursuant to Section 404. These permits are an essential part of protecting streams and wetlands. Wetlands are vital to the ecosystem in filtering streams and rivers and providing habitat for wildlife.

The USEPA is the federal agency responsible for water quality management and administers the federal Water Pollution Control Act Amendments of 1972 and 1987, collectively known as the Clean Water Act (CWA). The CWA establishes the principal federal statutes for water quality protection. It was established with the intent “to restore and maintain the chemical, physical, and biological integrity of the nation’s water, to achieve a level of water quality which provides for recreation in and on the water, and for the propagation of fish and wildlife.” Also see Section 9.1.2.1 in Chapter 9, *Water Resources*.

5.1.3.1.5 Executive Order 11990, Protection of Wetlands (May 24, 1977)

This order provides for the protection of wetlands. The administering agency for the above authority is the USACE.

5.1.3.1.6 Federal Insecticide, Fungicide, and Rodenticide Act

FIFRA defines a pesticide as “any substance intended for preventing, destroying, repelling, or mitigating any pest.” FIFRA requires USEPA registration of pesticides prior to their distribution for use in the US, sets registration criteria (testing guidelines), and mandates that pesticides perform their intended functions without causing unreasonable adverse effects on people and the environment when used according to USEPA-approved label directions. FIFRA defines an "unreasonable adverse effect on the environment" as (1) any unreasonable risk to man or the environment, taking into account the economic, social, and environmental costs and benefits of the use of the pesticide, or (2) a human dietary risk from residues that result from a use of a pesticide in or on any food inconsistent with the standard under Section 408 of the Federal Food, Drug, and Cosmetic Act (21 USC 346a)."

FIFRA regulates only the active ingredients of pesticides, not inert ingredients, which manufacturers are not required to reveal. However, toxicity studies conducted under FIFRA are required to evaluate the active ingredient and the entire product formulation, through which any potential additive or synergistic effects of inert ingredients are established.

5.1.3.1.7 Stipulated Injunction and Order, Protection of California Red-Legged Frog and 11 Other Threatened or Endangered Species from Pesticides

On October 20, 2006, the US District Court for the Northern District of California imposed no-use buffer zones around California red-legged frog (CRLF) upland and aquatic habitats for certain pesticides and herbicides. This injunction and order will remain in effect for each pesticide listed in the injunction until the USEPA goes through formal 7(A)(2) consultation with the USFWS on each of the 66 active ingredients, and the USFWS issues a Biological Opinion including a “not likely to adversely affect” statement for the pesticides. Under the injunction and order, no-use buffer zones of 60 feet for ground applications and 200 feet for aerial applications apply from the edge of the following CRLF habitats as defined by the USFWS and the Center for Biological Diversity: Aquatic Feature, Aquatic Breeding Habitat, Nonbreeding Aquatic Habitat, and Upland Habitat. These habitats are found in 33 counties of California including San Mateo County.

As discussed in greater detail in Section 4.1.3.1.6, the US District Court for the Northern District of California issued another Order and Stipulated Injunction in 2010 that covered 11 additional federally listed species, 8 of which occur in San Mateo County or surrounding counties. As a public agency conducting public health

vector control, the District is exempt from the limitations placed on pesticide use in both the 2006 and 2010 injunction orders.

Of the 66 pesticides listed in the injunction orders, the District currently uses methoprene and permethrin, while naled and esfenvalerate are part of the Proposed Program for vector control. Esfenvalerate may be applied directly to yellow jacket and wasp nests in response to public complaints in the future if District surveillance indicated a public health risk. Methoprene is used for larval mosquito control, and permethrin is currently used for yellow jacket control and may be used in the future for adult mosquito and tick control. Naled is not currently used, but may be used for adult mosquito control in the future. Best management practices related to the CRLF are laid out in Table 2-8 and 4-5 (BMPs E1-8). However, for applications of a pesticide for purposes of public health vector control under a program administered by a public entity, the injunction does not apply.

The District proposes to use the following herbicides listed in the injunctions: oryzalin, DCPA (chlorthal dimethyl), and, triclopyr, and utilizes glyphosate and imazapyr as part of its Existing Program. Where used for vegetation management for control of mosquito-breeding habitat, the injunction would not apply. If these herbicides were to be used for invasive species management to assist other agencies or landowners, then the injunction generally applies until such time that the material has been reviewed by USEPA and USFWS determines that it does not apply or the following “exceptions for invasive species and noxious weed programs” can be met:

> You are applying an herbicide for purposes of controlling state-designated invasive species and noxious weeds under a program administered by a public entity; and

> You do not apply the pesticide within 15 feet of aquatic breeding critical habitat or nonbreeding aquatic critical habitat within critical habitat areas, or within 15 feet of aquatic features within noncritical habitat sections subject to the injunction; and

> Application is limited to localized spot treatment using handheld devices; and

> Precipitation is not occurring or forecast to occur within 24 hours; and

> You are a certified applicator or working under the direct supervision of a certified applicator; and

> If using 2,4-D or triclopyr, you are using only the amine formulations. (USEPA 2014a)

Although the District is exempt from the use limitations in the stipulated injunctions when applying insecticides and herbicides for the purposes of public health mosquito control, several BMPs incorporated into the District’s IMVMP Plan also aim to protect CRLF and other species of concern and their habitats (see Chapter 2, Table 2-8, Categories E and F). The District’s Chemical Control and Vegetation Management Components as described in the IMVMP Plan are likely to keep District activities within compliance of the stipulated injunctions thorough self-imposed restrictions except in extreme or unusual circumstances. These injunctions also affect the cumulative impact discussion.

5.1.3.2 State

5.1.3.2.1 Porter-Cologne Water Quality Control Act of 1970

This law provides the SWRCB and the nine RWQCBs with authority to establish Water Quality Control Plans (Basin Plans) that are reviewed and revised periodically. The SWRCB and the RWQCBs carry out the federal CWA, including the NPDES permitting process for point source discharges and the CWA Section 303 water quality standards program. The administering agencies are the SWRCB and the RWQCBs.

As discussed in Chapter 9 Water Resources, the District is a member of the Mosquito Vector Control Association of California (MVCAC) NPDES Permit Coalition, which is responsible for coordinating all physical measurements and conducting all chemical monitoring required under the Vector Control Permit. The MVCAC NPDES Permit Coalition annual report now includes all physical monitoring data and makes

recommendations for modifications to the MRP, if appropriate. Based on the results of monitoring performed in 2011-2012 by the MVCAC Permit Coalition, the MRP for the Vector Control Permit was amended in March 2014 to limit the required monitoring to visual observations, monitoring and reporting of pesticide application rates, and reporting of noncompliant applications. Further chemical monitoring was determined to not be necessary. This decision was based on the physical and chemical monitoring results contained in the 2012 Annual Report (MVCAC 2013), which indicates that the pesticide active ingredients were rarely present in the waterway and/or the presence of the material in the waterway was of extremely short duration after pesticide application.

5.1.3.2.2 California Fish and Game Code Section 1600 et seq.

This law provides for protection and conservation of fish and wildlife resources with respect to any project that may substantially divert or obstruct the natural flow of, or substantially change or use any material from the bed, channel, or bank of any river, stream, or lake. The administering agency is the CDFW.

5.1.3.2.3 California Endangered Species Act of 1984 (California Fish and Game Code Sections 2050 2098)

This law provides for the protection and management of species and subspecies listed by the State of California as endangered or threatened, or designated as candidates for such listing. They are listed at 14 CCR Section 670.5. This law prohibits “take” of state-listed or candidate species, except as otherwise authorized by the Fish and Game Code. (The term “take” is defined by Section 86 of the Fish and Game Code as “hunt, pursue, catch, capture, or kill, or attempt to hunt, pursue, catch, capture, or kill.” This definition is different in some respects from the definition of “take” under the Federal Endangered Species Act.) The administering agency is the CDFW.

5.1.3.2.4 California Fish and Game Code §3503

This law prohibits take, possession, or needless destruction of any bird egg or nest, except as otherwise provided by the Fish and Game Code or regulation made pursuant thereto. The administering agency is the CDFW.

5.1.3.2.5 California Fish and Game Code §3503.5

This law prohibits take, possession, or destruction of any bird of prey (birds in the order of Falconiformes or Strigiformes), except as otherwise provided by the Fish and Game Code or regulation adopted pursuant thereto. The administering agency is the CDFW. However, CDPH maintains a scientific collecting permit with CDFW for vector and vector-borne disease surveillance and control (Section 1.1.3.1.1.).

5.1.3.2.6 California Fish and Game Code §3511, 4700, and 5050

These laws prohibit take or possession of birds, mammals, and reptiles listed as “fully protected,” except as provided by the Fish and Game Code. The administering agency is the CDFW.

5.1.3.2.7 California Fish and Game Code Section 5650

This law protects water quality from substances or materials deleterious to fish, plant life, or bird life. It prohibits such substances or materials from being placed in waters or places where they can pass into waters of the state, except as authorized pursuant to, and in compliance with, the terms and conditions of permits or authorizations of the SWRCB or a RWQCB such as a waste discharge requirement issued pursuant to California Water Code Section 13263, a waiver issued pursuant to Water Code Section 13269(a), or permit pursuant to Water Code Section 13160. The administering agency for Fish and Game Code Section 5650 is the CDFW.

5.1.3.2.8 Natural Community Conservation Planning Act (California Fish and Game Code §2800 to 2835)

This law provides for the development of NCCPs to provide for regional or areawide protection and perpetuation of natural wildlife diversity, while allowing compatible and appropriate development and growth. The administering agency is the CDFW.

5.1.3.2.9 Native Plant Protection Act; California Fish and Game Code §1900 et seq.

This law provides for the preservation, protection, and enhancement of endangered or rare native plants of the state. The Native Plant Protection Act allows for the designation of endangered and rare native plant species and states that no person shall take any native plant, or any part or product thereof that the commission has determined to be an endangered native plant or rare native plant, except as otherwise provided in the act. The administering agency is the CDFW.

5.1.3.2.10 California Health and Safety Code

The SMCMVCD operates under the California Health and Safety Code and the California Government Code (reference Division 1, Administration of Public Health, Chapter 2, Powers and Duties; also Part 2, Local Administration, Chapter 8, State Aid for Local Health Administration; Division 3, Pest Abatement, Chapter 5, Mosquito Abatement Districts or Vector Control Districts, Sections 2200 - 2910).

5.1.3.2.11 California Food and Agricultural Code, Section(s) 12976 and Section(s) 12981

This code states that no pesticide application should be made or continued when a reasonable possibility exists of damage to nontarget crops, animals, or other public or private property. The administering agency for the above authority is the CDPR.

5.1.3.2.12 California Food and Agricultural Code, Section(s) 29102

This code provides for the protection of bees from pesticide use through notification of beekeepers and the establishment of citrus bee protection areas. Prohibited applications to citrus within a citrus/bee protection area include any pesticide toxic to bees, except those exempted in a subsequent subsection during a citrus bloom period, unless the need for control of lepidoptera larvae or citrus thrips has been established by written recommendation of a representative of the University of California, Agricultural Extension Service, or a licensed agricultural pest control adviser. The recommendation should state either that the citrus planting does not meet the citrus bloom period criteria, or why components less hazardous to bees would not be effective. The administering agency for the above authority is the CDPR.

5.1.3.2.13 California Pesticide Regulatory Program

CDPR regulates the sale and use of pesticides in California. CDPR is responsible for reviewing the toxic effects of pesticide formulations and determining whether a pesticide is suitable for use in California through a registration process. Although CDPR cannot require manufacturers to make changes in labels, it can refuse to register products in California unless manufacturers address unmitigated hazards by amending the pesticide label. Consequently, many pesticide labels that are already approved by the USEPA also contain California-specific requirements. The CDPR is the state agency within California that has the authority to refuse, revoke, or suspend the license of any pesticide that harms or is likely to harm endangered species. CDPR has drafted the California State Plan for Protection of Endangered Species from Pesticide Exposure (CDPR 1995) to protect threatened and endangered species in California from effects of pesticides. Pesticide labels defining the registered applications and uses of a chemical are mandated by USEPA as a condition of registration. The label includes instructions telling users how to make sure the product is applied only to intended target pests, and includes precautions the applicator should take to protect human health and the environment. For example, product labels may contain such measures as restrictions in certain land uses and weather (i.e., wind speed) parameters Pesticide product

labels provide critical information about how to safely and legally handle and use pesticide products. District use of all pesticides shall be in strict accordance with the manufacturer's label instructions and all applicable federal, state, and local laws.

In addition to the label instructions, pesticide risks to endangered species within California are evaluated by an interagency network that includes CDPR, the CDFG Pesticide Investigation Unit, CDFA, the Pesticide Registration and Evaluation Committee, and the County Agricultural Commissioners as well as the USEPA and USFWS. Statewide protection strategies and local plans that resolve pesticide use conflicts, as well as communication tools for implementation are described in more detail in Section 4.1.3.2.12.

5.1.3.3 Local

Local governing bodies may pass ordinances that regulate or restrict pesticide use within their jurisdictional areas. However, these restrictions do not apply to state operations (including those conducted under the authority of the state, specifically CDPH in this case) and would not be applicable to treatments the District proposes under the Program (including those conducted under the authority of the state, specifically CDPH for the District's vector control activities) because California state law preempts local regulation and restriction of pesticide use. A school district board can decree that certain pesticides cannot be used in schools (under the Healthy Schools Act 2000[2]); however, some pesticide products are exempt and pesticide use to protect public health by an agent of CDPH is allowed. The District works collaboratively with schools and school district administration to minimize mosquito and vector production and control populations, when necessary. The District will work with other local entities and property owners to implement BMPs for the protection of public health.

Concerning local ordinances, plans, and policies to protect biological resources including trees, San Mateo County and its cities (Atherton, Belmont, Brisbane, Burlingame, Colma, Daly City, East Palo Alto, Foster City, Half Moon Bay, Menlo Park, Millbrae, Pacifica, Portola Valley, Redwood City, San Carlos, San Bruno, San Mateo, and South San Francisco), and towns (Hillsborough and Woodside) as well as the adjacent counties and cities therein maintain general plans for development and protection of lands within their jurisdictions. The general plans address the protection and enhancement of natural resources including plant, wildlife, and fish habitat and special-status species with broad goals and more specific policies to implement those goals. The discussions below are examples of the local general plan policies and tree ordinances affecting biological resources.

San Mateo County General Plan

The San Mateo County General Plan (1986) is comprised of multiple documents. The Overview provides a discussion of the function and organization of the General Plan, and a description of the physical, political, social, and economic settings of San Mateo County. Background and Issues present factual descriptions of existing conditions and assessments of current and future problems and needs, while the Policies set forth prescribed actions the County will take to achieve the goals and objectives of the General Plan. The maps provide a graphic representation of factual information and County land use policy. The Policy document contains vegetative, water, fish and wildlife resources policies in Chapter 1. Key policies are presented here relative to the mosquito and vector control activities of the District. The following goals and objectives are taken directly from the 1986 General Plan.

> *1.1 Conserve, Enhance, Protect, Maintain and Manage Vegetative, Water, Fish and Wildlife Resources*
> *Promote the conservation, enhancement, protection, maintenance and managed use of the County's Vegetative, Water, Fish and Wildlife Resources.*

[2] 2005 California Education Code Sections 17608-17613 Article 4. Healthy Schools Act of 2000. Section 17612 shall not apply to any agency signatory to a cooperative agreement with the State Department of Health Services pursuant to Section 116180 of the Health and Safety Code.

1.2 Protect Sensitive Habitats
Protect sensitive habitats from reduction in size or degradation of the conditions necessary for their maintenance.

1.3 Protection and Productive Use of Economically Valuable Vegetative, Water, Fish and Wildlife Resources
Protect the availability and encourage the productive use of the County's economically valuable vegetative, water, fish and wildlife resources in a manner which minimizes adverse environmental impacts.

1.4 Access to Vegetative, Water, Fish and Wildlife Resources
Protect and promote existing rights of public access to vegetative, water, fish and wildlife resources for purposes of study and recreation consistent with the need to protect public rights, rights of private property owners and protection and preservation of such resources.

San Mateo County defines a sensitive habitat as any area where the vegetative, water, fish and wildlife resources provide especially valuable and rare plant and animal habitats that can be easily disturbed or degraded. These areas include but are not limited to: (1) habitats containing or supporting rare or unique species; (2) riparian corridors; (3) marine and estuarine habitats; (4) wetlands; (5) sand dunes; (6) wildlife refuges, reserves, and scientific study areas; and (7) important nesting, feeding, breeding or spawning areas. It designates as sensitive habitats those areas which meet the definition of sensitive habitats. It recognizes the Sensitive Habitats Map (dated December 1984) or subsequent updates or refinements as indicative of the distribution of sensitive habitats within San Mateo County, based upon the best and most current information available.

General policies include the following:

1.20 Importance of Sensitive Habitats
Consider areas designated as sensitive habitats as a priority resource requiring protection.

1.21 Importance of Economically Valuable Vegetative, Water, Fish and Wildlife Resources
Consider Vegetative, Water, Fish and Wildlife Resources which are economically valuable as a priority resource to be enhanced, utilized, managed and maintained for the needs of present and future generations.

Furthermore, the General Plan contains the specific policy 1.38 Control Incompatible Vegetation, Fish and Wildlife: Encourage and support the control of vegetation, fish and wildlife resources which are harmful to the surrounding environment or pose a threat to public health, safety, and welfare.

The San Mateo County Planning and Building Department regulates tree removal by permit based on Sections 11,000 et seq. and 12,000 et seq. of the San Mateo County Ordinance Code. The County identifies several tree species as potential heritage tree species; and the Significant Tree Ordinance protects any species with a diameter of 38 inches or greater. All tree removals shall comply with the San Mateo County Heritage Tree Ordinance and Significant Tree Ordinance, requiring replacement at a 1:1 ratio of any native trees greater than 38 inches in circumference.

The San Mateo County General Plan does not contain policy specific to mosquito and vector control activities because the District was formed under the Mosquito Abatement Act and has since remained an independent special district, separate from other county services. .However, policies above are considered when implementing the IMVMP Plan, especially the Physical Control and Vegetation Management Components.

5.1.4 Habitat Conservation Plans and Natural Community Conservation Plans

HCPs are planning documents required as part of an application by a nonfederal entity for incidental take of a species listed under the federal Endangered Species Act as part of their proposed activities. An HCP describes the proposed action(s), and anticipated effects on the individuals and populations of listed species. It also describes how impacts will be minimized and mitigated. An HCP also can include protections for species that are candidates for listing or are proposed for listing. The USFWS or NOAA Fisheries review the HCP, when reviewing a project. If they approve a project, they will issue an incidental take permit for the project actions, which provides for take of these species based on the actions provided for in the HCP, as well as additional measures that they might include.

The California legislature first passed the California Natural Community Conservation Planning Act in 1991, then updated and superseded it in 2003. The primary objective of the NCCP program is to conserve natural communities at the ecosystem level, while accommodating compatible land use. It focuses on the long-term stability of wildlife and habitat and seeks to avoid controversy and delays associated with species listings.

Twelve HCPs and NCCPs are in effect or under development within the Program Area. Table 5-5 was developed through review of information available on the USFWS and CDFW's websites. The District is not signatory to these HCPs or NCCPs, but will consult with HCP managers and agency biologists when their activities occur within the boundaries of an existing HCP or NCCP or those that may be developed during the Program lifetime, to ensure that their activities are not inconsistent with the provisions of those plans while protecting public health. Coordination with the District by the HCP/NCCP implementing agency may be needed to ensure that habitats preserved in the plans do not create vector control problems.

These 12 plans are described in Section 4.1.4 and are not repeated herein. Only San Bruno Mountain HCP is located within the District's Service Area. This HCP has been created under the direction of the San Bruno Mountain HCP Drafting Committee to address potential impacts caused by a private landowner's desire to develop their land, the spread of brush and exotic species, and sensitive habitat destruction due to trespassing by illegal offroad vehicles. This HCP addresses impacts to these endangered species: San Bruno elfin butterfly, mission blue butterfly, Callippe silverspot (*Speyeria callippe callippe*), and San Francisco garter snake (SFGS) over 3,500 acres on San Bruno Mountain in San Mateo County for a duration of 30 years. The federal ESA Section 10(a)(1)(B) permit was expanded in 2013 to include the Callippe silverspot (*Speyeria callippe callippe*). The butterflies are in danger of extinction and to increase their chances of survival, their existing habitat must be preserved and improved. Necessary improvements include increasing the number of butterfly food plants on the mountain and preventing destruction of the habitat by development and unauthorized offroad vehicles. San Mateo County Department of Parks manages the plan area.

Table 5-5 Habitat Conservation Plans and Natural Community Conservation Plans in the San Mateo County Mosquito and Vector Control District Program Area

Plan Title	Location	Covered Species Listed and Nonlisted	Date Permit Issued	Size (acres)	Duration
1. Donald Von Raesfeld Power Plant LE (formerly Pico Power Plant)	Santa Clara County	5 species, No nonlisted species Bay checkerspot butterfly, coyote ceanothus, Metcalf Canyon jewelflower, Santa Clara Valley dudleya, and Tiburon paintbrush	09/25/2014	9,926 acres (California) The 2.86-acre power plant site itself is not in an area with habitat. As a result of its emissions, however, a fractional increase in nitrogen deposition could affect up to 9,926 acres of serpentine habitat in Santa Clara County, resulting in the net loss of approximately 40 acres	40 years, Anticipated life of the power plant
2. Los Esteros LE	Santa Clara County	5 species No nonlisted species Bay checkerspot butterfly, coyote ceanothus, Metcalf Canyon jewelflower, Santa Clara Valley dudleya, and Tiburon paintbrush	03/11/2011	9,926 acres (California) The 21-acre power plant itself is not in an area with habitat. As a result of its emissions, however, the increase in nitrogen deposition could indirectly affect the covered species within 9,926 acres of serpentine habitat in Santa Clara County, resulting in the net loss of approximately 40 acres	50 years, Estimated project life of power plant

Plan Title	Location	Covered Species Listed and Nonlisted	Date Permit Issued	Size (acres)	Duration
3. San Bruno Mountain	San Mateo County	4 species No nonlisted species San Bruno elfin butterfly, mission blue butterfly, Callippe silverspot, and San Francisco garter snake	03/04/1983 Renewed 03/2013	3,500 acres	30 years
4. Santa Clara Valley HCP/NCCP	Santa Clara County	9 species 9 Nonlisted species	07/30/2013	508,669 acres	50 years
5. Santa Cruz Gardens Unit 12	Near Soquel, Santa Cruz County	Ohlone tiger beetle, Santa Cruz tarplant, and Gairdner's yampah	08/26/2009	58.5 acres	10 years
6. Seascape Uplands	Aptos, Santa Cruz County	salamander, Santa Cruz long-toed (Entire), No nonlisted species	08/18/1997	192 acres	30 years
7. Stanford University HCP	City of Palo Alto, Santa Clara County	3 species No nonlisted species California red-legged frog, California tiger salamander, San Francisco garter snake	08/13/2013	8,000 acres 4,300 acres covered under HCP	50 years
8. Tucker	Aptos, Santa Cruz County	2 species No nonlisted species Santa Cruz long-toed salamander and California red-legged frog	03/02/2007	55 acres, including a 38.8-acre preserve	10 years
9. University of California, Santa Cruz – Ranch View Terrace HCP	UC Santa Cruz Campus, Santa Cruz County	2 species No nonlisted species California red-legged frog and Ohlone tiger beetle	10/27/2005	38.8 acres	60 years

Plan Title	Location	Covered Species Listed and Nonlisted	Date Permit Issued	Size (acres)	Duration
10. Wilder Quarry (Granite Rock)	Santa Cruz	California red-legged frog (Entire), No nonlisted species	06/19/1998	125 acres	30 years
11. Hochler HCP	Scotts Valley, Santa Cruz County	Beetle, Mount Hermon June (Entire), No nonlisted species	Data not available	1.758 acres)	5 years
12. Interim Programmatic HCP for the Zayante Sandhills (Mt. Hermon June Beetle and Ben Lomond Spineflower)	City of Scotts Valley and communities of Ben Lomond, Felton, Mt. Hermon, and Olympia, Santa Cruz County	2 species No nonlisted species Mt. Hermon June beetle and Ben Lomond spineflower	November 2011	139 acres	5 years

Sources:

[1] USFWS ECOS website (http://ecos.fws.gov/conserv_plans/PlanReport?region=8andtype=HCPandrtype=2andhcpUser=andview=report) accessed September 22, 2015

[2] CDFW NCCP website (https://www.wildlife.ca.gov/Conservation/Planning) accessed September 22, 2015 (CDFW 2015b)

[3] Sacramento USFWS Office website (http://www.fws.gov/sacramento/es/Habitat-Conservation-Plans/es_hcp.htm) accessed September 22, 2015

Note: The District will review these websites periodically to determine if new HCP/NCCPs are being considered for or have been implemented in their area.

