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4 Biological Resources – Aquatic

This chapter evaluates the potential impacts of the Program alternatives on aquatic resources. These results are provided at a programmatic level. Section 4.1, Environmental Setting, presents an overview of the aquatic resources in the Program Area and vicinity.

Section 4.2, Environmental Impacts and Mitigation Measures, presents the following:

> Environmental concerns and evaluation criteria to determine whether the Program alternatives would cause significant impacts to aquatic resources

> Evaluation methods and assumptions

> Discussion of the impacts from the No Program and Program alternatives, and recommendations for mitigation, if required, for those impacts

> Mitigation measures summary

> Cumulative impacts

> A summary of environmental impacts

> Monitoring of recommended mitigation measures

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. Terrestrial resources are addressed in Chapter 5.

4.1 Environmental Setting

Section 4.1.1 identifies the zoogeographic provinces in the Alameda County Mosquito Abatement District's Program Area, Section 4.1.2 describes the special status aquatic species that have the potential to occur within the Program Area, and Section 4.1.3 provides an overview of federal, state, and local ordinances and regulations pertinent to these resources that are applicable to the Program. Section 4.1.4 identifies the Habitat Conservation Plans (HCPs) and Natural Community Conservation Plans (NCCPs) in the Program Area.

4.1.1 Aquatic Resources within the Program Area

The Program will be implemented within the District's Service Area, located in Alameda County, and in the Program Area which includes the adjacent counties of Contra Costa, San Joaquin, Stanislaus, and Santa Clara. This area encompasses a range of aquatic habitats and a diverse array of fish, amphibians, and other species that live a substantial portion of their lives in the water and breed in aquatic environments. Bird and mammals are included as terrestrial species and discussed in Chapter 5. The zoogeographic provinces and species assemblages presented in Moyle (2002) have been used to describe the areas where the Program activities and treatments would be implemented and are shown on Figure 4-1. The zoogeographic provinces are described in Appendix A.

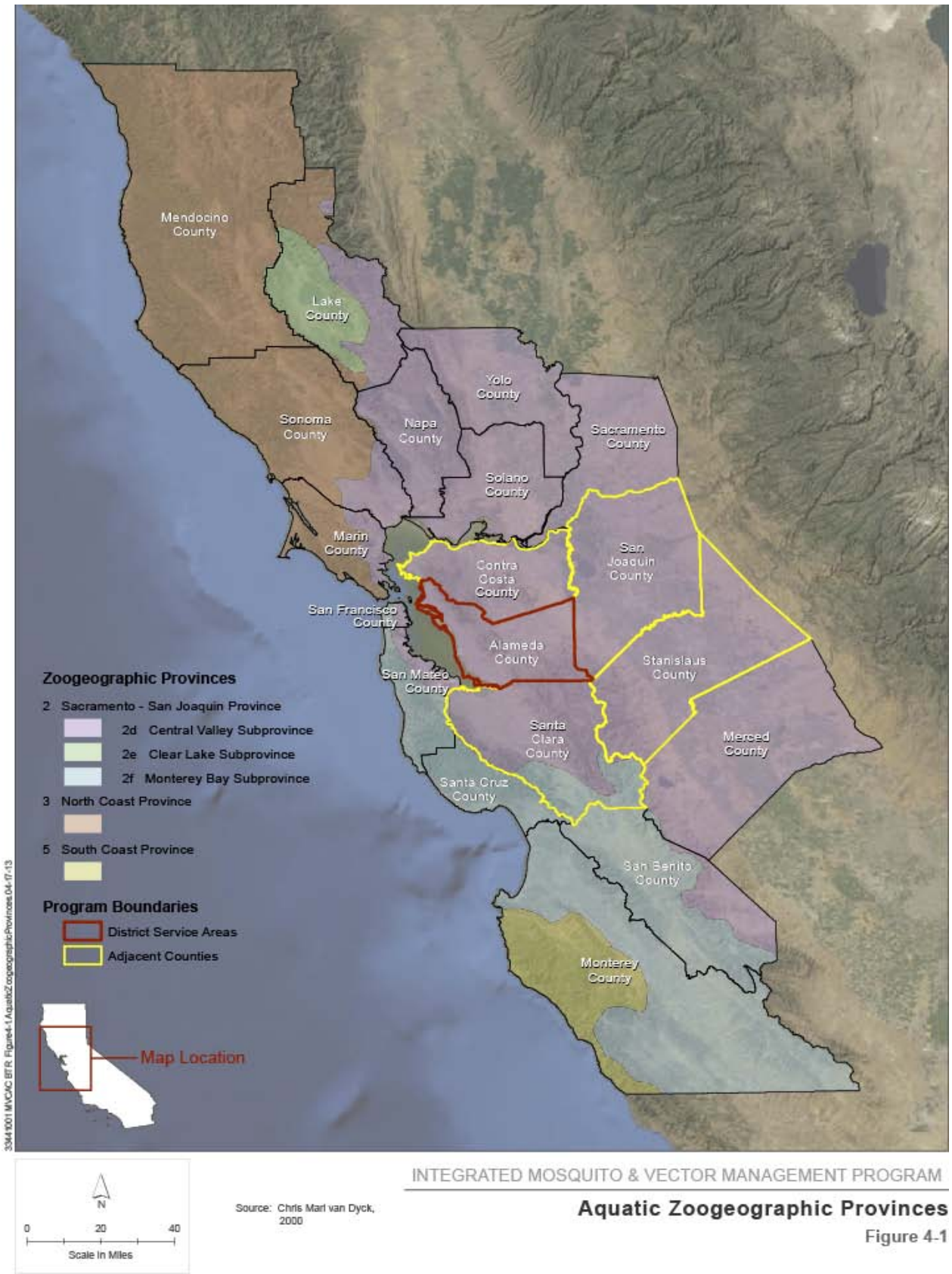

Figure 4-1 Aquatic Zoogeographic Provinces

Figure 4-1 BACK

To facilitate the evaluation of impacts and impact avoidance measures by habitat type, a consistent set of habitat types was developed for wetland areas (Table 4-1). Wetland habitat types were based on those developed as part of the Bayland Ecosystem Habitat Goals Project (Goals Project 1999). To better capture the habitats potentially affected by the project alternatives, habitat types were selected from both the Goals Project and the San Francisco Estuary Project, as reflected in the Goals Project document (1999). Marine/Brackish Open Water and Tidal Flat habitat types defined in the San Francisco Bay system would not be treated under the project and are not discussed further in this document. The last two categories in the table are artificial habitats that were not addressed in the Goals Project, but are important for consideration in the DEIR impact evaluations. In the case of Artificial Containers, Temporary Standing Waters and Ornamental Ponds, these habitats would not be expected to support special status species. Within the Water and Wastewater Management category, water treatment facilities and septic systems would not be expected to support substantial populations of special status species, but water discharged from these facilities may support special status species in down-stream or down-gradient areas. These species may move into these facilities from adjacent wetlands and waterways. Flood channels and ditches may provide seasonal habitat for special status species depending on the length of time these channels carry water and the characteristics of these channels.

Table 4-1 Aquatic and Wetland Habitat Types

Habitat	Description
Creeks and Rivers	Areas of flowing freshwater, although most downstream reaches may be influenced by tides.
Riparian Corridor	The trees, shrubs and other vegetation that grow along the edges of creeks and rivers. This vegetation is typically dependent on water from the river and forms an ecotone between the river and the surrounding uplands. May extend to broader riparian forest, where such exist.
Ponds and Lakes (includes stock and golf ponds that have natural bottoms)	Areas of still water that typically remain wet throughout the year.
Freshwater Marsh/Seeps	Freshwater areas that support reeds, rushes and other vegetation typical of wetlands.
Seasonal Wetlands (includes Vernal Pools)	Areas that support standing water for part of the year, but dry out during the summer months.
Lagoon	Area behind the mouth of a river or stream that has been closed off by sand or other material, but is at least sporadically subject to tidal action.
Tidal Marsh and channels	Vegetated wetland area subject to tidal action. Includes both salt and brackish marshes. Includes tidal channels that carry water into and away from the marsh during the tidal cycle.
Tidal Flats	Mud flats exposed during low tide that do not hold water throughout the day and do not support substantial vegetation. Occurs between Mean Lower Low Water (MLLW) and Mean Tide Level (MTL).
Open Water (Marine/Brackish)	Continuously inundated areas of San Francisco Bay. Exposed to current and wave action. Occurs below MLLW.
Water and Wastewater Management Facilities	Constructed channels, ponds and other facilities designed for the management of water or wastewater. May include natural or artificial bottoms. Includes flood control channels, agricultural and roadside ditches, retention basins, treatment ponds, winery waste ponds, wastewater treatment facilities, septic systems and all associated facilities.
Artificial Containers, Temporary Standing Waters and Ornamental Ponds	Artificial habitats that have little likelihood of supporting native plants and wildlife, including pots, ornamental ponds, tires, stormwater retention basins.

Source: Goals Project 1999

Each of these habitat types may be affected by one or more of the Program Alternatives, as indicated in Table 4-2. The Program Alternatives are described in Chapter 2 and the BMPs that would be applied to avoid and minimize potential impacts are provided in Table 2-6.

Table 4-2 Wetland and Aquatic Habitat Types Potentially Affected by each Program Alternative

	Surveillance	Physical Control	Vegetation Management	Biological Control	Chemical Control
Creeks and Rivers	X	X	X		X
Riparian Corridor	X		X		X
Ponds and Lakes	X	X	X		X
Freshwater Marsh/Seeps	X	X	X		X
Seasonal Wetlands (includes Vernal Pools)	X	X	X		X
Lagoon	X	X	X		X
Tidal Marsh and channels	X	X	X		X
Water and Wastewater Management Facilities	X	X	X		X
Artificial Containers, Temporary Standing Waters and Artificial Ponds	X	X	X	X	X

4.1.2 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 of California. Brief life-history descriptions for special status species represented in Appendix A, Attachment A. Plant species are listed for the District in Table 4-3, while animal species are listed in Table 4-4. These tables also show the habitat types these species are likely to utilize. Because some species occur in both wetland and upland habitat types, all habitat types are included in this table. Upland habitat types are described in Chapter 5.

Table 4-3 California Natural Diversity Database Occurrences for Plant Species in Alameda County Mosquito Abatement District and its Adjacent Program Area

Species Name	Status	Habitat	ACMAD	ACMAD adjacent	Upland Habitats							Wetland Habitats										
					Coniferous 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)	Freshwater Marsh/Seeps	Riparian Corridor	Artificial Containers, Temporary Standing Waters and Artificial Ponds	Water and Wastewater Management Facilities
Sharsmith's onion *Allium sharsmithiae*	RPR, 1B	Cismontane woodland. Rocky, serpentine slopes. 400-1200 m.	●						●													
Large-flowered fiddleneck *Amsinckia grandiflora*	FE, SE, RPR, 1B	Cismontane woodland, valley and foothill grassland. Annual grassland in various soils. 275-550 m.	●	●				●														
Bent-flowered fiddleneck *Amsinckia lunaris*	RPR, 1B	Cismontane woodland, valley and foothill grassland. 50-500 m.	●	●			●															
Slender silver moss *Anomobryum julaceum*	RPR 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.		●	●	●																
Anderson's manzanita *Arctostaphylos andersonii*	RPR, 1B	Broadleaved upland forest, chaparral, north coast coniferous forest. Open sites, redwood forest. 180-800 m.		●	●		●															
Mt. Diablo manzanita *Arctostaphylos auriculata*	RPR, 1B	Chaparral. In canyons and on slopes. On sandstone. 120-500 m.		●			●															
Contra Costa manzanita *Arctostaphylos manzanita* ssp. *laevigata*	RPR, 1B	Chaparral. Rocky slopes. 500-1100 m.		●			●															
Pallid manzanita *Arctostaphylos pallida*	FT, SE, RPR, 1B	Broadleafed upland forest, closed-cone coniferous forest, chaparral, cismontane woodland, coastal scrub. Grows on uplifted marine terraces on siliceous shale or thin chert. May require fire. 185-465 m.	●	●	●		●															
Kings Mountain manzanita *Arctostaphylos regismontana*	RPR, 1B	Broadleaved upland forest, chaparral, north coast coniferous forest. Granitic or sandstone outcrops. 305-730 m.		●	●		●															
Alkali milk-vetch *Astragalus tener* var. *tener*	RPR, 1B	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.	●	●				●										●				

Table 4-3 California Natural Diversity Database Occurrences for Plant Species in Alameda County Mosquito Abatement District and its Adjacent Program Area

Species Name	Status	Habitat	ACMAD	ACMAD adjacent	Upland Habitats							Wetland Habitats										
					Coniferous 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)	Freshwater Marsh/Seeps	Riparian Corridor	Artificial Containers, Temporary Standing Waters and Artificial Ponds	Water and Wastewater Management Facilities
Heartscale *Atriplex cordulata* var. *cordulata*	RPR, 1B	Chenopod scrub, valley and foothill grassland, meadows. Alkaline flats and scalds in the Central Valley, sandy soils. 1-150(600)m.	●	●			●	●														
Brittlescale *Atriplex depressa*	RPR, 1B	Chenopod scrub, meadows, playas, valley and foothill grassland, vernal pools. Usually in alkali scalds or alk. clay in meadows or annual grassland; rarely associate with riparian, marshes, or v.p's. 1-320 m.	●	●			●	●										●				
San Joaquin spearscale *Atriplex joaquinana*	RPR, 1B	Chenopod scrub, alkali meadow, valley and foothill grassland. In seasonal alkali wetlands or alkali sink scrub with *Distichlis Spicata*, *Frankenia*, etc. 1-250 m.	●	●			●	●														
Lesser saltscale *Atriplex minuscula*	RPR, 1B	Chenopod scrub, playas, valley and foothill grassland. In alkali sink and grassland in sandy, alkaline soils. 20-100 m.	●				●	●														
Big-scale balsamroot *Balsamorhiza macrolepis*	RPR, 1B	Valley and foothill grassland, cismontane woodland. Sometimes on serpentine. 35-1000 m.	●	●		●		●	●													
Big tarplant *Blepharizonia plumosa*	RPR, 1B	Valley and foothill grassland. Dry hills and plains in annual grassland. Clay to clay-loam soils; usually on slopes and often in burned areas. 15-455 m.	●	●				●														
Watershield *Brasenia schreberi*	RPR 2	Freshwater marshes and swamps. Aquatic from water bodies both natural and artificial in California.		●															●			
Round-leaved filaree *California macrophylla*	RPR, 1B	Cismontane woodland, valley and foothill grassland. Clay soils. 15-1200 m.	●	●		●		●														
Mt. Diablo fairy-lantern *Calochortus pulchellus*	RPR, 1B	Chaparral, cismontane woodland, riparian woodland, valley and foothill grassland. On wooded and brushy slopes. 200-800 m.	●	●			●	●														
Santa Cruz Mountains pussypaws *Calyptridium parryi* var. *hesseae*	RPR, 1B	Chaparral, cismontane woodland. Sandy or gravelly openings. 305-1530 m.		●	●		●															
Coastal bluff morning-glory *Calystegia purpurata* ssp. *saxicola*	RPR, 1B	Coastal dunes, coastal scrub. 15-105 m.		●			●			●												

Table 4-3 California Natural Diversity Database Occurrences for Plant Species in Alameda County Mosquito Abatement District and its Adjacent Program Area

Species Name	Status	Habitat	ACMAD	ACMAD adjacent	Upland Habitats							Wetland Habitats										
					Coniferous 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)	Freshwater Marsh/Seeps	Riparian Corridor	Artificial Containers, Temporary Standing Waters and Artificial Ponds	Water and Wastewater Management Facilities
Chaparral harebell *Campanula exigua*	RPR, 1B	Chaparral. Rocky sites, usually on serpentine in chaparral. 300-1250 m.	●	●			●		●													
Sharsmith's harebell *Campanula sharsmithiae*	RPR, 1B	Chaparral. Serpentine barrens. 490-855 m.		●			●		●													
Bristly sedge *Carex comosa*	RPR 2	Marshes and swamps. Lake margins, wet places; site below sea level is on a delta island. -5-1005 m.		●													●		●			
Tiburon paintbrush *Castilleja affinis* ssp. *neglecta*	FE, ST, RPR, 1B	Valley and foothill grassland. Rocky serpentine sites. 75-400 m.		●				●	●													
Succulent owl's-clover *Castilleja campestris* ssp. *succulenta*	FT, SE, RPR, 1B	Vernal pools, valley and foothill grassland. Moist places, often in acidic soils. 25-750 m.		●														●				
Pink creamsacs *Castilleja rubicundula* ssp. *rubicundula*	RPR, 1B	Chaparral, meadows and seeps, valley and foothill grassland. Openings in chaparral or grasslands. On serpentine. 20-900 m.		●			●	●	●										●			
Lemmon's jewel-flower *Caulanthus lemmonii*	RPR, 1B	Pinyon-juniper woodland, valley and foothill grassland. 80-1220 m.	●	●	●			●														
Coyote ceanothus *Ceanothus ferrisiae*	FE, RPR, 1B	Chaparral, valley and foothill grassland, coastal scrub. Serpentine sites in the Mt. Hamilton range. 120-455 m.		●			●	●	●													
Congdon's tarplant *Centromadia parryi* ssp. *congdonii*	RPR, 1B	Valley and foothill grassland. Aalkaline soils, sometimes described as heavy white clay. 1-230 m.	●	●				●														
Point Reyes bird's-beak *Chloropyron maritimum* ssp. *palustre*	RPR, 1B	Coastal salt marsh. usually in coastal salt marsh with *Salicornia*, *Distichlis*, *Jaumea*, *Spartina*, etc. 0-15 m.	●	●		●		●														

Table 4-3 California Natural Diversity Database Occurrences for Plant Species in Alameda County Mosquito Abatement District and its Adjacent Program Area

Species Name	Status	Habitat	ACMAD	ACMAD adjacent	Upland Habitats							Wetland Habitats											
					Coniferous 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)	Freshwater Marsh/Seeps	Riparian Corridor	Artificial Containers, Temporary Standing Waters and Artificial Ponds	Water and Wastewater Management Facilities
Hispid bird's-beak *Chloropyron molle* ssp. *hispidum*	RPR, 1B	Meadows, playas, valley and foothill grassland. In damp alkaline soils, especially in alkaline meadows and alkali sinks with *Distichlis*. 10-155 m.	●											●									
Soft bird's-beak *Chloropyron molle* ssp. *molle*	FE, SR, RPR, 1B	Coastal salt marsh. In coastal salt marsh with *Distichlis*, *Salicornia*, *Frankenia*, etc. 0-3 m.		●										●									
Palmate-bracted bird's-beak *Chloropyron palmatum*	FE, SE, RPR, 1B	Chenopod scrub, valley and foothill grassland. Usually on Pescadero silty clay which is alkaline, with *Distichlis*, *Frankenia*, etc. 5-155 m.	●	●			●	●															
San Francisco Bay spineflower *Chorizanthe cuspidata* var. *cuspidata*	RPR, 1B	Coastal bluff scrub, coastal dunes, coastal prairie, coastal scrub. Closely related to *C. pungens*. Sandy soil on terraces and slopes. 5-550 m.	●				●	●		●													
Robust spineflower *Chorizanthe robusta* var. *robusta*	FE, RPR, 1B	Cismontane woodland, coastal dunes, coastal scrub. Sandy terraces and bluffs or in loose sand. 3-120 m.	●	●			●			●													
Bolander's water-hemlock *Cicuta maculata* var. *bolanderi*	RPR 2	Marshes, fresh or brackish water. 0-200 m.		●									●	●	●								
Franciscan thistle *Cirsium andrewsii*	RPR, 1B	Coastal bluff scrub, broadleaved upland forest, coastal scrub. Sometimes serpentine seeps. 0-135 m.		●		●	●		●										●				
slough thistle *Cirsium crassicaule*	RPR, 1B	Chenopod scrub, marshes and swamps, riparian scrub. Sloughs, riverbanks, and marshy areas. 3-100 m.		●															●	●			
Mt. Hamilton fountain thistle *Cirsium fontinale* var. *campylon*	RPR, 1B	Cismontane woodland, chaparral, valley and foothill grassland. In seasonal and perennial drainages on serpentine. 95-890 m.	●	●				●	●														
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* according to D. Keil. 0-100 m.		●																			

Table 4-3 California Natural Diversity Database Occurrences for Plant Species in Alameda County Mosquito Abatement District and its Adjacent Program Area