LE = low-effect

5.2 Environmental Impacts and Mitigation Measures

This section identifies the environmental issues and concerns associated with the Program components and presents the significance criteria used to evaluate the likely impacts of the various Program components on terrestrial resources under CEQA. The significance criteria establish thresholds, utilizing the intent of the HCPs and NCCPs associated with each area, for determining whether an impact rises to a level that is biologically significant. The environmental issues describe the mechanisms by which such impacts might occur.

5.2.1 Evaluation Concerns and Criteria

The Program components are implemented as part of an IMVMP Plan as described in Section 2.3. The IMVMP Plan uses alternative nonchemical and chemical treatments in a sequential manner to minimize potential environmental impacts, evaluating each treatment site and situation and implementing the least harmful technique that is applicable for that situation consistent with IPM principles. Treatments with higher potential risk to the environment are only implemented when treatments with lower potential risk are ineffective or cannot be applied to that site. This approach minimizes the overall Program risk to the environment, but environmental concerns relating to different components remain.

5.2.1.1 Environmental Concerns

The Program components have the potential to affect terrestrial resources directly by affecting physical habitat and through acute or chronic toxicity to special-status species or other nontarget organisms. Habitat alterations such as removal or reduction of habitat and vegetative cover may also indirectly result in impacts to the ranges and abundance of prey animals. Exposure of nontarget organisms to pesticides can result in acute or chronic toxicity, depending on the concentrations encountered. Additionally, indirect exposure may occur via ingestion of contaminated prey animals, bioaccumulation of chemicals, or biotransformation of pesticide active ingredients to different compounds. The Program's potential to affect ecological health through impacts to nontarget ecological receptors is evaluated separately in Section 6.2 with an emphasis there on chemicals used or proposed for use as part of the District's IMVMP Plan. Material herein is summarized from the more detailed discussion for the Vegetation Management and Chemical Control Components in Section 6.2.

The following comments identifying areas of concern to the public were received during the public scoping process or through other public contact with the District. These concerns are addressed as elements of the broader issues explained above.

> Discuss potential impacts on insect pollinators/bees from chemicals in treatment applications.

> Describe the effects of all chemicals that are used and/or proposed for use on wildlife and natural ecosystems, including insect prey, birds, mammals, fish, vegetation, and site topography. The loss of prey for birds is a particular concern. Also, consider unwanted effects of the "inactive" portion of the pesticides. What effects will the carrier portion of the chemicals have on the environment?

> Discuss the potential impact of *Bacillus sphaericus* (Bs)/*Bacillus thuringiensis israelensis* (Bti) products on native species.

> Describe the role of mosquitoes within the food chain, and subsequent impacts if they were removed in terms of amphibians, birds, reptiles, fish, and insects. This issue is also addressed in Section 6.2.

> Consider whether the pesticides used can also kill the natural predators of mosquitoes, which can have difficulty in recovery from pesticides.

> Consider the attenuation of pesticide efficacy and possible long-term resistance which is an issue for all chemically based mosquito control programs. This is addressed by the use of different control

methods and different agents over time where possible (BMP and IVM techniques are designed to identify these issues early and modify applications as appropriate and feasible).

> Note that the Program Area includes potential habitat for several California and federally threatened and other sensitive plant and wildlife species and, as such, comprehensive biological studies should be implemented.

> Coordinate with CDFW, California Natural Diversity Database (CDFW 2015c), USFWS, and USFWS' Information, Planning, and Conservation planning tool to identify special-status plant and wildlife species. If impacts are found to be significant, the PEIR should identify adequate mitigation measures to reduce impacts to lower levels.

> A primary concern is the environmental impact on natural resources in terms of vegetation removal, soil erosion, and possible wildlife impact.

> Ensure mosquito abatement staff minimizes impact to tidal marsh and vernal pool habitats (especially during breeding season). Restrict operation of vehicles to levees and existing roads, and avoid vernal pool plants during blooming season (March–June).

> Concern for spread of invasive weeds, erosion, and sedimentation.

> The PEIR should include a detailed description and complete assessment of the surveillance, physical control, biological control, and chemical control impacts (current and future, direct and indirect) on habitats (including endangered, threatened, and locally unique species and sensitive habitats) and on species (sensitive fish, wildlife, or plants).

5.2.1.2 Significance Criteria

Significance criteria were developed based on applicable regulations and management policies, a review of the available information, and the professional judgment of the authors.

The CEQA Guidelines include several criteria for determining whether a potentially significant impact exists to biological resources in the CEQA Appendix G, *Environmental Checklist Form*, Section IV. Those that could apply to the Proposed Program as thresholds of significance for biological resources have been used in the following evaluation with the analysis organized according to these criteria as environmental topics. Impacts were considered potentially significant if they would:

a. Have a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special-status species in local or regional plans, policies, or regulations, or by the CDFW or USFWS.

b. Have a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, regulations, or by the CDFW or USFWS.

c. Have a substantial adverse effect on federally protected wetlands as defined by CWA Section 404, (including but not limited to, marsh, vernal pool, coastal, etc.) through direct removal, filling, hydrological interruption, or other means.

d. Interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors or impede the use of native wildlife nursery sites.

e. Conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance.

f. Conflict with the provisions of an adopted Habitat Conservation Plan, Natural Community Conservation Plan, or other approved local, regional, or state habitat conservation plan.

The specific criteria below are for determining that an effect is considered significant to nontarget species within an appropriate time-frame, the likely exposure, and ecological context (Coastal Conservancy and USFWS 2003). If the effects caused relatively high magnitude, persistent, or permanent changes compared with an environmental baseline (which here means rooted in the existing condition) as assessed by the best professional judgment of the PEIR author, then the effect would be considered "substantial" and the impact of the given program component could be considered significant. These determinations are best when based on risk assessment studies addressing a variety of habitats; but in lieu of a risk assessment, prior understanding of similar adverse effects/impacts by a technical expert can be utilized.

> Substantially reduce the population size, distribution, viability, or recovery potential of a rare, threatened, or endangered species, or species of concern;

> Result in changes in the population size, distribution, viability, or resilience of a native fish, wildlife, or plant species;

> Result in changes in the range, patterns, or fluctuation (dynamics) of physical or chemical attributes of physical estuarine habitats (tidal waters or substrates) or other aquatic and terrestrial habitats; and

> Result in changes in stability or structure of estuarine or other aquatic and terrestrial habitats.

The thresholds for each chemical are based on the estimated exposures and documented toxicity contrasted in a simple risk paradigm where practical and estimates of likelihood of impact where a complete risk assessment is not practical. The USEPA and state thresholds for effects are the basis for the information in Appendix B, Table 6.3.

For determination of a significant impact for this PEIR, the baseline is the existing San Mateo County terrestrial ecosystem (approximately in place from 2012 to 2018 or as described in recent source material cited). The existing conditions of an ecosystem are not static but involve dynamic changes in the status and trends that are reasonably foreseeable over an ecologically meaningful timeframe. For the purposes of terrestrial systems, this may range from a 1- to 2-year "short-term" timeframe to a 50-year "long-term" timeframe. An adverse effect or impact would be considered significant or substantial if it caused relatively high magnitude, persistent, or permanent changes in the above listed factors, compared with a dynamic environmental baseline established in existing conditions.

5.2.2 Evaluation Methods and Assumptions

5.2.2.1 Evaluation Methods

In general, the methodology for determining impacts under CEQA focuses on types of habitat and special-status terrestrial species, and are evaluated using the criteria described above as environmental topics. Potential impacts were assessed using available information on the types of vector control and treatment as described in Chapter 2, Program Description, and assuming that all applicable BMPs as described in Chapter 2, Table 2-9, (based on *Best Management Practices for Mosquito Control in California* [CDPH and MVCAC 2012], the Statewide General NPDES Vector Control Permit [SWRCB 2011a, 2012), and District-specific BMPs, as indicated in the PAPs. The BMPs most applicable to minimizing and/or avoiding impacts to terrestrial resources are included in Table 4-5, which also indicates the habitat types in which those BMPs will be applied. This assessment considers the physical and biological connections between treatment areas and terrestrial ecosystems. This information was evaluated in the context of the Program components and the existing environment under baseline conditions in 2012 to 2018 in the Program Area as described in Section 5.1.1.

The detailed BMPs described in Table 2-9 (and associated with the habitat types they would be applied to in Table 4-5) can be placed into several categories. These categories include:

1. Agency communication includes periodic discussion with resource agencies, refuge managers and other land managers about topics such as: planning, specific site issues, special-status species occurrence, opportunities for source reduction, observations made by District staff (e.g., wildlife, trespass/unauthorized equipment use) and activities to be implemented. It also includes the District obtaining any required permits and reporting regarding existing permits, periodic check-in calls, and other communications as needed, when unanticipated circumstances arise.
2. Environmental training includes environmental awareness training provided to all field staff regarding environmental resource issues, recognition, and documentation of sensitive environmental resources in the field, and BMPs to avoid or minimize impacts to those resources. This category includes both general training, training to avoid or eliminate the spread of weeds, and special-status species or habitat specific training provided to District staff by USFWS, CDFW, or other appropriately trained persons approved by these agencies.
3. Pretreatment screening involves a pretreatment assessment of pesticide treatment locations for environmentally sensitive resources to determine appropriate treatment, access routes, and other BMPs to be applied for that location. This category may include a pretreatment site visit to confirm information used in the screening.
4. Disturbance minimization includes:
    a. avoiding environmentally sensitive areas as much as practical
    b. using existing access routes where ever possible, whether on foot or in a vehicle
    c. minimizing use of offroad vehicles as much as possible, and driving slowly when they are used
    d. being observant and working carefully to avoid or minimize disturbance
    e. using hand tools rather than mechanized tools as much as practical for all vegetation clearing (including clearing of access ways) or physical control treatments
5. Habitat or species-specific BMPs includes BMPs targeted to a specific habitat type or species (e.g., tidal marshes or salt marsh harvest mouse). These BMPs include measures specific to those habitat types or species including diurnal or seasonal limitations on specific project activities, specific controls on the types of activities or how they are carried out. Specific measures are those documented in Tables 2-8 and 4-5.
6. Component-specific BMPs relate specifically to the implementation of a particular treatment (Physical Control, Vegetation Management, Chemical Control). These may overlap many of the BMPs described above, but also include component-specific measures to protect environmental resources, based the type of activity to be conducted (e.g., protection of soil surface, minimization of turbidity under the Physical Control Component or adherence to label directions, treating only during periods with acceptable weather conditions, and employing appropriate buffers for Chemical Control).

These categories are not inclusive of all the BMPs in Table 4-5, nor are they intended to replace those more specific BMPs. These categories are provided to facilitate the discussion of the impact evaluations through the end of this chapter. Table 4-5 lists all of the BMPs for Program implementation by component and habitat types that are relevant to biological resources and determinations of impact significance. In practical terms, the District treats terrestrial areas with the same care and sensitivity to plants and wildlife that it does for aquatic and wetland habitats.

Impact determinations follow the analysis for each Program component and cover the following issues derived from the CEQA significance criteria (Section 5.2.1.2):

a. Impacts to special-status species

b. Impacts to riparian habitats or other sensitive natural communities

c. Impacts to federally protected wetlands

d. Impacts to movement of native resident or migratory fish or wildlife species

e. Impacts to local policies

f. Conflicts with provisions of HCP, NCCP, or other approved habitat conservation plan

Impacts are evaluated with regard to desired terrestrial plant and animal (e.g., native and listed species) communities, and effects on food supply for wildlife, using the CEQA criteria described above (Section 5.2.1.2). Potential impacts were assessed using available information on the types of control and treatment and the toxicity of the various chemicals used, the treatment descriptions, and the physical and biological connections between treatment areas and terrestrial ecosystems. This information was evaluated in the context of the Program components and the existing environment under baseline conditions in the Program Area as described in Section 5.1.1. Note that Chapter 6, Ecological Health, specifically addresses potential impacts to nontarget ecological receptors but is not focused on terrestrial habitat types.

The potential impacts of the nonchemical components are based on the type and location of habitats treated and the magnitude and frequency of treatment. The potential impacts of the chemical components were evaluated based on the magnitude and duration of the treatments and the toxicity and application information presented in Chapter 6, Ecological Health, and Appendix B, Ecological and Human Health Assessment Report. The evaluation of all components considered the life histories of the different listed species and ecological interactions, including impacts to the terrestrial food chain. Pesticides the District uses or proposes to use in the future were investigated to provide a preliminary assessment of the potential impacts to nontarget ecological receptors. Appendix B provides the results of review and evaluations of pesticide (insecticides, herbicides) active ingredients and adjuvants the District currently uses or proposes for use (along with others the District has not selected for use). A comprehensive literature review was conducted to evaluate environmental fate and general toxicity characteristics for the active ingredients and adjuvants. The results of the assessment were used to rank the potential for adverse effects to human health and the environment. Chemical and application characteristics such as the likelihood of exposure for nontarget species and habitats, the potential for drift, and the possible transport and fate of the chemical in various media (i.e., air, surface water/groundwater, soil) were considered in the assessment. Those active ingredients that appear to exhibit either a higher level of risk or have specific use patterns warranting further research are listed in Table 6-5 (in Section 6.2.7).

The pesticide application scenarios that result in reasonable efficacy with minimal unwanted risk are preferred and are the basis of IPM approaches and BMPs the District employs. Each of the pesticides and herbicides identified for further evaluation in Appendix B (as a subset of all pesticides and herbicides in use) is known to exhibit at least one parameter that appears to have an important role in the resulting potential or perceived risk. Toxicity levels are helpful in making significance determinations under CEQA. Toxicity thresholds are presented in the Vegetation Management Component for herbicides (Section 5.2.5, Table 5-7) and for the other pesticides in the Chemical Control Component (Section 5.2,7, Table 5-9).

5.2.2.2 Assumptions

The following assumptions were used in the assessment of potential terrestrial resource impacts from the Program components:

- Site-specific evaluation of terrestrial resource impacts is not within the scope of this programmatic evaluation. Rather, the analysis uses habitat types likely to be affected by any of the components as the basis for evaluation.
- The BMPs listed in Table 4-5 will be implemented by District staff as appropriate to the type of activity under the Program components.
- This evaluation assumes that all pesticides are applied in accordance with product label instructions and USEPA and CDPR requirements (and in consideration of the local context for that area, i.e., nearby area land uses and habitats).
- This terrestrial resources evaluation does not include assumptions about which component treatment strategy or strategies would be applied in any given area. Therefore, each Program component is considered as a stand-alone option, although the Program may include multiple component implementations within a given area (i.e., physical controls followed by larvicide application). Guidelines used to trigger a particular component based on mosquito abundance and other variables are included in District-specific operating procedures contained in the IMVMP Plan and its appendices.

The USEPA requires mandatory statements on pesticide product labels that include directions for use; precautions for avoiding certain dangerous actions; and where, when, and how the pesticide should be applied. This guidance is designed to ensure proper use of the pesticide and prevent unreasonable adverse effects to humans and the environment. All pesticide labels are required to include the name and percentage by weight of each active ingredient in the product/formulation. Toxicity categories for product hazards and appropriate first-aid measures must be properly and prominently displayed. Pesticide labels also outline proper use, storage, and disposal procedures, as well as precautions to protect applicators. The directions for use specify the target organism (pest), appropriate application sites, application rates or dosages, contact times, and required application equipment for the pesticide. Warnings regarding appropriate wind speeds, droplet sizes, or habitats to avoid during application are also prominently displayed.

Concerning the application of multiple chemical treatments in the same area, such as larvicides followed by adulticides (which is not likely to occur under normal circumstances), or the application of multiple pesticides at the same time in a specific area (e.g., usually multiple active ingredients in the formulation such as VectoMax which combines Bti and Bs), the following information applies:

> Products sold as herbicides and pesticides are evaluated herein both for the active ingredient and for the adjuvants and surfactants used to make the product more useful. When multiple products are used in a vector control application, the impacts are weighed against the proximity and timing of each application. Some commercial products actually contain more than one active ingredient (e.g., FourStar Briquets contain BS and Bti), and these products are evaluated for toxicity. If products with similar or even different active ingredients are applied simultaneously, the potential toxicity of each is summed to estimate potential adverse effects. This scenario is not typical unless the potential adverse effects of the vector are potentially extreme. The need for reapplication of mosquito larvicides or adulticides is surveillance driven and performed according to the label directions. The District can apply larvicide materials with different active ingredients during a single timeframe if multiple hatches of mosquito larvae occur and results in mosquito populations occurring at different stages of the life cycle. An example is when liquid Bti and methoprene are applied simultaneously. The combination of the materials is a product called Duplex, and the mixture of the materials and active ingredients is

provided for on the product label. Another example includes a preapplication of a liquid trans allethrin and phenothrin spray product which may be used to minimize the hazard of approaching a yellow jacket nest. Situations that would produce a residual exposure adequate to cause harm to nontarget wildlife would not occur unless the application(s) were inappropriate or the timing of applications is inappropriately close. Actual applications do not generally occur close together unless a problem exists with treatment effectiveness. A material is applied followed by post-treatment inspection to determine effectiveness. Only if the vectors (mosquitoes) have not been sufficiently killed would the District reapply a pesticide to the same area.

Assumptions and/or background information related to the analysis of hazards, toxicity, and exposure for chemical treatment methods are explained below, including the definition of key terms. The concept of ecological food web is explained as well, and it is addressed primarily in Section 6.2.2.2 Assumptions. Background information on bioaccumulation and biomagnification is provided in Section 6.1.1.3.

5.2.2.2.1 Hazardous Material

A “hazardous material” is defined in California Health and Safety Code Section 25501 (p): as “any material that, because of its quantity, concentration, or physical or chemical characteristics, poses a significant present or potential hazard to human health and safety or to the environment if released into the workplace or the environment. “Hazardous materials” include, but are not limited to, “hazardous substances, hazardous waste, and any material that a handler or the administering agency has a reasonable basis for believing that it would be injurious to the health and safety of persons or harmful to the environment if released into the workplace or the environment.” Any liquid, solid, gas, sludge, synthetic product, or commodity that exhibits characteristics of toxicity, ignitability, corrosiveness, or reactivity has the potential to be considered a “hazardous material.

5.2.2.2.2 Toxicity and Exposure

Toxicology is the study of a compound’s potential to elicit an adverse effect in an organism. The toxicity of a compound is dependent upon exposure, including the specific amount of the compound that reaches an organism’s tissues (i.e., the dose), the duration of time over which a dose is received, the potency of the chemical for eliciting a toxic effect (i.e., the response), and the sensitivity of the organism receiving the dose of the chemical. Toxicity effects are measured in controlled laboratory tests on a dose/response scale, whereby the probability of a toxic response increases as dose increases. Exposure to a compound is necessary for potential toxic effects to occur. However, exposure does not, in itself, imply that toxicity will occur. Thus, toxic hazards can be mitigated by limiting potential exposure to ensure that doses are less than the amount that may result in adverse health effects.

The toxicity data included in the numerous tables and charts in this document are generally derived from rigidly controlled laboratory animal studies designed to determine the potential adverse effects of the chemical under several possible routes of exposure. In these studies, the species of interest is exposed to 100 percent chemical at several doses to determine useful information such as the lowest concentration resulting in a predetermined adverse effect (LOAEL) on numerous selected physiological and behavioral systems. The second component of these tests is to determine the highest concentration of chemical that results in no measurable adverse effect (NOAEL). These two levels are used to describe the potential range of exposures that could result in adverse effects, including the highest dose with no observed effects.

However, these and other coordinated and focused laboratory tests are designed to document the effects of the chemical using a continuous, controlled laboratory exposure that does not realistically reflect the likely patchy exposures typical of the District field application scenarios. As such, the toxicity information generated using laboratory tests (and some limited field tests) are intended as an overview of potential issues that might be associated with maximum direct exposures to develop and recommend guidance for use that should provide maximum exposure levels of applications that are protective of ecological health.

These guidelines include numerous “safety margins” in the toxicity calculations that are intended to provide adequate efficacy to target organisms while not adversely impacting humans or nontarget plant and animal species. In some instances, the regulatory guidance may include additional suggestions for protective application to assure no significant adverse effect on nontarget species and humans.

The regulatory community uses this basic information to provide a relative comparison of the potential for a chemical to result in unwanted adverse effects and this information is reflected in the approved usage labels and MSDSs, in actual practice, the amounts actually applied by the District within the District’s Program Area for vector control are substantially less than the amounts used in the toxicity studies. Because of these large inherent safety factors in recommended product application rates, the amount of chemical resulting in demonstrated toxicity in the laboratory is nowhere near the low exposure levels associated with an actual application for vector control. The application concentrations consistent with the labels or MSDSs[3] are designed to be protective of the health of humans and other nontarget species (i.e., low enough to not kill them, weaken them, or cause them to fail to reproduce). Impacts may occur to some nontarget organisms. Although numerous precautions (BMPs) and use of recommended application guidance is intended to provide efficacy without adverse effects to nontarget organisms, misapplication or unexpected weather conditions may still result in effects on some nontarget organisms in the exposure area. This potential impact is ameliorated/mitigated by having the application concentrations consistent with the labels or MSDSs (now SDSs). These documents are designed to protect the health of humans and other nontarget species. The careful use of pesticide application BMPs, and advance planning by the District further avoids substantial impacts (see Sections 6.2.5 and 6.2.7 where the potential impact analyses are provided).

Although laboratory toxicity testing focuses on tiered concentrations of chemical exposure, the results of these tests produce a series of toxicity estimates of concentrations less than those that produce mortality. Extrapolation of these data is used to generate estimates of chronic toxicity or possible effects of lower doses that may result in sublethal effects such as reproduction or metabolic changes. In reality, these low-dose exposures need to be sustained over longer periods than are relevant to typical application scenarios for vector control. As part of the District’s IVM program, targeted chemical control is applied only when inspections reveal that mosquitoes or other vector populations are present at threshold levels – based on the vector’s abundance, density, species composition, proximity to human settlements, water temperature, presence of predators, and other factors –and when other control options are unavailable or inappropriate. District staff will then apply pesticides to the site in strict accordance with the pesticide label instructions and District BMPs. This approach results in chemical treatments using the least amount of product to be effective (often below the maximum that the label allows), with minimal repeated applications. Additionally, the District employs techniques to ensure applications do not generally occur that close together. Measures include following label instruction, education of state-certified field personnel, real-time application recording equipment and the use of color-coded data management tools that alert personnel of estimated active ingredient remaining at application sites.

5.2.2.2.3 Chemistry, Fate, and Transport

The toxicity of a chemical is also affected by various biological, chemical, and physical parameters that affect the behavior of a compound in the environment and its potential toxicity. The chemistry, fate, and transport of a compound must be analyzed to fully estimate potential exposure to a given receptor. The fate and transport of a compound is determined by the physical and chemical properties of the compound itself and the environment in which it is released. Thus, the following characteristics of a compound must be evaluated: its half-life in various environmental media (e.g., sediment, water, air); photolytic half-life; lipid and water solubility; adsorption to sediments and plants; and volatilization. Environmental factors that affect fate and transport processes include temperature, rainfall, wind, sunlight, water turbidity, dissolved

[3] Although the MSDS format is referenced in this document, it should be noted that under the international Globally Harmonized System, the MSDS format has been substantially revised and is now largely replaced by standardized Safety Data Sheets (SDSs).

oxygen concentrations, and water and soil pH. Information pertaining to these parameters allows evaluation of how compounds may be transported between environmental media (e.g., from sediments to biota), how a compound may be degraded into various breakdown products, and how long a compound or its breakdown products may persist in different environmental media. In general, when a compound or its breakdown products decomposes rapidly in the environment and does not persist for extended periods, then the compound or product poses a lower risk to nontarget species and a lower potential for environmental pollution. Appendix B provides a discussion of the environmental fate of the pesticide active ingredients and other chemicals associated with specific pesticide formulations used in the Vegetation Management and Chemical Control Components.

5.2.2.2.4 Ecological Food Webs

While it is important to evaluate the potential adverse impacts of a pesticide application to potentially affected nontarget species, it is neither feasible nor practical to evaluate those potential impacts to a representative food web. An ecological food web is represented in the illustration representing some of the multitude of possible biotic and food uptake interactions in an ecosystem. Each of the possible connections between species is also associated with other interactions. These interactions can be the result of higher levels of animal species organization (trophic) or paired interactions between individuals that result in added, positive associations (symbiotic) for both species.