Species Name	Status	Habitat	ACMAD	ACMAD adjacent	Upland Habitats: Coniferous Forest	Deciduous Forest	Shrublands	Grasslands	Serpentine	Coastal Dunes	Tree Holes	Wetland Habitats: Open Water (Marine/Brackish)	Tidal Flats	Tidal Marsh and channels	Lagoon	Creeks and Rivers	Ponds and Lakes	Seasonal Wetlands (includes Vernal Pools)	Freshwater Marsh/Seeps	Riparian Corridor	Artificial Containers, Temporary Standing Waters and Artificial Ponds	Water and Wastewater Management Facilities
Presidio clarkia *Clarkia franciscana*	FE, SE, RPR, 1B	Coastal scrub, valley and foothill grassland. Serpentine outcrops in grassland or scrub. 20-335 m.	●					●	●	●												
San Francisco collinsia *Collinsia multicolor*	RPR, 1B	Closed-cone coniferous forest, coastal scrub. On decomposed shale (mudstone) mixed with humus. 30-250 m.		●	●		●															
Mt. Diablo bird's-beak *Cordylanthus nidularius*	SR, RPR, 1B	Chaparral. Grassy or rocky areas within serpentine chaparral. 600-800 m.		●				●	●													
Hoover's cryptantha *Cryptantha hooveri*	RPR 1A	Valley and foothill grassland. In coarse sand. ?-150 m.		●				●														
Livermore tarplant *Deinandra bacigalupii*	RPR, 1B	Meadows and seeps. Alkaline meadows. 150-185 m.	●					●														
Hospital Canyon larkspur *Delphinium californicum* ssp. *interius*	RPR, 1B	Cismontane woodland, chaparral. In wet, boggy meadows, openings in chaparral and in canyons. 225-1060 m.	●	●	●		●		●										●			
Recurved larkspur *Delphinium recurvatum*	RPR, 1B	Chenopod scrub, valley and foothill grassland, cismontane woodland. On alkaline soils; often in valley saltbush or valley chenopod scrub. 3-685 m.	●	●		●	●	●														
Norris' beard moss *Didymodon norrisii*	RPR 2	Cismontane woodland, lower montane coniferous forest. Moss from seasonally wet sheet drainages on exposed rock slabs or terraces that completely dry in summer. Less frequent		●	●			●														
Western leatherwood *Dirca occidentalis*	RPR, 1B	Broadleafed upland forest, chaparral, closed-cone coniferous forest, cismontane woodland, north coast coniferous forest, riparian forest, riparian woodland. On brushy slopes, mesic sites; mostly in mixed evergreen and foothill woodland communities. 30-550 m.	●	●	●	●	●													●		
Dwarf downingia *Downingia pusilla*	RPR 2	Valley and foothill grassland (mesic sites), vernal pools. Vernal lake and pool margins with a variety of associates. In several types of vernal pools. 1-485 m.		●				●										●				

Table 4-3 California Natural Diversity Database Occurrences for Plant Species in Alameda County Mosquito Abatement District and its Adjacent Program Area

Species Name	Status	Habitat	ACMAD	ACMAD adjacent	Upland Habitats							Wetland Habitats										
					Coniferous 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)	Freshwater Marsh/Seeps	Riparian Corridor	Artificial Containers, Temporary Standing Waters and Artificial Ponds	Water and Wastewater Management Facilities
Santa Clara Valley dudleya *Dudleya abramsii* ssp. *setchellii*	FE, RPR, 1B	Valley and foothill grassland, cismontane woodland. On rocky serpentine outcrops and on rocks within grassland or woodland. 80-335 m.		●			●	●														
Tracy's eriastrum *Eriastrum tracyi*	SR, RPR 3	Chaparral, cismontane woodland. Gravelly shale or clay; often in open areas. 315-760 m.		●		●	●															
Tiburon buckwheat *Eriogonum luteolum* var. *caninum*	RPR, 1B	Chaparral, valley and foothill grassland, cismontane woodland, coastal prairie. Serpentine soils; sandy to gravelly sites. 0-700 m.	●				●	●	●													
Ben Lomond buckwheat *Eriogonum nudum* var. *decurrens*	RPR, 1B	Chaparral, cismontane woodland, lower montane coniferous forest. Ponderosa pine sandhills in Santa Cruz County. 50-800 m.		●	●		●															
Antioch Dunes buckwheat *Eriogonum nudum* var. *psychicola*	RPR, 1B	Interior dunes. Grows on the Antioch dunes (interior dune system) with *lupinus albifrons*, *gutierrezia californica*, and introduced grasses		●				●														
Mt. Diablo buckwheat *Eriogonum truncatum*	RPR, 1B	Chaparral, coastal scrub, valley and foothill grassland. Dry, exposed clay or sandy substrates. 3-350 m.		●			●	●														
Hoover's button-celery *Eryngium aristulatum* var. *hooveri*	RPR, 1B	Vernal pools. Alkaline depressions, vernal pools, roadside ditches and other wet places near the coast. 5-45 m.	●	●														●				
Delta button-celery *Eryngium racemosum*	SE, RPR, 1B	Riparian scrub. Seasonally inundated floodplain on clay. 3-75 m.		●														●		●		
Contra Costa wallflower *Erysimum capitatum* var. *angustatum*	FE, SE, RPR, 1B	Inland dunes. Stabilized dunes of sand and clay near Antioch along the San Joaquin river. 3-20 m.		●																●		
Diamond-petaled California poppy *Eschscholzia rhombipetala*	RPR, 1B	Valley and foothill grassland. Alkaline, clay slopes and flats. 0-975 m.	●	●				●														

Table 4-3 California Natural Diversity Database Occurrences for Plant Species in Alameda County Mosquito Abatement District and its Adjacent Program Area

Species Name	Status	Habitat	ACMAD	ACMAD adjacent	Upland Habitats							Wetland Habitats										
					Coniferous 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)	Freshwater Marsh/Seeps	Riparian Corridor	Artificial Containers, Temporary Standing Waters and Artificial Ponds	Water and Wastewater Management Facilities
Talus fritillary *Fritillaria falcata*	RPR, 1B	Chaparral, cismontane woodland, lower montane coniferous forest. On shale, granite, or serpentine talus. 300-1525 m.	●	●	●		●		●													
Fragrant fritillary *Fritillaria liliacea*	RPR, 1B	Coastal scrub, valley and foothill grassland, coastal prairie. Often on serpentine; various soils reported though usually clay, in grassland. 3-410 m.	●	●			●	●	●													
Boggs Lake hedge-hyssop *Gratiola heterosepala*	SE, RPR, 1B	Marshes and swamps (freshwater), vernal pools. Clay soils; usually in vernal pools, sometimes on lake margins. 5-2400 m.		●													●	●	●			
Diablo helianthella *Helianthella castanea*	RPR, 1B	Broadleaved upland forest, chaparral, cismontane woodland, coastal scrub, riparian woodland, valley and foothill grassland. Usually in chaparral/oak woodland interface in rocky, azonal soils. Often in partial shade. 25-1150 m.	●	●			●	●												●		
Brewer's western flax *Hesperolinon breweri*	RPR, 1B	Chaparral, cismontane woodland, valley and foothill grassland. Often in rocky serpentine soil in serpentine chaparral and serpentine grassland. 30-885 m.		●		●	●	●	●													
Tehama County western flax *Hesperolinon tehamense*	RPR, 1B	Chaparral, cismontane woodland. Serpentine barrens in chaparral. 225-1155 m.	●				●		●													
Woolly rose-mallow *Hibiscus lasiocarpos* var. *occidentalis*	RPR, 1B	Marshes and swamps (freshwater). Moist, freshwater-soaked river banks and low peat islands in sloughs; in Calif., known from the delta watershed. 0-150 m.		●															●			
Loma Prieta hoita *Hoita strobilina*	RPR, 1B	Chaparral, cismontane woodland, riparian woodland. Serpentine; mesic sites.	●	●												●			●			
Santa Cruz tarplant *Holocarpha macradenia*	FT, SE, RPR, 1B	Coastal prairie, valley and foothill grassland. Light, sandy soil or sandy clay; often with nonnatives. 10-260 m.	●	●				●														
Kellogg's horkelia *Horkelia cuneata* var. *sericea*	RPR, 1B	Closed-cone coniferous forest, coastal scrub, chaparral. Old dunes, coastal sandhills; openings. 10-200 m.	●		●		●															

Table 4-3 California Natural Diversity Database Occurrences for Plant Species in Alameda County Mosquito Abatement District and its Adjacent Program Area

Species Name	Status	Habitat	ACMAD	ACMAD adjacent	Upland Habitats							Wetland Habitats										
					Coniferous 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)	Freshwater Marsh/Seeps	Riparian Corridor	Artificial Containers, Temporary Standing Waters and Artificial Ponds	Water and Wastewater Management Facilities
Carquinez goldenbush *Isocoma arguta*	RPR, 1B	Valley and foothill grassland. Alkaline soils, flats, lower hills. On low benches near drainages and on tops and sides of mounds in swale habitat. 1-20 m.		●				●														
Northern California black walnut *Juglans hindsii*	RPR, 1B	Riparian forest, riparian woodland. Few extant native stands remain; widely naturalized. Deep alluvial soil associated with a creek or stream. 0-395 m.		●																●		
Contra Costa goldfields *Lasthenia conjugens*	FE, RPR, 1B	Valley and foothill grassland, vernal pools, cismontane woodland. Extirpated from most of its range; extremely endangered. Vernal pools, swales, low depressions, in open grassy areas. 1-445 m.	●	●		●		●										●				
Delta tule pea *Lathyrus jepsonii* var. *jepsonii*	RPR, 1B	Freshwater and brackish marshes. Often found with *Typha*, *Aster lentus*, *Rosa californica*, *Juncus* spp., *Scirpus*, etc. Usually on marsh and slough edges.		●								●		●					●			
Legenere *Legenere limosa*	RPR, 1B	Vernal pools. Many historical occurrences are extirpated in beds of vernal pools. 1-880 m.	●	●														●				
Mt. Hamilton coreopsis *Leptosyne hamiltonii*	RPR, 1B	Cismontane woodland on steep shale talus with open southwestern exposure. 530-1300 m.	●	●		●																
Mason's lilaeopsis *Lilaeopsis masonii*	SR, RPR, 1B	Freshwater and brackish marshes, riparian scrub, tidal zones, in muddy or silty soil formed through river deposition or river bank erosion. 0-10 m.	●	●										●		●				●	●	
Delta mudwort *Limosella australis*	RPR 2	Riparian scrub, freshwater marsh, brackish marsh. Probably the rarest of the suite of delta rare plants. Usually on mud banks of the delta in marshy or scrubby riparian associations; often with lilaeopsis masonii. 0-3 m.		●								●								●	●	
Showy golden madia *Madia radiata*	RPR, 1B	Valley and foothill grassland, cismontane woodland, chenopod scrub. Mostly on adobe clay in grassland or among shrubs. 25-1125 m.		●			●	●														
Indian Valley bush-mallow *Malacothamnus aboriginum*	RPR, 1B	Cismontane woodland, chaparral, granitic outcrops and sandy bare soil, often in disturbed soils. 150-1700 m.		●		●	●															

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arcuate bush-mallow *Malacothamnus arcuatus*	RPR, 1B	Chaparral. Gravelly alluvium. 80-355 m.		●			●															
Hall's bush-mallow *Malacothamnus hallii*	RPR, 1B	Chaparral. Some populations on serpentine. 10-550 m.		●			●		●													
Oregon meconella *Meconella oregana*	RPR, 1B	Coastal prairie, coastal scrub. Open, moist places. 250-500 m.		●				●														
Woodland woollythreads *Monolopia gracilens*	RPR, 1B	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	●	●				●	●													
Lime Ridge navarretia *Navarretia gowenii*	RPR, 1B	Chaparral on calcium carbonate-rich soil with high clay content. 180-305 m		●				●														
Shining navarretia *Navarretia nigelliformis* ssp. *radians*	RPR, 1B	Cismontane woodland, valley and foothill grassland, vernal pools. Apparently in grassland, and not necessarily in vernal pools. 200-1000 m.	●	●				●										●				
Prostrate vernal pool navarretia *Navarretia prostrata*	RPR, 1B	Coastal scrub, valley and foothill grassland, vernal pools. Alkaline soils in grassland, or in vernal pools. Mesic, alkaline sites. 15-700 m.	●	●				●										●				
Antioch Dunes evening-primrose *Oenothera deltoides* ssp. *howellii*	FE, SE, RPR, 1B	Interior dunes. Remnant river bluffs and sand dunes east of Antioch. 0-30 m.		●																●		
San Benito pentachaeta *Pentachaeta exilis* ssp. *aeolica*	RPR, 1B	Cismontane woodland, valley and foothill grassland. Grassy areas. 635-855 m.		●				●														
Mt. Diablo phacelia *Phacelia phacelioides*	RPR, 1B	Chaparral, cismontane woodland. Adjacent to trails, on rock outcrops and talus slopes; sometimes on serpentine. 500-1370 m.		●			●		●													

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White-flowered rein orchid *Piperia candida*	RPR, 1B	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 and muskeg. 0-1200 m.		●	●	●			●													
Choris' popcornflower *Plagiobothrys chorisianus* var. *chorisianus*	RPR, 1B	Chaparral, coastal scrub, coastal prairie. Mesic sites. 15-100 m.	●				●															
San Francisco popcornflower *Plagiobothrys diffusus*	SE, RPR, 1B	Valley and foothill grassland, coastal prairie. Historically from grassy slopes with marine influence. 60-485 m.	●					●														
Hairless popcornflower *Plagiobothrys glaber*	RPR 1A	Meadows and seeps, marshes and swamps. Coastal salt marshes and alkaline meadows. 5-180 m.	●	●										●					●			
Warty popcorn-flower *Plagiobothrys verrucosus*	RPR 2	Chaparral. Shale substrate. 610-760 m.		●			●															
Oregon polemonium *Polemonium carneum*	RPR 2	Coastal prairie, coastal scrub, lower montane coniferous forest. 0-1830 m.	●		●		●	●														
Eel-grass pondweed *Potamogeton zosteriformis*	RPR 2	Marshes and swamps. Ponds, lakes, streams. 0-1860 m.		●												●	●		●			
Sanford's arrowhead *Sagittaria sanfordii*	RPR, 1B	Marshes and swamps. In standing or slow-moving freshwater ponds, marshes, and ditches. 0-610 m.		●													●		●			
Adobe sanicle *Sanicula maritima*	SR, RPR, 1B	Meadows and seeps, valley and foothill grassland, chaparral, coastal prairie. Moist clay or ultramafic soils. 30-240 m.	●				●	●	●										●			
Rock sanicle *Sanicula saxatilis*	SR, RPR, 1B	Broadleafed upland forest, chaparral, valley and foothill grassland. Bedrock outcrops and talus slopes in chaparral or oak woodland habitat. 615-1215 m.		●			●	●														

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Marsh skullcap *Scutellaria galericulata*	RPR 2	Marshes and swamps, lower montane coniferous forest, meadows and seeps. Swamps and wet places. 0-2100 m.		●	●														●			
Side-flowering skullcap *Scutellaria lateriflora*	RPR 2	Meadows and seeps, marshes and swamps. Wet meadows and marshes. In the delta, often found on logs. -3-500 m.		●															●			
Chaparral ragwort *Senecio aphanactis*	RPR 2	Cismontane woodland, coastal scrub. Drying alkaline flats. 20-575 m.	●	●		●	●															
Metcalf Canyon jewel-flower *Streptanthus albidus* ssp. *albidus*	FE, RPR, 1B	Valley and foothill grassland. Relatively open areas in dry grassy meadows on serpentine soils; also on serpentine balds. 45-245 m.		●				●	●													
Most beautiful jewel-flower *Streptanthus albidus* ssp. *peramoenus*	RPR, 1B	Chaparral, valley and foothill grassland, cismontane woodland. Serpentine outcrops, on ridges and slopes. 120-730 m.	●	●			●	●	●													
Mt. Diablo jewel-flower *Streptanthus hispidus*	RPR, 1B	Valley and foothill grassland, chaparral. Talus or rocky outcrops. 275-970 m.		●			●	●														
Slender-leaved pondweed *Stuckenia filiformis*	RPR 2	Marshes and swamps. Shallow, clear water of lakes and drainage channels. 15-2310 m.	●	●												●	●		●			
California seablite *Suaeda californica*	FE, RPR, 1B	Marshes and swamps. Margins of coastal salt marshes. 0-5 m.	●	●										●					●			
Suisun Marsh aster *Symphyotrichum lentum*	RPR, 1B	Marshes and swamps (brackish and freshwater). Most often seen along sloughs with *Phragmites*, *Scirpus*, blackberry, *Typha*, etc. 0-3m.		●								●		●					●			
Wright's trichocoronis *Trichocoronis wrightii* var. *wrightii*	RPR 2	Marshes and swamps, riparian forest, meadows and seeps, vernal pools. Mud flats of vernal lakes, drying river beds, alkali meadows. 5-435 m.		●														●	●	●		
Saline clover *Trifolium hydrophilum*	RPR, 1B	Marshes and swamps, valley and foothill grassland, vernal pools. Mesic, alkaline sites. 0-300 m.	●	●				●										●	●			

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Coastal triquetrella *Triquetrella californica*	RPR, 1B	Coastal bluff scrub, coastal scrub valley and foothill grasslands. Grows within 30 m from the coast in coastal scrub, grasslands and in open gravels on roadsides, hillsides, rocky slopes,		●			●	●														
Caper-fruited tropidocarpum *Tropidocarpum capparideum*	RPR, 1B	Valley and foothill grassland. Alkaline clay. 0-455 m.	●	●				●														
Crampton's tuctoria or Solano grass *Tuctoria mucronata*	FE, SE, RPR, 1B	Vernal pools, valley and foothill grassland. Clay bottoms of drying vernal pools and lakes in valley grassland. 5-10 m.		●				●										●				
oval-leaved viburnum *Viburnum ellipticum*	RPR 2	Chaparral, cismontane woodland, lower montane coniferous forest. 215-1400 m.		●	●	●	●															

1A = plants believed to be extinct in California
1B = plants rare or endangered in California and elsewhere
2 = plants rare or endangered in California, but more common elsewhere
3 = plants for which more information is needed

FE = federally listed as endangered
FT = federally listed as threatened
RPR = state Rare Plant Rank
SE = listed by California as endangered

SR = listed by California as rare
ST = listed by California as threatened
AM1 = Alameda County
AM2 = Adjacent counties

Table 4-4 California Natural Diversity Database Occurrences for Special Status Wildlife Species in Alameda County Mosquito Abatement District and its Adjacent Program Area

Species Name	Status	Habitat	ACMAD	ACMAD adjacent	Upland Habitats							Wetland Habitats										
					Coniferous 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)	Freshwater Marsh/Seeps	Riparian Corridor	Artificial Containers, Temporary Standing Waters and Artificial Ponds	Water and Wastewater Management Facilities
Invertebrates																						
Lange's metalmark butterfly *Apodemia mormo langei*	FE	Inhabits stabilized dunes along the San Joaquin river. Endemic to Antioch Dunes, Contra Costa County. Primary host plant is *Eriogonum nudum var auriculatum*; feeds on nectar of other wildflowers, as well as host plant.		●						●												
Longhorn fairy shrimp *Branchinecta longiantenna*	FE	Endemic to the eastern margin of the central coast mountains in seasonally astatic grassland vernal pools. Inhabit small, clear-water depressions in sandstone and clear-to-turbid clay/grass-bottomed pools in shallow swales.	●	●														●				
Vernal pool fairy shrimp *Branchinecta lynchi*	FT	Endemic to the grasslands of the Central Valley, central coast mountains, and south coast mountains, in astatic rain-filled pools. Inhabit small, clear-water sandstone-depression pools and grassed swale, earth slump, or basalt-flow depression pools.	●	●														●				
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*.		●				●														
Valley elderberry longhorn beetle *Desmocerus californicus dimorphus*	FT	Occurs only in the Central Valley of California, in association with blue elderberry (*Sambucus mexicana*). Prefers to lay eggs in elderberrries 2-8 inches in diameter; some preference shown for "stressed" elderberries.		●				●												●		
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* and *O. purpurscens* are the secondary host plants.	●	●				●	●													
Vernal pool tadpole shrimp *Lepidurus packardi*	FE	Inhabits vernal pools and swales in the Sacramento valley containing clear to highly turbid water. Pools commonly found in grass bottomed swales of unplowed grasslands. Some pools are mud-bottomed and highly turbid.	●	●														●				
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 and in sparse chaparral with grass.		●	●																	

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Fish																						
Sacramento perch *Archoplites interruptus*	SSC	Historically found in the sloughs, slow-moving rivers, and lakes of the Central Valley. Prefers warm water. Aquatic vegetation is essential for young. Tolerates wide range of physio-chemical water conditions.		●										●		●	●					
Tidewater goby *Eucyclogobius newberryi*	FE, SSC	Brackish water habitats along the California coast from Agua Hedionda Lagoon, San Diego County to the mouth of the smith river. Found in shallow lagoons and lower stream reaches, they need fairly still but not stagnant water and high oxygen levels.	●											●	●	●						
Delta smelt *Hypomesus transpacificus*	FT, SE	Sacramento-San Joaquin Delta. Seasonally in Suisun Bay, Carquinez Strait and San Pablo Bay. Seldom found at salinities > 10 ppt. most often at salinities < 2ppt.		●								●		●								
Hardhead *Mylopharodon conocephalus*	SSC	Low to mid-elevation streams in the Sacramento-San Joaquin drainage. Also present in the Russian River. Clear, deep pools with sand-gravel-boulder bottoms and slow water velocity. Not found where exotic centrarchids predominate.		●												●						
Steelhead - south/central California coast DPS *Oncorhynchus mykiss irideus*	FT, SSC	From Russian River, south to Soquel Creek and to, but not including, Pajaro River. Also San Francisco and San Pablo Bay basins.		●										●	●	●						
Sacramento splittail *Pogonichthys macrolepidotus*	SSC	Endemic to the lakes and rivers of the Central Valley, but now confined to the delta, Suisun Bay and associated marshes. Slow moving river sections, dead end sloughs. Requires flooded vegetation for spawning and foraging for young.		●										●		●						
Amphibians																						
California tiger salamander *Ambystoma californiense*	FT, ST, SSC	Central Valley DPS federally listed as threatened. Santa Barbara and Sonoma Counties DPS federally listed as endangered. Need underground refuges, especially ground squirrel burrows and vernal pools or other seasonal water sources for breeding	●	●				●										●				
Foothill yellow-legged frog *Rana boylii*	SSC	Partly-shaded, shallow streams and riffles with a rocky substrate in a variety of habitats. Need at least some cobble-sized substrate for egg-laying. Need at least 15 weeks to attain metamorphosis.	●	●	●											●				●		

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California red-legged frog *Rana draytonii*	FT, SSC	Lowlands and foothills in or near permanent sources of deep water with dense, shrubby or emergent riparian vegetation. Requires 11-20 weeks of permanent water for larval development. Must have access to estivation habitat.	●	●												●	●		●	●		
Western spadefoot *Spea hammondii*	SSC	Occurs primarily in grassland habitats, but can be found in valley-foothill hardwood woodlands. Vernal pools are essential for breeding and egg-laying.	●	●		●		●										●				
Reptiles																						
Silvery legless lizard *Anniella pulchra pulchra*	SSC	Sandy or loose loamy soils under sparse vegetation. Soil moisture is essential. They prefer soils with a high moisture content.		●						●												
Western pond turtle *Emys marmorata*	SSC	A thoroughly aquatic turtle of ponds, marshes, rivers, streams and irrigation ditches, usually with aquatic vegetation. Need basking sites and suitable (sandy banks or grassy open fields) upland habitat up to 0.5 km from water for egg-laying.	●	●			●	●								●	●		●	●		
San Joaquin whipsnake *Masticophis flagellum ruddocki*	SSC	Open, dry habitats with little or no tree cover. Found in valley grassland and saltbush scrub in the San Joaquin Valley. Needs mammal burrows for refuge and oviposition sites.	●	●				●														
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 and ravines, with rock outcrops, deep crevices or abundant rodent burrows, where shrubs form a vegetative mosaic with oak trees and grasses.	●	●		●	●	●														
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, and abundant supply of ants and other insects.	●	●			●															
Giant garter snake *Thamnophis gigas*	FT, ST	Prefers freshwater marsh and low gradient streams. Has adapted to drainage canals and irrigation ditches. This is the most aquatic of the garter snakes in California.		●				●								●			●			

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Birds																						
Tricolored blackbird *Agelaius tricolor*	SSC	Highly colonial species, most numerous in Central Valley and vicinity. Largely endemic to California. Requires open water, protected nesting substrate, and foraging area with insect prey within a few km of the colony.	●	●										●				●	●			
Golden eagle *Aquila chrysaetos*	FP	Rolling foothills, mountain areas, sage-juniper flats, and desert. Cliff-walled canyons provide nesting habitat in most parts of range; also, large trees in open areas.	●	●			●	●														
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.		●				●						●					●			
Burrowing owl *Athene cunicularia*	SSC	Open, dry annual or perennial grasslands, deserts and scrublands characterized by low-growing vegetation. Subterranean nester, dependent upon burrowing mammals, most notably, the California ground squirrel.	●	●			●	●														
Swainson's hawk *Buteo swainsoni*	SSC	Breeds in grasslands with scattered trees, juniper-sage flats, riparian areas, savannahs, and agricultural or ranch lands. Requires adjacent suitable foraging areas such as grasslands, or alfalfa or grain fields supporting rodent populations.	●	●			●	●												●		
Western snowy plover *Charadrius alexandrinus nivosus*	FT, SSC	Sandy beaches, salt pond levees and shores of large alkali lakes. Needs sandy, gravelly or friable soils for nesting.	●	●						●												
Northern harrier *Circus cyaneus*	SSC	Coastal salt and fresh-water marsh. Nest and 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.	●	●				●						●					●			
Western yellow-billed cuckoo *Coccyzus americanus occidentalis*	FC, SE	riparian forest nester, along the broad, lower flood-bottoms of larger river systems. nests in riparian jungles of willow, often mixed with cottonwoods, with lower story of blackberry, nettles, or wild grape.		●																●		
Black swift *Cypseloides niger*	SSC	Coastal belt of Santa Cruz and Monterey County; central and southern Sierra Nevada; San Bernardino and San Jacinto Mountains. Breeds in small colonies on cliffs behind or adjacent to waterfalls in deep canyons and sea-bluffs above the surf; forages widely		●						●										●		

Table 4-4 California Natural Diversity Database Occurrences for Special Status Wildlife Species in Alameda County Mosquito Abatement District and its Adjacent Program Area

Species Name	Status	Habitat	ACMAD	ACMAD adjacent	Upland Habitats: Coniferous Forest	Deciduous Forest	Shrublands	Grasslands	Serpentine	Coastal Dunes	Tree Holes	Wetland Habitats: Open Water (Marine/Brackish)	Tidal Flats	Tidal Marsh and channels	Lagoon	Creeks and Rivers	Ponds and Lakes	Seasonal Wetlands (includes Vernal Pools)	Freshwater Marsh/Seeps	Riparian Corridor	Artificial Containers, Temporary Standing Waters and Artificial Ponds	Water and Wastewater Management Facilities
Yellow warbler *Dendroica petechia brewsteri*	SSC	Riparian plant associations. Prefers willows, cottonwoods, aspens, sycamores, and alders for nesting and foraging. Also nests in montane shrubbery in open conifer forests.	●	●	●															●		
White-tailed kite *Elanus leucurus*	FP	Rolling foothills and valley margins with scattered oaks and river bottomlands or marshes next to deciduous woodland. Open grasslands, meadows, or marshes for foraging close to isolated, dense-topped trees for nesting and perching.	●	●		●		●											●	●		
American peregrine falcon *Falco peregrinus anatum*	SSC	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.	●	●										●	●	●	●		●			
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.	●	●										●					●			
Bald eagle *Haliaeetus leucocephalus*	SE	Ocean shore, lake margins, and rivers for both nesting and wintering. Most nests within 1 mile of water. Nests in large, old-growth, or dominant live tree with open branches, especially ponderosa pine. Roosts communally in winter.	●	●											●	●	●					
Yellow-breasted chat *Icteria virens*	SSC	Summer resident; inhabits riparian thickets of willow and other brushy tangles near watercourses. Nests in low, dense riparian, consisting of willow, blackberry, wild grape; forages and nests within 10 ft of ground.	●	●																●		
Loggerhead shrike *Lanius ludovicianus*	SSC	Broken woodlands, savannah, pinyon-juniper, Joshua tree, and riparian woodlands, desert oases, scrub and washes. Prefers open country for hunting, with perches for scanning, and fairly dense shrubs and brush for nesting.		●	●	●		●												●		
California black rail *Laterallus jamaicensis coturniculus*	ST	Inhabits freshwater marshes, wet meadows and shallow margins of saltwater marshes bordering larger bays. Needs water depths of about 1 inch that does not fluctuate during the year and dense vegetation for nesting habitat.	●	●				●						●					●			
Suisun song sparrow *Melospiza melodia maxillaris*	SSC	Resident of brackish-water marshes surrounding Suisun Bay. Inhabits cattails, tules and other sedges, and *Salicornia*; also known to frequent tangles bordering sloughs.		●										●								

Table 4-4 California Natural Diversity Database Occurrences for Special Status Wildlife Species in Alameda County Mosquito Abatement District and its Adjacent Program Area

Species Name	Status	Habitat	ACMAD	ACMAD adjacent	Upland Habitats: Coniferous Forest	Deciduous Forest	Shrublands	Grasslands	Serpentine	Coastal Dunes	Tree Holes	Wetland Habitats: Open Water (Marine/Brackish)	Tidal Flats	Tidal Marsh and channels	Lagoon	Creeks and Rivers	Ponds and Lakes	Seasonal Wetlands (includes Vernal Pools)	Freshwater Marsh/Seeps	Riparian Corridor	Artificial Containers, Temporary Standing Waters and Artificial Ponds	Water and Wastewater Management Facilities
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.*	●	●										●								
San Pablo song sparrow *Melospiza melodia samuelis*	SSC	Resident of salt marshes along the north side of San Francisco and San Pablo Bays. Inhabits tidal sloughs in the *Salicornia* marshes; nests in *Grindelia* bordering slough channels.		●										●								
Ridgway's rail *Rallus longirostris obsoletus*	FE, SE	Salt-water and 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.	●	●										●								
Bank swallow *Riparia 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.	●	●																●		
Black skimmer *Rynchops niger*	SSC	Nests on gravel bars, low islets, and sandy beaches, in unvegetated sites. Nesting colonies usually less than 200 pairs.	●										●	●								
California least tern *Sternula antillarum browni*	FE, SE	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.	●	●						●												
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.		●																●		
Yellow-headed blackbird *Xanthocephalus xanthocephalus*	SSC	Nests in freshwater emergent wetlands with dense vegetation and deep water. Often along borders of lakes or ponds. Nests only where large insects such as odonata are abundant, nesting timed with maximum emergence of aquatic insects.		●													●		●			

Table 4-4 California Natural Diversity Database Occurrences for Special Status Wildlife Species in Alameda County Mosquito Abatement District and its Adjacent Program Area

Species Name	Status	Habitat	ACMAD	ACMAD adjacent	Upland Habitats: Coniferous Forest	Deciduous Forest	Shrublands	Grasslands	Serpentine	Coastal Dunes	Tree Holes	Wetland Habitats: Open Water (Marine/Brackish)	Tidal Flats	Tidal Marsh and channels	Lagoon	Creeks and Rivers	Ponds and Lakes	Seasonal Wetlands (includes Vernal Pools)	Freshwater Marsh/Seeps	Riparian Corridor	Artificial Containers, Temporary Standing Waters and Artificial Ponds	Water and Wastewater Management Facilities
Mammals																						
Pallid bat *Antrozous pallidus*	SSC	Deserts, grasslands, shrublands, woodlands and 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.	●	●	●	●	●	●														
Townsend's big-eared bat *Corynorhinus townsendii*	SSC	Throughout California in a wide variety of habitats. Most common in mesic sites. Roosts in the open, hanging from walls and ceilings. Roosting sites limiting. Extremely sensitive to human disturbance.	●			●	●	●														
Western mastiff bat *Eumops perotis californicus*	SSC	Many open, semi-arid to arid habitats, including conifer and deciduous woodlands, coastal scrub, grasslands, chaparral etc. Roosts in crevices in cliff faces, high buildings, trees and tunnels.	●	●	●	●	●	●														
Western red bat *Lasiurus blossevillii*	SSC	Roosts primarily in trees, 2-40 ft above ground, from sea level up through mixed conifer forests. Prefers habitat edges and mosaics with trees that are protected from above and open below with open areas for foraging.		●	●		●	●														
San Francisco dusky-footed woodrat *Neotoma fuscipes annectens*	SSC	Forest habitats of moderate canopy and moderate to dense understory. May prefer chaparral and redwood habitats. Constructs nests of shredded grass, leaves and other material. May be limited by availability of nest-building materials.	●	●	●		●															
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.	●	●		●	●															
Salt-marsh harvest mouse *Reithrodontomys raviventris*	FE, SE	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.	●	●										●								
Alameda Island mole *Scapanus latimanus parvus*	SSC	Only known from Alameda island. Found in a variety of habitats, especially annual and perennial grasslands. Prefers moist, friable soils. Avoids flooded soils.	●					●														
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*.	●	●										●								

Table 4-4 California Natural Diversity Database Occurrences for Special Status Wildlife Species in Alameda County Mosquito Abatement District and its Adjacent Program Area

Species Name	Status	Habitat	ACMAD	ACMAD adjacent	Upland Habitats: Coniferous Forest	Deciduous Forest	Shrublands	Grasslands	Serpentine	Coastal Dunes	Tree Holes	Wetland Habitats: Open Water (Marine/Brackish)	Tidal Flats	Tidal Marsh and channels	Lagoon	Creeks and Rivers	Ponds and Lakes	Seasonal Wetlands (includes Vernal Pools)	Freshwater Marsh/Seeps	Riparian Corridor	Artificial Containers, Temporary Standing Waters and Artificial Ponds	Water and Wastewater Management Facilities
Riparian brush rabbit *Sylvilagus bachmani riparius*	FE, SE	Riparian areas on the San Joaquin River in northern Stanislaus County. Dense thickets of wild rose, willows, and blackberries.		●				●												●		
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 and open, uncultivated ground. Preys on burrowing rodents. Digs burrows.	●	●		●	●	●														
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.	●	●			●	●														

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

4.1.3 Regulatory Setting

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

4.1.3.1 Federal

4.1.3.1.1 Endangered Species Act of 1973

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 United States Fish and Wildlife Service (USFWS) is the administering agency for this authority for freshwater species. The National Marine Fisheries Service (NMFS) is the administering agency for anadromous species.

4.1.3.1.2 Magnusson-Stevenson Fishery Conservation and Management Act of 1996

This law provides for the conservation and management of all fish resources within the exclusive economic zone of the U.S. and supports and encourages the implementation and enforcement of international fisheries agreements for conservation and management of highly migratory species. It calls for the establishment of Regional Fisheries Management Councils to develop, implement, monitor, and revise fish management plans to promote domestic commercial and recreational fishing. Specifically to this Program, it calls for the protection of essential fish habitat in review of projects conducted under federal permits, licenses, or other authorities that affect or have the potential to affect such habitat. The NMFS is responsible for the administration of this act.

4.1.3.1.3 Clean Water Act of 1977

These sections provide for the protection of wetlands. The administering agency for the above authority is the United States Army Corps of Engineers (USACE).

4.1.3.1.4 Executive Order 11990, Protection of Wetlands

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

4.1.3.1.5 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.

4.1.3.2 State

4.1.3.2.1 Porter-Cologne Water Quality Control Act of 1970

This law provides the California State Water Resources Control Board (SWRCB) and the nine Regional Water Quality Control Boards (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 Clean Water Act, including the National Pollutant Discharge Elimination System (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.

4.1.3.2.2 California Fish and Wildlife 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 California Department of Fish and Wildlife (CDFW).

4.1.3.2.3 California Endangered Species Act of 1984

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 Wildlife Code. (The term "take" is defined by Section 86 of the Fish and Wildlife 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.

4.1.3.2.4 California Fish and Wildlife Code Section 3503

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

4.1.3.2.5 California Fish and Wildlife Code Section 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 Wildlife Code or regulation adopted pursuant thereto. The administering agency is the CDFW.

4.1.3.2.6 California Fish and Wildlife Code Section 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 Wildlife Code. The administering agency is the CDFW.

4.1.3.2.7 California Fish and Wildlife 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 State Water Resources Control Board or a Regional Water Quality Control Board 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 Wildlife Code Section 5650 is the CDFW.

4.1.3.2.8 Stipulated Injunction and Order, Protection of California Red-Legged Frog from Pesticides

On October 20, 2006, the U.S. District Court for the Northern District of California imposed no-use buffer zones around California red-legged frog upland and aquatic habitats for certain pesticides. 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 California red-legged frog 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 Alameda County.

Of the 66 pesticides listed in the injunction, the District may employ methoprene, permethrin, and naled for mosquito control. Methoprene is used for larval mosquito control. Permethrin and naled may be used for adult mosquito control. However, mosquito control programs are exempt. Specifically, for applications of a pesticide for purposes of public health mosquito control under a program administered by a public entity, the injunction does not apply. The District may use the following herbicides listed in the injunction: glyphosate, imazapyr, and triclopyr. 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:

a. You are applying a pesticide for purposes of controlling state-designated invasive species and noxious weeds under a program administered by a public entity; and
b. You do not apply the pesticide within 15 feet of aquatic breeding critical habitat or non-breeding aquatic critical habitat within critical habitat areas, or within 15 feet of aquatic features within non-critical habitat sections subject to the injunction; and
c. Application is limited to localized spot treatment using hand-held devices; and
d. Precipitation is not occurring or forecast to occur within 24 hours; and
e. You are a certified applicator or working under the direct supervision of a certified applicator; and
f. If using triclopyr, you are using only the amine formulations. (USEPA 2014a).

4.1.3.2.9 Native Plant Protection Act (California Fish and Wildlife Code Section 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.

4.1.3.2.10 Natural Community Conservation Planning Act (California Fish and Wildlife Code Section 2800 to 2835)

This law provides for the development of Natural Community Conservation Plans (NCCP) to provide for regional or area-wide protection and perpetuation of natural wildlife diversity, while allowing compatible and appropriate development and growth. The administering agency is the CDFW.

4.1.3.2.11 California Food and Agricultural Code, Section(s) 12976 and 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 California Department of Pesticide Regulation (CDPR).

4.1.3.3 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 and would not be applicable to treatments proposed by the District under the Program because California state law preempts local regulation and restriction of pesticide use. The Municipal Regional Stormwater NPDES Permit (NPDES Permit No. CAS612008), which regulates stormwater discharges from municipalities and local agencies in Alameda, Contra Costa, and Santa Clara Counties, requires all cities to adopt an Integrated Pest Management (IPM) ordinance or policy (Provision C.9) (SFBRWQCB 2009). The District already adheres to an IPM program for the management of mosquitoes and mosquito-borne diseases. The District will work with the local entities and property owners to implement best management practices for the protection of public health. However, if the California Department of Public Health declares a public health emergency and requires the assistance of the District, then pesticides may be used within local jurisdictions including those with local restrictions on pesticide use.

Concerning local ordinances and policies to protect biological resources, Alameda County and its cities 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. Some jurisdictions have tree ordinances that are focused on the preservation of significant or heritage trees, street trees, and other trees along public rights-of-way. The County of Alameda and City of Hayward discussions below are examples of the local policies affecting biological resources.

4.1.3.3.1 County of Alameda General Plan

The County's General Plan contains countywide elements as well as three area plans, Eden Area, Castro Valley Area, and East County Area Plans. The plans serve as a broad framework for planning the future of Alameda County; they are the official policy statements of the County Board of Supervisors to guide physical, economic, and environmental growth. The plans serves as a guide for the establishment of programs and legislation dealing with the preservation and enhancement of agricultural open space, preserves, residential-canyon open space, and connecting open space corridors in the county. The objective of the general plans conservation element is to provide economic and environmental information critical to the development of resources, land use, and the preservation of environmental balance. The following Conservation Element Goals and Objectives are most relevant to biological resources evaluated in this PEIR:

> Vegetative and Wildlife Resources (Alameda County Community Development Agency 1994a)

Goal: To protect and enhance wildlife habitats and natural vegetation areas in Alameda County.

Objectives:

1. To identify areas of critical or sensitive concern for wildlife and vegetation.
2. To maintain and, if necessary, restore deteriorating environments to a level of diversity appropriate in this area of California.
3. To identify the principles of resource management as criteria for resource evaluation.
4. To educate government, business and citizens to conserve and protect wildlife resources.

> Natural Resources Within Open Space Areas Should be Permanently Protected

Within open space areas, either publicly or privately owned, removal of mature trees should not be permitted without the permission of the local authority. Alteration of streambeds or bodies of water and adjacent vegetation should be permitted only as a means of erosion or flood control, as permitted by the adopted plans of regional or local jurisdictions, and in such a manner to enhance water courses, scenic shoreline and marshlands within the county (Alameda County Community Development Agency 1994b).

> Biological Resources (Alameda County Community Development Agency 2000)

Goal: To preserve a variety of plant communities and wildlife habitat.

Policies:

Policy 124: The County shall encourage the maintenance of biological diversity in East County by including a variety of plant communities and animal habitats in areas designated for open space.

Policy 125: The County shall encourage preservation of areas known to support special status species.

Policy 126: The County shall encourage no net loss of riparian and seasonal wetlands.

Policy 127: The County shall encourage the preservation of East County's oak woodland plant communities.

Policy 129: The County shall protect existing riparian woodland habitat present along the Arroyo Mocho, Arroyo Del Valle, Arroyo Las Positas, Arroyo de la Laguna; and Alamo, Tassajara, and Alameda Creeks.

Policy 130: The County shall preserve an open space corridor connecting the Bird's Beak Preserve with lands designated "Resource Management." This open space corridor shall vary in width between 50 and 150 feet.

Policy 132: The County shall designate a zone of approximately 200 yards around the perimeter of the defined Bird's Beak Preserve in North Livermore as a Special Management Area. Within this zone, all proposed land uses and project designs shall be evaluated regarding their potential to effect the viability of the Springtown valley sink scrub habitat, and mitigation shall be incorporated into the approval of detailed development plans within this 200 yard zone to avoid the impact. Mitigation may take the form of clustering development to avoid sensitive areas, management practices, land swap with the FCC Monitoring Station, or other appropriate measures.

4.1.3.3.2 City of Hayward

The City of Hayward General Plan: "Looking Forward 2040" (approved on July 1, 2014) includes Part 3.5, Natural Resources which establishes goals and policies to protect and enhance the natural resources within the Hayward Planning Area (Hayward Planning Division 2014). Its Goal NR-1 is: Protect, enhance, and restore sensitive biological resources, native habitat, and vegetation communities that support wildlife species so they can be sustained and remain viable. Specific policies seek to protect special status species and their habitat, protect riparian habitat; protect native plant and wildlife habitat; and restore culvert or channelized creeks. Policy NR-1.4 requires the City to review all future waterway improvement projects (e.g., flood control, dredging, private development) as well as all projects that are within 100 feet of the waterway, to ensure that they protect and minimize effects on the riparian and aquatic habitats. For implementation of this policy, the City is required to review and modify as necessary existing regulations for the conservation and management of marsh, wetland, riparian, wildlife and plant habitats, to ensure consistency with the General Plan.