Although ecological food webs could be used to describe the complex system interactions that might be associated with District application scenarios, it is neither feasible nor practical to evaluate those potential impacts using a food-web approach. The numerous, complex interactions in typical food webs would be fraught with uncertainty and complex animal associations and, as such, difficult to confidently assess relevant impacts. Because of these constraints and complexity, it would be neither practical nor productive to attempt to predict food-web interactions for each of the numerous application scenarios the District uses. It is appropriate, however, to use a food-web analysis to identify and consider the first level of potentially adverse effects to nontarget species that might result from a pesticide application. This information is used to assure a minimal impact to nontarget species and is typically a part of the MSDS and Toxicology profiles, providing the basis for the more reasonable, technically feasible approach to consider the possible nontarget impacts prior to use and the compatibility of each proposed pesticide in the overall approach to the typical vector control by the District. Figure 5-2 illustrates the ecological food web concept.

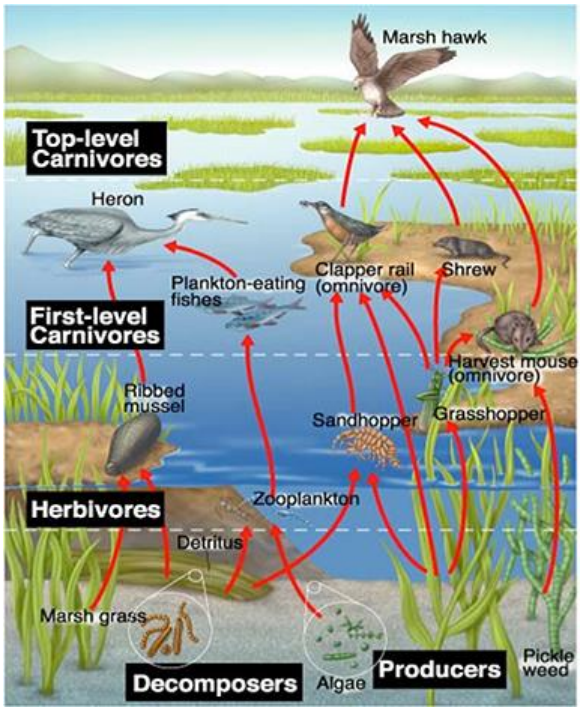

Figure 5-2 Ecological Food Web Concept

Pesticides can kill natural predators of mosquitoes. The District's activities associated with the Physical Control and Vegetation Management Components would help allow these predators to access habitats where mosquito larvae are present. When chemical control is used to manage mosquitoes, it generally is used at levels that are below the effects thresholds for other insects and invertebrate predators, as described above. Although mosquito pesticides may also affect invertebrate predators (e.g., dragonflies), recovery of predator populations is usually rapid as the predator populations extend beyond the application areas and will rapidly replace any lost individuals. In

general, the pesticides used for mosquito control exhibit low or no toxicity to birds or mammals. Limited information is available regarding toxic effects to reptile or terrestrial amphibian mosquito predators.

Mosquitoes are part of the food web and their loss may reduce the food base for some predators. Although mosquitoes serve a role as one of many types of prey items for some fish, avian insectivores, bats, and small reptiles and amphibians, the reduction of mosquito abundance over a small area will not affect the predator populations overall, because these species generally have large foraging ranges and can find other prey sources within the range of their habitat use (Williams et al. 1994). (See Section 2.8, Biological Control Predators, of Appendix E, Alternatives Analysis Report, for references on studies of gut contents of mosquito predators.)

5.2.3 Surveillance Component

Surveillance activities involve monitoring the abundance of adult and larval mosquitoes, field inspection of mosquito habitat, testing for the presence of antibodies specific to encephalitis virus in domestic and wild fowl, collection and testing of ticks, small rodent trapping, and/or response to public service requests regarding pests such as mosquitoes. Mosquito populations are monitored through the use of traps, inspections, and sampling in mosquito habitats. Known and suspected habitats are anywhere that water can collect, be stored, or remain standing for more than a few days, including, but not limited to, catch basins, stormwater detention systems, residential communities, parks, ornamental ponds, unmaintained swimming pools, seeps, seasonal wetlands, tidal and diked marshes, wastewater ponds, sewer plants, winery waste/agricultural ponds, managed waterfowl ponds, canals, creeks, treeholes, and flooded basements. If preexisting roads and trails are not available to access monitoring sites, low ground pressure ATVs may be used to access sites. Offroad access is minimized and used only when roads and trails are not available. Ticks are collected along trails and sampled for disease. Rodents (roof rats and Norway rats) may be collected as part of disease surveys.

5.2.3.1 Impacts to Special-Status Species

The Surveillance Component would affect small areas with the intent of monitoring vector populations to determine where control components are required. Small numbers of vector and nontarget organisms are trapped through this Program strategy at sites with the potential to support substantial vector populations. These sites are dispersed throughout the District. Chemicals may be used within adult mosquito traps (some adult mosquito traps use a Vapona strip infused with dichlorvos), but these chemicals are confined to the traps and do not enter the environment. Surveillance activities would occur in all terrestrial habitat types, except open water and tidal flats (see Table 5-2 in Section 5.1.1). Surveillance activities would be conducted in accordance with the BMPs relating to agency communication, pretreatment screening, environmental training, and disturbance minimization as detailed in Table 4-5. The potential impacts of the Surveillance Component would be similar for all habitat types, although the species potentially affected would differ, as indicated in Tables 5-3 and 5-4.

Minor impacts to upland and wetland habitats in the vicinity of aquatic ecosystems may occur when the District is required to maintain paths and clearings to access surveillance sites and facilitate sampling. These impacts are kept to the minimum amount necessary to minimize potential ingress of predators into these habitats. Such maintenance may include clearing small amounts of vegetation to retain footpaths up to 3 feet wide, or ATV/ARGO paths up to 6 feet wide. However, the vast majority of access routes are via preexisting roads, trails, and walkways, and do not require clearing by the District. Some trails do require periodic trimming or clearing by the District. Occasionally new access routes may be required to assess a vector source. This process will often consist of personnel navigating their way through natural openings in the vegetation to the source, but in some cases (i.e., heavy growth of blackberries or poison oak) a trail may need to be created or an old one maintained. Where such clearing is required, it is generally done with hand tools. In those rare cases where especially dense vegetation is encountered, gas-powered chainsaws and trimmers are used. No trimming of vegetation greater than 4 inches diameter

at breast height would be conducted. Trail maintenance activities would be conducted in the fall, when potential impacts to special-status species would be minimized. However, lighter trail maintenance activities (trimming back small branches or fronds hanging over the access route) may occasionally occur during other times of year. When necessary the District will consult and coordinate with resource agencies as well as have all necessary permits prior to the commencement of work (as outlined in BMP F3). These activities are of small size with limited duration and noise effects, and new access routes would be minimal; therefore, indirect impacts to terrestrial habitats would be inconsequential.

The presence of District personnel implementing the Surveillance Component could result in disturbance to special-status species. Such disturbance is most likely to occur during the nesting or breeding season, should the animals abandon suitable habitat as a result of such disturbance including equipment noise. However, these disturbances would be very minor and of short duration (typically less than 1 hour), so would likely not cause these animals to abandon the area, but rather move away from the activity while it is occurring. Special-status plants would not be disturbed by the presence of District personnel during surveillance activities.

The Surveillance Component may also result in disturbance to species as District personnel are traveling to and from surveillance sites. These access-related impacts would be minimized by adherence to the BMPs indicated in Table 4-5, but in particular those BMPs requiring discussing activities regularly with regulatory agencies or wildlife refuge managers, staying on existing access routes wherever possible, and maintaining and implementing training from USFWS and CDFW personnel regarding special-status species.

In addition, when working in tidal marshes, the District will implement all Tidal Marsh-Specific BMPs, as well as those for salt marsh harvest mouse and Ridgway's rail, where these species are potentially present, as determined through discussion with refuge managers, CDFW, or USFWS personnel. This implementation will include continuing to follow the measures provided in the USFWS' Walking in the Marsh; employing seasonal and daily activity restriction periods, wherever practical; minimizing travel along tidal channels and sloughs; limiting vegetation removal to the minimum amount necessary; and other BMPs, as indicated in Table 4-5. Through the implementation of these BMPs, substantial impacts to habitat would be avoided, and little to no impact to special-status animals would occur.

Surveillance activities might result in some physical damage to habitat or associated vegetation from foot traffic and vehicle use in areas without marked trails to access areas for potential vector inspection. Special-status species could be directly impacted by these activities. The District investigates sites for the presence of special-status and sensitive species prior to initiating any further surveillance measures in natural habitat areas, and only small areas would be disrupted briefly by access activities. Most surveillance occurs along access routes that are already established and would only be cleared periodically to maintain access, as necessary. Where new access routes are required they would have only a very small effect on habitat in areas where surveillance occurs. Therefore, minimal impacts would occur to habitat or special-status species.

> **Impact TR-1.** The Surveillance Component would have a **less-than-significant** impact, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special-status species. No mitigation is required.

5.2.3.2 Impacts to Habitats

Surveillance activities would not affect the quantity or distribution of habitats, such as riparian areas, marshes, lakes or ponds, seasonal wetlands, or other habitat types identified in local or regional plans or listed by CDFW and USFWS. This component would not affect the composition of their vegetative communities, as very limited numbers of plants would be pruned or removed over a very small area. Most surveillance occurs along access routes that are already established and would only be cleared periodically, during the fall, to maintain access, as necessary. Surveillance activities might result in some physical damage to habitat or associated vegetation from foot traffic and vehicle use in areas without

marked trails to access areas for potential vector inspection. Where new access routes are required, they would have only a very small effect on habitat in areas where surveillance occurs.

The District has long-standing cooperative and collaborative relationships with CDFW, professional biologists and property owners with regard to access, mosquito surveillance, and control in association with sensitive habitats. District staff have received information and training from CDFW and professional biologists with respect to minimizing the potential for impacts to vernal pool habitat (which is limited in acreage and located in remote portions of the Service Area) and specifically California tiger salamander (CTS). Hickman's cinquefoil, and Point Reyes meadowfoam (see Table 5-3). All surveillance in the proximity of vernal pools will be done on foot. ATV's will not be used, District staff stay outside of the margin of the vernal pools (delineated by change from wetland to upland vegetation types), and never operate ATVs within wetland vegetation or the actual vernal pool. Although District staff have not reported any encounters with CTS in the field, in an abundance of caution, the District avoids performing mosquito surveillance in vernal pool environments on rainy days or during dawn and dusk to avoid peak movement periods for CTS. This component would not result in any ground-disturbing activity and, therefore, would not result in any removal, filling, or hydrologic interruption of federally protected wetlands as defined by CWA Section 404 (including, but not limited to, marsh, vernal pool, coastal).

> **Impact TR-2.** The Surveillance Component would have a **less-than-significant** impact on riparian habitat or other sensitive natural communities. No mitigation is required.
>
> **Impact TR-3.** The Surveillance Component would have a **less-than-significant** impact on federally protected wetlands as defined by Section 404 of the Clean Water Act. No mitigation is required.

5.2.3.3 Impacts to Migration and Movement

Any disruption of migration patterns would be due to the presence of personnel and vehicles in the environment. In all cases this occurrence would be very short term, generally not more than a few hours in any given location. Therefore, this effect would be minimal, would have no effect on the movement of any native resident or migratory fish or wildlife, and would not affect wildlife migration corridors or nursery areas, as no physical disturbance would occur.

> **Impact TR-4.** The Surveillance Component would have **no impact** on the movement of any native resident or migratory fish or wildlife species, nor would it impact any native resident or migratory wildlife corridors or impede the use of native wildlife nursery sites.

5.2.3.4 Conflict with Local Ordinances

The county and city general plans and their goals and policies pertaining to natural resources are protective of terrestrial resources and focused on conservation of existing resources including mature trees and important woodland communities. Surveillance activities would not result in the conversion of natural habitats to other land uses or in the long-term or permanent dislocation of plant and animal species from natural areas except indirectly for mosquitoes and vectors of disease and discomfort. Surveillance activities would not affect trees more than 4 inches diameter at breast height and, therefore, would not conflict with local tree ordinances.

> **Impact TR-5.** The Surveillance Component would have **no impact** on local policies or ordinances protecting biological resources.

5.2.3.5 Conflict with Conservation Plans

One conservation plan, the San Bruno Mountain HCP located in San Mateo County, was identified whose action area is within the District's primary Service Area. This HCP addresses impacts to three endangered species: San Bruno elfin butterfly, mission blue butterfly, and SFGS over 3,500 acres on San Bruno Mountain in San Mateo County for a duration of 30 years.

The District conducts limited surveillance operations within the area covered by this HCP on San Bruno Mountain, which has no aquatic habitat, and it is unlikely that the District's mosquito control activities would occur within this HCP's boundaries. The District conducts surveillance for plague, hantavirus, tularemia on San Bruno Mountain because this is a known focus of these diseases. Plague and tularemia have been documented among the rodent populations here since 1942. Surveys were originally conducted by the US Public Health Service. Regular surveys are continued by the County Department of Environmental Health and have been continued by the District since 1999 at the request of the county. Surveys consist of trapping rodents at various locations on the mountain 1-4 times per year. The District coordinates survey activities with the County Department of Parks. All work is done on foot.

While District activities may occur within the boundaries of conservation areas, these activities are coordinated with the plan managers. The District regularly communicates with and works collaboratively with representatives from agencies such as RWQCB, USEPA, USACE, CDFW, and USFWS. The District receives training from agency staff and independent biologists (e.g., CDFW, USACE) to minimize impacts and conducts annual field training for field staff regarding precautionary and avoidance measures related to vernal pool habitat, but this habitat is not present on San Bruno Mountain.

Eleven conservation plans affect portions of adjacent counties as identified in Table 5-5. District surveillance activities are typically not among those covered by these HCPs. When called into these adjacent counties to perform work where access to the HCP/NCCPs may be restricted, the District would operate under the auspices of that county's mosquito and vector control district and in compliance with their practices and permits, or with the county, if there is no vector control district. The District would operate in compliance with all active HCP/NCCPs. Therefore, the District activities would not be in conflict with the provisions of any adopted HCP, NCCP, or other approved local, regional, or state-approved conservation plan.

> **Impact TR-6**. The Surveillance Component has a **less-than-significant** impact on any adopted HCPs or NCCPs. No mitigation is required.

5.2.4 Physical Control Component

The Physical Control Component would be a continuation of existing activities using applicable techniques, equipment, vehicles, and watercraft. In the future, some additional ditching may occur and utilize heavy equipment.

Physical control for mosquitoes consists of the management of aquatic areas that provide mosquito-producing habitat (including freshwater marshes, saltwater marshes, temporary standing water, and wastewater treatment facilities) especially through water control and maintenance or improvement of channels, tide gates, levees, and other water control facilities.

The District may also advise landowners and homeowners about the importance of dumping/inverting of containers holding water, controlling vegetation against structures, avoiding stagnant ponds, and conducting the work in a manner consistent with applicable regulations and permitting requirements. In situations where any potential exists for sensitive habitats or special-status species to be present, the District includes information and contact data for resource agencies and potential permits.

Concerning physical control measures for other vectors such as yellow jacket wasps, ticks, rats, and mice, the focus of physical control is on proper sanitation/removal of food sources and exclusion of the animal from the site, which poses a conflict with human activities. Such measures do not directly impact terrestrial habitats containing native or special-status species.

5.2.4.1 Impacts to Special-Status Species and Habitats

The District would not conduct physical control measures in upland habitat types, but may affect terrestrial species that occur in wetland habitat types. Mosquitoes typically breed in shallow areas, with emergent vegetation, little to no current, and where fish are excluded. This component modifies habitats that support mosquito larva to make these habitats less suitable for mosquitoes and/or more suitable for their predators. This component includes maintenance of ditches and water control structures, removal of debris and weeds, clearance of brush for access to areas to be treated, and filling of nonfunctional water circulation ditches. It may also include reconnecting backwaters or isolated pools on the floodplains of streams and rivers, and increased drainage rates and areas in managed wetlands. These activities are conducted in accordance with all appropriate environmental regulations. This work in creeks, rivers, ponds, lakes, marshes, and other wetlands may require permits and any necessary subsequent environmental review from the USACE, RWQCB, CDFW, USFWS, NOAA Fisheries, and others. Federally protected wetlands are defined by CWA Section 404, (including but not limited to, marsh, vernal pool, coastal, etc.) where adverse effects could occur through direct removal, filling, hydrological interruption, or other means. The Physical Control Component would not reduce the quantity of this habitat, but simply improve circulation within the marsh. Only inactive channels would be filled to eliminate ponding. Work would not begin until all required permits are obtained. The potential effects of this component on these habitats are described below.

District activities largely involve maintenance of existing facilities in the same manner they do under baseline conditions. The District is rarely involved in new drainage projects, and when they are, they consult with the appropriate agencies, conduct applicable environmental review, and acquire all required permits for implementing that work, which provides protection for native and special-status fish species. The District's annual work plans are submitted for review by other responsible agencies prior to implementation. Completed work is available for inspection by the USACE, USFWS, and CDFW upon request.

Mosquitoes are part of the food web and their loss may reduce the food base for some predators. Although mosquitoes serve a role as one of many types of prey items for some fish, avian insectivores, bats, and small reptiles and amphibians, the reduction of mosquito abundance over a small area will not affect the predator populations overall, because these species generally have large foraging ranges and can find other prey sources within the range of their habitat use (Williams et al. 1994). (See Section 2.8, Biological Control Predators, of Appendix E, Components Analysis Report, for numerous references on studies of gut contents of mosquito predators.)

Physical control measures for rodents and nuisance wildlife would be limited to performing site inspections by the District, providing advice to property owners for restricting ingress of rodents into structures or decreasing habitat for them near residences, and possible trapping. These measures would not affect aquatic or terrestrial habitats and would have no effect on aquatic or terrestrial resources. Physical controls are not implemented for yellow jackets or ticks.

5.2.4.1.1 Coniferous Forest

The general lack of surface water in coniferous forests (dominated by cone-bearing trees with needles, which include pines, firs and redwoods, and excluding treeholes) usually does not facilitate the appropriate habitat to support mosquitoes. This habitat does support a variety of special-status species found in San Mateo County including marbled murrelet, raptors and other avian species (afforded protection under USFWS and CDFW), pallid bat, Townsend's big-eared bat, American badger, and San Francisco dusky-footed woodrat, as well as special-status plants such as Hickman's cinquefoil, Point Reyes meadowfoam, robust spineflower, San Mateo wooly sunflower and white rayed pentachaeta (see Tables 5-3 and 5-4). The Physical Control Component would have no impact on special-status species, since this component would not occur in this habitat.

5.2.4.1.2 Deciduous Forest

The general lack of standing surface water in deciduous forests (dominated by trees that drop leaves annually including buckeyes, some oaks and maples, and excluding treeholes) usually does not facilitate the appropriate habitat to support mosquitoes. This habitat does support a variety of special-status species including white-tailed kite and other avian species (afforded protection under USFWS and CDFW), pallid bat, Townsend's big-eared bat, American badger, and San Francisco dusky-footed woodrat, as well as special-status plants such as Hickman's cinquefoil, Point Reyes meadowfoam, robust spineflower, San Mateo wooly sunflower, and white rayed pentachaeta. The Physical Control Component would have no impact on special-status species or their habitat, since this component would not occur in this habitat.

5.2.4.1.3 Shrublands

The general lack of standing surface water in shrublands (dense to moderate stands of coyote brush, ceanothus, poison oak, sage, sagebrush, chamise and diverse other shrubs with grassy openings) usually does not facilitate the appropriate habitat to support mosquitoes. This habitat does support a variety of special-status species including burrowing owl, northern harrier, and other avian species (afforded protection under USFWS and CDFW), pallid bat, big free-tailed bat, American badger, San Francisco dusky-footed woodrat, CRLF (seasonally), callippe silverspot butterfly, and mission blue butterfly, as well as special-status plants such as beach layia, Butano Ridge cypress, Crystal Springs fountain thistle, Marin western flax, Point Reyes meadowfoam, robust spineflower, San Mateo thorn-mint, San Francisco lessingia, and Pacific manzanita. The Physical Control Component would have no impact on special-status species or their habitat, since this component would not occur in this habitat.

5.2.4.1.4 Grasslands

The general lack of standing surface water in grasslands (grasslands dominated by annual grasses, with varying amounts of native perennials) usually does not facilitate the appropriate habitat to support mosquitoes. This habitat does support a variety of special-status species including burrowing owl, northern harrier, short-eared owl, and other avian species (afforded protection under USFWS and CDFW), pallid bat, big free-tailed bat, American badger, CRLF (seasonally), CTS (seasonally), San Bruno elfin butterfly, and mission blue butterfly, as well as special-status plants such as Crystal Springs fountain thistle, Marin western flax, Point Reyes meadowfoam, San Mateo thorn-mint, San Francisco popcornflower, white rayed pentachaeta, and showy rancheria clover. The Physical Control Component would have no impact on special-status species or their habitat, since this component would not occur in this habitat.

5.2.4.1.5 Serpentine

The general lack of standing surface water in serpentine soils (shrublands and grasslands on serpentine soils and rock) usually does not facilitate the appropriate habitat to support mosquitoes. This habitat does support a variety of special-status species including burrowing owl, northern harrier, and other avian species (afforded protection under USFWS and CDFW) and Bay checkerspot butterfly, as well as special-status plants such as Crystal Springs fountain thistle, Marin western flax, San Mateo thorn-mint, San Mateo wooly sunflower, white rayed pentachaeta and showy rancheria clover. The Physical Control Component would have no impact on special-status species or their habitat, since this component would not occur in this habitat.

5.2.4.1.6 Coastal Dunes

The general lack of standing surface water in coastal dunes (sandy soils with some active sand movement that supports low stands of diverse native perennials and beach grass) usually does not facilitate the appropriate habitat to support mosquitoes. This habitat does support a variety of special-status species including American peregrine falcon, California least tern, and other avian species

(afforded protection under USFWS and CDFW) and Myrtle's silverspot butterfly, as well as special-status plants such as beach layia, San Francisco lessingia, and robust spineflower. The Physical Control Component would have no impact on special-status species or their habitat, since this component would not occur in this habitat.

5.2.4.1.7 Treeholes

Standing water in treeholes (cavities in branches and trunks of live trees or snags that may provide habitat for a variety of species) may facilitate the appropriate habitat to support mosquitoes. Treeholes support a variety of special-status species including purple martin and a variety of cavity nesting avian species including owls (afforded protection under USFWS and CDFW), San Francisco dusky-footed woodrat, and pallid bat and other bat species. Sometimes an absorbent material (e.g., Broadleaf P-4, a high-performance, long-lasting, hydrophilic polymer) may be used to reduce the quality of the habitats for treehole mosquitoes. This material absorbs the water as the treehole/rot cavity fills with rainwater. Use of this material is limited, as many treeholes are not readily accessible (too high off ground, steep slopes covered in poison oak, etc.). This physical control measure would be used in preference to adulticides. If physical controls are used, the treehole will be examined for potential use by special-status species before treatment is made. Sometimes the District will recommend the landowner/manager consult with an arborist or hire a crew to do this work. When carried out as proposed, the Physical Control Component would have a less-than-significant impact on special-status species or their habitat.

5.2.4.1.8 Creeks and Rivers and Riparian Corridors

Because their rapid currents do not provide suitable habitat for mosquitoes, creeks and rivers generally do not support substantial numbers of mosquitoes, although, some mosquitoes can be found in slow eddies and back channels, or in pools isolated on the banks as flows recede. Creeks and rivers and the surrounding riparian forest may support special-status species including American peregrine falcon, bank swallow, black swift, long-eared owl, white-tailed kite, and additional avian species (afforded protection under USFWS and CDFW), amphibians such as CRLF and CTS, and reptiles including SFGS and western pond turtle, as well as special-status plants such as coastal milk-vetch, Hickman’s cinquefoil, minute pocket moss, and white-flowered rein orchid as indicated in Tables 5-3 and 5-4. Accessing the site to complete the work during the avian nesting season would be avoided or minimized by implementation of the BMPs in Table 4-5. Habitat alterations to drain such areas will be avoided to the maximum extent possible due to instream special-status fish species addressed in Section 4.2.4.1.8. The District does not routinely conduct this type of activity, but it may be required in some circumstances. Mosquito control activity in creeks is restricted to sections of creek that run through, or directly next to, homes or businesses in urban or suburban areas.

The potential effects of this component on terrestrial species would be avoided or minimized through implementation of the BMPs in Table 4-5, including those relating to agency communication, environmental training, and pretreatment screening. Furthermore, BMP G3 requires that all maintenance work will be done at times that minimize adverse impacts to nesting birds, anadromous fish, and other species of concern, in consultation with USFWS, NMFS, and CDFW. Work conducted will, whenever possible, be conducted during approved in water work periods for that habitat, considering the species likely to be present. For example, tidal marsh work will be conducted between September 1 and January 31, where possible and not contraindicated by the presence of other sensitive species. With these BMPs, the effects of this component on terrestrial species would be less than significant.