Part 3.6 of the City of Hayward General Plan addresses Hazards. Goal Haz-6 is: Protect people and environmental resources from contaminated hazardous material sites and minimize risks associated with the use, storage, transport, and disposal of hazardous materials. Some of the efforts to accomplish this

goal include the implementation of Hazardous Materials Release Response Plans, California Accidental Release Prevention Program, Above-ground Petroleum Storage Act Program, site investigations, and land use buffer zones.

4.1.4 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 its anticipated effects on the individuals and populations of listed species. It also will describe 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 HCP is reviewed by USFWS or National Oceanic and Atmospheric Administration (NOAA) Fisheries, when reviewing a project. If a project is approved by the USFWS or NOAA Fisheries, 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 the USFWS or NOAA Fisheries might include.

The California Natural Community Conservation Planning Act was first passed by the state legislature in 1991, and was updated and superseded 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.

A number of HCPs and NCCPs are in effect or development within the Program Area. Table 4-5 was developed through review of information available on the USFWS and CDFW 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 comply with the provisions of those plans.

Table 4-5 Habitat Conservation Plans and Natural Community Conservation Plans in the Program Area

Plan Title	Location	Covered Species Listed and Nonlisted	Date Permit Issued	Size	Duration	Source
Basin A, Willow Pass Grade	Multiple Counties	Frog, California red-legged (Entire)	10/6/1997	5 acres	20 years	1
California Department of Corrections Statewide Electrified Fence Project	26 sites throughout California	45 species	6/12/2002	2,937 acres	50 years	1
East Bay Municipal Utility District	Alameda County, Contra Costa County, CA	6 species	No info	28,000 acres	TBD	1
East Contra Costa County HCP/NCCP	Contra Costa County, CA	36 species	7/25/2007	175,435 acres	30 years	1
Los Esteros LE	Santa Clara County, CA	5 species	3/11/2011	9,926 acres. The 21-acre power plant is not in an area with habitat, however, its emissions could indirectly affect the covered species within 9,926 acres of serpentine habitat.	50 years Estimated project life of power plant	1
PG&E San Joaquin Valley Operations & Maintenance HCP	San Joaquin, Tuolumne, Mariposa, Madera, Fresno, Tulare, Kern, Stanislaus, Merced, & Kings Counties	48 species	12/14/2007	276350 acres	30 years	1
San Joaquin County Multi-Species Habitat Conservation & Open Space Plan	Stockton, Tracy, Lathrop, Lodi, Manteca, Escalon, & Ripon; San Joaquin County	42 species	5/31/2001	896000 acres	50 years	1
Bay Delta Conservation Plan	Overlaps 5	57 Species	Not Reported	947,075	50 years	2
Santa Clara Valley	Santa Clara	22 Species	Not Reported	440,318	50 years	2

LE = low effect

[1] USFWS ECOS website accessed April 10, 2013: http://ecos.fws.gov/conserv_plans/PlanReport?region=8&type=HCP&rtype=2&hcpUser=&view=report

[2] CDFW NCCP website accessed April 10, 2013: http://www.dfg.ca.gov/habcon/nccp/status/NCCP Summary Table.pdf

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

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4.1.4.1 Basin A, Willow Pass Grade

No information was available on this plan which is due to expire in October of 2017. This HCP is located in the neighboring Contra Costa County and it is unlikely that the District's activities would occur within its boundaries.

4.1.4.2 California Department of Corrections Statewide Electrified Fence Project

This HCP was prepared by the California Department of Corrections for their Statewide Electrified Fence Project and addresses mortality or the potential for mortality of special status species and native migratory birds at 25 prisons where lethal electrified fences are operational and 4 future sites where electrified fences are planned. The HCP provides for take of 62 species covered by the ESA, CESA, or listed as California Species of Concern, along with an additional 57 species covered under the Migratory Bird Treaty Act, but not included in the preceding category. This HCP would apply to the Northern California Women's Facility in San Joaquin County which is within the District's Adjacent Project Area, although this facility is located in Stockton, where the District would not be expected to conduct its activities. As the HCP is confined to the prison sites and specifically to mortality due to electrocution of covered species on those fences, this HCP does not apply to the District's activities.

4.1.4.3 East Bay Municipal Utility District

The EBMUD HCP was developed to enhance and protect approximately 28,200 acres of watershed lands owned and operated by EBMUD. The plan identifies existing and prospective maintenance and operation activities that may result in incidental take of endangered, threatened, or candidate species for the duration of the 30 year permit. Biological goals and objectives for the covered species are outlined in the HCP; watershed vegetation communities in the HCP are described. Activities in the EBMUD-owned watershed HCP areas are outlined including Water Quality Program, Biodiversity Program, Forestry Program, Livestock Grazing Program, Agricultural Operations Program, Fire and Fuels Program, Recreation and Trails Program, Trench Spoils Storage and Removal Program, and Multiple Program Activities. The HCP also outlines the potential incidental take of endangered species with each of their programs and their mineralization and avoidance measures. Monitoring plans are outlined in the HCP which include annual review of monitoring and reports to UCFWS and CDFW.

4.1.4.4 East Contra Costa County HCP/NCCP

The East Contra Costa County HCP is developed by the East Contra Costa County Habitat Conservation Plan Association with consultants Jones and Stokes, Resources Law Group and Economic and Planning systems with the goals of an effective framework to protect natural resources in eastern Contra Costa County and streamlining environmental permitting process for impacts on endangered species for a duration of 30 years. The permit holders are joint powers of Contra Costa County, Contra Costa County Flood Control and Water Conservation District, the East Bay Regional Park District, Cities of Brentwood, Clayton, Oakley, and Pittsburg, and the Implementing Entity. The Implementing Entity will be run by a Governing Board or representatives from the cities and County, an Executive Director and will be advised by USFWS, CDFW, and other regulatory agencies. The geographical scope of the HCP encompasses an inventory area which consists of approximately 174, 018 acres.

Urban areas are designated into two areas: initial urban development area (9,796 acres) and the maximum urban development area (13,029 acres). Covered activities that are authorized for take of covered species under ESA and NCCP Act for future urban development (cities of Clayton, Pittsburg, Brentwood, Oakley, and unspecified unincorporated areas of Contra Costa County) include all ground-disturbing activities controlled by permit holders via their land use planning process; activities also include specific rural infrastructure projects outside urban boundaries that will support urban growth (e.g., road and flood control project and maintenance).HCP conservation strategy has a preserve system, habitat restoration program, and an adaptive management and monitoring outline.

4.1.4.5 Los Esteros LE

This HCP was prepared by CH2MHill for the Los Esteros Critical Energy Facility, LLC specifically for the protection and conservation of Bay Checkerspot Butterfly and Serpentine Endemic Plant Species. The HCP plan was developed for a period of 50 years. Los Esteros Critical Energy Facility, LLC is currently seeking a CEC license to convert the facility to combined-cycle operation that would involve the addition of four heat recovery steam generators, one steam-turbine generator, a six-cell cooling tower, and ancillary equipment, resulting in a total nominal generating capacity of 320 MW. As no direct impacts to serpentine habitats will occur from the facility, the low-effect HCP addresses the indirect impacts that occur from nitrogen deposition (power plant activity, vehicle emissions, etc.) on serpentine habitats that support federal threatened or endangered species. The nearest serpentine habitats are located nearly 10 miles southeast of the project site. A large area of potential effect from nitrogen compound emissions includes a portion of the hills located east of Highway 101 and south of San Jose that are collectively known as Coyote Ridge. The HCP has in place preservation and mitigation measures as well as a monitoring program for the concerned species. As the HCP was developed to cover indirect impact from the power plant's nitrogen deposition, this HCP does not apply to the District's activities.

4.1.4.6 PG&E San Joaquin Valley O&M Habitat Conservation Plan

This HCP was prepared by Jones and Stokes for San Joaquin Valley PG&E for a 30 year permit. The purpose and goal is to avoid, minimize, and compensate for potential adverse effects on threatened and endangered species resulting from covered activities; accommodate PG&E's current and future operations and maintenance activities in the San Joaquin Valley; and provide the basis for take authorization pursuant to ESA and CESA; integrate PG&E's other programs and agreements that protect or minimize the potential impacts of operation and maintenance activities into the HCP and Implementing agreement, including the ESA section 7 consultation for the valley elderberry longhorn beetle, PG&E's Migratory Bird Protection Program, a Master Streambed Alteration Agreement, and a conservation practices regarding operations and maintenance practices near western burrowing owl. The plan area comprises of portions of these counties: San Joaquin, Stanislaus, Merced, Fresno, Kings, Kern, Mariposa, Madera, and Tulare. Covered activities in the HCP include operation activities: inspecting, monitoring, testing, operating valves, reclosures, switches, etc. Maintenance activities include: repairing and replacing facilities, structures, access roads, emergency repairs and replacements, vegetation management, tree trimming, and fire breaks. Minor construction activities include installing newer replacement structures to upgrade existing facilities within 1 mile or less of a new electric or gas line and 0.5 acre of less of permanent facilities. District activities are unlikely to occur within the boundaries of this HCP since it does not extend into Alameda County.

4.1.4.7 San Joaquin County Multi-Species Habitat Conversation & Open Space Plan

The HCP was collaboratively created by committees from several local, state, and federal agencies with the technical assistance from Augustine Land Use Planning, Hausrath Economics Group, and Toyon Environmental Consultants, Inc. to provide a strategy for balancing the need to conserve Open Space and the need to Convert Open Space to non-Open Space uses for an area of approximately 900,000 acres and for the duration of 50 years. The area consists of 43% of the Sacramento-San Joaquin Delta's Primary Zone. The HCP encompasses all of the San Joaquin County except for federally owned lands. There is an estimated 109,302 acres of habitat loss resulting from Open Space Conversions. The plan compensates for the conversions of the Open Space for the following activities: urban development, mining, expansion of urban boundaries, school expansions, transportation projects, levee maintenance undertaken by the San Joaquin Area Flood Control Agency, new parks and trails, utility installation, maintenance activities, etc. Both private and public individuals and agencies will take part in these activities. District activities do not permanently alter land usage and are unlikely to occur within the boundaries of this HCP since it does not extend into Alameda County.

4.1.4.8 Bay Delta Conservation Plan

The Bay Delta Conservation Plan is an HCP being developed as part of California's overall water management portfolio. It is being developed as a 50-year habitat conservation plan with the goals of restoring the Sacramento-San Joaquin Delta (Delta) ecosystem and securing California water supplies. The plan area encompasses the legal Delta and surrounding areas. It encompasses parts of adjoining San Joaquin and Contra Costa counties. The activities covered under the HCP include improvements to water infrastructure facilities in and around the Delta and the protection of approximately 150,000 acres of habitat to address the Delta's environmental challenges. The HCP includes 22 conservation measures aimed at improving water operations, protecting water supplies and water quality, and restoring the Delta ecosystem within a stable regulatory framework (BDCP website, accessed October 24, 2014, at http://baydeltaconservationplan.com/AboutBDCP/WhatistheBDCP.aspx).

The Bay Delta Conservation Plan seeks coverage for 56 species and identifies conservation measures designed to contribute to their protection and recovery. The plan includes 67 goals and 165 objectives that form the basis of the conservation strategy, which includes landscape scale, natural community and biological and species specific goals and objectives. The HCP also includes 37 Avoidance and Minimization Measures (AMMs) that are incorporated into covered activities to minimize the effects of these actions on various resources. Many of these AMMs focus on minimizing the general environmental effects construction activities and many others are species specific AMMs.

AMM 33 Mosquito Management calls for management and control of mosquitoes during construction of project facilities. The HCP Implementation Office will accomplish this through consultation with appropriate mosquito and vector control districts and for the HCP Implementation Office to carry out mosquito control activities as necessary and applicable. The types of mosquito control activities that may be carried out under this AMM include surveillance, biological controls, physical controls, vegetation management, and use of larvicides and adulticides, as necessary.

4.1.4.9 Santa Clara Valley

The Santa Clara Valley Habitat Plan allows the County of Santa Clara, the Santa Clara Valley Water District, the Santa Clara Valley Transportation Authority and the cities of Gilroy, Morgan Hill, and San Jose to receive endangered species permits for activities and projects they conduct and those under their jurisdiction in an area of 519,506 acres, excluding tidally influenced portions of baylands, for the permit term of 50 years. The plan was developed in association with USFWS and CDFW. Permittees will be able to streamline future mitigation requirements into a single comprehensive program. Covered activity categories authorized for incidental take are urban development, in-stream capital projects, in-stream operations and maintenance, rural capital projects, rural operations and maintenance, rural development, and conservation strategy implementation. The plan provides take authorization for 18 listed and non listed species and conservation to protect those species. The boundary of the HCP extends into Fremont, located in Alameda County and the District's service area, for the implementation of conservation action for western burrowing owl. District staff may cross through western burrowing owl habitat in order to access mosquito breeding sites but it is unlikely that control activities would occur in those areas. District activities would not be in conflict with this HCP.

4.2 Environmental Impacts and Mitigation Measures

This section presents the environmental concerns associated with the various alternatives and presents significance criteria used to evaluate the likely impacts of the various Program alternatives under CEQA. The significance criteria establish thresholds 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. Mitigation measures to reduce potentially significant impacts to less than significant are listed after each potentially significant but mitigable impact with additional explanation of the measure provided in Section 4.2.11 Mitigation and Monitoring.

4.2.1 Evaluation Concerns and Criteria

The Program alternatives are implemented as part of an IMMP as described in Section 2.3. The IMMP uses alternative nonchemical and chemical treatments in 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. 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, but environmental concerns relating to different alternatives remain.

4.2.1.1 Environmental Concerns

Some Program alternatives have the potential to affect aquatic resources directly by affecting physical habitat and through direct toxicity to nontarget organisms. The Program alternatives may also affect aquatic resources indirectly through effects on nontarget organisms that may affect food webs, making food less available.

Direct impacts would include habitat modifications, such as draining or changing the hydrology of waterways through removal of or placement of sediment and fill, removal of debris and weeds, and trimming or removal of emergent and riparian vegetation. The District may also request other landowners to perform similar activities. These activities may be undertaken in a variety of aquatic or wetland habitats including creeks and rivers, riparian corridors, ponds and lakes, freshwater marsh and seeps, seasonal wetlands (including vernal pools), lagoons, tidal marsh and channels, as well as wastewater treatment and septic systems, and temporary standing waters and artificial ponds.

Introduction of mosquito predators, specifically mosquitofish, into natural, and some artificial, environments could adversely affect nontarget organisms including insects, amphibians, and fish. These organisms may prey upon these nontarget species directly or may compete with them for food resources.

Chemical control alternatives, including larvicides, adulticides, herbicides (under the Vegetation Management Alternative), and the biological agents (Bs), or their byproducts (Bti, and *Saacropolyspora spinosa*), have the potential to affect nontarget organisms, either through direct toxicity or through effects on nontarget organisms, which could affect the food web. Similar types of effects could occur through the use of surfactants.

Concerns identified during public scoping, comments made during other District activities, and historical questions raised by individuals include the following which are addressed as elements of the broader issues explained above:

> Employ techniques associated with the physical control of mosquitoes and their habitat that conform to HCP avoidance, minimization, and mitigation measures.

> Consider direct/indirect effects *o*f using mosquitofish as control. Do not stock mosquitofish (*Gambusia affinis*) in ponds, creeks, or reservoirs. As the mosquitofish used (*Gambusia affinis)* are nonnative predatory fish, describe how their impact on native fish populations is considered.

> The PEIR should include a detailed description and complete assessment of the surveillance impacts (current and future, direct and indirect) on habitats (including endangered, threatened, and locally unique species and sensitive habitats) and on species (special status fish, wildlife, or plants) and ensure CEQA requirements are met.

> The PEIR should include a detailed description and complete assessment of the biological control impacts (current and future, direct and indirect) on habitats (including endangered, threatened, and locally unique species and sensitive habitats) and on species (special status fish, wildlife, or plants) and ensure CEQA requirements are met.

> The PEIR should include a detailed description and complete assessment of the chemical control impacts (current and future, direct and indirect) on habitats (including endangered, threatened, and

locally unique species and sensitive habitats) and on species (special status fish, wildlife, or plants) and ensure CEQA requirements are met.

4.2.1.2 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 there is a potentially significant impact 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. Impacts were considered potentially significant if they would:

> 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.

> 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.

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

> 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.

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

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

4.2.2 Evaluation Methods and Assumptions

Impacts are evaluated with regard to desired fish and amphibian species (e.g., native and listed species), macroinvertebrate communities, and effects on food supply for fish or amphibians, using the criteria described above. Potential impacts were assessed using available information on the types of control and treatment as described in Chapter 2, and assuming that all applicable BMPs as described in Chapter 2, Program Description, CDPH's Best Management Practices for Mosquito Control in California, the Statewide General NPDES Permit for Biological and Residual Pesticide Discharges to Waters of the US from Spray Applications (SWRCB Water Quality Order No. 2011-0004-DWQ; NPDES No. CAG 990007; Spray Applications Permit) and District-specific BMPs, as indicated in the PAPs and Aquatic Weed Control Permits (Aquatic Pesticide Application Plans [APAPs]), and in Table 2-6, are implemented. This assessment also considers the physical and biological connections between treatment areas and aquatic or wetland ecosystems. This information was evaluated in the context of the treatment alternatives and the existing environment under baseline conditions in the Program Area as described in Section 4.1.1.

The detailed BMPs listed in Table 2-6 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 activities to be implemented. This will include an annual work plan that may be part of any permits, obtaining any required permits, periodic check-in calls, and calls 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 includes both general training, training to avoid or eliminate the spread of weeds, and species or habitat specific training provided to District staff by USFWS, CDFW or other appropriately trained individuals approved by these agencies.

3. Pre-treatment Screening – involves a pre-treatment, in-office assessment of treatment locations for environmentally sensitive resources to determine appropriate treatment, access routes and other BMPs to be applied for that location. This may include a pre-treatment site visit to confirm information used in the screening.

4. Disturbance Minimization – includes:

    a. avoiding environmentally sensitive areas as much as practical,

    b. use of 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 California tiger salamander). 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 Table 2-6.

6. Alternative 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 alternative-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 Alternative 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 Chapter 2 or Table 2-6, nor are they intended to replace those more specific BMPs. These categories are provided to facilitate the discussion of the impact evaluation through the end of this chapter. The application of specific BMPs by alternative and habitat type is provided in Table 4-6.

Impact determinations follow the analysis for each Program alternative and cover the following issues derived from the CEQA significance criteria (Section 4.2.1.2):

> Impacts to special status species

> Impacts to riparian habitats or other sensitive natural communities

> Impacts to federally-protected wetlands

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

> Impacts to local policies

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

The potential effects of the treatment alternatives will vary depending on the specific treatment applied, the size and location of the treated area, the type of habitat treated, and the timing and frequency of

treatment. Small treatment areas or less frequent applications of a treatment would generally be expected to result in lesser effects than the same treatment applied over a larger area or more frequently.

The potential impacts of the nonchemical alternatives are based on the type and location of habitats treated and the magnitude and frequency of treatment. The potential impacts of the chemical alternatives 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, Human and Ecological Health Assessment Report. The evaluation of all alternatives considered the life histories of the different listed fish and amphibian species and ecological interactions including impacts to the aquatic food chain.

This evaluation does not incorporate any assumptions about which alternative treatment strategy or strategies would be applied in any given area. Therefore, each treatment alternative is considered as a stand-alone option, although the Program may include multiple alternative treatments within a given area, i.e., physical controls followed by larvicide application. This evaluation assumes that all chemical treatments would be made in accordance with label instructions and guidance provided by the USEPA and CDPR.

Assumptions related to the analysis of hazards, toxicity, and exposure for chemical treatment methods are explained below, including the definition of key terms. The ecological food web concept is explained as well, and it is addressed primarily in Section 6.1.1.1, *Toxicity and Exposure*.

4.2.2.1 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.”

Table 4-6 Alameda County Mosquito Abatement District BMPs to Avoid / Minimize Environmental Impacts by Alternative

Best Management Practice (BMP)	Alternative					Upland Habitats							Aquatic and Wetland Habitats								
	Surveillance	Physical Control	Vegetation Management	Biological Control	Chemical Control	Coniferous Forest	Deciduous Forest	Shrublands	Grasslands	Serpentine	Coastal Dunes	Tree Holes	Tidal Marsh and channels	Lagoon	Creeks and Rivers	Ponds and Lakes	Seasonal Wetlands (includes Vernal Pools)	Freshwater Marsh/Seeps	Riparian Corridor	Artificial Containers, Temporary Standing Waters and Artificial Ponds	Water and Wastewater Management Facilities
A. General BMPs																					
1. District staff has had long standing and continues to have cooperative, collaborative relationships with federal, state, and local agencies. The District regularly communicates with agencies regarding the District's operations and/or the necessity and opportunity for increased access for surveillance, source reduction, habitat enhancement, and the presence of special status species and wildlife. The District often participates in and contributes to interagency projects. The District will continue to foster these relationships, communication, and collaboration.	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
2. In particular, District staff will regularly communicate with resource agency staff regarding mosquito management operations, habitat, and flora and fauna in sensitive habitats. Such communications will include wildlife studies and occurrences of sensitive species in areas that may be subject to mosquito management activities.	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
3. When walking or using small equipment in marshes, riparian corridors, or other sensitive habitats, existing trails, levees and access roads will be used whenever possible to minimize or avoid impacts to species of concern and sensitive habitats. Specific care will be taken when walking and performing surveillance in the vicinity of natural and manmade ditches or sloughs or in the vicinity of tidal marsh habitat.	√	√	√	*	√								√	√	√	√	√	√	√		
4. District staff has received training from USFWS and CDFW biologists regarding endangered species, endangered species habitat, and wildlife/wildlife habitat recognition and avoidance measures. District supervisory staff frequently engages staff on these subjects. For example, District staff has become familiar with Ridgway's Rail call recordings to invoke avoidance measures if these calls are heard in the field. District staff is trained to be observant, proceed carefully, and practice avoidance measures if needed when accessing areas that may serve as bird nesting habitat (e.g., watch for flushing birds that may indicate a nest is nearby). Emphasis will be placed on species and habitats of concern where mosquito management activities might occur (e.g., SMHM, RR, special status plants, vernal pools, tidal marsh, etc.). These training sessions will be included as a part of the required safety training records that are kept by mosquito control agencies.	√	√	√	*	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
5. Conduct worker environmental awareness training for all treatment field crews and contractors for special status species and sensitive natural communities that a qualified person (e.g., District biologist) determines to have the potential to occur on the treatment site. Conduct the education training prior to starting work at the treatment site and upon the arrival of any new worker onto sites with the potential for special status species or sensitive natural communities.	√	√	√	*	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
6. District staff will work with care and caution to minimize potential disturbance to wildlife while performing surveillance and mosquito treatment/population management activities (see 1 through 5 above).	√	√	√	*	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
7. Identify probable (based on historical experience) treatment sites that may contain habitat for special status species every year prior to work to determine the potential presence of special status flora and fauna using the CNDDB, relevant Habitat Conservation Plans (HCPs), NOAA Fisheries and USFWS websites, Calfish.org, and other biological information developed for other permits. Establish a buffer of reasonable distance, when feasible, from known special status species locations and do not allow application of pesticides/herbicides within this buffer whenever possible. Nonchemical methods are acceptable within the buffer zone when designed to avoid damage to any identified and documented rare flora and fauna.	√	√	√	*	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
8. Vehicles driving on levees to travel through tidal marsh or to access sloughs or channels for surveillance or treatment activities will travel at speeds no greater than 10 miles per hour to minimize noise and dust disturbance.	√	√	√	*	√								√								
9. District staff will implement site access selection guidelines to minimize equipment use in sensitive habitats including active nesting areas and to use the proper vehicles for onroad and offroad conditions.	√	√	√	*	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√

Table 4-6 Alameda County Mosquito Abatement District BMPs to Avoid / Minimize Environmental Impacts by Alternative

Best Management Practice (BMP)	Alternative					Upland Habitats							Aquatic and Wetland Habitats								
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10. Properly train all staff, contractors, and volunteer help to prevent spreading weeds and pests to other sites. The District headquarters contains wash rack facilities (including high-pressure washers) to regularly (in many cases daily) and thoroughly clean equipment to prevent the spread of weeds.	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√		
11. Operation of noise-generating equipment (e.g., chainsaws, brushcutters) will abide by the time-of-day restrictions established by the applicable local jurisdiction (i.e., City and/or County) if such noise activities would be audible to receptors (e.g., residential land uses, schools, hospitals, places of worship) located in the applicable local jurisdiction. Shut down all motorized equipment when not in use.	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
12. For operations that generate noise expected to be of concern to the public, the following measures will be implemented: – Measure 1: Provide Advance Notices: A variety of measures are implemented depending on the magnitude/nature of the activities undertaken by the District, and may include but are not limited to press releases, the District website, social media, and posted signs. Public agencies and elected officials also may be notified of the nature and duration of the activities, including the Board of Supervisors or City Council, environmental health and agricultural agencies, emergency service providers, and airports. – Measure 2: Provide Mechanism to Address Complaints: District staff is available during regular business hours to respond to service calls and address concerns about nighttime operations.	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
13. The District will perform public education and outreach activities.	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
14. Engine idling times will be minimized either by shutting equipment and vehicles off when not in use or reducing the maximum idling time to 5 minutes. Correct tire inflation will be maintained in accordance with manufacturer's specifications on wheeled equipment and vehicles to prevent excessive rolling resistance. All equipment and vehicles will be maintained and properly tuned in accordance with manufacturer's specifications. All equipment will be checked by a certified visible emissions evaluator if visible emissions are apparent to onsite staff.	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
B. Tidal Marsh-Specific BMPs																					
1. District staff will continue to implement the measures in the USFWS's "Walking in the Marsh: Methods to Increase Safety and Reduce Impacts to Wildlife/Plants." District staff will receive annual training and review of this document to remain up to date and current on this document and its methodologies for protecting sensitive species and the marsh habitat.	√	√	√	*	√								√	√							
2. District will minimize the use of equipment (e.g., ARGOs) in tidal marshes and wetlands. When feasible and appropriate, surveillance and control work will be performed on-foot with handheld equipment. Aerial treatment (helicopter) treatments will be utilized when feasible and appropriate to minimize the disturbance of the marsh during pesticide applications. When ATVs (e.g., ARGOs) are utilized techniques will be employed that limit impacts to the marsh including: slow speeds; slow, several point turns; using existing levees or upland to travel through sites when possible; use existing pathways or limit the number of travel pathways used.	√	√	√	*	√								√	√							
3. District will minimize travel along tidal channels and sloughs in order to reduce impacts to vegetation used as habitat (e.g., rail nesting and escape habitat).	√	√	√	*	√								√	√							
4. District staff will minimize the potential for the introduction and spread of *Spartina*, perennial pepperweed and other invasive plant species by cleaning all equipment, vehicles, personal gear, clothing, and boots of soil, seeds, and plant material prior to entering the marsh, and avoiding walking and driving through patches of perennial pepperweed to the maximum extent feasible.	√	√	√	*	√								√	√	√	√	√	√			
5. When feasible, boats will be used to access marsh areas for surveillance and treatment of mosquitoes to further reduce the risk of potential impacts that may occur when using ATVs to conduct mosquito management activities.	√	√	√	*	√								√	√							

Table 4-6 Alameda County Mosquito Abatement District BMPs to Avoid / Minimize Environmental Impacts by Alternative

Best Management Practice (BMP)	Alternative					Upland Habitats							Aquatic and Wetland Habitats								
	Surveillance	Physical Control	Vegetation Management	Biological Control	Chemical Control	Coniferous Forest	Deciduous Forest	Shrublands	Grasslands	Serpentine	Coastal Dunes	Tree Holes	Tidal Marsh and channels	Lagoon	Creeks and Rivers	Ponds and Lakes	Seasonal Wetlands (includes Vernal Pools)	Freshwater Marsh/Seeps	Riparian Corridor	Artificial Containers, Temporary Standing Waters and Artificial Ponds	Water and Wastewater Management Facilities
6. The District currently references and provides staff training relevant to the USFWS "Walking in the Marsh: Methods to Increase Safety and Reduce Impacts to Wildlife/Plants" guidelines (USFWS undated). – District staff is trained to walk carefully in the marsh and to continuously look ahead of themselves to avoid potential wildlife disturbance (e.g., carefully make observations in their surroundings to detect flushing birds and nests). Specific care is taken when walking and performing surveillance in the vicinity of natural and manmade ditches or sloughs or in vicinity of cord grass habitat (e.g., rack line). – When walking in marshes District staff utilizes existing trails when possible (i.e., deer trails and other preexisting trails).	√	√	√	*	√	√	√	√	√	√	√		√	√	√	√	√	√	√		
C. Salt Marsh Harvest Mouse (SMHM)																					
1. Activities [surveillance, treatment (excluding aerial applications), source reduction] within or adjacent to harvest mouse habitat will not occur within two hours before or after extreme high tides of 6.9 feet National Geodetic Vertical Datum (NGVD) or above as measured at the Golden Gate Bridge (corrected for time and tide height for the site) or when the marsh plain is completely inundated because suitable upland refugia cover is limited and potentially disturbance-creating activities could prevent mice from reaching available cover.	√	√	√	*	√								√	√							
2. Vegetation removal is limited to the minimum amount necessary to allow for surveillance, treatment, and mosquito habitat reduction (vegetation management) to minimize or avoid loss of SMHM. Similarly, excavation, fill, or construction activities will also be limited to the minimum amount necessary to minimize/avoid loss of SMHM.	√	√	√	*	√								√	√							
3. Vegetation clearing will be conducted systematically within the project area to ensure that SMHM are encouraged to move toward remaining vegetation and are not trapped in islands of vegetation subject to removal and far from suitable cover.		√	√										√	√							
4. To the extent feasible, physical control, vegetation management and other mosquito habitat reduction activities will be conducted between December 1 and February 28 (outside of the SMHM breeding season). Surveillance, chemical control, biological control, and public education activities occur year-round and are therefore carefully coordinated with resource agencies to minimize potential impacts to SMHMs and their habitats.		√	√										√	√							
5. When walking in the marsh, existing trails will be used whenever possible. Specific care will be taken when walking and performing surveillance in the vicinity of natural and manmade ditches or sloughs or in the vicinity of tidal marsh habitat to avoid potential disturbance of SMHM.	√	√	√	*	√								√	√							
6. District staff will receive training on measures to avoid impacts to SMHM.	√	√	√	*	√								√	√							
7. If SMHM nests or adults are encountered during mosquito management activities, avoidance measures will be immediately implemented and findings will be reported to the appropriate resource agency.	√	√	√	*	√								√	√							
D. Ridgway's Rail (RR)																					
1. Activities (surveillance, treatment, source reduction) within or adjacent to Ridgway's Rail habitat will not occur within two hours before or after extreme high tides of 6.9 feet National Geodetic Vertical Datum (NGVD) or above as measured at the Golden Gate Bridge (corrected for time and tide height for the site) or when the marsh plain is completely inundated because suitable upland refugia cover is limited and potentially disturbance-creating activities could prevent clapper rails from reaching available cover.	√	√	√		√								√	√							
2. Vegetation removal is limited to the minimum amount necessary to allow for surveillance, treatment, and mosquito habitat reduction (vegetation management) to minimize or avoid loss of RR. Similarly, excavation, fill, or construction activities will also be limited to the minimum amount necessary to minimize/avoid loss of RR.	√	√	√		√								√	√							

Table 4-6 Alameda County Mosquito Abatement District BMPs to Avoid / Minimize Environmental Impacts by Alternative

Best Management Practice (BMP)	Alternative					Upland Habitats							Aquatic and Wetland Habitats								
	Surveillance	Physical Control	Vegetation Management	Biological Control	Chemical Control	Coniferous Forest	Deciduous Forest	Shrublands	Grasslands	Serpentine	Coastal Dunes	Tree Holes	Tidal Marsh and channels	Lagoon	Creeks and Rivers	Ponds and Lakes	Seasonal Wetlands (includes Vernal Pools)	Freshwater Marsh/Seeps	Riparian Corridor	Artificial Containers, Temporary Standing Waters and Artificial Ponds	Water and Wastewater Management Facilities
3. To the extent feasible, physical control, vegetation management and other mosquito habitat reduction activities will be conducted between September 1 and January 31 (outside of the RR breeding season). Surveillance, chemical control, biological control, and public education activities occur year-round and are therefore carefully coordinated with resource agencies to minimize potential impacts to RRs and their habitats.		√	√										√	√							
4. District staff will notify the appropriate resource agency prior to entering potential RR habitats and will regularly coordinate with the resource agency(ies) on the locations of breeding RRs and avoid breeding RRs to the extent feasible. Any observations of adverse effects to RRs will be reported by District staff.	√	√	√		√								√	√							
5. When walking in the marsh District staff will use existing trails whenever possible. Specific care will be taken when walking and performing surveillance in the vicinity of natural and manmade ditches or sloughs or in the vicinity of tidal marsh habitat to avoid potential disturbance of RRs.	√	√	√		√								√	√							
6. Entry into suitable breeding habitat for RR will be minimized. When entry is required, the preferred method will be by foot. Other entry methods will be based on consultation with the appropriate resource agency.	√	√	√		√								√	√							
7. District staff will receive training on measures to avoid impacts to RRs	√	√	√		√								√	√							
8. If RR nests or adults are encountered during mosquito management activities, avoidance measures, as provided during training from the resource agencies, will be immediately implemented and findings will be reported to the appropriate resource agency.	√	√	√		√								√	√							
E. California Least Tern (CLT)																					
1. District staff will notify the appropriate resource agency prior to entering potential CLT habitats between April 15 and August 31 (breeding season) and will regularly coordinate with the resource agency(ies) on the locations of breeding CLTs and avoid breeding CLTs to the extent feasible. Any observations of adverse effects to CLTs will be reported by District staff.	√				√						√										
2. Entry into suitable breeding habitat for CLT will be minimized. When entry is required, vehicle speed will be reduced to 5mph and peripheral paths will be utilized to the extent feasible. Other entry methods will be based on consultation with the appropriate resource agency.	√				√						√										
3. District staff will receive training on measures to avoid impacts to CLTs	√				√						√										
4. If CLT nests or adults are encountered during mosquito management activities, avoidance measures, as provided during training from the resource agencies, will be immediately implemented and findings will be reported to the appropriate resource agency.	√				√						√										
F. Western Snowy Plover (WSnPl)																					
1. District staff will notify the appropriate resource agency prior to entering potential WSnPl habitats between March 1 and September 15 (breeding season) and will regularly coordinate with the resource agency(ies) on the locations of breeding WSnPls and avoid breeding WSnPls to the extent feasible. Any observations of adverse effects to WSnPls will be reported by District staff.	√				√						√										
2. Entry into suitable breeding habitat for WSnPl will be minimized. When entry is required, vehicle speed will be reduced to 5mph and peripheral paths will be utilized to the extent feasible. Other entry methods will be based on consultation with the appropriate resource agency.	√				√						√										

Table 4-6 Alameda County Mosquito Abatement District BMPs to Avoid / Minimize Environmental Impacts by Alternative

Best Management Practice (BMP)	Alternative					Upland Habitats							Aquatic and Wetland Habitats								
	Surveillance	Physical Control	Vegetation Management	Biological Control	Chemical Control	Coniferous Forest	Deciduous Forest	Shrublands	Grasslands	Serpentine	Coastal Dunes	Tree Holes	Tidal Marsh and channels	Lagoon	Creeks and Rivers	Ponds and Lakes	Seasonal Wetlands (includes Vernal Pools)	Freshwater Marsh/Seeps	Riparian Corridor	Artificial Containers, Temporary Standing Waters and Artificial Ponds	Water and Wastewater Management Facilities
3. District staff will receive training on measures to avoid impacts to WSPs	√				√						√										
4. If WSnPl nests or adults are encountered during mosquito management activities, avoidance measures, as provided during training from the resource agencies, will be immediately implemented and findings will be reported to the appropriate resource agency.	√				√						√										
G. California Tiger Salamander (CTS)																					
1. Trucks and ARGOs will be restricted to established roads and berms in vernal pool areas. Only small ATVs (e.g. Polaris) will be utilized near vernal pools.	√				√				√								√				
2. Methoprene, monomolecular films, and adulticides will not be used in vernal pool areas.					√				√								√				
3. District staff will receive training on measures to avoid impacts to CTS	√				√				√								√				
H. Vernal Pool Tadpole Shrimp (VPTS)																					
1. Trucks and ARGOs will be restricted to established roads and berms in vernal pool areas. Only small ATVs (e.g. Polaris) will be utilized near vernal pools.	√				√												√				
2. Methoprene, monomolecular films, and adulticides will not be used in vernal pool areas.					√												√				
3. District staff will receive training on measures to avoid impacts to VPTS	√				√												√				
I. Contra Costa Goldfields (CCG)																					
1. District staff will receive training on the identification, biology and preferred habitat of Contra Costa goldfields.	√				√		√		√								√				
2. When possible, project actions to be conducted in areas containing suitable habitat for this species will occur during the time period when CCG is in bloom and identifiable (March-June), so that any CCG plants observed can be avoided and documented.	√				√		√		√								√				
3. District staff will coordinate with CDFW and USFWS regarding the locations of known CCG populations, so that these populations can be avoided. Flagging may be used to identify the boundaries of known CCG populations.	√				√		√		√								√				
4. Trucks and ARGOs will be restricted to established roads and berms in vernal pool areas. Only small ATVs (e.g. Polaris) will be utilized near vernal pools. When feasible, mosquito management activities will be conducted on foot using hand equipment.	√				√		√		√								√				
J. Palmate-Bracted Bird's Beak (PBBB)																					
1. District staff will receive training on the identification, biology and preferred habitat of palmate-bracted bird's beak.	√				√			√	√												
2. When possible, project actions to be conducted in areas containing suitable habitat for this species will occur during the time period when palmate-bracted bird's beak is in bloom and identifiable (May-October), so that any palmate-bracted bird's beaks plants observed can be avoided and documented.	√			*	√			√	√												

Table 4-6 Alameda County Mosquito Abatement District BMPs to Avoid / Minimize Environmental Impacts by Alternative

Best Management Practice (BMP)	Alternative					Upland Habitats							Aquatic and Wetland Habitats								
	Surveillance	Physical Control	Vegetation Management	Biological Control	Chemical Control	Coniferous Forest	Deciduous Forest	Shrublands	Grasslands	Serpentine	Coastal Dunes	Tree Holes	Tidal Marsh and channels	Lagoon	Creeks and Rivers	Ponds and Lakes	Seasonal Wetlands (includes Vernal Pools)	Freshwater Marsh/Seeps	Riparian Corridor	Artificial Containers, Temporary Standing Waters and Artificial Ponds	Water and Wastewater Management Facilities
3. District staff will coordinate with CDFW and USFWS regarding the locations of known palmate-bracted bird's beak populations, so that these populations can be avoided. Flagging will be used to identify the boundaries of known palmate-bracted bird's beak populations.	√			*	√			√	√												
4. When possible, mosquito management activities will be conducted on foot using hand equipment.	√			*	√			√	√												
K. Vegetation Management																					
1. Consultations will be made with the appropriate resource agency to discuss proposed vegetation management work, determine potential presence of sensitive species and areas of concern, and any required permits.		√	√										√	√	√	√	√	√	√		
2. Vegetation management work performed will typically be by hand, using handheld tools, to provide access to mosquito habitat for surveillance, and when needed control activities. Tools used include: machetes, small garden variety chain saw, hedge trimmers and "weed-eaters".		√	√										√	√	√	√	√	√	√		
3. District will consult and coordinate with resource agencies as well as have all necessary permits prior to the commencement of work using heavy equipment (e.g., larger than handheld/garden variety tools such as small excavators with rotary mowers) in riparian areas.		√	√										√	√	√	√	√	√	√		
4. Minor trimming of vegetation (e.g., willow branches approximately three inches in diameter or less, blackberry bushes, and poison oak) to the minimum extent necessary will occur to maintain existing paths or create access points through dense riparian vegetation into mosquito habitat. This may include minor trimming of overhanging limbs, brush and blackberry thickets that obstruct the ability to walk within creek channels. Paths to be maintained will not be a cut as a defined corridor but rather a path maintained by selective trimming of overhanging or intrusive vegetation. Paths to be maintained will range in width from 3 to 6 feet across.		√	√																√		
5. Downed trees and large limbs that have fallen due to storm events or disease will be cut only to the extent necessary to maintain existing access points or to allow access to mosquito habitats.		√	√																√		
6. Every effort will be made to complete vegetation management in riparian corridors prior to the onset of heavy rains. Maintenance work to be done in early spring will be limited to trimming of access routes to new tree shoots, poison oak, blackberries, and downed trees that block these paths.		√	√																√		
7. District staff will work with care and caution to minimize potential disturbance to wildlife, while performing vegetation management activities within or near riparian corridors.		√	√										√	√	√	√	√	√	√		
8. If suitable habitat necessary for special status species is found and if nonchemical physical and vegetation management control methods have the potential for affecting special status species, then the District will coordinate with the CDFW, USFWS, and/or NMFS before conducting control activities within this boundary or cancel activities in this area. If the District determines no suitable habitat is present, control activities may occur without further agency consultations.		√	√										√	√	√	√	√	√	√		
9. If using heavy equipment for vegetation management, District staff (and contractors) will minimize the area that is affected by the activity and employ all appropriate measures to minimize and contain turbidity. Heavy equipment will not be operated in the water and appropriate containment and cleanup systems will be in place on site to avoid, contain, and clean up any leakage of toxic chemicals.		√	√										√	√	√	√	√	√	√		
L. Maintenance / Construction and Repair of Tide Gates and Water Structures in Waters of the U.S.																					
1. District staff will consult with appropriate resource agencies (USACE, USFWS, CDFW, NMFS, BCDC, Regional Water Quality Control Board) and obtain all required permits prior to the commencement of ditch maintenance or construction within tidal marshes.		√											√	√	√	√	√	√			

Table 4-6 Alameda County Mosquito Abatement District BMPs to Avoid / Minimize Environmental Impacts by Alternative

Best Management Practice (BMP)	Alternative					Upland Habitats							Aquatic and Wetland Habitats								
	Surveillance	Physical Control	Vegetation Management	Biological Control	Chemical Control	Coniferous Forest	Deciduous Forest	Shrublands	Grasslands	Serpentine	Coastal Dunes	Tree Holes	Tidal Marsh and channels	Lagoon	Creeks and Rivers	Ponds and Lakes	Seasonal Wetlands (includes Vernal Pools)	Freshwater Marsh/Seeps	Riparian Corridor	Artificial Containers, Temporary Standing Waters and Artificial Ponds	Water and Wastewater Management Facilities
2. Work plans for the upcoming season' proposed work as well as a summary of the last season' completed work will be submitted for review and comment to USACE, USFWS, NMFS, CDFW, BCDC and the Regional Water Quality Control Board no later than July 1 of each year for which work is being proposed. The work plan will include a delineation of all proposed ditching overlain on topographic maps at a minimum of 1" = 1000' scale, with accompanying vicinity maps. The plan will also indicate the dominant vegetation of the site, based on subjective estimates, the length and width of the ditches to be maintained, cleared or filled, and the estimated date the work will be carried out.		√											√	√	√	√	√	√			
3. 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. Similarly, in water work in waterbodies that support anadromous fish, work will be conducted between July 1 and September 30[1].		√											√	√	√	√	√	√			
4. Care will be taken to minimize the risk of potential disruption to the indigenous aquatic life of a waterbody in which ditch maintenance is to take place, including those aquatic organisms that migrate through the area.		√											√	√	√	√	√	√			
5. Staging of equipment will occur on upland sites.		√											√	√	√	√	√	√			
6. Mats or other measures will be taken to minimize soil disturbance (e.g., use of low ground pressure equipment) when heavy equipment is used.		√											√	√	√	√	√	√			
7. All projects will be evaluated prior to bringing mechanical equipment on site, in order to identify and flag sensitive sites, select the best access route to the work site consistent with protection of sensitive areas, and clearly demarcate work areas.		√											√	√	√	√	√	√			
8. Measures will be taken to minimize impacts from mechanical equipment, such as hand ditching as much as possible; reducing turns by track-type vehicles, taking a minimum number of passes with equipment, varying points of entry, driving vehicles at low speed, and not driving on open mud and other soft areas.		√											√	√	√	√	√	√			

[1] Dates are from District's USACE source reduction permit. July 31, 2007.