5.2.4.1.9 Ponds and Lakes

The freshwater habitats that could be treated include the margin of reservoirs and ponds (including artificial ponds such as golf course ponds or stock ponds with natural bottoms). These areas are generally man-made habitats, but they may support special-status species such as American peregrine falcon, bank swallow, western snowy plover, and additional avian species (afforded protection under USFWS and CDFW), CRLF, CTS, SFGS, and western pond turtle, as well as special-status plants on the margins and slender-leaved pondweed in the water. This potential effect would be avoided and minimized by the BMPs in Table 4-5 relating to agency communication, environmental training, pretreatment screening (BMP A7), and BMP G3 cited above. With these BMPs, the effects of this component would be less than significant.

5.2.4.1.10 Freshwater Marsh/Seeps

Freshwater marsh and seeps may provide ideal habitat for mosquito breeding due to their substantial areas of shallow water, limited circulation, and emergent vegetation. These areas may potentially support a number of special-status species as indicated in Tables 5-3 and 5-4 such as northern harrier, white-tailed kite, saltmarsh common yellowthroat, and additional avian species (afforded protection under USFWS and CDFW), CRLF, CTS, SFGS, and western pond turtle, as well as special-status plants such as adobe sanicle, bristly sedge, Choris' popcornflower, Point Reyes meadowfoam, Hickman's cinquefoil, and slender-leaved pondweed in the water. Physical control in these areas would have the same potential effects as described for lake and pond habitats and would be avoided or minimized by the BMPs in Table 4-5 relating to agency communication, environmental training, pretreatment screening, and BMP G3 cited above. With these BMPs, the effects of this component would be less than significant.

5.2.4.1.11 Seasonal Wetlands (includes Vernal Pools)

The USACE defines wetlands as "*those areas that are inundated or saturated by surface water or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas. (33 [Code of Federal Regulations] CFR 328.3(b); 40 CFR 230.3(t))*." For the purposes of this document, seasonal wetlands are areas that are flooded for 1 week or more during the year, generally during the rainy season, but do not retain water through the entire year. Seasonal wetlands may be flooded by increased runoff, rainfall, or unusually high tides. The availability of such habitats has been substantially reduced by human land-use practices and flood control measures. Reducing the frequency or duration with which such habitats are flooded would adversely affect habitat and terrestrial resources. The Physical Control Component would not reduce the quantity of this habitat, but simply improve circulation within the marsh. Only inactive channels would be filled to eliminate ponding. All work in wetlands would be subject to additional permitting by the USACE, CDFW, BCDC, and RWQCB.

Vernal pools[4], a specific type of seasonal wetland, often support a unique assemblage of endemic plant and animal species, many of which have been identified as special-status species by federal and state agencies. Terrestrial species that might occur here include short-eared owl and additional avian species (afforded protection under USFWS and CDFW), CRLF, CTS, SFGS, and western pond turtle, as well as special-status plants such as Choris' popcornflower, legenere, Point Reyes meadowfoam, Hickman's cinquefoil, Hoover's button-celery, saline clover, and others as indicated in Tables 5-3 and 5-4. The District does not perform physical control in vernal pools.

[4] ' 'Vernal pool,'' whether by transfer or by independent invention, is now applied to small wetlands that are present primarily or exclusively in the early part of the growing season and that typically ''dry'' completely or ''substantially'' at some point during the growing season. (Zedler 2003 [http://users.ipfw.edu/isiorho/wetvernalisolatedwetlands2003.pdf])

The District receives environmental awareness training from agency staff (e.g., CDFW, USACE) and independent biologists to minimize impacts and conducts annual field training for field staff regarding precautionary and avoidance measures related to sensitive habitats. This training addresses CTS, Hickman's cinquefoil, Point Reyes meadowfoam, and other special-status species.

Because of the sensitive nature of seasonal wetland habitat types, the District generally would not undertake physical control measures in these areas. In the event that physical control in seasonal wetlands or vernal pools was required, the District would not implement water management and vegetation removal actions without previously discussing them with the relevant regulatory agencies or refuge wildlife managers to verify that no other component or option is preferable to control the mosquito problem at that location and to make sure that any such activity would be done in such a way as to minimize its impacts. As a result, this "consultation prior to implementation" BMP and the practices described above would result in a less-than-significant impact to terrestrial resources.

5.2.4.1.12 Lagoon

Lagoons, located at the mouths of creeks or rivers where they enter the ocean or bay, but isolated from the receiving waterbody by a berm, are indirectly influenced by the tide, which may cause freshwater to back up within the lagoon, and may also allow water to percolate through the berm, with the direction of such movement depending on water levels on either side of the berm. As a result, lagoons often contain a lens of freshwater at the surface and brackish water at the bottom. Thus, lagoons may support species from both creeks and rivers, and from the receiving waterbodies. Lagoons are an important feeding area for special-status birds including bald eagles, osprey, and other surface feeder, as well as diving birds. Lagoons would support mosquitoes in areas of reduced circulation, often associated with emergent vegetation. Physical control in lagoons would include reconnecting isolated areas to the main lagoon. The BMPs in Table 4-5, in particular BMP G3, will be applied to avoid or minimize impacts to environmental resources. With implementation of these BMPs, the impact of the Physical Control Component on resources within the lagoon would be less than significant.

5.2.4.1.13 Tidal Marsh and Channels

Tidal marsh and tidal channel habitats occur along the margins of San Francisco Bay in San Mateo County and are subject to tidal action. They are typically bounded by levees and water control structures. The San Francisco Bay-Delta once supported vast tracts of freshwater, brackish, and saline marsh habitat. The vast majority of these marsh habitats have been converted to human uses such as farming, industrial uses, and urban development. Some of the remaining marsh lands along the Highway 101 corridor are maintained and operated to provide habitat for wildlife. A few of these refuges include Bair Island in Redwood City, which is part of Don Edwards San Francisco Bay National Wildlife Refuge (see Section 3.1.2), Bedwell Bayfront Park in Menlo Park, and Ravenswood Open Space Preserve/Pond SF2 and Ravenswood Open Space Preserve/Cooley Landing, both located in East Palo Alto. These wetlands can be important sources of mosquitoes seasonally. No special-status amphibians or aquatic reptiles occupy these habitats.

Physical measures to control mosquitoes in these areas include maintenance of ditches and water control structures, removal of debris and weeds, clearance of brush for access to areas to be treated, and filling of nonfunctional water circulation ditches, as described in Section 2.3.2. Other measures include retaining water on the surface of the area, and rotational impoundment monitoring, which reduces mosquito populations by increasing the frequency with which suitable habitats are inundated and drained. The District advises the landowner and property managers that these actions may require discussion with CDFW, USACE, BCDC, NOAA Fisheries, or the USFWS and that these agencies should be contacted before work is initiated.

These physical control activities would be subject to the BMPs described in Table 4-5, relating to agency communication, environmental training, and pretreatment screening. The Tidal Marsh-Specific BMPs will also be employed including conducting this work during appropriate seasons and times of day (when the tide is out and when Ridgway's rail, California black rail, Alameda song sparrow, saltmarsh common yellow throat, and salt marsh harvest mouse as well as other special-status species are not nesting), making sure staff have appropriate training when working in the marsh, and minimizing the use of mechanical equipment where practical. Tidal marshes may support a number of special-status plants, including pappose tarplant, Point Reyes salty bird's beak, coastal marsh milk vetch, and others (Table 5-3), and animals, including salt-marsh harvest mouse, salt-marsh wandering shrew, Ridgway's rail, northern harrier, short-eared owl, and other species (Table 5-4). Channels that have substantial tidal flow and inundation would not support mosquitoes and, thus, would not need to be maintained. The disturbance associated with the Physical Control Component would be short term and temporary; and with the implementation of the BMPs described above, physical control activities would not substantially affect special-status species.

5.2.4.1.14 Water and Wastewater Treatment Facilities

Wastewater treatment facilities may provide nesting habitat for special-status avian species such as northern harrier hawk since such facilities may lie close to suitable habitats near streams or the San Francisco Bay. The extent to which these species may enter these facilities is unknown. Because of the limited number of such facilities, the limited use of such facilities by special-status species, and the application of the BMPs described in Table 4-5, physical control measures are not anticipated to substantially affect avian or other species. Maintenance activities could result in the short-term disturbance of special-status animals due to human presence and the noise associated with the activity. This disturbance is only anticipated to last a few hours. Animals may move away from the disturbance while it was ongoing, but to return to the area shortly after the activity ceases. Such work would be conducted outside of bird nesting season, wherever practical. If work needed to be done during the nesting season, nest surveys would be conducted prior to initiating work, and suitable buffers would be established around any active nests while performing the work (BMP F6 would be implemented).

Septic/onsite wastewater treatment systems with their associated leach fields may provide habitat for special-status avian species associated with riparian and emergent vegetation, such as black swift, bank swallow, saltmarsh common yellowthroat, and other passerine birds as indicated in Table 5-4, under freshwater marsh/seeps and riparian forest, although their presence would be dependent on suitable vegetation and other habitat conditions, generally not associated with septic systems.

Winery waste ponds generally contain waste from grape pressings and wash water from cleaning winery equipment. These ponds generally do not provide suitable habitat for special-status species, as they are highly managed and often suffer from low water quality. The San Mateo County Health System, Environmental Health Department, and, in some cases, the RWQCB controls the management of these ponds. County Environmental Health deals with flows of up to 10,000 gallons per day and with subsurface disposal only. If the daily flow exceeds this value or surface disposal is used, then the RWQCB is the controlling agency. The District provides input relating to controlling mosquitoes and other vectors associated with the ponds and winery operations. Physical control is not typically undertaken in winery waste ponds, although it is possible that it could be required under unusual circumstances. Because of the poor quality habitat provided and because physical control activities would rarely be conducted in these waste ponds, little likelihood of impacts to special-status species exists.

Flood control channels and ditches may support special-status species where they have suitable physical and vegetative structure. Physical management activities would be designed to reduce ponding of water within these areas. The application of the BMPs in Table 4-5, particularly those pertaining to agency communication, pretreatment screening, and environmental training, will avoid impacts to any special-status species that might occur in these habitats.

5.2.4.1.15 Artificial Containers, Temporary Standing Waters, and Ornamental Ponds

Artificial containers do not provide habitat for special-status terrestrial species, i.e., those identified as a candidate, sensitive, or special-status species in local or regional plans, policies, or regulations, or by the CDFW or USFWS. Thus, physical control of artificial containers (ensuring that these containers do not hold water for a sufficient period to support mosquito larvae) would have no impact on these species or their habitat.

Temporary standing waters refers to water ponding on an upland habitat because of rainfall or irrigation. The District rarely performs physical control activity in these waters. Ornamental ponds are small ponds with artificial bottoms. These habitats do not provide habitat for special-status aquatic or terrestrial species.

5.2.4.1.16 Impact Determinations for Special-Status Species and Habitats

Impact TR-7. The Physical Control Component, would have a **less-than-significant** impact, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special-status species. No mitigation is required.

Impact TR-8. The Physical Control Component would have a **less-than-significant** impact on any riparian habitat or other sensitive natural community. No mitigation is required.

Impact TR-9. The Physical Control Component would have a **less-than-significant** impact on federally protected wetlands as defined by CWA Section 404. No mitigation is required.

5.2.4.2 Effects on Movement and Migration

Physical changes in habitat are unlikely to affect wildlife migration due to the restricted areas within which physical control activities would occur. Additional disruption of migration patterns may occur due to the presence of personnel and equipment in the environment. In all cases this occurrence would be short term, generally not more than a few days in any given location and, therefore, this effect would be minimal and would have little effect on the movement of wildlife. Nor would it impact any native resident or migratory wildlife corridors or impede the use of native wildlife nursery sites

Impact TR-10. The Physical Control Component would have a **less-than-significant** impact on the movement of any native resident or migratory fish or wildlife species. No mitigation is required.

5.2.4.3 Conflict with Local Ordinances

The county and city general plans and their goals pertaining to natural resources are protective of terrestrial resources and focused on conservation of existing resources including mature trees and important woodland communities. Physical control activities would not result in the conversion of natural habitats to other land uses or in the long-term or permanent dislocation of plant and animal species from natural areas except for mosquitoes and vectors of disease and discomfort. The Physical Control Component would not affect trees more than 4 inches diameter breast height and, therefore, would not conflict with local tree ordinances.

Impact TR-11. The Physical Control Component would have **no impact** on local policies or ordinances protecting terrestrial resources.

5.2.4.4 Conflict with Conservation Plans

One conservation plan, the San Bruno Mountain HCP located in San Mateo County, was identified whose action area is within the District's primary Service Area. This HCP addresses impacts to three endangered species: San Bruno elfin butterfly, mission blue butterfly, Callippe silverspot, and SFGS over 3,500 acres on San Bruno Mountain in San Mateo County for a duration of 30 years.

The District conducts limited physical control operations within the area covered by this HCP on San Bruno Mountain, which has no aquatic habitat, and it is unlikely that the District's mosquito control activities would occur within this HCP's boundaries. However, control for ticks, yellow jackets, wasps, and rodents may involve accessing portions of the mountain in close proximity to roads and adjacent hiking trails and residences. ATV use for control (trapping) would be avoided. While District activities may occur within the boundaries of conservation areas, these activities are coordinated with the plan managers and would not conflict with the provisions of any adopted HCP, NCCP, or other approved local, regional, or state habitat conservation plan.

The District regularly communicates with and works collaboratively with representatives from agencies such as RWQCB, USEPA, USACE, CDFW, and USFWS. The District receives training from agency staff and independent biologists (e.g., CDFW, USACE) to minimize impacts and conducts annual field training for field staff regarding precautionary and avoidance measures related to seasonal wetland and wetland habitats, but this habitat is not present on San Bruno Mountain. While District activities may occur within the boundaries of conservation areas, these activities are coordinated with the plan managers and would not conflict with the provisions of any adopted HCP, NCCP, or other approved local, regional, or state habitat conservation plan.

Eleven conservation plans affect portions of adjacent counties. District activities are typically not among those covered by these HCPs. When called into these adjacent counties to perform work, the District would operate under the auspices of the affected county or that county's mosquito and vector control district and in compliance with their practices and permits, including compliance with all active HCP/NCCPs. Therefore, the District activities would not be in conflict with the provisions of any adopted HCP, NCCP, or other approved local, regional, or state-approved conservation plan.

> **Impact TR-12**. The Physical Control Component would have a **less-than-significant** impact on adopted HCPs or NCCPs. No mitigation is required.

5.2.5 Vegetation Management Component

The District performs vegetation management primarily to facilitate access to vector habitat, improve efficiency and effectiveness of mosquito control operations, and as a source reduction measure. The District uses hand tools (e.g., shovels, pruners, chain saws, and weed-whackers) and may use heavy equipment where necessary in the future for vegetation removal or thinning. The District also sometimes applies herbicides to improve surveillance or reduce vector habitats. These activities primarily occur in or adjacent to aquatic habitats to assist with the control of mosquitoes but are also implemented in terrestrial habitats to help with the control of other vectors.

The District preferentially uses physical control for vegetation management and rarely uses herbicides and adjuvants for vegetation management in natural environments. The District may use herbicides in artificial environments, winery waste ponds, wastewater treatment ponds, and agricultural ditches. Whenever herbicides are used, they are applied in compliance with label requirements and District BMPs.

Vegetation management in upland habitats would be restricted to providing access to treatment areas though patches of dense vegetation, or in those rare cases when larger equipment is needed for physical vegetation removal.

For projects that result in materials (including plant materials, soils or sediments, or herbicides) entering the water or that occur in sensitive wetland habitat, subsequent environmental review and permits may be

required from the USACE, RWQCB, CDFW, USFWS, NOAA Fisheries, and others. Work would not begin until all required environmental clearances and permits are obtained. The District may also perform vegetation management to assist other agencies and landowners with the management of invasive/nonnative vegetation, especially the Coastal Conservancy at their request. These actions are typically performed under the direction of the concerned agency, which also maintains any required environmental clearances and permits.

Physical management activities are evaluated first, followed by the herbicide options. Then the impact analysis and significance determinations are provided by environmental topic and apply to all of the preceding nonchemical and chemical options for the Vegetation Management Component.

5.2.5.1 Physical Management

Nonherbicide or physical vegetation removal actions may involve reducing standing vegetation using equipment for the purposes discussed in Section 5.2.5. The use of weed-whackers, small chainsaws, pruners, or shovels may lead to physical injury of terrestrial plants and animals in the treatment area. Manual removal is the primary method of vegetation removal and would not be anticipated to affect substantial patches of vegetation in the affected area. This work is typically done in the fall to minimize potential impacts to special-status species by avoiding the breeding season for birds and other species. The District will ensure that all required permits are in place before vegetation management activities are undertaken. Short-term (a few days to a week) increases in noise could result from the operation of heavy equipment under this component. The District is in communication with resource agencies prior to performing this type of work. In carrying out this work, the District complies with BMP numbers F1 through F11, as well as other BMPs, from Table 4-5 to reduce these impacts by: (1) identifying sensitive species locations, if any, in the treatment area prior to commencing any vegetation removal actions, and (2) limiting the extent of heavy equipment use to minimize the area affected. If work is being conducted in tidal marshes, the BMPs specific to tidal marshes (B1 through B6), and those for salt marsh harvest mouse (C1 through C8), Ridgway's rail (D1 through D8), and in other terrestrial/aquatic habitats for CRLF, CTS, and steelhead (E1 through E4) would also be implemented. The potential impact on wildlife would be minimal, as the animals would return to their selected habitats within a few hours after the cessation of the noise sources for most of the physical application techniques the District currently uses.

5.2.5.2 Herbicides and Adjuvants

The District may use herbicides to control vegetation in and around mosquito habitats to improve surveillance and reduce suitable mosquito habitats. The herbicides the District may use are discussed in detail in Appendix B and are listed in Table 5-6.

Table 5-6 Herbicide Control Options for Mosquito Abatement as Discussed in Appendix B

Active Ingredient	Appendix B
Imazapyr	Section 4.6.1
Glyphosate	Section 4.6.2
Triclopyr	Section 4.6.3
Sulfometuron methyl	Section 4.6.5
Benfluralin (Benefin)	Section 4.6.8
Oryzalin	Section 4.6.9
DCPA	Section 4.6.10
Dithiopyr	Section 4.6.11

Herbicides included in the Program have diverse chemical structures, act through distinct modes of action, and exhibit varying levels of potential toxicity to humans and nontarget species.

Certain herbicides are nonselective and broad-spectrum (e.g., imazapyr, sulfometuron methyl, DCPA,), while others are selective for certain plants (e.g., oryzalin, dithiopyr). Herbicides function by inhibiting growth, but do so in a multitude of ways. For example, sulfometuron methyl retards or stops root and shoot development, and oryzalin inhibits cell division during seed germination (USEPA 1994). Most of the herbicides are moderately persistent in soil and water (for each herbicide's half-life in soil and water, please refer to Appendix B).

Herbicides the District uses or may use in the future exhibit low, very low, or practically no toxicity to mammals, birds, and terrestrial invertebrates (bees in particular) and would not pose potentially significant impacts based on laboratory studies. See Table 5-7 (Herbicide Toxicity Thresholds to Mammals, Birds, and Bees). For detailed toxicity information, see Appendix B, Section 4.6. In addition to label requirements for use, BMPs are applied to minimize the impact of herbicide use on nontarget terrestrial plants, including special-status plants. In particular, the District takes action to minimize drift of sprays to nontarget areas by carefully considering weather variables such as wind velocity and direction and chance of precipitation.

Table 5-7 Herbicide Toxicity Thresholds[1,2] to Mammals, Birds, and Bees

Chemical	Toxicity[3] to		
	Mammals	Birds	Bees
Imazapyr, glyphosate, sulfometuron methyl, DCPA (chlorthal dimethyl), modified vegetable/plant oils, lecithin	Low	Low	Low
Oryzalin, triclopyr (triclopyr acid, TEA)	Very Low	Very Low	Practically nontoxic
Benfluralin, alkylphenol ethoxylates (APEs)	Very Low	Very Low	Low
Dithiopyr	Very Low	Very Low	Low

1. Because some products have a range of effects, depending on route and exposure, more and specific toxicity information is summarized in Appendix B (Table 6-1).
2. The toxicity data are derived from rigidly controlled laboratory animal studies designed to determine the potential adverse effects of the chemical under several possible routes of exposure (see Appendix B for further information). In these studies, the species of interest is continuously exposed to 100 percent chemical at several doses. In actual practice, the amounts applied in the District's Program Area are substantially less than the amounts used in the toxicity studies, and organisms are not continuously exposed to the chemical. Furthermore, actual application rates by the District may be less than label requirements. Thus, the laboratory test results do not provide a realistic assessment of field exposure.
3. The toxicity designations are based on the USEPA toxic criteria for chemicals listed in Table 1.1

The herbicides that were identified for further evaluation based on issues regarding use patterns, environmental fate, and/or toxicity characteristics in Appendix B (specifically glyphosate and benfluralin) are discussed in further detail in Section 6.2.5 and summarized below.

5.2.5.2.1 Glyphosate

The District may use glyphosate on a limited, infrequent basis to reduce vegetation at sites for mosquito source control or to facilitate access to mosquito sources. Although some recent concerns have been expressed about possible sublethal effects of glyphosate products (e.g., endocrine disruption in humans), it is virtually nontoxic to mammals and practically nontoxic to birds, fish, and invertebrates on an acute basis (USEPA 1993). The USEPA recently evaluated whether glyphosate products are endocrine disruptors and determined that based on weight of evidence considerations, no additional testing for

mammals or wildlife was recommended for glyphosate since there was no convincing evidence of potential interaction with the estrogen, androgen, or thyroid pathways (USEPA 2015a). With BMP application techniques, glyphosate can be used safely because these techniques ensure an adequate buffer to water sources is maintained (to avoid possible sublethal effects to fish and aquatic invertebrates). In terrestrial systems, glyphosate is immobile and breaks down relatively quickly via microbial processes.

Claims that glyphosate is destroying bee and butterfly populations have not been substantiated. Recently, there have been media reports about the potential for glyphosate to impact bees and bee colonies, possibly leading to Colony Collapse Disorder (CCD). Most of these media reports have been based on suggestions that populations and colonies of bees are declining (from studies by Hopwood et al. 2012) with contrasting reports of bumper crops of honey in some beekeeper journals (Arnason 2015). These reports have been based on extrapolation of the general use of glyphosate to reports of CCD. In fact, the claims about CCD have usually been associated with applications of neonicotinoid pesticides which have been shown to be toxic to bees with direct thoracic applications of the chemical. Regardless of the potential for toxicity to bees by the neonicotinoid products, the District does not use neonicotinoid products. The label guidance and the BMP approach (BMP H12) are tailored to minimize the potential for direct bee exposure to any of the pesticides the District uses for vector control.

The use of glyphosate to control milkweed, which is a severe problem for farmers, may be connected to loss of foraging vegetation and, thereby, indirectly impacting butterfly populations. However, this effect is an indirect effect and not actually toxicity to the butterflies from glyphosate. The District is not removing milkweed. Glyphosate does not pose a risk to nontarget terrestrial mammals, birds, or invertebrates based on current usage patterns and use of District BMPs. This herbicide is nonselective and may affect many types of plants. Glyphosate is not effective on submerged or mostly submerged foliage and, therefore, is only applied to control emergent foliage (Schuette 1998; Siemering 2005). When BMPs are applied, the potential impact of glyphosate on special-status species or other nontarget plants is greatly reduced. They include using targeted, small-scale treatments and taking actions to minimize drift and runoff post-application. See Section 6.2.5.1.1 for further analysis of glyphosate and potential effects on nontarget species including bees.

5.2.5.2.2 Benfluralin

Benfluralin (Benefin) is a pre-emergent dinitroaniline herbicide used to control grasses on commercial and residential turf. This active ingredient volatilizes rapidly, but application practices and granular formulations are designed to slow volatilization, increasing the active life of the compound (USEPA 2004a).

Benfluralin is practically nontoxic to mammals, birds, and bees on an acute basis; however, it is highly toxic to fish and aquatic invertebrates and is bioaccumulative. When benfluralin is used according to label guidelines and District BMPs and application techniques, particularly those designed to minimize wind drift, the proposed use is not expected to result in unwanted adverse impacts to nontarget terrestrial organisms, i.e., not more than a less-than- significant impact.

5.2.5.2.3 Adjuvants

An adjuvant is any compound that is added to an herbicide formulation or tank mix to facilitate the mixing, application, or effectiveness of that herbicide. Adjuvants can either enhance activity of an herbicide's active ingredient (activator adjuvant) or offset any problems associated with spray application, such as adverse water quality or wind (special purpose or utility modifiers). Activator adjuvants include surfactants, wetting agents, sticker-spreaders, and penetrants. The environmental fate and toxicity of adjuvants the District uses are described in detail in Appendix B. A subset of the adjuvants available for District use was identified for further examination based upon use patterns and/or toxicity (Table 5-8).

Table 5-8 Adjuvants for Weed Abatement as Discussed in Appendix B

Active Ingredient	Appendix B
APEs	Section 4.7.1
Modified Plant Oils	Section 4.7.3
Lecithin	Section 4.7.4

Alkylphenol ethoxylates (APEs) include a broad range of chemicals that tend to bind strongly to particulates and persist in sediments. Current information about APEs is based on Federal Drug Administration evaluations; regardless, USEPA has speculated that they may pose risk to nontarget terrestrial organisms (USEPA 2010). However, this speculation has not been substantiated and given the limited use of herbicides by the District, in general, and the application of BMPs when using herbicides, the District's limited use of herbicides with APEs would not be expected to cause any substantive harm to the environment.

Modified plant oils are essentially nontoxic to most organisms, including plants. Little is known of the environmental fate of these adjuvants. Although toxicity and environmental fate information for these oils is scarce, using current BMP application techniques to reduce the transfer of APEs to nontarget areas post-application (i.e., targeted applications), these products should not result in unwanted adverse effects to nontarget terrestrial organisms.

Little is known about the toxicity or environmental fate of lecithins. Lecithins are naturally occurring phospholipids in biological cell membranes (Bakke 2007). Although toxicity and environmental fate information for these products is scarce, with BMP application techniques to reduce the transfer of lecithins to nontarget areas post-application (i.e., targeted applications), use of these lecithins should not result in unwanted adverse effects to nontarget terrestrial organisms or habitats.

See Section 6.2.5 for further analysis of the herbicides and adjuvants that could be used on a limited basis for vegetation management. The herbicides the District would potentially use are discussed in detail in Appendix B (Section 4.6) and are listed in Table 2-1 with the active ingredients listed in Table 6-2. The environmental fate and toxicity of adjuvants the District may use are described in detail in Appendix B (Section 4.7) and listed in Table 6-3.

5.2.5.3 Impacts to Special-Status Species and Habitats

The District would conduct very limited vegetation management measures in upland habitat types. This would be associated with providing access to mosquito habitats for surveillance or treatment. Vegetation management activities may affect terrestrial species that occur in wetland habitat types. This work in creeks, rivers, ponds, lakes, marshes, and other wetlands may require subsequent environmental review and permits from the USACE, RWQCB, CDFW, USFWS, NOAA Fisheries, and others. Work would not begin until all required environmental clearances and permits are obtained. The potential effects of this component on these habitats are described below.

Mosquitoes are part of the food web and their loss may reduce the food base for some predators. Although mosquitoes serve a role as one of many types of prey items for some fish, avian insectivores, bats, and small reptiles and amphibians, the reduction of mosquito abundance over a small area will not affect the predator populations overall, because these species generally have large foraging ranges and can find other prey sources within the range of their habitat use (Williams et al. 1994). (See Section 2.8, Biological Control Predators, of Appendix E, Alternatives Analysis Report, for numerous references on studies of gut contents of mosquito predators.)

5.2.5.3.1 Coniferous Forest

The general lack of surface water in coniferous forests (dominated by cone-bearing trees with needles, which include pines, firs, and redwoods) usually does not facilitate the appropriate habitat to support mosquitoes and, therefore, vegetation management would not be conducted in this habitat. However, access routes may be needed through this habitat to reach areas that do support mosquito breeding habitat. This access would generally be via existing access routes, but may require some vegetation removal along the route. This habitat does support a variety of special-status species including marbled murrelet, raptors and other avian species (afforded protection under USFWS and CDFW), pallid bat, Townsend's big eared bat, American badger, and San Francisco dusky-footed woodrat, as well as special-status plants such as Hickman's cinquefoil, Point Reyes meadowfoam, robust spineflower, San Mateo wooly sunflower, and white rayed pentachaeta found in San Mateo County (see Tables 5-3 and 5-4). This access activity would be done in coordination with landowners or land managers and resource agencies, as well as following the BMPs described in Table 4-5 relating to environmental training, pretreatment screening, disturbance minimization, avian nesting season, habitat and species-specific BMPs, and applicable vegetation management-specific BMPs (F1 through F10). This activity would result in less-than-significant impacts to special-status species associated with coniferous forest habitat from the Vegetation Management Component.

5.2.5.3.2 Deciduous Forest

The general lack of standing surface water in deciduous forests (dominated by trees that drop leaves annually including buckeyes, some oaks and maples) usually does not facilitate the appropriate habitat to support mosquitoes and, therefore, vegetation management activity would not be conducted in this habitat. However, access routes may be needed through this habitat to reach areas that do support mosquito breeding habitat. This access would generally be via existing access routes, but may require some vegetation removal along the route. This habitat does support a variety of special-status species including white-tailed kite and other avian species (afforded protection under USFWS and CDFW), pallid bat, Townsend's big-eared bat, American badger, and San Francisco dusky-footed woodrat, as well as special-status plants such as Hickman's cinquefoil, Point Reyes meadowfoam, robust spineflower, San Mateo wooly sunflower, and white rayed pentachaeta. This access activity would be done in coordination with landowners or land managers and resource agencies, as well as following the BMPs described in Table 4-5 relating to environmental training, pretreatment screening, disturbance minimization, avian nesting season, habitat and species-specific BMPs, and vegetation management-specific BMPs. This activity would result in less-than-significant impacts to special-status species associated with deciduous forest from the Vegetation Management Component.

5.2.5.3.3 Shrublands

The general lack of standing surface water in shrublands (dense to moderate stands of coyote brush, Ceanothus, poison oak, sage, sagebrush, chamise and diverse other shrubs with grassy openings) usually does not facilitate the appropriate habitat to support mosquitoes and, therefore, vegetation management would not be conducted in this habitat. However, access routes may be needed through this habitat to reach areas that do support mosquito breeding habitat. This access would generally be via existing access routes, but may require some vegetation removal along the route. This habitat does support a variety of special-status species including burrowing owl, northern harrier, and other avian species (afforded protection under USFWS and CDFW), pallid bat, big free-tailed bat, American badger, San Francisco dusky-footed woodrat, CRLF (seasonally), callippe silverspot butterfly, and mission blue butterfly, as well as special-status plants such as beach layia, Butano Ridge cypress, Crystal Springs fountain thistle, Marin western flax, Point Reyes meadowfoam, robust spineflower, San Mateo thorn-mint, San Francisco lessingia, and Pacific manzanita. This access activity would be done in coordination with landowners or land managers and resource agencies, as well as following the BMPs described in Table 4-5 relating to environmental training, pretreatment screening, disturbance minimization, avian

nesting season, habitat and species-specific BMPs, and vegetation management-specific BMPs. This activity would result in less-than-significant impacts to special-status species associated with shrublands habitat from the Vegetation Management Component.

5.2.5.3.4 Grasslands

The general lack of standing surface water in grasslands (grasslands dominated by annual grasses, with varying amounts of native perennials) usually does not facilitate the appropriate habitat to support mosquitoes and, therefore, vegetation management would not be conducted in this habitat. However, access routes may be needed through this habitat to reach areas that do support mosquito breeding habitat. This access would generally be via existing access routes, but may require some vegetation removal along the route. This habitat does support a variety of special-status species including burrowing owl, northern harrier, short-eared owl and other avian species (afforded protection under USFWS and CDFW), pallid bat, big free-tailed bat, American badger, CRLF (seasonally), CTS (seasonally), San Bruno elfin butterfly, and mission blue butterfly, as well as special-status plants such as Crystal Springs fountain thistle, Marin western flax, Point Reyes meadowfoam, San Mateo thorn-mint, San Francisco popcornflower, white rayed pentachaeta, and showy rancheria clover. This access activity would be done in coordination with landowners or land managers and resource agencies, as well as following the BMPs described in Table 4-5 relating to environmental training, pretreatment screening, disturbance minimization, avian nesting season, habitat and species-specific BMPs, and vegetation management-specific BMPs. This activity would result in less-than-significant impacts to special-status species associated with grassland habitat from the Vegetation Management Component.

5.2.5.3.5 Serpentine

The general lack of standing surface water in serpentine soils (shrublands and grasslands on serpentine soils and rock) usually does not facilitate the appropriate habitat to support mosquitoes and, therefore, vegetation management would not be conducted in this habitat. However, access routes may be needed through this habitat to reach areas that do support mosquito breeding habitat. This access would generally be via existing access routes, but may require some vegetation removal along the route. This habitat does support a variety of special-status species including burrowing owl, northern harrier, and other avian species (afforded protection under USFWS and CDFW) and Bay checkerspot butterfly, as well as special-status plants such as Crystal Springs fountain thistle, Marin western flax, San Mateo thorn-mint, San Mateo wooly sunflower, white rayed pentachaeta, and showy rancheria clover. This access activity would be done in coordination with landowners or land managers and resource agencies, as well as following the BMPs described in Table 4-5 relating to environmental training, pretreatment screening, disturbance minimization, avian nesting season, habitat and species-specific BMPs, and vegetation management-specific BMPs. This activity would result in less-than-significant impacts to special-status species associated with serpentine soils and outcroppings habitat from the Vegetation Management Component.

5.2.5.3.6 Coastal Dunes

The general lack of standing surface water in coastal dunes (sandy soils with some active sand movement that supports low stands of diverse native perennials and beach grass) usually does not facilitate the appropriate habitat to support mosquitoes and, therefore, vegetation management would not be conducted in this habitat. However, access routes may be needed through this habitat to reach areas that do support mosquito breeding habitat. This access would generally be via existing access routes, but may require some vegetation removal along the route. This habitat does support a variety of special-status species including American peregrine falcon, California least turn, and other avian species (afforded protection under USFWS and CDFW) and Myrtle's silverspot butterfly, as well as special-status plants such as beach layia, San Francisco lessingia, and robust spineflower. This activity would be done in coordination with landowners or land managers and resource agencies, as well as following the BMPs

described in Table 4-5 relating to environmental training, pretreatment screening, disturbance minimization, avian nesting season, habitat and species-specific BMPs, and vegetation management-specific BMPs. This activity would result in less-than-significant impacts to special-status species associated with coastal dunes habitat from the vegetation management component.

5.2.5.3.7 Treeholes

Vegetation management activities would not be conducted in treehole habitat nor would vegetation management be used to access such habitats. Therefore, no impacts would occur to special-status species associated with treeholes from the Vegetation Management Component.

5.2.5.3.8 Creeks and Rivers and Riparian Corridors

Because their rapid currents do not provide suitable habitat for mosquitoes, creeks and rivers generally do not support substantial numbers of mosquitoes, although, some mosquitoes can be found in slow eddies and back channels, or in pools isolated on the banks as flows recede. Creeks and rivers and the surrounding riparian forest may support special-status terrestrial species including American peregrine falcon, bank swallow, black swift, long-eared owl, white-tailed kite, and additional avian species (afforded protection under USFWS and CDFW), amphibians such as CRLF and CTS, and reptiles including SFGS and western pond turtle, as well as special-status plants such as coastal milk-vetch, Hickman's cinquefoil, minute pocket moss, and white-flowered rein orchid as indicated in Tables 5-3 and 5-4.

Mosquito control work in creeks is restricted to sections of creek that run through, or directly next to, homes or businesses in urban or suburban areas. Work is confined to making paths so that technicians can travel through creeks to do inspections and control. Vegetation that requires management would typically be confined to channel margins and backwaters with slow currents. This management activity would be done in coordination with landowners or land managers and resource agencies, as well as following the BMPs described in Table 4-5 relating to environmental training, pretreatment screening, disturbance minimization, avian nesting season, habitat and species-specific BMPs, and vegetation management-specific BMPs. This activity would result in less-than-significant impacts to special-status species associated with creeks, rivers, streams and the associated riparian forests.

5.2.5.3.9 Ponds and Lakes

The freshwater habitats that could be treated include the margin of reservoirs and ponds (including artificial ponds such as golf course ponds or stock ponds with natural bottoms). These areas are generally man-made habitats, and they may support special-status terrestrial species such as American peregrine falcon, bank swallow, western snowy plover, and additional avian species (afforded protection under USFWS and CDFW), CRLF, CTS, SFGS, and western pond turtle, as well as special-status plants on the margins and slender-leaved pondweed in the water. This potential effect would be avoided and minimized by the BMPs in Table 4-5 relating to agency communication, environmental training, and pretreatment screening.

Vegetation management would be limited in this habitat type, except in smaller ponds, as the depth and size of these areas would typically preclude emergent vegetation from exceeding 30 percent of the surface area. Where necessary, vegetation management activities (including control of cattails) would be implemented in stagnant areas along the edges of these habitats where mosquito eggs and larvae occur. Special-status avian species would likely not be impacted in reservoirs and ponds, as vegetation removal in these habitats is minimal. Special-status plants would likely not be present in lakes or ponds but may be present along the margins. Vegetation management could directly affect these plant species but substantial areas of similar habitat would remain undisturbed.

The scope of the District's vegetation management work in these areas would be dictated or minimized by the BMPs in Table 4-5 relating to agency communication, environmental training, and pretreatment screening. Vegetation management-specific BMPs (BMP A7), and BMP G3 cited above will be applied.

Furthermore, work conducted will, whenever possible, be conducted during approved in water work periods for that habitat, considering the species likely to be present. When carried out as proposed, the effects of vegetation management would be less than significant.

5.2.5.3.10 Freshwater Marsh/Seeps

Freshwater marsh and seeps may provide ideal habitat for mosquito breeding due to their substantial areas of shallow water, limited circulation, and emergent vegetation. These areas may potentially support a number of special-status terrestrial species as indicated in Tables 5-3 and 5-4, such as northern harrier, white-tailed kite, saltmarsh common yellowthroat, and additional avian species (afforded protection under USFWS and CDFW), CRLF, CTS, SFGS, and western pond turtle, as well as special-status plants such as adobe sanicle, bristly sedge, Choris' popcornflower, Point Reyes meadowfoam, Hickman's cinquefoil, and slender-leaved pondweed found in the water. Vegetation management in these areas would have the same potential effects as described for lake and pond habitats and would be avoided and/or minimized by the BMPs in Table 4-5 relating to agency communication, environmental training, pretreatment screening, and maintenance and in water work. When carried out as proposed, the effects of this activity would be less than significant.

5.2.5.3.11 Seasonal Wetlands (includes Vernal Pools)

Seasonal wetlands, including vernal pools, may also support substantial stands of emergent vegetation, although these areas are typically not inundated for long enough periods to support dense stands of vegetation preferred by mosquitoes. As a result, these areas are unlikely to be subject to vegetation management actions. Terrestrial species that might occur here include short-eared owl and additional avian species (afforded protection under USFWS and CDFW), CRLF, CTS, SFGS, and western pond turtle, as well as special-status plants such as Choris' popcornflower, legenere, Point Reyes meadowfoam, Hickman's cinquefoil, Hoover's button-celery, saline clover, and others as indicated in Table 5-3 and Table 5-4. If vegetation management activities were required, potential effects would be avoided and minimized by the BMPs in Table 4-5 relating to agency communication, environmental training, and pretreatment screening. Mosquito control work in or near vernal pools is limited in scope and conducted on foot.

The District has long-standing cooperative and collaborative relationships with CDFW, professional biologists and property owners with regard to access, mosquito surveillance, and control in association with sensitive habitats. District staff have received information and training from CDFW and professional biologists with respect to minimizing the potential for impacts to sensitive habitat and specifically CTS, Hickman's cinquefoil, Point Reyes meadowfoam, and other special-status species. The District avoids performing vegetation management on rainy days or during dawn and dusk to avoid peak movement periods for CTS.

The Vegetation Management Component would not result in the direct removal, filling, or hydrological interruption of federally protected wetlands as defined by CWA Section 404 (including, but not limited to, marsh, vernal pool, coastal, etc.). It may result in the removal of minor amounts of vegetation in these areas. All work in wetlands would be subject to additional permitting by the USACE, CDFW, BCDC, and RWQCB. Vegetation management-specific BMPs will be applied if necessary (see Table 4-5). With these BMPs and the practices described above, the effects of vegetation management activities on seasonal wetlands would be less-than-significant.

5.2.5.3.12 Lagoon

Lagoons are an important feeding area for special-status birds, including bald eagles, osprey, and other surface feeding as well as diving birds. Lagoons would support mosquitoes in areas of reduced circulation, often associated with emergent vegetation, supporting a number of special-status species as identified in Tables 5-3 and 5-4, including many of the marsh and riparian species listed previously.

Vegetation management in lagoons would be subject to the BMPs in Table 4-5 to avoid or minimize impacts to environmental resources. With these BMPs, the effects of the Vegetation Management Component on biological resources within lagoons would be less-than-significant.

5.2.5.3.13 Tidal Marsh and Channels

Vegetation management activities are conducted in coordination with the Coastal Conservancy upon their request, and generally focus on the removal of cordgrass, a nondesired plant species. Otherwise the District does not conduct vegetation management activity in tidal marshes. Tidal marshes may support a number of special-status plants, including pappose tarplant, Point Reyes salty bird's beak, coastal marsh milk vetch, and others (Table 5-3), and animals, including salt-marsh harvest mouse, salt-marsh wandering shrew, Ridgway's rail, northern harrier, short-eared owl, and other species (Table 5-4). If needed in the future, vegetation removal in tidal marshes would be done using hand tools and in accordance with the tidal marsh-specific BMPs identified in Table 4-5, and others relating to agency coordination, environmental training, pretreatment screening, disturbance minimization BMPs, as well as vegetation management and species-specific BMPs. With limited activity and these BMPs, the effects of the Vegetation Management Component on biological resources within or dependent upon tidal marshes would be less-than-significant.

5.2.5.3.14 Water and Wastewater Treatment Facilities

Vegetation management activities may occur in coordination with the owners or operators of wastewater treatment facilities or septic/onsite wastewater treatment systems. These facilities may provide nesting habitat for special-status avian species such as northern harrier hawk since such facilities may lie close to suitable habitats in streams or the San Francisco Bay. The extent to which these species may enter these facilities is unknown. Septic systems and their associated leach fields may provide habitat for special-status avian species such as black swift, bank swallow, saltmarsh common yellowthroat, and other passerine birds as indicated in Table 5-4, particularly those that nest in riparian or emergent vegetation. Because of the limited number of such facilities and the very limited use of such facilities by special-status species, vegetation management measures would have a less-than-significant impact on terrestrial special-status species and will be minimized with the implementation of the BMPs in Table 4-5 particularly those pertaining to agency communication, pretreatment screening, and environmental training.

5.2.5.3.15 Artificial Containers, Temporary Standing Waters, and Ornamental Ponds

Vegetation management does not occur in artificial containers. Artificial containers do not provide habitat for nor support populations of native or special-status terrestrial species. Thus, this component would have no impact on these species or their habitat.

Temporary standing waters refer to water ponding on an upland habitat because of rainfall or irrigation, and the District would only manage these if in close proximity to homes. Ornamental ponds are small ponds with artificial bottoms. These habitats do not provide habitat for special-status aquatic or terrestrial species. Therefore, no impact would occur to special-status species from the vegetation management component in these habitats.

5.2.5.3.16 Impact Determinations for Special-Status Species and Habitats

Impact TR-13. The Vegetation Management Component would have a **less-than-significant** impact, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special-status species. No mitigation is required.

Impact TR-14. The Vegetation Management Component would have a **less-than-significant** impact on any riparian habitat or other sensitive natural community. No mitigation is required.

Impact TR-15. The Vegetation Management Component would have a **less-than-significant** impact on federally protected wetlands as defined by CWA Section 404. No mitigation is required.

5.2.5.4 Effects on Movement and Migration

The Vegetation Management Component could have a small effect on the migration of wildlife and movement and migration corridors. The removal of small areas of vegetation would not substantially affect movement corridors, but the presence of personnel and machinery may result in short-term avoidance of active work areas by terrestrial animals. In all cases this occurrence would be short term, generally not more than a few hours to a few days in any given location. Therefore, this minimal effect would have little impact on the movement of wildlife. It would not affect wildlife migration corridors or nursery areas, as no physical disturbance to these areas would occur.

Impact TR-16. The Vegetation Management Component would have a **less-than-significant** impact on the movement of any native resident or migratory fish or wildlife species. No mitigation is required.

5.2.5.5 Conflict with Local Ordinances

The county and city general plans and their goals and policies pertaining to natural resources are protective of terrestrial resources and focused on conservation of existing resources including mature trees and important woodland communities. Vegetation management activities would not result in the conversion of natural habitats to other land uses or in the long-term or permanent dislocation of plant and animal species from natural areas except indirectly for mosquitoes and vectors of disease and discomfort. Vegetation removal would not affect trees more than 4 inches diameter at breast height and, therefore, would not conflict with local tree ordinances.

Impact TR-17. The Vegetation Management Component would have **no impact** on local policies or ordinances protecting terrestrial resources.

5.2.5.6 Conflict with Conservation Plans

One conservation plan, the San Bruno Mountain HCP located in San Mateo County, was identified whose action area is within the District's primary Service Area. This HCP addresses impacts to three endangered species: San Bruno elfin butterfly, mission blue butterfly, Callippe silverspot, and SFGS over 3,500 acres on San Bruno Mountain for a duration of 30 years.

The District conducts limited control operations within the area covered by this HCP on San Bruno Mountain, which has no aquatic habitat; and it is unlikely that the District's mosquito control activities would occur within this HCP's boundaries. However, if control for ticks, yellow jackets, wasps, and rodents became necessary to protect public health, then vegetation management may involve accessing portions of the mountain in close proximity to roads and adjacent hiking trails and residences. ATV use for this access would be avoided. San Bruno Mountain is a known historical focus of plague and hantavirus. Surveys for plague have been conducted at this site since the 1940s, and plague continues to be detected there among wild rodents. The District works closely with the San Mateo County Parks Department staff which administers the HCP, so as to not be in conflict with the HCP's requirements. The HCP also does not cover biocide use, although it does provide minimization measures for biocide use.

The District regularly communicates with and works collaboratively with representatives from agencies such as RWQCB, USEPA, USACE, CDFW, and USFWS. The District receives training from agency staff and independent biologists (e.g., CDFW, USACE) to minimize impacts and conducts annual field training for field staff regarding precautionary and avoidance measures related to seasonal wetland and wetland habitats, but this habitat is not present on San Bruno Mountain. While District activities may occur within the boundaries of conservation areas, these activities are coordinated with the plan managers and would

not conflict with the provisions of any adopted HCP, NCCP, or other approved local, regional, or state habitat conservation plan.

Eleven conservation plans affect portions of adjacent counties. District activities are typically not among those covered by these HCPs. When called into these adjacent counties to perform work, the District would operate under the auspices of the affected county or that county's mosquito and vector control district and in compliance with their practices and permits, including compliance with all active HCP/NCCPs. Therefore, the District activities would not be in conflict with the provisions of any adopted HCP, NCCP, or other approved local, regional, or state-approved conservation plan.

> **Impact TR-18**. The Vegetation Management Component would have a **less-than-significant** impact on adopted HCPs or NCCPs. No mitigation is required.

5.2.6 Biological Control Component

This component consists of the introduction of mosquito predators, specifically mosquitofish (*Gambusia affinis*), into habitats occupied by mosquito larvae. These fish are ideal candidates for this use because they are highly tolerant of a wide range of temperature and water quality conditions, they can reproduce rapidly, and they are highly effective at locating and consuming mosquito larvae. Mosquito control agents such as Bs (a live bacteria) or Bti, and Saccharopolyspora spinosa (bacteria byproducts) may be considered biological controls, but are regulated by USEPA. Therefore, they are addressed in the Chemical Control Component. There are no additional biological control agents or products available to include in the District's proposed mosquito control program.

Currently, no commercial biological control agents or products are available for wasp and yellow jacket control, and the District does not employ predators (e.g., cats) for rodent control.

5.2.6.1 Impacts to Special-Status Species

Mosquitofish (*Gambusia affinis*) are presently the only commercially available mosquito predators. The District's rearing and stocking of these fish in mosquito habitats is the most commonly used biological control agent for mosquitoes in the world. Used correctly, this fish can provide safe, effective, and persistent suppression in various mosquito sources. However, due to concerns that mosquitofish may potentially impact red-legged frog and tiger salamander populations in natural waterbodies, the District limits the use of mosquitofish to artificial waterbodies such as ornamental fish ponds, water troughs, water gardens, fountains, unused swimming pools, and other types of isolated man-made ponds. These artificial habitats are not included in HCPs/NCCPs. The Biological Control Component's use of mosquitofish would have no impact, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special-status species in local or regional plans, policies, or regulations, or by the CDFW or USFWS, as the use of this component would be confined to artificial environments that are not capable of supporting the breeding or aquatic rearing of California red-legged frog or California tiger salamander, and are not connected to natural environments where special-status species occur.

> **Impact TR-19.** The Biological Control Component would have **no impact,** either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special-status species.