Table 4-6 Alameda County Mosquito Abatement District BMPs to Avoid / Minimize Environmental Impacts by Alternative

Best Management Practice (BMP)	Alternative					Upland Habitats							Aquatic and Wetland Habitats								
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9. Discharges of dredged or fill material into tidal waters will be minimized or avoided to the maximum extent possible at the project site and will be consistent with all permit requirements for such activity. No discharge of unsuitable material (e.g., trash) will be made into waters of the United States, and material that is discharged will be free of toxic pollutants in toxic amounts (see section 307 of the Clean Water Act). Measures will be taken to avoid disruption of the natural drainage patterns in wetland areas.		√											√	√	√	√	√	√			
10. Discovery of historic or archeological remains will be reported to USACE and all work stopped until authorized to proceed by the appropriate regulatory authorities/resource agencies.		√											√	√	√	√	√	√			
11. Ditching that drains high marsh ponds will be minimized to the extent possible in order to protect the habitat of native salt pan species.		√											√	√							
12. No spoils sidecast adjacent to circulation ditches will exceed 8 inches above the marsh plain to minimize risk of colonization of spoils by invasive, nonnative plants and/or the spoils lines from becoming access corridors for unwanted predators (e.g., dogs, cats, red fox). Sidecast spoil lines exceeding 4 inches in height above the marsh plain will extend no more than 6 feet from the nearest ditch margin. Any spoils in excess of these dimensions will be hydraulically redispersed on site (e.g., by rotary ditcher), or removed to designated upland sites (per conditions of resource agency issued permits). Sidecast spoil lines will be breached at appropriate intervals to prevent local impediments to water circulation.		√											√	√							
13. If review of the proposed work plan by USACE, USFWS, or CDFW determines the proposed maintenance is likely to destroy or damage substantial amounts of shrubby or sub-shrubby vegetation (e.g., coyote brush, gumplant) on old sidecast spoils, the District will provide a quantitative estimate of the extent and quality of the vegetation, and provide a revegetation plan for the impacted species prepared by a biologist/botanist with expertise in marsh vegetation. The Corps approved revegetation plan will be implemented prior to April 1 of the year following the impacts.		√											√	√							
14. Small ditch maintenance work will be performed by hand, whenever possible, using handheld shovels, pitch forks, etc., and small trimmers such as "weed-eaters". (Note: the majority of small ditch work performed by the District is by hand.)		√											√	√	√	√	√	√			
15. When feasible, work will be done at low tide (for tidal areas) and times of entry will be planned to minimize disruption to wildlife.		√											√	√	√	√	√	√			
16. In marshes which contain populations of invasive nonnative vegetation such as pepperweed or introduced *Spartina*, sidecast spoils will be surveyed for the frequency of establishment of these species during the first growing season following deposition of the spoils. The results of the surveys will be reported to the USACE, USFWS and CDFW. If it is determined the sidecasting of spoils resulted in a substantial increase in the distribution or abundance of the nonnative vegetation which is detrimental to the marsh, the District will implement appropriate abatement measures after consultation with the USACE, USFWS and CDFW.		√											√	√							
17. When possible (i.e., with existing labor and vehicles), refuse such as tires, plastic, and man-made containers found at the work site will be removed and properly discarded.		√											√	√	√	√	√	√			
M. Applications of Pesticides, Surfactants, and/or Herbicides																					
1. District staff will conduct applications with strict adherence to product label directions that include approved application rates and methods, storage, transportation, mixing, and container disposal.			√		√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√

Table 4-6 Alameda County Mosquito Abatement District BMPs to Avoid / Minimize Environmental Impacts by Alternative

Best Management Practice (BMP)	Alternative					Upland Habitats							Aquatic and Wetland Habitats								
	Surveillance	Physical Control	Vegetation Management	Biological Control	Chemical Control	Coniferous Forest	Deciduous Forest	Shrublands	Grasslands	Serpentine	Coastal Dunes	Tree Holes	Tidal Marsh and channels	Lagoon	Creeks and Rivers	Ponds and Lakes	Seasonal Wetlands (includes Vernal Pools)	Freshwater Marsh/Seeps	Riparian Corridor	Artificial Containers, Temporary Standing Waters and Artificial Ponds	Water and Wastewater Management Facilities
2. District will avoid use of surfactants when possible in sites with aquatic nontargets or natural enemies of mosquitoes present such as nymphal damselflies and dragonflies, dytiscids, hydrophilids, corixids, notonectids, ephydrids, etc. Surfactants are a least preferred method but must be used with pupae to prevent adult mosquito emergence. The District will use a microbial larvicide (Bti, Bs) or IGR (e.g., methoprene) instead or another alternative when possible.					√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
3. Materials will be applied at the lowest effective concentration for a specific mosquito species and environmental conditions. Application rates will never exceed the maximum label application rate.			√		√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
4. To minimize application of pesticides, applications will be determined by surveillance and monitoring of mosquito populations.			√		√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
5. District staff will follow label requirements for storage, loading, and mixing of pesticides and herbicides. Handle all mixing and transferring of pesticides and herbicides within a contained area.			√		√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
6. Postpone or cease application when predetermined weather parameters exceed product label specifications, when wind speeds exceed the velocity as stated on the product label, or when a high chance of rain is predicted and rain is determining factor on the label of the material to be applied.			√		√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
7. Applicators will remain aware of wind conditions prior to and during application events to minimize any possible unwanted drift to waterbodies, and other areas adjacent to the application areas.			√		√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
8. Clean containers at an approved site and dispose of at a legal dumpsite or recycle in accordance with manufacturer's instructions if available.			√		√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
9. Special status Aquatic Wildlife Species: – A CNDDB search was conducted in 2012 and the results incorporated into Appendix A for this PEIR. District staff communicates with state, federal, and county agencies regarding sites that have potential to support special status species. Many sites where the District performs surveillance and control work have been visited by staff for many years and staff is highly knowledgeable about the sites and habitat present. If new sites or site features are discovered that have potential to be habitat for special status species, the appropriate agency and/or landowner is contacted and communication initiated. – Use only pesticides, herbicides, and adjuvants approved for aquatic areas or manual treatments within a predetermined distance from aquatic features (e.g., within 15 feet of aquatic features). Aquatic features are defined as any natural or man-made lake, pond, river, creek, drainage way, ditch, spring, saturated soils, or similar feature that holds water at the time of treatment or typically becomes inundated during winter rains. – If suitable habitat for special status species is found, including vernal pools, and if aquatic-approved pesticide, herbicide, and adjuvant treatment methods have the potential for affecting the potential species, then the District will coordinate with the CDFW, USFWS, and/or National Marine Fisheries Service (NMFS) before conducting treatment activities within this boundary or cancel activities in this area. If the District determines no suitable habitat is present, treatment activities may occur without further agency consultation.			√		√		√	√	√		√		√	√	√	√	√	√	√	√	√
10. District staff will monitor sites post-treatment to determine if the target mosquito population or weeds were effectively controlled with minimum effect to the environment and nontarget organisms. This information will be used to help design future treatment methods in the same season or future years to respond to changes in site conditions.			√		√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√

Table 4-6 Alameda County Mosquito Abatement District BMPs to Avoid / Minimize Environmental Impacts by Alternative

Best Management Practice (BMP)	Alternative					Upland Habitats							Aquatic and Wetland Habitats								
	Surveillance	Physical Control	Vegetation Management	Biological Control	Chemical Control	Coniferous Forest	Deciduous Forest	Shrublands	Grasslands	Serpentine	Coastal Dunes	Tree Holes	Tidal Marsh and channels	Lagoon	Creeks and Rivers	Ponds and Lakes	Seasonal Wetlands (includes Vernal Pools)	Freshwater Marsh/Seeps	Riparian Corridor	Artificial Containers, Temporary Standing Waters and Artificial Ponds	Water and Wastewater Management Facilities
11. Do not apply pesticides that could affect insect pollinators in liquid or spray/fog forms over large areas (more than 0.25 acres) during the day when honeybees are present and active or when other pollinators are 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 hand held equipment), but the technician will first inspect the area for the presence of bees and other pollinators. If pollinators are present in substantial numbers, the treatment will be made at an alternative time when these pollinators are inactive or absent.			√		√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
12. The District will provide notification to the public (as soon as operationally possible) and/or appropriate agency(ies) when applying pesticides or herbicides for large-scale treatments (e.g., fixed-wing aircraft or helicopters) that will occur in close proximity to homes, heavily populated, high traffic, and sensitive areas. The District infrequently applies or participates in the application of herbicides in areas other than District facilities.			√		√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
N. Hazardous Materials and Spill Management																					
1. Exercise adequate caution to prevent spillage of pesticides during storage transportation, mixing or application of pesticides. All pesticide spills and cleanups (excepting cases where dry materials may be returned to the container or application equipment) will be reported to the Field Operations Supervisor and District Manager and recorded in the District safety and incident file.			√		√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
2. Maintain a pesticide spill cleanup kit and proper protective equipment at the District's Service Yard and in each vehicle used for pesticide application or transport.			√		√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
3. Manage the spill site to prevent entry by unauthorized personnel. Contain and control the spill by stopping it from leaking or spreading to surrounding areas, cover dry spills with polyethylene or plastic tarpaulin, and absorb liquid spills with appropriate absorbent materials.			√		√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
4. Properly secure the spilled material, label the bags with service container labels identifying the pesticide, and deliver them to the District/Field Operations Supervisor for disposal.			√		√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
5. A hazardous spill plan will be developed, maintained, made available, and staff trained on implementation and notification for petroleum-based or other chemical-based materials prior to commencement of mosquito treatment activities.			√		√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
6. Field-based mixing and loading operations will occur in such a manner as to minimize the risk of accidental spill or release of pesticides.			√		√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
Worker Illness and Injury Prevention and Emergency Response																					
1. Equip all vehicles used in wildland areas with a shovel and a fire extinguisher at all times.	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
2. Train employees on the safe use of tools, equipment and machinery, including vehicle operation.	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
3. District will regularly review and update their existing health and safety plan to maintain compliance with all applicable standards. Employees will be required to review these materials annually.	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√

4.2.2.2 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 (lowest observed adverse effects level, or 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 (no observed adverse effects level, or NOAEL).

However, these, and other, coordinated and focused laboratory tests are designed to document the effects of the chemical when a continuous, controlled, exposure exists and do not realistically reflect the likely exposures or toxicity in the District field application scenarios. As such, the toxicity information is intended as an overview of potential issues and guidance for understanding the completely "safe" maximum exposure levels of applications that would not adversely impact humans or nontarget plant and animal species.

Although 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 material safety data sheets (MSDSs), in actual practice, the amounts applied in the District's Program Area are often substantially less than the amounts used in the laboratory toxicity studies. Because of the large safety factors used to develop recommended product label application rates, the amount of chemical resulting in demonstrated toxicity in the laboratory is much higher than the low exposure levels associated with an actual application. The application concentrations consistent with the labels or MSDSs 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). However, adverse effects may still occur to some non-target organisms.

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 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. 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 Program alternatives.

4.2.2.3 Ecological Food Web

While it is important to evaluate the potential adverse impacts of a pesticide application to potentially affected nontarget species, it is not practical to evaluate those potential impacts to all of the food webs present in the various ecosystems under consideration. An ecological food web is represented in the illustration representing some of the multitude of possible biotic and food uptake interactions in an ecosystem. Figure 4-2 depicts a highly simplified food web. In an ecological system each level in the food web is occupied by dozens or hundreds of species, with consumers using those resources (in this case species from a lower trophic level) in different ways depending on availability and competition for those resources. Their utilization of these resources shifts by time of day and season, and multiple resources being used simultaneously or alternatively. If the availability of one resource deceases, the consumer can generally replace that with another resource. Each of the possible connections between species is also associated with other interactions, such as competitive release, where the abundance of a species increases in response to the decline in a competitor's abundance, or competitive interactions between consumers where one consumer can use a particular resource better than its competitor.

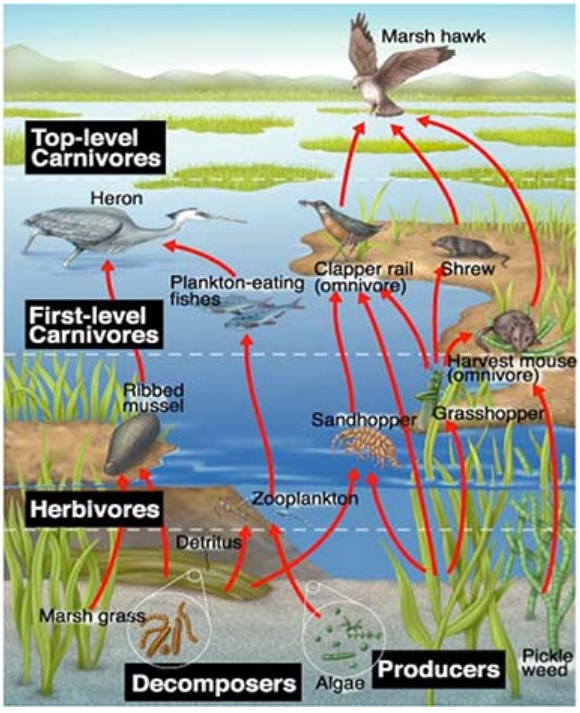

Figure 4-2 Ecological Food Web Concept

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, interactions in typical food webs are highly complex and would be subject to substantial uncertainty. This would make it exceedingly difficult to confidently assess relevant impacts. Because of these constraints and complexity, it is 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 evaluate the safety of the pesticides the District commonly uses.

4.2.3 Surveillance Alternative

The Surveillance Alternative would affect small areas with the intent of monitoring mosquito populations to determine where control alternatives are required. Small numbers of mosquito and nontarget organisms are trapped through this Program strategy at sites with the potential to support substantial mosquito 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 wetland and aquatic habitat types, except open water and tidal flats (see Table 4-2). Surveillance activities would be conducted in accordance with the BMPs relating to agency communication, pre-

treatment screening, environmental training, and disturbance minimization as detailed in Table 4-6. The potential impacts of the Surveillance Alternative would be similar for all habitat types, although the species potentially affected would differ, as indicated in Tables 4-3 and 4-4.

Small 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. 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 clearing by the District. Occasionally new access routes may be required to assess a mosquito source. This will often consist of personnel picking 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. Where such clearing is required, it is done with hand tools such as weed trimmers, small chainsaws, or other motorized equipment. These activities are typically of small size and new access routes would be minimal, so indirect impacts to wetland and aquatic habitats would be inconsequential.

The presence of District personnel and equipment implementing the Surveillance Alternative and associated noise could result in disturbance to special status aquatic species. Such disturbance is most likely to occur during breeding season for fish and amphibians, should the animals abandon suitable habitat as a result of such disturbance. These disturbances would be very minor and of short duration, so would likely not cause these animals to abandon the area. Special status invertebrates (all species associated with vernal pools) would likely not be disturbed by the presence of District personnel.

The Surveillance Alternative may also result in disturbance to species as District personnel are traveling to and from surveillance sites. These impacts would be minimized by adherence to the BMPs previously cited, but in particular discussing activities regularly with regulatory agencies or wildlife refuge managers, staying on existing access routes wherever possible, maintaining and implementing training from USFWS and CDFW personnel regarding special status species, and being aware of the environment and minimizing noise and disturbance when working in the field.

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 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 necessary; and other BMPs as indicated in Table 4-6. Through the implementation of these BMPs, substantive impacts to habitat would be avoided and no impact to special status animals would occur.

The only potential for the Surveillance Alternative to directly impact fish, amphibians or special status aquatic invertebrates would be when dipping to collect samples. Prior to collection of a sample, the technician would visually inspect the area to be sampled for nontarget organisms and avoid areas where special status species were potentially present. Samples consist of collection of approximately 1 pint of water from the immediate surface of the water body, where mosquito larvae live, an area special status fish and invertebrates are unlikely to occupy, as their risk of predation is increased in these areas. The sample would be inspected for vertebrates or special status invertebrates, and in the unlikely event that such are captured, these animals would be returned immediately to the source water. It is highly unlikely that the organism would be harmed.

Surveillance activities might result in some physical damage to habitat or associated vegetation from foot traffic in areas without marked trails to access areas for potential mosquito 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 temporarily by access activities. Therefore, few impacts would occur to aquatic resources.

This alternative would not affect the quantity or distribution of habitats, such as riparian areas, marshes, lakes or ponds, seasonal wetlands, or other habitat types. This alternative would not affect the composition of their vegetative community as very limited numbers of plants would be pruned or removed over a very small area. This alternative would not result in any ground disturbing activity, and therefore would not result in any removal, filling or hydrologic interruption of federally protected wetlands. Any disruption of migration patterns would be due to the presence of personnel and machinery in the environment. In all cases this would be a very short-term occurrence, generally not more than a few hours in any given location, and therefore this effect would be minimal and 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.

The county and city general plans and their goals and policies pertaining to natural resources are generally consistent with the CEQA criteria regarding impacts on species and habitats. Any impacts identified for these CEQA criteria would also be relevant to the county and city goals. The project would not affect trees more than 4 inches diameter breast height and, therefore, would not conflict with any tree ordinances.

Several HCPs or NCCPs were identified whose action area is within Alameda County, the primary service area, or in adjacent counties. District activities are typically not among those covered by these HCPs.. Therefore, the District activities would not be in conflict with the provisions of any HCP, NCCP or other approved local, regional, or state approved conservation plan.

Impact AR-1. The Surveillance Alternative 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 in local or regional plans, policies, or regulations, or by the CDFW, NOAA Fisheries, or USFWS. This alternative would not directly affect these species, as described above. 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. No mitigation is required.

Impact AR-2. The Surveillance Alternative would have a **less-than-significant** impact on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, regulations, or by the CDFW or USFWS. 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. No mitigation is required.

Impact AR-3. The Surveillance Alternative would have a **less-than-significant** impact on federally protected wetlands as defined by Section 404 of the Clean Water Act, (including but not limited to, marsh, vernal pool, coastal, etc.) through direct removal, filling, hydrological interruption, or other means. 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. No mitigation is required.

Impact AR-4. The Surveillance Alternative 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.

Impact AR-5. The Surveillance Alternative would have **no impact** on local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance, as none have been identified.

Impact AR-6. The Surveillance Alternative have **no impact** on HCPs or NCCPs as it would not conflict with the provisions of any adopted HCP, NCCP, or other approved local, regional or state habitat conservation plan

4.2.4 Physical Control Alternative

4.2.4.1 Mosquitoes

Mosquitoes typically breed in shallow areas, with emergent vegetation, little to no current, and where fish are excluded. This alternative modifies habitats that support mosquito larvae to make these habitats less suitable for mosquitoes and/or more suitable for their predators. This alternative 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 from the USACE, Regional Water Quality Control Board, CDFW, USFWS, NOAA Fisheries and others. Work would not begin until all required permits are obtained. The District may also advise land owners and home owners about the importance of dumping/inverting of containers holding water, controlling vegetation against structures. In situations where there is any potential for sensitive habitats or species to be present, the District includes information and contact data for resource agencies and potential permits.

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 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.

Physical control activities occur in most aquatic and wetland habitats, with the exception of open water and tidal flat habitats, as these do not provide suitable habitat for mosquitoes, due to their circulation patterns. Impacts are evaluated based on the types and locations of habitats where such activities would be performed. Impact determinations of significance follow the analyses by habitat type. These activities would generally occur over a period of a few days in any specific location, and so the physical disturbance would be very short term. The impacts could potentially include short-term increases in dust and sedimentation, but BMPs would be implemented to make these impacts less than significant. Short-term increases in noise could also result. This would be expected to have the largest effect on adult amphibians when they are out of the water, or terrestrial animals. Most of this work will be conducted when the area is dry or otherwise isolated from active waterways, so impacts to purely aquatic organisms from noise and vibration are not expected to occur.

4.2.4.1.1 Tidal Marsh and Channels

Tidal marsh and tidal channel habitats occur along the margins of San Francisco, San Pablo, and Suisun bays 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 marshlands are maintained and operated to provide habitat for wildlife or as

private or public duck clubs. These types of habitats occur along the western border of Alameda County in close proximity to the cities of Alameda, Oakland, San Leandro, Hayward, Newark, and Fremont. Tidal wetlands can be important sources of mosquitoes seasonally. These marshes could be used by tideway goby in Alameda County and a variety of special status fish species including steelhead, delta smelt, Sacramento splittail, and Sacramento perch in the surrounding counties. These tidal marshes, however, do not provide primary habitat for these species. No special status amphibians, aquatic reptiles, or invertebrates 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 Chapter 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 works with land owners and property managers to accomplish these actions on an as needed basis. The District advises the land owner and property managers that these actions may require discussion with CDFW, NOAA Fisheries, or the USFWS and that these agencies should be contacted before work is initiated.

These activities would be subject to the BMPs described in Table 4-6, relating to agency communication, environmental training, and pre-treatment screening, but the tidal marsh specific BMPs would also be employed including conducting this work during appropriate seasons and times of day (when the tide is out and when Ridgway's rail and salt marsh harvest mouse are not nesting), making sure staff have appropriate training when working in the marsh, minimizing the use of mechanical equipment where practical. Channels that have substantial tidal flow and inundation would not support mosquitoes and thus would not need to be maintained. Fish would be absent from the channels where maintenance is required during low tides, when the work would be conducted. Thus, fish would not be directly affected. Increasing circulation of water in low lying areas these areas would not substantially affect fish populations. Improving drainage of low-lying areas within these managed areas, which would be drained with or without mosquito control activities, could decrease the likelihood that fish become trapped or stranded. Construction of channels could result in temporary increases in turbidity, which could adversely affect fish. BMPs to avoid discharge of unsuitable material and spoils would be implemented to control and localize this turbidity. They may include constructing new channels during periods when the marsh is dry or isolating areas where new channels are being constructed from the surrounding environment and other BMPs associated with the USACE 404 and other permits required for such work. These turbidity increases would be short term and temporary and, thus, would not substantially affect aquatic species.

4.2.4.1.2 Lagoon

Lagoons, located at the mouths of creeks or rivers where they enter the ocean or bay, but isolated from the receiving water body 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. Lagoons may therefore contain species from both creeks and rivers, and from the receiving water bodies. Amphibians are not likely to occur in lagoons due to elevated salt content, but could occur at the upstream end of the lagoon, within the backwater, but above the reach of the saline influence. 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 4-6 would be applied to avoid or minimize impacts to environmental resources. With these BMPs, the effects of the Physical Control Alternative on resources within the lagoon would be less than significant.

4.2.4.1.3 Creeks and Rivers and Riparian Areas

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 may support special status species including steelhead, foothill yellow legged frog, California red legged frog, western pond turtle, and other species, as indicated in Table 4-4. Isolated ponds and back channels may provide habitat for mosquito larva, but these areas may also provide excellent rearing habitat for young fish and amphibians, as they provide warmer water temperatures, higher primary productivity and protection from predaceous fish. Draining areas of shallow freshwater habitat to reduce the amount of standing water or reduce the amount of time such water remains standing could result in adverse effects to young fish or amphibians using those habitats, leaving organisms that cannot vacate the area without water, or requiring organisms that can leave the area to move to new locations, and reducing the amount of larval rearing habitat present. Where native or special status fish species are not present, these impacts would be negligible. Where native or special status species are present, these areas could be important nursery areas, depending on location, season, species present, and amount of other habitat available to the species. Habitat alterations to drain such areas will be avoided to the maximum extent possible. This type of activity is not routinely conducted by the District, but may be required in some circumstances. The potential effects of this alternative would be avoided or minimized through implementation of the BMPs in Table 4-6, including those relating to agency communication, environmental training, and pre-treatment screening. Depending on the species potentially present in an area, species-specific BMPs may also be applied, including seasonal avoidance measures. With these BMPs, the effects of this action would be less than significant.

4.2.4.1.4 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 if they support fish, these fish will largely consist of introduced species, or stocked native species such as rainbow trout. While rainbow trout are native to the region, these stocked fish are not considered to be natural populations, and are treated as introduced fish. Amphibians (i.e., red legged-frog, California tiger salamander) or western pond turtles may also use these reservoirs and ponds, particularly if these areas do not support fish.

Treatment of stagnant areas where mosquito larvae eggs and larvae occur would be accomplished by increasing circulation (water flow) to these areas. This increases the accessibility of these areas to young fish, which then eat the mosquito larvae. This access provides these fish with a previously inaccessible food source. Additionally, these areas can be important for young fish, as they provide protection from predation by larger fish and tend to be warmer, with higher primary productivity, providing good conditions for the growth of young fish. Most young fish eat insect larvae during at least the first few months of their lives, and some species eat insect larvae throughout their lives. Special status fish species would not be impacted in reservoirs and ponds, and ditches, as these species do not occur in these habitats.

This type of treatment could affect breeding and rearing areas for amphibians, as they tend to avoid areas where fish are present. This would increase the risk of predation on eggs and tadpoles. This potential effect would be avoided and minimized by the BMPs in Table 4-6 relating to agency communication, environmental training, and pre-treatment screening. Depending on the species potentially present in an area, species-specific BMPs may also be applied, including seasonal avoidance measures. With these BMPs, the effects of this action would be less than significant.

4.2.4.1.5 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. Fish may use these areas for spawning and rearing. Splittail, for instance, use floodplain habitats to spawn and rear (Moyle 2002). Their young may live in these seasonally flooded habitats for several weeks, until these habitats dry out. 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 aquatic resources.

Vernal pools, a specific type of seasonal wetland, sometimes 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 (see Tables 4-3 and 4-4). Because of the sensitive nature of these habitat types, the District generally would not undertake Physical Control measures in these areas. In the event that Physical Control in a vernal pool was required, the District would not implement such actions without previously discussing their need with the relevant regulatory agencies to verify that no other option exists to control the mosquito problem and to make sure that any such activity would be done in such a way as to minimize its impacts. As a result, this would result in a less than significant impact to aquatic resources.

4.2.4.1.6 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 native and non-native fish, amphibians (California tiger salamander) and reptiles (western pond turtle), as indicated in Table 4-4. 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 4-6 relating to agency communication, environmental training, and pre-treatment screening. Depending on the species potentially present in an area, species-specific BMPs may also be applied, including seasonal avoidance measures. With these BMPs, the effects of this action would be less than significant.

4.2.4.1.7 Artificial Containers, Temporary Standing Waters and Ornamental Ponds

Artificial containers do not provide habitat for fish or support populations of native or special status fish, amphibians, aquatic reptiles, or invertebrates. 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. Ornamental ponds are small ponds with artificial bottoms. These habitats do not provide habitat for special status aquatic species.

4.2.4.1.8 Water and Wastewater Management Facilities

Wastewater treatment facilities do not provide habitat for native or special status fish species, although such facilities may lie close to suitable habitats in streams or the San Francisco Bay Delta system and connectivity may exist between the system and the natural environment that could allow aquatic resources to enter the system. The extent to which these species may enter these facilities is unknown. Because of the limited number of such facilities and the very limited use of such facilities by fish species, physical control measures are not anticipated to substantially affect these fish species.

Septic systems and their associated leach fields do not provide habitat for native fish or special status fish, amphibian, aquatic reptile or invertebrate species. This type of facility would only affect fish if they drained into a water body supporting fish, in which case the physical control measures for freshwater habitats would apply.

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 low water quality. The management of these ponds is controlled by the County Department of Environmental Management and in some cases, the Regional Water Quality Control Board. The District provides input relating to controlling mosquitoes associated with the ponds and winery operations. Physical control is not typically undertaken in winery waste ponds, although it is possible that this 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, there is little likelihood of impacts to special status species.

Flood control channels and ditches may support special status species where they have standing water for sufficient periods of time and 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 4-6, particularly those pertaining to agency communication, pre-treatment screening, and environmental training, would avoid impacts to any special status species that might occur in these habitats.

4.2.4.1.9 Effects on Habitat, Movement, Local Policies and Ordinances and HCP/NCCPs

Mosquitoes are part of the food web and their loss may reduce the food base for predators. Although mosquitoes serve a positive role as prey items for some avian insectivores, bats, and small reptiles and amphibians, the reduction of mosquito abundance over a small area will not affect the predator populations overall, as other prey sources are available.

Physical changes in the habitat that would result have the potential to affect migration. However these changes would tend to enhance migration, opening routes, not closing them. However this effect would occur within restricted areas and would not substantially alter migratory pathways or success. Additional disruption of migration patterns may occur due to the presence of personnel and machinery in the environment. In all cases this would be a short-term occurrence, 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.

The county and city general plans and their goals pertaining to natural resources are generally consistent with the CEQA criteria regarding impacts on species and habitats. Any impacts identified for these CEQA criteria would also be relevant to the county and city goals. The project would not affect trees more than 4 inches diameter breast height and therefore would not conflict with any tree ordinances.

Several HCPs or NCCPs were identified whose action area is within Alameda County, the primary service area, or in adjacent counties. District activities are typically not among those covered by these HCPs. Therefore, the District activities would not be in conflict with the provisions of any HCP, NCCP or other approved local, regional, or state approved conservation plan.

4.2.4.1.10 Impact Determinations

Impact AR-7. The Physical Control Alternative, with the BMPs identified in Table 4-6, 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 in local or regional plans, policies, or regulations, or by the CDFW or USFWS. Regular coordination with resource agencies, worker environmental awareness training, disturbance minimization measures, and application of habitat and species-specific BMPs as appropriate make it unlikely that this alternative would result in adverse effects to special status species. No mitigation is required.

Impact AR-8. The Physical Control Alternative, with the BMPs identified in Table 4-6, would have a **less-than-significant** impact on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, regulations, or by the CDFW or USFWS. Very little

physical control work would be conducted in riparian habitats or other sensitive natural communities. No mitigation is required.

Impact AR-9. The Physical Control Alternative would have a **less-than-significant** impact on federally protected wetlands as defined by Section 404 of the Clean Water Act, (including but not limited to, marsh, vernal pool, coastal, etc.) through direct removal, filling, hydrological interruption, or other means. The Physical Control alternative 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 U.S. Army Corps of Engineers, CDFW, BCDC, and the Regional Water Quality Control Board. No mitigation is required.

Impact AR-10. The Physical Control Alternative 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. This alternative would likely benefit the movement of fish and other aquatic species, as it would deepen channels and improve flow.

Impact AR-11. The Physical Control Alternative would have **no impact** on local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance, as none have been identified.

Impact AR-12. The Physical Control Alternative would have **no impact** on HCPs or NCCPs as it would not conflict with the provisions of any adopted HCP, NCCP, or other approved local, regional or state habitat conservation plan.

4.2.4.2 Other Vectors

Physical control measures for other vectors (yellow jackets) would not affect aquatic habitats and, thus, would have no effect on aquatic resources.

Impact AR-13. Physical control measures for other vectors would have **no impact** on aquatic habitats, native fish or aquatic invertebrates, or special status fish species.

4.2.5 Vegetation Management Alternative

The vegetation within and surrounding aquatic and wetland habitats is an important component of the aquatic ecosystem. This vegetation provides shade, helping to keep the water cool; increases structure and habitat complexity; and contributes organic material and insect drop, subsidizing the food web. It provides fish and other aquatic organisms with cover from aquatic and terrestrial predators and provides visual separation that increases the density of territorial species. Vegetation also helps slow runoff from the surrounding land surface, protecting the aquatic environment from sediments and toxins that may wash in from upland areas.

Vegetation management involves the trimming or removal of vegetation to improve circulation to areas that support mosquito breeding and improve access to natural predators, so that chemical treatments are not required. All such work is done in coordination with the land owner or land manager and the resource agencies. Permits are generally required for this type of activity, and this work would only be initiated after all necessary permits are obtained. The District has rarely undertaken this type of work. All areas are pre-screened to determine the potential presence of special status species and to develop appropriate measures to avoid or minimize effects to these species. The vast majority of this vegetation management work is conducted manually and encompasses only a small area. On rare occasions, larger areas of vegetation may be removed using heavy equipment, such as a backhoe. Mechanized vegetation management is typically restricted to ditches, wastewater ponds and stormwater retention basins or areas. 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 alternative. This would be expected to have the largest effect on adult amphibians when they are out of the water (or terrestrial animals, discussed in Chapter 5), and would cause them to move away from the work area. Most of this work will be conducted when the area is dry or otherwise isolated from active waterways, so impacts to purely aquatic organisms from noise and vibration are not expected to occur.

When thinning areas of emergent vegetation, the District attempts to thin or remove emergent vegetation to provide a maximum of 30 percent coverage.

The use of heavy equipment could have substantial effects if used in waterways supporting native or special status fish species. Appropriate BMPs will be employed when using heavy equipment for vegetation management, including: not operating such equipment in the water, providing appropriate containment and cleanup systems to avoid, contain, and clean up any leakage of toxic chemicals into the aquatic environment, controlling turbidity, and minimizing the area that is affected by the vegetation management activity.

The District preferentially uses physical control for vegetation management and rarely uses herbicides for vegetation management in natural environments. The District may use herbicides in artificial environments, winery waste ponds, wastewater treatment ponds, agricultural ditches. Whenever herbicides are used, they are applied in compliance with label requirements and any applicable federal and state requirements. As indicated in Table 4-7, a number of herbicides have low toxicity to fish and aquatic invertebrates. These herbicides may be used in areas near aquatic environments potentially supporting native or special status fish species. Herbicides with moderate to high toxicity to fish and aquatic invertebrates would not be used in these areas, but may be used in less sensitive areas where needed. Additionally, limited information regarding the toxicity of polydimethylsiloxane on aquatic organisms could be found. The use of these herbicides in and around aquatic environments will be avoided until the product is shown to be safe to aquatic organisms. Additional toxicity information for these herbicides can be found in Appendix B and Chapter 6.

Table 4-7 Herbicide Toxicity[1,2] to Fish and Aquatic Invertebrates

Chemical	Toxicity to	
	Fish	Aquatic Invertebrates
Imazapyr, glyphosate, sulfometuron methyl, mod. vegetable oils and methylated seed oil	Low	Low
Triclopyr (triclopyr acid, TEA)	Moderate	Moderate
Triclopyr (TBEE), alkylphenol ethoxylates (APEs)	High	High
Polydimethylsiloxane,	Unknown	Unknown

[1] Toxicity information is summarized from the information provided in Appendix B (Table 4-1).

[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.

Impact determinations of significance for the Vegetation Management Alternative follow the analyses of impacts by habitat type.

4.2.5.1.1 Tidal Marsh and Channels

Vegetation management activities are conducted in coordination with land owners or land managers and the resource agencies and generally focus on the removal of non-desired species. This work is done using hand tools and in accordance with the BMPs identified in Table 4-6, relating to agency coordination, environmental training, pre-treatment screening, disturbance minimization, tidal marsh and species specific BMPs, and Vegetation Management Alternative specific BMPs. With these BMPs, the effects of the Vegetation Management Alternative on biological resources within tidal marshes would be less-than-significant.

4.2.5.1.2 Lagoon

Lagoons would support mosquitoes in areas of reduced circulation, often associated with emergent vegetation. Vegetation management in lagoons would be subject to the BMPs in Table 4-6 to avoid or minimize impacts to environmental resources. With these BMPs, the effects of the Vegetation Management Alternative on biological resources within lagoons would be less-than-significant.

4.2.5.1.3 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 may support special status species including steelhead, foothill yellow legged frog, California red legged frog, western pond turtle, and other species, as indicated in Table 4-4. Isolated ponds and back channels may provide habitat for mosquito larva, but these areas may also provide excellent rearing habitat for young fish and amphibians, as they provide warmer water temperatures, higher primary productivity and protection from predaceous fish.

Vegetation that requires management would typically be confined to channel margins and backwaters with slow currents. This activity would be done in coordination with land owners or land managers and resource agencies, as well as following the BMPs described in Table 4-6 relating to environmental training, pre-treatment screening, disturbance minimization, habitat and species-specific BMPs, and Vegetation Management Alternative specific BMPs. This would result in less than significant impacts to fish, amphibians, and aquatic reptiles associated with creeks and streams.

4.2.5.1.4 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 if they support fish, these fish will largely consist of introduced species, or stocked native species such as rainbow trout. While rainbow trout are native to the region, these stocked fish are not considered to be natural populations, and are treated as introduced fish. Amphibians (i.e., red legged-frog, California tiger salamander) or western pond turtles may also use these reservoirs and ponds, particularly if these areas do not support fish.

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 would be implemented in stagnant areas along the edges of these habitats where mosquito larvae eggs and larvae occur. Special status fish species would not be impacted in reservoirs and ponds, and ditches, as these species do not occur in these habitats. Amphibians would likely not be present in lakes or ponds supporting fish, but may be present in some areas. Vegetation management could reduce cover for these species and increase their vulnerability to predation, but substantial areas of similar habitat would remain.

This potential effect would be avoided and minimized by the BMPs in Table 4-6 relating to agency communication, environmental training, and pre-treatment screening. Vegetation Management Alternative specific BMPs would be applied. Depending on the species potentially present in an area, species specific BMPs may also be applied, including seasonal avoidance measures. With these BMPs, the effects of this action would be less than significant.

4.2.5.1.5 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. If vegetation management activities were required, potential effects would be avoided and minimized by the BMPs in Table 4-6 relating to agency communication, environmental training, and pre-treatment screening. Vegetation Management Alternative specific BMPs would be applied. Depending on the species potentially present in an area, species-specific BMPs may also be applied, including seasonal avoidance measures. With these BMPs, the effects of this action would be less-than-significant.

4.2.5.1.6 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 native and non-native fish, amphibians (California tiger salamander) and reptiles (western pond turtle), as indicated in Table 4-4. Vegetation management 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 4-6 relating to agency communication, environmental training, and pre-treatment screening. Depending on the species potentially present in an area, species-specific BMPs may also be applied, including seasonal avoidance measures. With these BMPs, the effects of this action would be less than significant.

4.2.5.1.7 Artificial Containers, Temporary Standing Waters and Ornamental Ponds

Vegetation management would not performed for artificial containers, temporary standing waters or ornamental ponds, as these areas would not support substantial stands of vegetation.

4.2.5.1.8 Water and Wastewater Management Facilities

Vegetation management activities may occur in coordination with the owners or operators of wastewater treatment facilities or septic systems. These facilities do not provide habitat for native or special status fish or other aquatic species, although such facilities may lie close to suitable habitats in streams or the San Francisco Bay Delta system and connectivity may exist between the system and the natural environment that could allow aquatic resources to enter the system. The extent to which these species may enter these facilities is unknown. Because of the limited number of such facilities and the very limited use of such facilities by fish, amphibian or aquatic reptiles, vegetation management measures would have a less-than-significant impact on aquatic resources.

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 low water quality. The management of these ponds is controlled by the County Department of Environmental Management and in some cases, the Regional Water Quality Control Board. These entities require that vegetation within the waste ponds to be managed to prevent the creation of risks to public health. The District provides input relating to controlling mosquitoes associated with the ponds and winery operations. The District may ask the land owner to implement vegetation management measures where appropriate. Because of the poor quality habitat provided and

because physical control activities would rarely be conducted in these waste ponds, there is little likelihood of impacts to special status species.

Flood control channels and ditches may support special status species where they have standing water for sufficient periods of time and have suitable physical and vegetative structure. The application of the BMPs in Table 4-6, particularly those pertaining to agency communication, pre-treatment screening, and environmental training, would avoid impacts to any special status species that might occur in these habitats.

4.2.5.1.9 Effects on Habitat, Movement, Local Policies and Ordinances and HCP/NCCPs

Mosquitoes are part of the food web and their loss may reduce the food base for predators. Although mosquitoes serve a positive role as prey items for some avian insectivores, bats, and small reptiles and amphibians, the reduction of mosquito abundance over a small area will not affect the predator populations overall, as other prey sources are available.

This alternative 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. In all cases this would be a short-term occurrence, 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 and would not affect wildlife migration corridors or nursery areas, as no physical disturbance would occur.

The county and city general plans and their goals pertaining to natural resources are generally consistent with the CEQA criteria regarding impacts on species and habitats. Any impacts identified for these CEQA criteria would also be relevant to the county and city goals. The project would not affect trees more than 4 inches diameter breast height and therefore would not conflict with any tree ordinances.

Several HCPs or NCCPs were identified whose action area is within Napa Alameda County, the primary service area, or in adjacent counties. District activities are typically not among those covered by these HCPs. Therefore, the District activities would not be in conflict with the provisions of any HCP, NCCP or other approved local, regional, or state approved conservation plan.

4.2.5.1.10 Impact Determinations

Impact AR-14. The Vegetation Management Alternative, with the BMPs identified in Table 4-6, 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 in local or regional plans, policies, or regulations, or by the CDFW, NOAA Fisheries, or USFWS. This work would be conducted in coordination with land owners or land managers and resource agencies, and all necessary permits would be acquired before work was implemented. BMPs relating to worker environmental awareness training, disturbance minimization measures, and application of habitat and species-specific BMPs, as appropriate, make it unlikely that this alternative would result in adverse effects to special status species. No mitigation is required.