5.2.6.2 Impacts to Habitats

The use of mosquitofish for biological control of mosquitoes would not affect any natural habitats identified in local or regional plans, policies, or regulations, or by the CDFW or USFWS or result in the presence of District personnel or equipment in natural habitats. Mosquitofish would not be used in federally protected wetlands as defined by CWA Section 404 (including, but not limited to, marsh, vernal pool, coastal, etc.). Therefore, it would not affect the quantity or distribution of habitats, such as riparian areas, marshes, lakes or ponds, seasonal wetlands, or other natural habitat types. This component would

not affect the composition of their vegetative communities. This component would not result in any ground-disturbing activity and, therefore, would not result in any removal, filling, or hydrologic interruption of federally protected wetlands.

Impact TR-20. The Biological Control Component would have **no impact** on any riparian habitat or other sensitive natural community.

Impact TR-21. The Biological Control Component would have **no impact** on federally protected wetlands as defined by CWA Section 404.

5.2.6.3 Effects on Movement and Migration

Because mosquitofish would only be used in artificial waterbodies not connected to natural waterways or wetlands, this component would not occur in natural environments and would have no effect on the movement of wildlife and would not affect wildlife migration or movement corridors or impede the use of native wildlife nursery sites.

Impact TR-22. The Biological Control Component would have **no impact** on the movement of any native resident or migratory fish or wildlife species.

5.2.6.4 Conflict with Local Ordinances

The county and city general plans and their goals pertaining to natural resources are protective of terrestrial resources and focused on conservation of existing resources including mature trees and important woodland communities. Biological control activities with mosquitofish would not result in the conversion of natural habitats to other land uses or in the long-term or permanent dislocation of plant and animal species from natural areas except for mosquitoes and vectors of disease and discomfort. This component would not affect trees more than 4 inches diameter breast height and, therefore, would not conflict with local tree ordinances.

Impact TR-23. The Biological Control Component would have **no impact** on local policies or ordinances protecting biological resources.

5.2.6.5 Conflict with Conservation Plans

Biological control with mosquitofish would not be implemented within the boundaries of the San Bruno Mountain HCP or the other eleven conservations plans in adjacent counties, unless appropriate protocols as required by the USFWS demonstrated that special-status species did not occupy that habitat and such habitat did not connect to other waters that could support special-status species. When called into adjacent counties to perform work, the District would operate under the auspices of the county or that county's mosquito and vector control district and in compliance with their practices and permits, including compliance with all active HCP/NCCPs. Therefore, the District activities would not be in conflict with the provisions of any adopted HCP, NCCP, or other approved local, regional, or state-approved conservation plan.

Impact TR-24. The Biological Control Component would have **no impact** on approved HCPs, NCCPs, or local conservation plans.

5.2.7 Chemical Control Component

Chemical control consists of the application of chemicals to directly reduce populations of vectors that pose a risk to public health. The majority of chemical control tools are used for mosquito abatement. As part of their IMVMP Plan, the District prioritizes the least toxic materials available for control of the larval stages, focusing on bacterial larvicides, growth regulators, and surface films rather than organophosphates (OPs) or pyrethroids. Control of adult mosquitoes may become necessary under some circumstances, such as in the event of a disease outbreak (documented presence of infectious virus in active host-seeking adult mosquitoes), or lack of access to larval sources and habitats leading to the

emergence of large numbers of biting adult mosquitoes. Adulticides potentially used by the District include pyrethrins (Pyrocide®, Pyrenone 25-5®, Pyrenone Crop Spray®) and the synthetic pyrethroids resmethrin (Scourge®), Suspend® Deltamethrin, Resmethrin Clarke Anvil, and Etofenprox (Zenivex®). Table 2-3 lists the adulticides currently used or under consideration for future use by the District for mosquito abatement. An OP insecticide naled is under consideration as part of the Proposed Program and would be used in rotation with pyrethrins or pyrethroids to avoid the development of resistance. The active ingredients are used for control of adult mosquitoes and have been deliberately selected for lack of persistence and minimal effects on nontarget organisms when applied at label rates for ULV mosquito control.

The District also uses insecticides to control populations of ground-nesting yellow jackets and ticks that pose an imminent threat to people or pets. This activity is generally triggered by public requests rather than as a result of regular surveillance activities. The District does not treat yellow jacket nests that are located inside or on a structure; instead, the resident is encouraged to contact a private pest control company. The District has occasionally done demonstration projects with poison baits for yellow jackets, using small amounts of encapsulated insecticides in protein baits in tamper-resistant bait stations designed for yellow jackets. Tick control is conducted on a very limited basis at the request of parks, private landowners, or schools and primarily as a demonstration project. Residents complaining of honeybee swarms or hives are referred to the County Agricultural Commissioner's Office or the San Mateo County Beekeeper's Guild for a referral list of beekeepers. If District technicians deem it appropriate to treat stinging insects, they will apply the insecticide directly within the nest to avoid drift or harm to other organisms. As a future option as part of the Proposed Program, technicians may place tamper-resistant traps or bait stations, selective for the target insect, in the immediate environment. Chemicals used in the traps are contained and do not interact with the environment.

The District's rat population control program includes limited use of rodenticides in response to resident requests. It would involve bait in bait blocks (underground) and bait stations (aboveground). Rodent baits containing first and second generation anticoagulants are typically placed in secure bait stations or at underground sites such as sewers, storm drains, or catch basins. In sewer baiting, bait blocks containing bromadiolone are often suspended by wire above the water line. For rodent burrows, fumigants or anticoagulant dust is blown into the burrows. See Section 2.3.5.3 Rat Abatement for more information on these activities primarily in residential and commercial areas including urban creeks.

All chemicals are applied in strict conformance with label requirements, which have been approved by CDPR for use in California. Pesticide labels are legal requirements and include instructions telling users how to apply the product and precautions the applicator should take to protect human health and the environment. In addition, chemicals are applied in conformance with the PAP as required by the NPDES Vector Control Permit. All BMPs included in the PAP and product labels are followed and include such measures as restrictions in certain land uses and weather (i.e., wind speed) parameters.

The chemicals the District uses or proposes to use for vector control are presented in Tables 6-1 and 6-2 in Chapter 6, Ecological Health. Toxicity levels are helpful in making significance determinations under CEQA. Table 5-9 (Chemical Classes and Toxicity Thresholds for Terrestrial Animals and Birds) is provided below. Those chemicals with moderate to high toxicity pose potentially significant impacts to nontarget species initially (based on laboratory studies) and are evaluated based on the physical context (i.e., in consideration of the physical conditions present including location and timing) and application methods and practices associated with their use by the District in order to make final significance determinations. Note that the pesticides under consideration for future use are in addition to those that are currently in use. The pesticide application scenarios that result in reasonable efficacy with minimal unwanted estimated risk are preferred and are the basis of IPM/IVM approaches and BMPs the District employs. BMPs are described in Section 2.7 (Table 2-8),

Table 5-9 Chemical Classes and ToxicityThresholds[1] for Terrestrial Animals and Birds[2,3]

Class	Chemical	Mammals	Birds	Bees and Other
Mosquito Larvicides Currently in Use				
Bacterial Larvicides	Bs, Bti, spinosad	Very Low	Very Low	No effect on amphibians Butterfly/moth low Wet contact low toxicity to bees, dry not toxic
Hydrocarbon esters	Methoprene, s-methoprene	Very Low	Very Low	No effect on amphibians
Surfactants	Biodegradable alcohol ethoxylated surfactant	Very Low to None	Very Low to None	No observable effects to amphibians
Mosquito Adulticides Currently in Use				
Pyrethrins/Pyrethroids	Pyrethrins, phenothrin, deltamethrin, resmethrin, etofenprox	Low	Very Low	Low to Moderate (direct contact)
Synergist	Piperonyl butoxide	Practically Nontoxic	Practically Nontoxic	Practically Nontoxic
Mosquito Adulticides Under Consideration for Future Use				
Pyrethrins/Pyrethroids	Prallethrin, permethrin	Low	Very Low	Low to Moderate (direct contact)
Organophosphates	Naled	Moderate	Moderate	Moderate
Yellow Jackets and/or Ticks Chemicals Currently in Use				
Pyrethrins/Pyrethroids	Lambda-cyhalothrin, pyrethrins, allethrins, phenothrin, prallethrin, deltamethrin, tetramethrin, permethrin	Moderate	High (application sensitive)	High (application sensitive)
Synergist	Piperonyl butoxide	Practically Nontoxic	Practically Nontoxic	Practically Nontoxic
Yellow Jackets and/or Ticks Chemicals Under Consideration for Future Use				
Pyrethrins/Pyrethroids	Esfenvalerate, etofenprox	Moderate	High (application sensitive)	High (application sensitive)
Potassium salts	Potassium Salts of Fatty Acids	Very Low	Very Low	Very Low

Class	Chemical	Mammals	Birds	Bees and Other
Rodenticides in Use				
Anticoagulants	Diphacinone, brodifacoum, bromadiolone	High (secondary toxicity)	High	Moderate
Central nervous system toxicant	Bromethalin	High (secondary toxicity)	Unknown	Unknown
Rodenticides Under Consideration for Future Use				
Anticoagulants	Chlorophacinone, difethialone	High (secondary toxicity)	High	Moderate
Miscellaneous	Cholecalciferol	Very low	Low	Moderate
Fumigants	Sulphur, sodium nitrate	Nontoxic	Nontoxic	Nontoxic

[1] Because some products have a range of effects, depending on route and exposure, more and specific toxicity information is summarized in Appendix B (Table 6-1).

[2] The toxicity data are derived from rigidly controlled laboratory animal studies designed to determine the potential adverse effects of the chemical under several possible routes of exposure (see Appendix B for further information). In these studies, the species of interest is continuously exposed to 100 percent chemical at several doses. In actual practice, the amounts applied in the District's Program Area are substantially less than the amounts used in the toxicity studies and organisms are not continuously exposed to the chemical. Furthermore, actual application rates by the District may be less than label requirements. Thus, the laboratory test results do not provide a realistic assessment of field exposure.

[3] The toxicity designations are based on the USEPA toxic criteria for chemicals listed in Table 1.1.

These pesticides are approved for commercial use by the USEPA and CDPR and, when applied with strict adherence to product label requirements and additional District BMPs listed in Table 4-5 and in Section 2.7, should not result in adverse effects to nontarget animals. Detailed discussions of the environmental fate and toxicity of these active ingredients are provided in Appendix B. A subset of the pesticides (Table 5-10) proposed for District use was identified for further examination based upon use patterns and/or toxicity (Appendix B, Table 1-1). The following discussion groups these chemicals based on their target organism or life stage and discusses these pesticides in reference to impacts to terrestrial resources.

The District would use a variety of techniques and equipment to apply mosquito larvicides, including hand-held sprayers, backpack sprayers and blowers, truck- or ATV-mounted spray rigs, and helicopters. The District uses conventional pickup trucks and ATVs as larvicide vehicles. Equipment used in ground applications of liquid formulations include hand-held sprayers (handcans or spray bottles), and backpack sprayers and blowers. Hand-held sprayers (handcans) are standard 1- or 2- or 3-gallon garden style pump-up sprayers used to treat very small isolated areas. Backpack sprayers are either hand pump-up for liquid applications and have a 2.5/3 to 5-gallon tank or are gas powered. When large areas are simultaneously producing mosquito larvae at densities exceeding District treatment thresholds, then the District may use helicopters to apply larvicides. Aerial application of larvicides is a relatively infrequent activity for the District, typically occurring only a few times each year, with each application covering around 400or fewer acres. Aerial applications of liquid larvicides by helicopter typically occur during daylight hours and at an altitude above the treatment site of less than 40 feet. Granular applications would occur during daylight hours at a less-than-50-foot altitude.

Table 5-10 Active Ingredients Identified for Further Evaluation in Appendix B

Active Ingredient	Vector	Potential Issue
Methoprene	Mosquito	Prevalent use; toxicity to aquatics and insects
Etofenprox	Mosquito, yellow jacket wasp*	Toxicity to aquatic organisms; no synergist required
Bti	Mosquito	Prevalent use; public concerns
Pyrethrins	Mosquito, yellow jacket wasp	Prevalent use; requires synergist (PBO)
Permethrin	Mosquito,* yellow jacket wasp, tick*	Toxicity to aquatic organisms; potential endocrine disruptor
Lambda-cyhalothrin	Yellow jacket wasp	Toxicity to aquatic organisms; potential to bioaccumulate
Bromadiolone	Rodents	Toxicity to nontarget organisms including mammals, birds, aquatics
Resmethrin	Mosquito, yellow jacket wasp*	Requires synergist (e.g., PBO); potential endocrine disruptor
Active Ingredients Under Consideration for Future Use		
Esfenvalerate	Yellow jacket wasp	Toxicity to aquatic organisms; potential to bioaccumulate
Difethialone	Rodents	Toxicity to nontarget organisms including mammals, birds, aquatics

See Appendix B, Table 1-1

*This active ingredient is proposed for future use for this particular vector, but is in current use for other vectors.

Aerial applications using helicopters (and fixed-wing aircraft in the future for adulticiding) are used to obtain effective control in areas bordered by extensive mosquito production sites or with small, narrow, or inaccessible network of roads. The flight parameters differ by program and technique. Some operations fly during hours of daylight that begin either at morning's first light or before sunset and work into twilight. The aircraft can be flown at a less than 200-foot altitude, which may make it easier to hit the target area. Other operations may be conducted in the dark of the night, typically after twilight or early in the morning before dawn. The aircraft typically are flown between 200- and 300-foot altitudes. Swath widths vary from operation to operation but are normally set somewhere between 400 and -1,200 feet. Aerial applications may be conducted over, but are not limited to, the following land uses within the Program Area: salt marsh, diked marsh, seasonal wetlands; evaporation ponds and wastewater ponds; and agricultural, residential, commercial, industrial, and recreational areas.

The number and type of vehicles and equipment required would vary, as shown in Table 12-8, which also shows the range of noise levels that they typically would generate at 50- and 400-foot distances from the source and the land uses that would be affected. Noise from helicopters also is shown at a 500-foot distance. All land use types potentially could be treated through aerial applications, although those shown are the most likely to be affected. Estimated noise levels and potential sources are included in Table 12-8 of Chapter 12, which addresses the potential impacts of noise on humans during routine operations that would be similar to future operations under the Proposed Program.

When applying chemical control products, the District adheres to and follows the product label guidance and its BMP H12 (below) for use of pesticides that may have an adverse impact on bees or other insect pollinators:

> *"Do not apply adulticides in spray/fog forms over large areas (more than 0.25 acre) during the day when honeybees and other pollinators are present and active. Preferred applications of these specific pesticides are to occur in areas with little or no honeybee or pollinator activity or after dark. These treatments may be applied over smaller areas (with handheld equipment), but the technician will first inspect the area for the presence of bees and other pollinators. If bees and other pollinators are present in substantial numbers, the treatment will be made at an alternative time when these pollinators are inactive or absent. Liquid larvicides are applied only to water bodies."*

5.2.7.1 Impacts to Special-Status Species

5.2.7.1.1 Mosquito Larvicides

As part of their Chemical Control Component, the District employs bacterial larvicides that are highly specific to mosquitoes. These controls include the active ingredients Bs, Bti, and spinosad. Larvicides are used to manage immature life stages of mosquitoes including larvae and pupae in aquatic habitats. Temporary aquatic habitats are usually targeted because permanent waterbodies generally support natural mosquito predators such as fish. The larvicides are applied using ground application equipment, watercraft, and rotary aircraft. District criteria for selecting application methods are predicated upon access, efficiency and effectiveness of application, size of the area to be treated, and the density and type of vegetation present at the application site (i.e., the likelihood of success in applying the material to the target area). The potential impact of equipment noise on wildlife would be minimal, as the animals would return to their selected habitats within a few hours at most for application techniques currently used by the District.

The toxicity of Bs, Bti, spinosad, methoprene, and monomolecular films are discussed in detail in Appendix B and listed in Table 5-11. The District employs BMPs to reduce the relative potential impacts of these chemical treatments to nontarget organisms as well as to applicators (Table 4-5 and Section 2.8). Because Bs, Bti, and spinosad are applied to aquatic rather than terrestrial environments to control larval mosquitoes, the potential for exposure of terrestrial organisms is low, although some overspray could occur.

Table 5-11 Chemicals Employed for Larval Mosquito Abatement

Chemical Classification	Active Ingredient	Appendix B
Bacterial larvicide	Bs	Section 4.3.1
Bacterial larvicide	Bti	Section 4.3.2
Bacterial larvicide	Spinosad	Section 4.3.3
Hydrocarbon ester (aliphatic hydrocarbon ester)	Methoprene	Section 4.3.4
Surfactant	Biodegradable Alcohol Ethoxylated Surfactant (monomolecular film, BVA-2, CoCoBear)	Section 4.3.5

Bacterial Larvicides (Bs, Bti, and Spinosad)

Bacterial larvicides such as Bti and Bs are highly selective microbial pesticides (for mosquitoes) that when ingested, produce gut toxins that cause destruction of the insect gut wall leading to paralysis and death. These microbial agents are delivered as endospores in granular, powder, or liquid concentrate formulations. Bs and Bti are applied directly to larval mosquito habitats (water) rather than to terrestrial environments and strictly adhere to product labels and other BMPs. Additionally, Bs and Bti are practically nontoxic to terrestrial organisms, including birds, bees, and mammals.

Spinosad is a natural insecticide derived from the fermentation of a common soil microorganism, Saccharopolyspora spinosa. Spinosad causes neurologic effects in insects consistent with the general activation of nicotinic acetylcholine receptors, but by a mechanism that is novel among known insecticides (Mayes et al. 2003). Exposure manifests as constant involuntary nervous system impacts ultimately leading to paralysis and death of the insect. Spinosad is highly effective against lepidopteron larvae (e.g., butterflies and moths), as well as some Diptera (mosquitoes and flies), Coleoptera (beetles), Thysanoptera (e.g., thrips), and Hymenoptera (e.g., bees, wasps) (Mayes et al. 2003). The effects of spinosad on beneficial pollinators such as honeybees are of concern. The District applies spinosad directly to aquatic habitats where mosquito larvae are present, and not on vegetation or other surfaces in terrestrial environments where bees or other pollinators are likely to come into contact with residues. Field studies evaluating typical agricultural spinosad applications on flowering crops have demonstrated low risk to adult honeybees and little to no effect on hive activity and brood development, provided that the residue is allowed to dry for up to three hours (Mayes et al. 2003). Given the specific methods and small amount of spinosad used in vector control applications, there should be virtually no residue coming into contact with honeybees and other terrestrial invertebrates.

Spinosad is of low acute toxicity to birds and mammals. Generally, spinosad is applied directly to larval mosquito habitat, thereby reducing potential exposures of sensitive terrestrial insects including moths, butterflies, and honeybees. Application of spinosad follows strict product label requirements.

Hydrocarbon Esters (Methoprene)

(S)-Methoprene is a hormone analogue that interferes with insect larval development (growth regulator). This chemical does not exhibit the nonspecific target effects of neurological toxins such as pyrethrin.

Methoprene is used as a larvicide and, as such, is not applied to terrestrial environments. Some drift into terrestrial environments may occur when it applied, but it is almost irrelevant for hand and aerial (e.g., helicopter) applications since treatments are restricted at moderate to high wind speeds. Methoprene is considered one of the safest of all larvicide options, and the District uses methoprene prevalently during each season of the year. Methoprene is highly effective against mosquitoes at low concentrations (very low volume applications are used when possible) and degrades quickly in the environment, thereby reducing the potential exposure and risk to nontarget organisms. Methoprene may be applied when feasible if requested by a regulatory agency. The District typically uses Bti and Bs in wetland environments. Extended release methoprene products are typically not used in vernal pool habitats.

Methoprene has high toxicity to nontarget insects such as moths, butterflies, and beetles; however, moths, butterflies, and most species of beetles do not occupy aquatic habitats and so would have very limited exposure.

The District uses methoprene prevalently during each season of the year. Liquid and granular forms are used in residential and ornamental pond application scenarios. Treatments to wetlands, including marshes, at times require the granular form (e.g., Altosid pellets) to penetrate dense aquatic vegetation including cattails and tules. See Section 9.2.7.1 for discussion of use of methoprene in malfunctioning onsite wastewater treatment systems due to improper lid seals, cracks, or missing vent screens and/or due to drain fields where water ponds on the surface.

Biodegradable Alcohol Ethoxylated Surfactant (Monomolecular Film)

Monomolecular films are biodegradable alcohol ethoxylated surfactants that are used as surface-active agents effective against larvae and pupae. These films are effective against these immature life stages when inhaled at the water surface or by physically forming a surface film that drowns the mosquito. These treatments may also be effective against adult mosquitoes during adult emergence. These treatments are specific to aquatic environments and are not applied to terrestrial environments, although some drift may occur.

> **Impact TR-25**: The Chemical Control Component's mosquito larvicides would have a **less-than-significant** impact, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special-status species. No mitigation is required.

5.2.7.1.2 Mosquito Adulticides

In addition to chemical control of mosquito larvae, the District may use pesticides for control of adult mosquitoes when no other tools are available and if specific criteria are met, including species composition, population density (as measured by landing count or other quantitative method), proximity to human populations, and/or human disease risk. Treatment of adult mosquitoes is a tertiary line of defense employed when physical controls and larviciding are not sufficiently effective. As with larvicides, adulticides are applied in strict conformance with label requirements because doing so is mandated by law (Appendix B). Adulticides the District uses are listed in Table 5-12. Because of the ecological sensitivity of vernal pools, which support numerous species of listed plants and invertebrates, and the toxicity of these chemicals to nontarget organisms, the District will use all available means to avoid use of adulticides over vernal pool habitats. Vernal pools are in remote areas, not in close proximity to residential areas, which minimizes the need for their treatment within the District's Service Area. If the use of adulticides over vernal pools were to become necessary, the District would notify the USFWS and CDFW of the need, and applications would be performed in strict accordance with the product label, using the appropriate BMPs as listed in Table 4-5, and in consultation with property owners. A detailed discussion of the environmental fate and toxicity of these pesticides is provided in Appendix B. The potential impact on wildlife from noise associated with equipment use would be minimal, as the animals would return to their selected habitats within a few hours at most for application techniques currently used by the District.

Table 5-12 Chemicals Currently Employed and Proposed for Adult Insect Abatement

Chemical Classification	Active Ingredient	Vector	Appendix B
Chemicals in Current Use			
Pyrethrin	Pyrethrin	Mosquito; yellow jacket wasp; tick	Section 4.1.1
Pyrethroid	d-*trans* allethrin	Yellow jacket wasp	Section 4.1.2
Pyrethroid	Phenothrin (sumithrin or d-phenothrin)	Yellow jacket wasp	Section 4.1.3
Pyrethroid	Prallethrin	Mosquito*; yellow jacket wasp	Section 4.1.4
Pyrethroid	Deltamethrin	Mosquito; Yellow jacket wasp; tick	Section 4.1.5
Pyrethroid	Lambda-cyhalothrin	Yellow jacket wasp	Section 4.1.7
Pyrethroid	Resmethrin	Mosquito; yellow jacket wasp*	Section 4.1.8

Table 5-12 Chemicals Currently Employed and Proposed for Adult Insect Abatement

Chemical Classification	Active Ingredient	Vector	Appendix B
Pyrethroid	Tetramethrin	Yellow jacket wasp	Section 4.1.9
Pyrethroid	Permethrin	Mosquito*; yellow jacket wasp; tick*	Section 4.1.10
Pyrethroid-like compound	Etofenprox	Mosquito; yellow jacket wasp*	Section 4.1.11
Synergist	PBO	Mosquito; yellow jacket	Section 4.1.12
Chemicals Under Consideration for Future Use			
Pyrethroid	Esfenvalerate	Yellow jacket wasp: tick	Section 4.1.6
Organophosphate	Naled	Mosquito	Section 4.2.1
Potassium Salts	Potassium salts	Yellow jacket wasp	Section 4.4.1

*This active ingredient is proposed for future use for this particular vector, but is in current use for other vectors.

Pyrethrins

The District uses pyrethrin for mosquito and yellow jacket wasp control. For yellow jacket control, pyrethrin is applied around parks, landscaping, and directly into ground nests. For mosquito control, pyrethrin is applied to man-made and natural sites including ditches, and moving and standing water. However, the District uses pyrethrins only when absolutely necessary due to mosquito abundance and density in an area; and, even then, minimal amounts are applied (via ULV application), thus reducing the potential for impacts to nontarget ecological receptors (see BMPs H3, H4, H11). As an additional measure, pyrethrin applications are canceled during less than ideal wind and potential drift conditions (BMP H6). For wasp (yellow jacket and paper wasps) control, the District applies pyrethrins in minute volumes directly to ground nests and tree nests if necessary, which essentially negates any impact to nontarget species. The District ensures that all applications are made in accordance with label specifications and USEPA and CDPR recommendations for use with mosquitoes. District practices that alleviate risk to aquatic receptors include minimizing the amount, frequency, and area with which these pesticides are applied over any waterbodies, especially those with the potential to contain special-status species. In addition, the risks to nontarget insects such as honeybees are reduced by restricting large scale pyrethrin applications to nighttime, predawn, and dusk hours when bees and many other pollinators are inactive (BMP H12).

Pyrethrins readily degrade in water and soil, but may persist under anoxic conditions. They tend to strongly adsorb to soil surfaces and, hence, have low potential to leach into groundwater. These chemicals may have low to moderate acute toxicity to mammals; however, no special precautions are required when label instructions are followed. When the product is being applied, proper personal protective equipment would alleviate potential for human exposure, especially when delivered via ULV techniques. The potential for effects on human health are discussed in Chapter 7, Section 7.2.7.2.1. Pyrethrins may be highly toxic to fish (freshwater, estuarine, marine) and invertebrates, although exposures would likely be low during and following ULV applications, which are designed to prevent environmental persistence and potential impacts to nontarget ecological receptors.

Pyrethrins have low to moderate acute toxicity to mammals via the oral, dermal, and inhalation routes and are practically nontoxic to birds. When applying to areas larger than 0.25 acre, the risks to nontarget insects such as honeybees are reduced by only applying pyrethrins at night in the dark when bees and other pollinators are inactive (BMP H12). The District also coordinates its activities with local beekeepers (when known or discovered via notifications) to further minimize risk of exposure to bees. Beekeepers will

cover or move their hives during applications of these chemicals, uncovering or returning them to the area within a few hours after spraying. This coordination has worked satisfactorily for both the beekeepers and the District, and no credible reports of bee kills have been associated with District applications of pyrethrins. Nighttime pollinators who might be present at an application site would not be affected at a population level, because their populations extend beyond the application areas and can replace any lost individuals.

Little risk to nontarget terrestrial organisms is expected when this and other BMPs to avoid unwanted drift are applied.

Pyrethroids and Pyrethroid-Like Compounds

Pyrethroid insecticides are synthetic compounds that are chemically similar to the pyrethrins but have been modified to increase stability and activity against insects. Some synthetic insecticides are similar to pyrethroids, such as etofenprox, but have a slightly different chemical composition. First generation or "Type I" photosensitive pyrethroids include d-allethrin, phenothrin (sumithrin), prallethrin, resmethrin, and tetramethrin. Typically, these pyrethroids are used indoors and around residential areas. The newer second-generation pyrethroids are mostly "Type II" pyrethroids. Type II pyrethroids are more toxic (than Type I pyrethroids) because they are less photosensitive and persist longer in the environment. The active ingredients that fall into this group include deltamethrin, permethrin and lambda-cyhalothrin, and esfenvalerate.

Pyrethroids affect insect neuroactivity by binding to a protein at the nerve fiber that regulates the voltage-gated sodium channel, This binding can delay the closing of sodium channels and/or cause a persistent activation of the sodium channels, which often results in repetitive activity (Type I pyrethroid) or blockage of nerve conduction (Type II pyrethroid). Most pyrethroids and pyrethroid-like compounds are of low toxicity to birds and mammals, but of high toxicity to honeybees. The risks to nontarget insects such as honeybees are reduced by restricting application of these compounds to night and predawn times, when bees and other pollinators are inactive. The District also coordinates its activities with local beekeepers (when known or discovered via notifications) to further minimize risk of exposure to bees. Beekeepers will cover or move their hives during applications of these chemicals, uncovering or returning them to the area within a few hours after spraying. The active ingredients that have been selected for further evaluation based upon issues regarding use patterns, environmental fate, and/or toxicity characteristics in Appendix B (resmethrin, permethrin, and etofenprox) are discussed individually below.

Resmethrin

The District has infrequently applied resmethrin for mosquito control in ULV applications. This chemical is usually reserved for use when circumstances are critical (e.g., an outbreak of infectious disease such as dengue). Additionally, resmethrin use is declining in favor of nonresmethrin components. Studies have shown rapid dissipation, low persistence, and no aquatic fish and invertebrate toxicity observed following aerial ULV applications (Appendix B). Resmethrin is moderately toxic to birds and highly toxic to honeybees; however, little risk to nontarget terrestrial organisms is expected when BMPs such as spray nozzle adjustments (BMP H8) and insect pollinator protection (BMP H12) are applied. The District has not used resmethrin for mosquito control in over 5 years, and has included this active ingredient in the Proposed Program primarily to provide an additional adult control option to manage pesticide resistance for critical circumstances such as a disease outbreak.

Permethrin

The District may in the future use permethrin for mosquito control, and currently uses it for yellow jacket wasp control during spring, summer, and fall. Permethrin products are currently applied directly to ground nests. Permethrin has low toxicity to mammals and is practically nontoxic to birds. It is highly toxic to honeybees; however, this pesticide is generally used with careful and strict BMP techniques such as using very small, localized applications. If permethrin were to be used for mosquito control, it would be

applied using the ULV technique. Permethrin has a strong repellent effect in the environment and has been considered to pose little risk to bees (USEPA 2006a). When used appropriately, little risk to nontarget terrestrial organisms is expected.

Etofenprox

Etofenprox is a pyrethroid-like compound that does not tend to persist in the environment or appear to pose a risk to mammals as it is frequently applied to backyards and patios and sometimes directly to domestic pets (for flea and tick control).

Etofenprox is generally applied in the current program for mosquito control during the nighttime hours when sensitive receptors such as honeybees are not active. Nighttime pollinators who might be present at an application site would not be affected at a population level, because their populations extend beyond the application areas and can replace any lost individuals. Based on toxicity, environmental fate, and usage patterns, etofenprox, using BMPs, is not likely to result in adverse impacts to nontarget terrestrial organisms. Etofenprox is included in the District's program as a future use active ingredient for yellow jacket control. The proposed product formulation, Wasp-X, is applied as a foam directly inside yellow jacket nests and would therefore not come into contact with nontarget terrestrial organisms.

Synergist (Piperonyl Butoxide)

PBO was first registered in the 1950s and acts as a synergist. Synergists are chemicals that primarily enhance the pesticidal properties of other active ingredients, such as pyrethrins and synthetic pyrethroids. PBO is a registered active ingredient in products used to control many different types of flying and crawling insects and arthropods, although no products contain only PBO. It is registered for use in agricultural, residential, commercial, industrial, and public health sites. PBO interferes with the insect's ability to detoxify pyrethrins and pyrethroids, by binding to microsomal enzymes in target organisms, thereby inhibiting the breakdown of other pesticides, including pyrethrins and pyrethroids (USEPA 2006b).

PBO degrades relatively rapidly in soil and water and, therefore, does not tend to persist in the environment. PBO is of low toxicity to terrestrial receptors such as mammals and honeybees. Although it has been suggested that PBO may be a possible endocrine disruptor, the USEPA published the results of Tier 1 screening assays which found no convincing evidence of potential interaction with the estrogen, androgen, or thyroid pathways of PBO in mammals or wildlife (USEPA 2015b). ULV applications of PBO are used (to prevent environmental persistence and adverse ecological effects) whenever possible and in conjunction with BMPs for the co-applied pesticides including using handheld application equipment when feasible and not applying when wind occurs to minimize drift into aquatic environments (see Chapter 2, Table 2-8, BMPs H-6, H-7, and H-12).

Organophosphates

Naled would be used in rotation with pyrethrins or pyrethroids for control of adult mosquitoes if necessary to avoid the development of resistance. In addition to use for controlling adult mosquitoes, naled also has indoor and outdoor general use, and is used on food and feed crops, farms, dairies, pastureland, and in greenhouses and over standing water (CDPR 2010a). Naled and its breakdown product tend to degrade quickly in surface waters especially following ULV applications which minimizes its exposure to and potential to impact aquatic and terrestrial species. It has low water solubility and is mobile in some soils. Drift is almost irrelevant for hand and some aerial (e.g., helicopter) applications, since treatments are restricted during moderate to high winds. The District strictly adheres to its pesticide application BMPs and product label requirements, including the restriction of naled application to targets outside adequate buffer zones around permanent waterbodies to reduce runoff and impacts to aquatic organisms. It is moderately toxic to mammals and birds but potential exposures would be extremely brief. See Section 6.2.7.2.4.

Naled has been associated with mortality of honeybees when residue levels exceed 2,000 µg/m2 following typical ULV applications in Florida (Zhong et al. 2004). If used in the future, the District would

spray naled during the evening when bees are inactive; however, if the weather is exceptionally hot and humid, bees will sometimes cluster outside around the entrance to the hive during the evening. To further minimize potential effects on nontarget pollinators, the District would communicate with the San Mateo County Beekeepers Guild as outlined in the District IMVMP Plan. Naled is not currently used, and its future use would be very infrequent.

> **Impact TR-26**: The Chemical Control Component's mosquito adulticides and synergists would have a **less-than-significant** impact, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special-status species. No mitigation is required.

5.2.7.1.3 Yellow Jacket, Wasp and Tick Abatement

Besides using insecticides for mosquito populations, the District selectively applies them to control ground-nesting yellow jacket and tick populations that pose an imminent threat to people or to pets. This activity is generally triggered by public requests for District assistance or action rather than as a result of regular surveillance of their populations. For control of yellow jackets and ticks, these pesticides are applied in highly localized, upland areas and residential areas.

The District excludes from its yellow jacket control program populations of this vector that are located in or on a structure. Yellow jacket nests that are off the ground would be treated under special circumstances to protect public health and safety of the District's residents. Whenever a District technician learns that a hive is situated inside or on a structure or is above ground, the resident(s) are encouraged to contact a private pest control company that is licensed to perform this work. When a technician encounters a honeybee swarm or unwanted hive, residents are referred to the County Agricultural Commissioner's Office or the San Mateo County Beekeepers' Guild contacts, which maintain referral lists of beekeepers that can safely remove the bees. If District technicians deem it appropriate to treat stinging insects, they will apply the insecticide directly within the nest in accordance with the District's policies to avoid drift of the insecticide or harm to other organisms. Alternatively, they will place tamper-resistant traps or bait stations, selective for the target insect, in the immediate environment of the vector.

Pyrethroid-based chemicals are typically used against ground-nesting yellow jackets and ticks. The potential environmental impacts of these materials are minimal due to the fact that they are applied directly to the underground nest and to vegetation supporting ticks. This application method prevents drift and further reduces the potential for inadvertent exposure of nontarget and sensitive species to these materials. The pesticides the District uses to control yellow jacket and tick populations are shown in Table 5-7 and those selected for further review in Appendix B have been discussed previously except for lambda-cyhalothrin, which is discussed below along with potassium salts.

Pyrethrin

The District uses pyrethrin for mosquito and yellow jacket wasp control. For yellow jacket control, pyrethrin is applied around parks, onto landscaping, and directly into ground nests. The potential impacts to terrestrial habitats through reduction of the amount or quality of habitat available, to native terrestrial plant or animal populations through direct mortality, or to special-status species are discussed above under Mosquito Adulticides (see Section 5.2.7.1.2).

Pyrethroids and Pyrethroid-like Compounds

Pyrethroid insecticides are synthetic compounds that are chemically similar to the pyrethrins but have been modified to increase stability and activity against insects. First generation or "Type I" photosensitive pyrethroids include d-allethrin, phenothrin (sumithrin), prallethrin, resmethrin, and tetramethrin. Typically, these pyrethroids are used indoors and around residential areas. The newer second-generation pyrethroids are mostly "Type II" pyrethroids. The active ingredients that fall into this group include deltamethrin, esfenvalerate, lambda-cyhalothrin, and permethrin. Type II pyrethroids are more toxic (than

Type I pyrethroids) because they are less photosensitive and persist longer in the environment. Most pyrethroids and pyrethroid-like compounds are of low toxicity to birds and mammals, but of high toxicity to honeybees. The potential impacts impact to terrestrial habitats through reduction of the amount or quality of habitat available, to native terrestrial plant or animal populations through direct mortality, or to special-status species are discussed above under Mosquito Adulticides (Section 5.2.7.1.2).

Lambda-cyhalothrin

The potential for persistence of lambda-cyhalothrin and its toxicity to mammals, aquatic organisms (vertebrates and invertebrates), and nontarget insects such as honeybees is of concern from a terrestrial resource perspective.

Lambda-cyhalothrin is available to the public in commonly used products for residential wasp control. The District uses lambda-cyhalothrin for targeted application only to yellow jacket and paper wasp nests. This product (0.01 percent lambda-cyhalothrin) is used as needed throughout the year. The District may use products containing this active ingredient as a courtesy to the public to assist with wasp control at residences (restricted to yards, gardens, and home exteriors). The amount the public and the District apply directly to wasp nests is minute, and little to no potential exists for nontarget organism exposures.

Although potential exists for environmental persistence and exposure to domestic pets and nontarget receptors, this active ingredient is readily available as an insect spray, and District uses are generally focused and very localized to minimize or eliminate those exposures. Lambda-cyhalothrin is only applied to ground-nesting yellow jackets. In addition, lambda-cyhalothrin is not applied where bee boxes are present to reduce risk to these pollinators. Little risk to nontarget terrestrial organisms is expected when these and other BMPs are applied.

The impacts of pyrethroids and pyrethroid-like insecticides are discussed above under Mosquito Adulticides (Section 5.2.7.1.2).

Potassium Salts

Potassium salts are used to control a variety of insects and mosses, algae, lichens, liverworts and other vegetation, in or on many food and feed crops, ornamental flower beds, house plants, trees, shrubs, walks and driveways, and on dogs, puppies, and cats. Potassium salts of fatty acids include potassium laureate, potassium myristate, potassium oleate, and potassium ricinoleate. Once applied, however, these salts are degraded quickly in soil by microbes and do not persist in the environment (USEPA 1992). They are of low toxicity to birds and mammals, but highly toxic to fish and aquatic nontarget invertebrates. Potassium salts are under consideration for future use and would be applied infrequently and according to label requirements.

Currently, the District does not use potassium salts. Potassium salts would be considered for future use by the District only if necessary for the control of Africanized honeybees. Under a California Department of Pesticide Regulation Section 24(c) special local need registration, a formulation of this active ingredient under the trade name M-Pede may be applied directly to bee swarms and exposed colonies by trained personnel in the state of California (CDPR 1994). As this product would be used only in extremely limited and targeted applications, following product label requirements and District BMPs, potassium salts may be effective in a variety of application sites without significant impact on terrestrial resources.

> **Impact TR-27**: The Chemical Control Component's use of pyrethrin, pyrethroids, pyrethroid-like pesticides, lambda-cyhalothrin, and potassium salts for yellow jacket wasp and/or tick control would have a **less-than-significant** impact, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special-status species. No mitigation is required.

5.2.7.1.4 Rodenticides

The District developed a rat population control program to serve residents in the Service Area. The District's limited use of rodenticides is not performed as result of surveillance, but in response to District resident requests. Table 5-13 lists the pesticides that may be used by the District for control of rats and mice, including existing and proposed pesticides. The District conducts rodent baiting in underground sites such as sanitary sewers. Secure bait stations or other accepted methods of rodent baiting are conducted in areas with severe rodent infestations. In sewer baiting, bait blocks containing bromadiolone (a second generation, single-feeding anticoagulant rodenticide) are often used. The block is suspended by wire above the water line to encourage rodent feeding. For rodent burrows, chlorophacinone (a first-generation, multiple-feeding anticoagulant dust) is blown into the burrows. A neurotoxin type of rodenticide may also be used where rapid breakdown of the active ingredient bromethalin is desired to minimize the potential for secondary poisoning of nontarget animals.

Table 5-13 Chemical Control Options for Rodent Abatement

Chemical Classification	Active Ingredient	Appendix B
First-generation anticoagulant	Chlorophacinone*	Section 4.5.1
First-generation anticoagulant	Diphacinone	Section 4.5.2
Second-generation anticoagulant	Brodifacoum	Section 4.5.3
Second-generation anticoagulant	Bromadiolone	Section 4.5.4
Other	Bromethalin	Section 4.5.5
Second-generation anticoagulant	Difethialone*	Section 4.5.6
Sterol	Cholecalciferol*	Section 4.5.7
Fumigant	Sulfur*	Section 4.5.8
Fumigant	Sodium nitrate*	Section 4.5.9

*Under consideration for future use.

Tamper proof bait stations may also be placed aboveground during summer months along creek banks within 50 feet of a structure in residential and commercial areas. They are never placed at water level and are removed in early fall to prevent them from becoming submerged in storm events. Tamper-proof bait stations are used to reduce impacts to nontarget organisms. The USEPA has determined that many of these rodenticides pose little risk to the environment (see Section 6.2.7.4 and Appendix B).

In addition, the areas being baited are in heavily residential areas that contain very few predatory birds and no foxes, mountain lions, or other predators. If predatory animals are present, the technician will select a less toxic bait (i.e., bromethalin, a neurotoxin that works on the nervous system to reduce the likelihood of acute death) that reduces the chance of secondary poisoning. Dead rodents are picked up and disposed of if seen during inspection periods. The baits are applied largely by a third party PCO, and the District acts as a quality control component. In certain circumstances, District staff will place the bait stations themselves. The bait is monitored regularly and, depending on results, may be moved to other locations if rodent activity is low. Bait stations may also be placed in public rights-of-way and on public property but not where children play.

Anticoagulant Rodenticides

The anticoagulant rodenticides are typically grouped into “first-generation” (e.g., chlorophacinone, diphacinone) and “second-generation” (e.g., brodifacoum, bromadiolone, difethialone) compounds.

Second-generation anticoagulants tend to be more acutely toxic than are the first-generation anticoagulants, and they are retained much longer in body tissues of primary consumers. In contrast, the first-generation compounds are less acutely toxic and more rapidly metabolized and/or excreted (Housenger and Melendez 2012). Both classes have the same mode of action but second generation anticoagulants have a significantly longer liver half-life than first generation anticoagulants (Hartless and Jones 2011).

All anticoagulant rodenticides are highly acutely toxic to mammals and birds. Exposure may occur through direct ingestion of the active ingredient in bait or by secondary ingestion (i.e., consumption of poisoned prey by scavengers or predators). Residential treatments involve bait station deployment generally within 50 feet of a man-made structure including homes. Bait stations are both tamper-proof and are anchored to treatment locations (e.g., wires, stakes) to ensure that they cannot be dragged away by wildlife. In addition, the wax blocks in bait stations have small openings that prevent the entrance and exposure to nonrodent mammals (e.g., squirrels, skunks, etc.) and do not leach rodenticide material into water. Residents are properly educated regarding the location of deployed tamper-proof bait stations and potential risks to children and pets. The anticoagulant rodenticides (bromadiolone and difethialone) that have been selected for further evaluation in Appendix B and listed in Table 5-8 are discussed individually below.

Bromadiolone

Bromadiolone is generally applied as food bait blocks or pellets. This second-generation rodenticide is highly toxic to mammals, including humans, domestic pets, and nontarget mammalian wildlife. Bromadiolone is often found in the tissues of wildlife, including avian and mammalian predators. Mortalities of raptors have been associated with secondary bromadiolone poisoning.

The District uses bromadiolone in both sewers and aboveground terrestrial environments. When deployed in sewers, bromadiolone blocks are sometimes attached to a string and hung below manhole covers. This method of bait deployment reduces the probability of exposure (by multiple routes) to humans and nontarget wildlife, especially dietary exposure (ingestion route) to ground-foraging birds and mammals. In addition, this rodenticide causes rapid mortality of targeted rats; therefore, poisoned individuals tend to expire in the sewers and not represent prey for secondary consumers in the terrestrial environment.

Outside of sewers, bromadiolone is typically contained in tamper-proof bait stations, which are most frequently deployed along urban creek corridors, Residential treatments involve bait station deployment generally within 100 feet of homes. Bait stations are anchored to treatment locations (e.g., wires, stakes) to ensure that they cannot be dragged away by wildlife. This use would not be likely to conflict with HCPs/NCCPs, but to the extent a conflict could exist, bromadiolone would not be used. In addition, bait stations have small openings that prevent the entrance and exposure to nonrodent mammals (e.g., squirrels, skunks, etc.). Residents are properly educated regarding the location of deployed tamper-proof bait stations and potential risks to children and pets.

Bromadiolone is a single-dose rodenticide that when used properly (such as in the absence of food competition) causes rapid knock-down of rat populations and has very limited potential to result in exposure to humans and nontarget wildlife. If nontarget terrestrial individuals consume the dead rodents as prey items, there is a potential for the loss of that nontarget individual but the infrequent loss of one or even a few individuals in urban areas does not substantially affect the size, distribution, and/or viability of populations. Special-status or native species are not generally affected, however, because the rodenticides are not used in wildlife refuges or habitat conservation areas where these species are known or likely to occur. Any aboveground use of bromadiolone will continue to be deployed in bait stations meeting the official criteria for “tamper-resistant bait stations” as described by the USEPA (2008a) (https://www.epa.gov/rodenticides/ rodent-control-pesticide-safety-review), and improved bait stations

meeting these criteria would be considered as they are developed and become available. Based on toxicity, environmental fate, and usage patterns, and District BMPs H15 and H16, bromadiolone is not likely to result in substantial impacts to nontarget terrestrial organisms.

Difethialone

Difethialone is generally applied as food bait blocks or pellets. This second-generation rodenticide is highly toxic to mammals, including humans, domestic pets, and nontarget mammalian wildlife. Difethialone is often found in the tissues of wildlife, including avian and mammalian predators. Difethialone has been categorized as "likely to adversely affect" several species of sensitive California wildlife and registered uses of difethialone exceed the Level of Concern for both primary and secondary exposure. Indirect effects to habitat have been suggested for areas where difethialone is used for pest control (Housenger and Melendez 2012). There is the potential for its use in terrestrial habitats to conflict with existing HCPs/NCCPs, so this product would not be used in those areas.

The District would apply difethialone around urban creeks, at edges of public property, and landscaping within 100 feet of a man-made structure. Application typically occurs in fall, winter, and spring. The functionality and quality of habitat for both special-status and nontarget species would not be altered substantially. Difethialone poses a risk of potential impact to nontarget terrestrial organisms. However, the District would minimize this risk by placing difethialone baits in tamper-proof bait stations, which are also anchored at treatment locations (e.g., wires, stakes) to ensure that they cannot be dragged away by wildlife. To minimize the dead rodent being consumed by nontarget wildlife (secondary consumption), difethialone products are not used in wildlife refuges or habitat conservation areas where special-status and native species are known or likely to occur. Therefore, the potential loss of wildlife individuals in urban creek corridors does not substantially affect the size, distribution, and/or viability of populations of special-status or native species. The impact to nontarget wildlife is less than significant. Consequently, this use primarily in residential and commercial areas would not be likely to conflict with HCPs/NCCPs. The District would provide public outreach regarding their practices, such as educating citizens about the locations of deployed bait stations and potential risks to pets and children.

The District does not currently use difethialone. If the District were to use difethialone in the future, it would be deployed in bait stations meeting the official criteria for "tamper-resistant bait stations" as described by the USEPA (2008a) (https://www.epa.gov/rodenticides/rodent-control-pesticide-safety-review). Improved bait stations meeting these criteria would be considered as they are developed and become available. Based on toxicity, environmental fate, and usage patterns, use of difethialone as part of the District Program, incorporating BMPs H15 and H16, would result in minimal potential for exposure and impacts to nontarget ecological receptors, including birds and small mammals.

Central Nervous System Toxin (Bromethalin)

Bromethalin is used to kill rodents that have become resistant to anticoagulants. Because its name resembles that of the anticoagulant baits bromadiolone and brodifacoum, bromethalin is often mistaken for anticoagulant bait (Dunayer 2003). Bromethalin is highly toxic to mammals and birds. However, toxicological data indicate that bromethalin bait is safer for predators because the delayed action allows the target species to survive while the neurological effect takes place and the chemical concentration decreases. Bromethalin is considered safer to the environment, and some bromethalin products meet the USEPA's new, more protective risk reduction standards. When applied properly, these products present a lower risk of accidental exposure to children, pets, and wildlife. They are applied in tamper-resistant and weather-resistant bait stations, which limit the exposure of nontarget animals (USEPA 2013a) and minimize the potential for conflicts with existing HCPs/NCCPs.

Sterol (Cholecalciferol)

Cholecalciferol is a sterol (Vitamin D3) and its ingestion results in hypercalcemia from mobilization of calcium from bone matrix into blood plasma leading to metastatic calcification of soft tissues (Clock-Rust and Sutton 2011). Often, use of this compound requires "prebaiting" prior to addition of the chemical to rat bait to achieve adequate bait acceptance. Although it is highly toxic to target rodents, cholecalciferol is considered of low hazard to nontarget animals such as birds or domestic dogs. Cholecalciferol would involve bait station deployment generally within 100 feet of homes. The District does not currently use cholecalciferol, but if used in the future, bait stations would be anchored to treatment locations (e.g., wires, stakes) to ensure that they cannot be dragged away by wildlife, and this reduces the potential to impact terrestrial habitats or conflict with HCPs/NCCPs. In addition, bait stations have small openings that prevent the entrance and exposure to nonrodent mammals (e.g., squirrels, skunks, etc.). Residents would be properly educated regarding the location of deployed tamper-proof bait stations and potential risks to children and pets.

Fumigants

Sulfur is one of the active ingredients in fumigant (gas-producing) cartridge products, which are used for rodent control on lawns, golf courses, and in gardens. Carbon, sodium and potassium nitrates, sawdust, and sulfur are used in the pyrotechnic fumigant gas-producing cartridge products. After the cartridges are ignited, they produce toxic gases that cause asphyxiation of the pests in burrows. These toxic gases, not the active ingredients, are the stressors for these products. The gases displace the oxygen in the burrows, creating an unbreathable atmosphere, causing asphyxiation of the target organisms (USEPA 2008b).Elemental sulfur, when applied as a pesticide, will become incorporated into the natural sulfur cycle. The main processes and dissipation of elemental sulfur are oxidation into sulfate and reduction into sulfide. These processes are mainly mediated by microbes (USEPA 2008b). Sulfur is nontoxic to mammals, birds, and bees.

Sodium nitrate fumigants work by the combustion of charcoal in the formulation of each product. Pyrolysis of these sodium nitrate products results in simple organic and inorganic compounds, mostly in the form of gases such as nitrous oxide and carbon monoxide, which eventually diffuse through burrow openings or into the soil causing organisms to die of asphyxiation (USEPA 1991a). Sodium nitrates are naturally occurring substances and exposure of the environment is limited and localized when the products are used as fumigants in burrows (USEPA 1991b). Sodium nitrate is nontoxic to mammals, birds, and bees.

However, even when used as indicated by the product label, any organism inside of a treated burrow would likely be killed by the toxic fumes of either of these fumigants. The nonselective nature of this pesticide is particularly problematic when protected species are present in a burrow. Nontarget protected species such as burrowing owls often inhabit pest burrows and may be at risk (Keefover-Ring 2009). **As part of the District's proposed future use plan for rodent control, fumigants would not be applied by the District to burrows when any evidence exists of nontarget, sensitive, or special-status animal presence or in areas managed by HCPs/NCCPs.** The District does not currently use fumigants, but if used in the future, would employ its BMPs to determine the presence of sensitive or special-status species in areas to be treated and determine whether or not the use of fumigants is appropriate (Section 2.8.2). These practices reduce or eliminate the potential exposure of sensitive or special-status species and substantially avoid conflicts with existing HCPs/NCCPs.

> **Impact TR-28**: The Chemical Control Component's use of anticoagulant and other rodenticides would have a **less-than-significant** impact, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special-status species. No mitigation is required.

5.2.7.2 Impacts to Habitats

The Chemical Control Component would not affect the quantity or distribution of habitats, such as riparian areas, marshes, lakes or ponds, seasonal wetlands, or other habitat types identified in local or regional plans, policies, or regulations, or by the CDFW or USFWS. This component would not affect the composition of their vegetative communities, as the pesticides used would not be expected to affect plants or their physical or hydrologic attributes. This component would not result in ground-disturbing activity and, therefore, would not result in any removal, filling, or hydrologic interruption of federally protected wetlands (including, but not limited to, marsh, vernal pool, coastal, etc.).

> **Impact TR-29.** The Chemical Control Component would have **no impact** on any riparian habitat or other sensitive natural community.

> **Impact TR-30.** The Chemical Control Component would have **no impact** on federally protected wetlands as defined by CWA Section 404.

5.2.7.3 Effects on Movement and Migration

Any disruption of migration patterns would be due to the presence of personnel and machinery in the environment. In all cases this occurrence would be very short term, generally not more than a few hours in any given location and, therefore, this effect would be minimal, would have little effect on the movement of wildlife, and would not affect wildlife migration corridors or nursery areas, as no physical disturbance would occur. Nor would it impact any native resident or migratory wildlife corridors or impede the use of native wildlife nursery sites.

> **Impact TR-31.** The Chemical Control Component would have a **less-than-significant** impact on the movement of any native resident or migratory fish or wildlife species. No mitigation is required.

5.2.7.4 Conflict with Local Ordinances

The county and city general plans and their goals and policies pertaining to natural resources are protective of terrestrial resources and focused on conservation of existing resources including mature trees and important woodland communities. Chemical control activities would not result in the conversion of natural habitats to other land uses or in the long-term or permanent dislocation of plant and animal species from natural areas except indirectly for mosquitoes and vectors of disease and discomfort. The Program would not affect trees more than 4 inches diameter breast height and, therefore, would not conflict with any tree ordinances.

> **Impact TR-32.** The Chemical Control Component would have **no impact** on local policies or ordinances protecting terrestrial resources.

5.2.7.5 Conflict with Conservation Plans

One conservation plan, the San Bruno Mountain HCP located in San Mateo County, was identified whose action area is within the District's primary Service Area. This HCP addresses impacts to three endangered species: San Bruno elfin butterfly, mission blue butterfly, and SFGS over 3,500 acres on San Bruno Mountain for a duration of 30 years.

The District conducts limited control operations within the area covered by this HCP on San Bruno Mountain, which has no aquatic habitat to breed mosquitoes; and it is unlikely that the District's mosquito control activities would occur within this HCP's boundaries. However, control for ticks, yellow jackets, wasps, and rodents may involve accessing portions of the mountain in close proximity to roads and adjacent hiking trails and residences. ATV use for control would be avoided. The District coordinates control activities at the mountain/developed area interface with the County Department of Parks. All work is done on foot.

The District regularly communicates with and works collaboratively with representatives from agencies such as RWQCB, USEPA, USACE, CDFW, and USFWS. The District receives training from agency staff and independent biologists (e.g., CDFW, USACE) to minimize impacts and conducts annual field training for field staff regarding precautionary and avoidance measures related to seasonal wetland and wetland habitats, but this habitat is not present on San Bruno Mountain. While District activities may occur within the boundaries of some conservation areas, these activities are coordinated with the plan managers and would not conflict with the provisions of any adopted HCP, NCCP, or other approved local, regional, or state habitat conservation plan.

Eleven conservation plans affect portions of adjacent counties. District activities are typically not among those covered by these HCPs. When called into these adjacent counties to perform work, the District would operate under the auspices of the affected county or that county's mosquito and vector control district and in compliance with their practices and permits, including compliance with all active HCP/NCCPs. Therefore, the District activities would not be in conflict with the provisions of any adopted HCP, NCCP, or other approved local, regional, or state-approved conservation plan.

> **Impact TR-33**. The Chemical Control Component would have a **less-than-significant** impact on adopted HCPs or NCCPs. No mitigation is required.

5.2.8 Other Nonchemical Control/Trapping Component

The trapping of rodents is conducted as part of disease surveillance/testing programs and may be utilized for surveillance and egregious situations regarding commensal rodents (e.g., roof rats and Norway rats) in the future. Rodent trapping is not and will not be performed routinely as a mass trapping control measure. Trapping of yellow jackets is generally ineffective at population control, and the landowner is advised that it is better to seek out and treat the nest. The District does not remove rats or yellow jackets that are in or on structures. When these requests for service are made, residents are referred to a private pest control company. Trapping is used for the removal of nuisance wildlife such as raccoons, skunks, and opossums when these animals pose a threat to public health and safety. While it is conceivable that nontarget wildlife could be inadvertently trapped, the District would conduct limited trapping and employs mechanisms and baits specific to target vectors to reduce the potential impacts to nontarget species.

Trapping of yellow jackets would not be expected to have any effect on special-status species or their habitats, as these traps are highly localized, self-contained, and inaccessible to these species.

Rodent trapping may also be performed in more rural settings to collect blood samples to test for disease. Traps for rodents are designed for small mammals and baited to attract the target species. These traps are usually not deployed in areas where special-status mammals occur. When trapping is required, the District consults with the CDFW and USFWS and obtains all appropriate environmental clearances and permits for trapping. All animals captured have a blood sample taken for testing and are released. A report of animals captured and released is filed in accordance with permit requirements. These traps are highly unlikely to attract special-status birds, reptiles or amphibians, and even more unlikely to capture special-status species. As described in Section 2.3.1.4, rodent disease surveys in the county have been routinely performed by the US Public Health Service and County Department of Environmental Health since 1942; since 1999, the District has been responsible for conducting these surveys. In the past eighteen years of conducting live-trap rodent surveys, nontarget animals have been trapped infrequently, immediately released on-site, and mortality to these species has been rare.

The placement and operation of all traps included in the Trapping Component would not change the amount or physical properties of any type of habitat or alter the hydrology in any way. They would not impair migration or alter migratory corridors or nursery sites.

5.2.8.1 Impacts to Special-Status Species

The Other Nonchemical Control/Trapping Component would have a less-than-significant impact on terrestrial wildlife including terrestrial species identified as a candidate, sensitive, or special-status species in local or regional plans, policies, or regulations, or by the CDFW or USFWS. Trapping is limited in scope and performed only when vectors pose a threat to public health and welfare. It is implemented most often in areas unlikely to support special-status species, and traps are baited to attract the target vector species to avoid trapping other animals. General BMPs contained in Table 4-5 serve to minimize or avoid impacts associated with vehicle used to place and collect the traps.

> **Impact TR-34.** The Other Nonchemical Control/Trapping Component would have a **less-than-significant** impact, either directly or through habitat modifications, on any terrestrial species identified as a candidate, sensitive, or special-status species. No mitigation is required.

5.2.8.2 Impacts to Habitats

This component would not affect the quantity or distribution of habitats, such as riparian areas, marshes, lakes or ponds, seasonal wetlands, or other habitat types or sensitive natural communities identified in local or regional plans, policies, or regulations, or by the CDFW or USFWS. Trapping would not affect the composition of their vegetative communities, as the placement of traps and baits would not affect plants. This component would not result in ground-disturbing activity and, therefore, would not result in any removal, filling, or hydrologic interruption of federally protected wetlands (including, but not limited to, marsh, vernal pool, coastal, etc.).

> **Impact TR-35.** The Other Nonchemical Control/Trapping Component would have **no impact** on any riparian habitat or other sensitive natural community.

> **Impact TR-36.** The Other Nonchemical Control/Trapping Component would have **no impact** on federally protected wetlands as defined by CWA Section 404.

5.2.8.3 Effects on Movement and Migration

Any disruption of migration patterns would be due to the presence of personnel to set traps in the environment. In all cases, this occurrence would be very short term, generally not more than a few hours in any given location and, therefore, this effect would be minimal, would have little effect on the movement of wildlife, and would not affect wildlife migration corridors or nursery areas, as no physical disturbance would occur.

> **Impact TR-37.** The Other Nonchemical Control/Trapping Component would have **no impact** on the movement of any native resident or migratory fish or wildlife species.

5.2.8.4 Conflict with Local Ordinances

The county and city general plans and their goals and policies pertaining to natural resources are protective of terrestrial resources and focused on conservation of existing resources including mature trees and important woodland communities. Trapping activities would not result in the conversion of natural habitats to other land uses or in the long-term or permanent dislocation of plant and animal species from natural areas except indirectly for vectors of disease and discomfort. The Program would not affect trees more than 4 inches diameter breast height and, therefore, would not conflict with any tree ordinances.

> **Impact TR-38.** The Other Nonchemical Control/Trapping Component would have **no impact** on local policies or ordinances protecting terrestrial resources.

5.2.8.5 Conflict with Conservation Plans

One conservation plan, the San Bruno Mountain HCP located in San Mateo County, was identified whose action area is within the District's primary Service Area. This HCP addresses impacts to three endangered species: San Bruno elfin butterfly, mission blue butterfly, and SFGS over 3,500 acres on San Bruno Mountain for a duration of 30 years.

The District conducts limited control operations within the area covered by this HCP on San Bruno Mountain, which has no aquatic habitat; and it is unlikely that the District's mosquito control activities would occur within this HCP's boundaries. However, control for ticks, yellow jackets, wasps, and rodents may involve accessing portions of the mountain in close proximity to roads and adjacent hiking trails and residences. ATV use for access would be avoided.

The District regularly communicates with and works collaboratively with representatives from agencies such as RWQCB, USEPA, USACE, CDFW, and USFWS. The District receives training from agency staff and independent biologists (e.g., CDFW, USACE) to minimize impacts and conducts annual field training for field staff regarding precautionary and avoidance measures related to seasonal wetland and wetland habitats, but this habitat is not present on San Bruno Mountain. While District activities may occur within the boundaries of conservation areas, these activities are coordinated with the plan managers and would not conflict with the provisions of any adopted HCP, NCCP, or other approved local, regional, or state habitat conservation plan.

Eleven conservation plans affect portions of adjacent counties. District activities are typically not among those covered by these HCPs. When called into these adjacent counties to perform work, the District would operate under the auspices of the affected county or that county's mosquito and vector control district and in compliance with their practices and permits, including compliance with all active HCP/NCCPs. Therefore, the District activities would not be in conflict with the provisions of any adopted HCP, NCCP, or other approved local, regional, or state-approved conservation plan.

> **Impact TR-39**. The Nonchemical Control/Trapping Component would have **no impact** on adopted HCPs or NCCPs.

5.2.9 Public Education

District activities to teach landowners how to avoid creating vector control problems primarily relate to the Physical Control and Vegetation Management Components. The District may advise landowners and homeowners about the importance of dumping/inverting of containers holding water, controlling vegetation against structures, and avoiding stagnant ponds by ensuring water drains correctly into storm sewers. In situations where any potential exists for sensitive habitats or special-status species to be present, the District includes information and contact data for resource agencies and potential permits. Therefore, public education activities would have no impact on the environment.

5.2.10 Environmental Impacts Summary

The Surveillance, Physical Control, Vegetation Management (including herbicide use), Biological Control, and Other Nonchemical Control/Trapping components are expected to have less-than-significant to no impact on terrestrial resources (Table 5-14). The Chemical Control Component (including the mosquito larvicide, mosquito adulticide, yellow jacket pesticide, and rodenticide application scenarios [under existing BMPs]) is expected to have only minimal to no impacts to nontarget terrestrial resources, and impacts are expected to be less than significant. Therefore, when all of the impacts of the components are combined, for both existing and future activities, the overall Proposed Program's impacts on terrestrial environments are less than significant or have no impact.

The impacts to terrestrial resources associated with just the future activities are summarized below based on the analyses contained previously in all of the Sections 5.2.4 through 5.2.8. Future activities under consideration do not add any significant impacts to terrestrial resources, and all of the impacts associated with their use are less than significant.

> Under the Vegetation Management Component, the District could expand the use of physical methods of controlling vegetation on land to minimize vector breeding habitat. This expansion of activity would have a less-than-significant impact, similar to the Existing Program.

> Under the Vegetation Management Component, the following additional herbicide active ingredients are under consideration for future use: dithiopyr, glyphosate, imazapyr, oryzalin, triclopyr (TEA), dimethyl tetrachloroterephthalate (DCPA), polymeric colorant, modified vegetable oil, dithiopyr, benefin and oryzalin, sulfometuron methyl, alkyl phenol ethoxylate, isopropanol, and fatty acids. Just as for the Existing Program, all of the impacts to aquatic resources are either “no impact” or “less-than-significant” impact.

> Under the Chemical Control Alternative, the types of chemicals (different formulations) under consideration for future use by active ingredient are:

- Adulticides: permethrin and PBO, naled, pyrethrins and PBO, sumithrin and PBO, prallethrin and PBO, deltamethrin, and resmethrin and PBO
- Yellow Jacket Wasp: potassium salts of fatty acids; esfenvalerate; resmethrin; lambda-cyhalothrin; etophenprox, tetramethrin, and PBO
- Tick: permethrin and pyrethrin
- Rat: cholecalciferol, bromadiolone, difethialone, sodium nitrate and sulfur fumigants, brodifacoum, chlorophacinone, sodium nitrate, bromadiolone, bromethalin, and cholecalciferol

The use of pesticides containing all active ingredients under consideration for future use by the District would have either no impact or a less-than-significant impact on terrestrial resources, similar to the Existing Program.

The Existing Program uses a variety of ground surveillance and application equipment, water surveillance and application equipment, and aerial application equipment using only helicopters to treat large source areas of 100 to 3,000 acres by contracting with an aerial application service. The future Program could add fixed-wing aircraft to aerial application equipment for adulticide applications in large areas if needed. The impact of fixed-wing aircraft use is similar to helicopter use, a less-than-significant impact to aquatic species and habitats. Also, the District could add the use of a piece of heavy equipment such as an excavator or a tractor for future use for ground-based physical control and vegetation management. Similar to existing equipment use, this new equipment would have a less-than-significant impact on aquatic resources.

Table 5-14 Summary of Biological Resources - Terrestrial Impacts by Technical Component

Impact Statement	Surveillance	Physical Control	Vegetation Management	Biological Control	Chemical Control	Other Nonchemical/ Trapping
Effects on Biological Resources - Terrestrial						
Impact TR-1. The Surveillance Component would have a **less-than-significant** impact, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special-status species. No mitigation is required.	LS	na	na	na	na	na
Impact TR-2. The Surveillance Component would have a **less-than-significant** impact on riparian habitat or other sensitive natural communities. No mitigation is required.	LS	na	na	na	na	na
Impact TR-3. The Surveillance Component would have a **less-than-significant** impact on federally protected wetlands as defined by Section 404 of the Clean Water Act. No mitigation is required.	LS	na	na	na	na	na
Impact TR-4. The Surveillance Component would have **no impact** on the movement of any native resident or migratory fish or wildlife species, nor would it impact any native resident or migratory wildlife corridors or impede the use of native wildlife nursery sites.	N	na	na	na	na	na
Impact TR-5. The Surveillance Component would have **no impact** on local policies or ordinances protecting biological resources.	N	na	na	na	na	na
Impact TR-6. The Surveillance Component has a **less-than-significant** impact on any adopted HCPs or NCCPs. No mitigation is required.	LS	na	na	na	na	na
Impact TR-7. The Physical Control Component, would have a **less-than-significant** impact, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special-status species. No mitigation is required.	na	LS	na	na	na	na
Impact TR-8. The Physical Control Component would have a **less-than-significant** impact on any riparian habitat or other sensitive natural community. No mitigation is required.	na	LS	na	na	na	na

Impact Statement	Surveillance	Physical Control	Vegetation Management	Biological Control	Chemical Control	Other Nonchemical/ Trapping
Impact TR-9. The Physical Control Component would have a **less-than-significant** impact on federally protected wetlands as defined by CWA Section 404. No mitigation is required.	na	LS	na	na	na	na
Impact TR-10. The Physical Control Component would have a **less-than-significant** impact on the movement of any native resident or migratory fish or wildlife species. No mitigation is required.	na	LS	na	na	na	na
Impact TR-11. The Physical Control Component would have **no impact** on local policies or ordinances protecting terrestrial resources.	na	N	na	na	na	na
Impact TR-12. The Physical Control Component would have a **less-than-significant** impact on adopted HCPs or NCCPs. No mitigation is required.	na	LS	na	na	na	na
Impact TR-13. The Vegetation Management Component would have a **less-than-significant** impact, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special-status species. No mitigation is required.	na	na	LS	na	na	na
Impact TR-14. The Vegetation Management Component would have a **less-than-significant** impact on any riparian habitat or other sensitive natural community. No mitigation is required.	na	na	LS	na	na	na
Impact TR-15. The Vegetation Management Component would have a **less-than-significant** impact on federally protected wetlands as defined by CWA Section 404. No mitigation is required.	na	na	LS	na	na	na
Impact TR-16. The Vegetation Management Component would have a **less-than-significant** impact on the movement of any native resident or migratory fish or wildlife species. No mitigation is required.	na	na	LS	na	na	na
Impact TR-17. The Vegetation Management Component would have **no impact** on local policies or ordinances protecting terrestrial resources.	na	na	N	na	na	na

Impact Statement	Surveillance	Physical Control	Vegetation Management	Biological Control	Chemical Control	Other Nonchemical/ Trapping
Impact TR-18. The Vegetation Management Component would have a **less-than-significant** impact on adopted HCPs or NCCPs. No mitigation is required.	na	na	LS	na	na	na
Impact TR-19. The Biological Control Component would have **no impact,** either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special-status species.	na	na	na	N	na	na
Impact TR-20. The Biological Control Component would have **no impact** on any riparian habitat or other sensitive natural community.	na	na	na	N	na	na
Impact TR-21. The Biological Control Component would have **no impact** on federally protected wetlands as defined by CWA Section 404.	na	na	na	N	na	na
Impact TR-22. The Biological Control Component would have **no impact** on the movement of any native resident or migratory fish or wildlife species.	na	na	na	N	na	na
Impact TR-23. The Biological Control Component would have **no impact** on local policies or ordinances protecting biological resources.	na	na	na	N	na	na
Impact TR-24. The Biological Control Component would have **no impact** on approved HCPs, NCCPs, or local conservation plans.	na	na	na	N	na	na
Impact TR-25: The Chemical Control Component's mosquito larvicides would have a **less-than-significant** impact, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special-status species. No mitigation is required.	na	na	na	na	LS	na
Impact TR-26: The Chemical Control Component's mosquito adulticides and synergists would have a **less-than-significant** impact, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special-status species. No mitigation is required.	na	na	na	na	LS	na

Impact Statement	Surveillance	Physical Control	Vegetation Management	Biological Control	Chemical Control	Other Nonchemical/ Trapping
Impact TR-27: The Chemical Control Component's use of pyrethrin, pyrethroids, pyrethroid-like pesticides, lambda-cyhalothrin, and potassium salts for yellow jacket wasp and/or tick control would have a **less-than-significant** impact, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special-status species. No mitigation is required.	na	na	na	na	LS	na
Impact TR-28: The Chemical Control Component's use of anticoagulant and other rodenticides would have a **less-than-significant** impact, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special-status species. No mitigation is required.	na	na	na	na	LS	na
Impact TR-29. The Chemical Control Component would have **no impact** on any riparian habitat or other sensitive natural community.	na	na	na	na	N	na
Impact TR-30. The Chemical Control Component would have **no impact** on federally protected wetlands as defined by CWA Section 404.	na	na	na	na	N	na
Impact TR-31. The Chemical Control Component would have a **less-than-significant** impact on the movement of any native resident or migratory fish or wildlife species. No mitigation is required.	na	na	na	na	LS	na
Impact TR-32. The Chemical Control Component would have **no impact** on local policies or ordinances protecting terrestrial resources.	na	na	na	na	N	na
Impact TR-33. The Chemical Control Component would have a **less-than-significant** impact on adopted HCPs or NCCPs. No mitigation is required.	na	na	na	na	LS	na

Impact Statement	Surveillance	Physical Control	Vegetation Management	Biological Control	Chemical Control	Other Nonchemical/ Trapping
Impact TR-34. The Other Nonchemical Control/Trapping Component would have a **less-than-significant** impact, either directly or through habitat modifications, on any terrestrial species identified as a candidate, sensitive, or special-status species. No mitigation is required.	na	na	na	na	na	LS
Impact TR-35. The Other Nonchemical Control/Trapping Component would have **no impact** on any riparian habitat or other sensitive natural community.	na	na	na	na	na	N
Impact TR-36. The Other Nonchemical Control/Trapping Component would have **no impact** on federally protected wetlands as defined by CWA Section 404.	na	na	na	na	na	N
Impact TR-37. The Other Nonchemical Control/Trapping Component would have **no impact** on the movement of any native resident or migratory fish or wildlife species.	na	na	na	na	na	N
Impact TR-38. The Other Nonchemical Control/Trapping Component would have **no impact** on local policies or ordinances protecting terrestrial resources.	na	na	na	na	na	N
Impact TR-39. The Nonchemical Control/Trapping Component would have **no impact** on adopted HCPs or NCCPs.	na	na	na	na	na	N

LS = Less-than-significant impact

N = No impact

na = Not applicable

SM = Potentially significant but mitigable impact

SU = Significant and unavoidable impact

5.2.11 Mitigation and Monitoring

Although most of the application scenarios are conducted using schedules that avoid periods when the nontarget receptors may be more sensitive to stresses (breeding and/or nesting, migration seasons, and known movements between habitats by small mammals and reptiles), the District conducts surveillance and monitoring of vector populations and treatment results on a routine basis. When the District receives information about vector outbreaks or unwanted population expansions, they are dealt with on a case-by-case basis, yet still following BMPs and acknowledging the HCPs and NCCPs whenever possible and feasible. The results of the pesticide application programs are constantly under surveillance and are monitored for total pesticide use, use per acre, timing of applications, and parameters affecting application scenarios.

No new mitigation measures are proposed, as no potentially significant impacts to terrestrial resources were identified.