Impact AR-15. The Vegetation Management Alternative, with the BMPs identified in Table 4-6, would have a **less-than-significant** impact on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, regulations, or by the CDFW or USFWS. Very little Vegetation Management work would be conducted in riparian habitats or other sensitive natural communities. No mitigation is required.

Impact AR-16. The Vegetation Management Alternative would not result in the direct removal, filling, or hydrological interruption of federally protected wetlands as defined by Section 404 of the Clean Water Act, (including but not limited to, marsh, vernal pool, coastal, etc.). It may result in the removal of minor amounts of vegetation in these areas. As such, this alternative would have a have a **less-than-significant** impact on these resources. No mitigation is required.

Impact AR-17. The Vegetation Management Alternative 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.

Impact AR-18. The Vegetation Management Alternative would have **no impact** on local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance, as none have been identified.

Impact AR-19. The Vegetation Management Alternative would have **no impact** on HCPs and NCCPs as it would not conflict with the provisions of any adopted HCP, NCCP, or other approved local, regional or state habitat conservation plan.

4.2.6 Biological Control Alternative

This alternative consists of the introduction of mosquito predators, specifically mosquitofish (*Gambusia affinus*), 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. Mosquitofish are also opportunistic omnivores, eating other invertebrates when they are more abundant and feeding at algae during times when insects are not abundant. This species can affect aquatic food webs. They are known to feed on fish and amphibian eggs and larvae (Moyle 2002; Nico et al. 2013). Mosquitofish can compete with other small fish for food and can also prey on other fish and insect mosquito predators when those species are present.

The use of mosquitofish in a given situation is given careful consideration with regard to the potential ecological consequences of such introductions. District policy is to limit the use of mosquitofish to artificial habitats (ornamental fish ponds, water troughs, water gardens, fountains, and unmaintained swimming pools) that do not connect to natural water bodies, and therefore, do not pose a threat to natural environments or native fish and amphibians. These artificial habitats are not included in HCP/NCCPs. Mosquitofish would not be introduced into any of the other habitat types.

Mosquito pathogens such as Bs (a live bacterium) or Bti, and *Saacharopolyspora spinosa* (bacteria byproducts) may be considered biological control agents, but are regulated by USEPA. Therefore, they are addressed in the Chemical Control Alternative.

4.2.6.1 Effects on Habitat, Movement, Local Policies and Ordinances and HCP/NCCPs

This alternative would not affect any natural habitats or result in the presence of District personnel or equipment in natural habitats. Therefore, it would not affect the quantity or distribution of habitats, such as riparian areas, marshes, lakes or ponds, seasonal wetlands, or habitat types. This alternative would not affect the composition of their vegetative community. This alternative would not result in any ground disturbing activity, and therefore would not result in any removal, filling or hydrologic interruption of federally protected wetlands. This alternative would have no effect on the movement of wildlife and would not affect wildlife migration corridors or nursery area.

The county and city general plans and their goals pertaining to natural resources are generally consistent with the CEQA criteria regarding impacts on species and habitats. Any impacts identified for these CEQA criteria would also be relevant to the county and city goals. The project would not affect trees more than 4 inches diameter breast height and therefore would not conflict with any tree ordinances.

Several HCPs or NCCPs were identified whose action area is within Alameda County, the primary service area, or in adjacent counties. District activities are typically not among those covered by these HCPs.. Therefore, the District activities would not be in conflict with the provisions of any HCP, NCCP or other approved local, regional, or state approved conservation plan.

Impact AR-20. The Biological Control Alternative 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 alternative would be confined to artificial environments that are not connected to natural environments where special status species occur.

Impact AR-21. The Biological Control Alternative, with the BMPs identified in Table 4-6, would have **no impact** on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, regulations, or by the CDFW or USFWS.

Impact AR-22. The Biological Control Alternative would have **no impact** on federally protected wetlands as defined by Section 404 of the Clean Water Act, (including but not limited to, marsh, vernal pool, coastal, etc.).

Impact AR-23. The Biological Control Alternative 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.

Impact AR-24. The Biological Control Alternative would have **no impact** on local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance, as none have been identified.

Impact AR-25. The Biological Control Alternative would have **no impact** on HCPs or NCCPs as it would not conflict with the provisions of any adopted HCP, NCCP, or other approved local, regional or state habitat conservation plan.

4.2.7 Chemical Control Alternative

A wide variety of chemicals and formulations are available for use to control mosquitoes. These chemicals can be used as mosquito larvicides, adulticides, or both. Chemical control may also be used to control nuisance populations of yellow jackets. Table 4-8 presents the chemical classes and their toxicity to fish and nontarget aquatic invertebrates.

These chemicals are used in accordance with all applicable BMPs as described in Section 2.9.1, CDPH's *Best Management Practices for Mosquito Control in California*, the Statewide General NPDES Permit for Biological and Residual Pesticide Discharges to Waters of the US from Spray Applications (SWRCB Water Quality Order No. 2011-0004-DWQ; NPDES No. CAG 990007; Spray Applications Permit) and District-specific BMPs as indicated in the PAPs and APAPs. All of these measures are designed to minimize impacts to nontarget organisms.

The toxicity data included in the tables in this section 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.

However, these, and other, coordinated and focused laboratory tests are designed to document the effects of the chemical when a continuous, controlled, exposure exists and do not realistically reflect the likely exposures or toxicity in the District field application scenarios. As such, the toxicity information is intended as an overview of potential issues and guidance for understanding the completely "safe" maximum exposure levels of applications that would not adversely impact humans or nontarget plant and animal species.

However, these, and other, coordinated and focused laboratory tests are designed to document the effects of the chemical when a continuous, controlled, exposure exists and do not realistically reflect the likely exposures or toxicity in the District field application scenarios. As such, the toxicity information is intended as an overview of potential issues and guidance for understanding the completely "safe" maximum exposure levels of applications that would not adversely impact humans or nontarget plant and animal species.

Although 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 applied in the District's Program Area are often substantially less than the amounts used in the laboratory toxicity studies. Because of the large safety factors used to develop recommended product label application rates, the amount of chemical resulting in demonstrated toxicity in the laboratory is much higher than the low exposure levels associated with an actual application. The application concentrations consistent with the labels or MSDSs 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). However, adverse effects may still occur to some non-target organisms.

This assessment also considers the physical and biological connections between treatment areas and aquatic ecosystems. These chemicals are assessed by the vectors they are primarily used to control, and are grouped within these vectors into classes based on their composition, mechanism of action, and relative effect on aquatic resources (Table 4-8). This section focuses on the potential impacts of these chemicals on fish, amphibians, aquatic reptiles, and aquatic invertebrates Impact determinations follow the analysis for yellow jackets and cover the following issues:

> Impacts to special status species

> Impacts to riparian habitats or other sensitive natural communities

> Impacts to federally-protected wetlands

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

> Impacts to local policies

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

These chemicals are discussed in greater detail in Chapter 6, Ecological Health, and Appendix B.

Pesticides may be applied using motorized equipment including trucks, ARGOs, and rotary or fixed wing aircraft operating at low altitudes. Each application is expected to take less than a day (perhaps two days for larger areas), and thus the noise effects would be temporary. This would be expected to have the largest effect on adult amphibians when they are out of the water (or on terrestrial animals, discussed in Chapter 5), and would cause them to move away from the work area. Impacts to purely aquatic organisms from noise and vibration are not expected to occur.

Table 4-8 Chemical Classes and their Toxicity[1] to Fish and Nontarget Aquatic Invertebrates

Class	Chemical	Mechanism of Action	Toxicity to	
			Fish	Nontarget Invertebrates
Mosquito Larvicides				
Bacterial Larvicides	Bs, Bti, spinosad	Paralyzes gut or disrupts central nervous system	Low	Low
Hydrocarbon esters	Methoprene and s-methoprene	Interferes with maturation process of insects	Moderate	High
Surfactants	Alcohol ethoxylated surfactant, aliphatic solvents	Drowns larvae	Very low	Affects Only Surface Breathing Insects
Organo-phosphates	Temephos	Cholinesterase inhibitor	Slight to Moderate	High
Mosquito Adulticides				
Pyrethroids	Pyrethrins, allethrins, phenothrin, prallethrin, deltamethrin, resmethrin, tetramethrin, permethrin, etofenprox	Interferes with operation of sodium channels in insect neurons	High	High
Piperonyl butoxide		Synergist. Enhances operation of other active ingredients by inhibiting their breakdown	Moderate to High	High
Organo-phosphates	Naled	Cholinesterase inhibitor	Moderate	Moderate
Yellow Jackets				
Pyrethroids	lambda-cyhalothrin, pyrethrins, allethrins, phenothrin, prallethrin, deltamethrin, tetramethrin, permethrin, etofenprox	Interferes with operation of sodium channels in insect neurons	High	High
Piperonyl butoxide		Synergist. Enhances operation of other active ingredients by inhibiting their breakdown	Moderate to High	High

[1] Toxicity information is summarized for each group from the information provided in Appendix B (Table 4-1).

[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.

4.2.7.1 Mosquito Larvicides

Mosquito larvicides are applied to aquatic and wetland environments that Surveillance has identified as having substantial concentrations of mosquito larvae. Larvicides may be applied in any of the aquatic and wetland habitat types previously listed. Special care is used when treating vernal pool habitats because of the number of special status invertebrate species endemic to these habitats. The District applies Bti, or Bs when mosquito treatment is required in vernal pools.

4.2.7.1.1 Bacterial Larvicides

These larvicides are developed from bacteria that have natural insecticidal properties. Concentrates are prepared that include fermentation solids, bacterial spores, and insecticidal toxins. These larvicides act by paralyzing the gut when ingested, causing the mosquito larvae to starve. Because Bs is a live bacterial pathogen of mosquitoes it may persist in the environment for 2 to 4 weeks; Bti, which is non-living and consists of protein spores and crystals, generally persists for 1 to 4 days.

Neither Bs nor Bti are acutely toxic to nontarget species including fish and invertebrates, nor are they toxic to predators of mosquito larvae (Appendix B). Bti may affect some dipterans (chironomids, simullids, ceratopogonids, and dixids), but only at concentrations 10 to 1,000 times higher than used for mosquito control.

Spinosad is a biologically derived insecticide produced from the fermentation of *Saacharopolyspora spinosa*, a naturally occurring soil organism. Spinosad activates the central nervous system of insects through interaction with neuroreceptors and causes continuous stimulation of the insect nervous system. In water, spinosad is degraded primarily through photolysis, which has a half-life of less than 1 day. It is slightly to moderately toxic to fish and most aquatic invertebrates. It may have slight impacts on some aquatic invertebrates with chronic exposure, but application for mosquitoes tends to be episodic, and given the rapid breakdown of spinosad in the environment, chronic exposure is unlikely.

4.2.7.1.2 Hydrocarbon Esters

Methoprene is an insect growth regulator and selective larvicide. Methoprene is used primarily against mosquitoes, but can also be used for flies, moths and butterflies, and beetles. Methoprene interferes with the development of larval insects, preventing them from becoming adults. Juvenile hormone is found during aquatic life stages of the mosquito and in other insects, but is most prevalent during the early instars. As mosquito larvae mature, the level of juvenile hormone steadily declines until the 4^{th} instar molt, when levels are very low. This is considered to be a sensitive period when all the physical features of the adult begin to develop. Methoprene in the aquatic habitat can be absorbed on contact and the insect's hormone system becomes inbalanced. When this happens during the sensitive period, the imbalance interferes with 4^{th} instar larval development. One effect is to prevent adults from emerging. Since pupae do not eat, they eventually deplete body stores of essential nutrients and then starve to death. Within the aquatic environment, methoprene has a half-life of a few hours to a couple of days, but is sometimes applied in an extended release format, which may persist for many days or even months in the environment. Methoprene is effective for mosquito control at concentrations of 0.5 to 3 microgram per liter (µg/L), with the District generally applying it at a maximum concentration of 0.5 (µg/L). At these application rates, some effects may occur to some nontarget midges (*Chrionomidae*) and blackflies (*Simuliidaes*), but these populations recover quickly after treatment (Appendix B; Maffei, pers. comm., 2013). No other invertebrates have shown signs of toxicity at these concentrations. Methoprene can be

toxic to fish, but the lowest 50 percent lethal dose[2] (LD50 4.62 milligrams per kilogram [mg/L]) is several orders of magnitude greater than the dose used by the District to control mosquitoes.

4.2.7.1.3 Surfactants

Surfactants (alcohol ethoxylated surfactants and aliphatic solvents) work by making it difficult for mosquito larvae and pupae to attach to the water's surface, causing them to drown. Surfactants affect only the uppermost layer of the water. They are nontoxic to most organisms at label application rates, but may impact other surface-breathing aquatic insects. The numbers of these nontarget surface-breathing insects were temporarily reduced following treatment, but recovered within a few days at Don Edwards Wildlife Area (Miles et al. 2002). These short-term impacts on a small portion of the food chain are unlikely to result in substantive impacts to nontarget species in the aquatic environment.

4.2.7.1.4 Organophosphate Insecticides

Organophosphates (OPs) are a class of chemicals that kill insects by interfering with their production of the acetylcholinestarase enzyme, resulting in nervous and respiratory system damage. Temephos is used as a larvicide to help prevent mosquitoes from developing resistance to the bacterial larvicides (Section 4.2.7.4). It is persistent in the environment, with a half-life in excess of 15 days via most degradation pathways. While applied widely in some areas of the country, the District is not currently using this chemical and has not used it since . Temephos is effective in highly polluted water. Temephos can be used to control dipteran midges and blackflies, but it is applied at higher concentrations for this application than for mosquito control.

Temephos is not toxic to fish at the concentrations the Districts use for mosquito control and is not applied in natural water bodies where fish or sensitive invertebrates would be present. It has been observed to be toxic to some planktonic crustaceans (copepods and cladocerans), as well as stoneflies (Plecopterans) and mayflies (Ephemeroptera). Because of this toxicity, its use is restricted to isolated, man-made habitats, where sensitive species are absent.

4.2.7.2 Mosquito Adulticides

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. Adulticides are generally the last tool used, when mosquito populations cannot or have not been controlled at their source. Adulticides are most commonly applied from the ground via truck, ATVs, utility vehicles or handheld devices as an ULV application.

Aerial adulticiding, although this least preferred technique, could potentially be utilized in the future to deal with a severe outbreak or risk of mosquito-borne disease transmission. Aerial applications are made using ULV techniques. Aerial application of adulticide may be the only reliable means of obtaining

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[2] LD50 refers to the lethal single dose of a chemical (amount of chemical regardless of the volume of liquid in which it is delivered) that that would kill 50 percent of a group of test animals treated with that dose.

effective control in areas bordered by extensive mosquito production sites with a small, narrow, or inaccessible network of roads, or to cover a very large area quickly in case of unusually severe mosquito outbreaks or mosquito-borne disease epidemics. The decision to conduct aerial application of adulticides is taken with every precaution, and is considered a last resort by the District. In making the decision to use this technique, the District considers the potential effects on human health and the potential for environmental harm. The maximum application of pesticides is 0.87 oz/acre, although maximum application rates are generally not required. The concentration of the active ingredient is 5 percent or less of this volume. This translates into a water concentration of 1.04 µg/L if the water is one foot deep or 4.14 µg/L if the water is three inches deep. This assumes all of the product contacts the water. Aerial applications are made over vegetated areas preferred by adult mosquitoes, so the amount of product encountering the water is generally a fraction of this. The chemicals used are selected for rapid breakdown and so are typically present for a few hours to a couple of days after application.

4.2.7.2.1 Pyrethrins and Pyrethroids

Pyrethrins are naturally occurring products distilled from the flowers of the *Chrysanthemum* species. Pyrethroid insecticides are synthetic compounds that are chemically similar to the pyrethrins that have been modified to increase stability and activity against insects. They are highly potent insecticides, but are highly toxic to fish and aquatic invertebrates as well, sometimes at environmental concentrations of less than 1 µg/L. The presence of these pesticides in aquatic environments can result in lethal and sublethal effects on fish and aquatic invertebrates. Where substantial numbers of such organisms are affected, food supplies can be diminished, resulting in indirect effects to secondary and tertiary consumers dependent on the aquatic food web, including aquatic invertebrates, fish, amphibians, and birds. Both sets of compounds tend to break down relatively quickly in the environment, often within hours, and usually within a few days. Of the pyrethroids that are applied adjacent to aquatic environments, phenothrin and permethrin are more persistent than the other chemicals in this group, with half lives of days to months in water under aerobic conditions.

Pyrethrins and pyrethroids are applied in ULV applications by aircraft, truck, ATV, or handheld foggers include pyrethrins, phenothrin, and permethrin. Numerous studies have found that these ULV applications result in concentrations in the aquatic environment of 0.23 to 3.77 µg/L and had little to no effect on fish or nontarget aquatic invertebrates (see Appendix B).

4.2.7.2.2 Piperonyl Butoxide

PBO is a synergist, a chemical applied with a pesticide to enhance the effectiveness of the pesticide (Appendix B). PBO works by interfering with an insect's ability to detoxify pyrethrins and pyrethroids. PBO is moderately toxic to fish (LD50=1.9 to 3.94 mg/L) and moderately to highly toxic (0.51 to 12.0 mg/L) to aquatic invertebrates. However, its toxicity is much lower than that of the pesticides it is used with. PBO can break down relatively rapidly by photolysis (half-life of 8.4 hours), but has a half-life exceeding 30 days based on aerobic metabolism in water. Although it degrades rapidly, release of PBO to the environment may "activate" persistent pyrethroids that are already present in the sediment. Field tests indicate that PBO concentrations were very low (~2 µg/L) immediately after 3 consecutive nights of treatment, declined rapidly thereafter, and was undetectable 8 days after application (see Appendix B). A number of studies indicate that PBO, when applied at the levels used for mosquito control, did not have any detectable effect on sentinel species (Appendix B). These studies also indicate that PBO does not persist in the environment very long after application. This information indicates that the use of PBO will not substantially affect aquatic organisms.

4.2.7.2.3 Organophosphate Insecticides

OPs are a class of chemicals that kill insects by interfering with their production of the acetylcholinestarase enzyme, resulting in nervous and respiratory system damage. Naled may be used infrequently (the District has not needed to use it thus far) in rotation with pyrethrins or pyrethroids to

avoid the development of pesticide resistance. It is used as a mosquito adulticide. Naled breaks down rapidly in water (hours to a few days). It is moderately to highly toxic to fish (minimum 0.08 mg/L), and highly toxic to aquatic invertebrates (minimum of 0.35 µg/L). As reported in Appendix B, environmental concentrations observed immediately after application in field tests ranged from 0.71 µg/L by truck to 20.15 µg/L from aircraft. The latter values appears to be exceptionally high, but reasons for such high values are unknown. In another field test, the environmental concentration following aerial application was 0.19 µg/L. The chemical was not detected in any of the field tests after 12.45 hours. At the lower concentrations reported, no mortality of fish or invertebrates was reported. At the higher concentration, mortality of invertebrates was significant, but no effect on fish was detected. Dichlorvos, a breakdown product of naled, and itself a registered pesticide, may be present in toxic concentrations after naled is no longer detectable. Dichlorvos has a half-life of a few hours to 5 days, depending on medium. It has a similar toxicity to fish, but is more toxic to invertebrates. Naled is typically used to combat resistance to pyrethrins and pyrethroids in mosquito populations. As such, it is used infrequently. For example, this product was not used by any Bay Area District in 2011-2012. It was used in 2010 within the various counties for agricultural and landscape purposes (CDPR website accessed April 18, 2013: http://www.cdpr.ca.gov/docs/pur/purmain.htm). As adulticiding is conducted only when larval control activities are ineffective, naled would be used infrequently. Because the District's potential use of this product would be infrequent and because of the relatively short half-life of naled and its breakdown product, dichlorvos, the effect of the District's use of it would be short term and temporary.

4.2.7.3 Yellow Jacket Abatement

The District may use pesticides (typically pyrethroids) to control yellow jackets that pose an imminent threat to staff. These pesticides are highly toxic to fish and aquatic invertebrates, as described in Section 4.2.7.2. For control of yellow jackets, these pesticides are applied in highly localized, upland areas.

Examples of pesticides the District might employ to control yellow jackets in residential or upland environments are: prallethrin, deltamethrin, lambda-cyhalothrin, and tetramethrin. These compounds are applied directly to a nest and would only be expected to enter the aquatic environment through runoff. All degrade rapidly and bind readily to soil, so they are not anticipated to enter aquatic environments in sufficient quantities to result in adverse effects.

A few of the pyrethroids are bioaccumulative in fish, meaning that they can occur in organisms at higher concentrations than what occurs in the environment. These bioaccumulative pyrethroids include deltamethrin and lambda-cyhalothrin. However, these pyrethroids would not be used near water. If they are used, they will generally be deployed directly to a nest, which is readily isolated from aquatic environments. Therefore, these compounds are not expected to affect fish or other aquatic organisms.

Because of the small quantity of pesticide that might be applied and because these chemicals would not be applied directly to aquatic environments, this control method would have little impact on aquatic organisms.

4.2.7.4 Effects on Habitat, Movement, Local Policies and Ordinances and HCP/NCCPs

The Chemical Control Alternative would not affect the quantity or distribution of habitats, such as riparian areas, marshes, lakes or ponds, seasonal wetlands, or habitat types. This alternative would not affect the composition of their vegetative community, as the pesticides used would not be expected to affect plants or their physical or hydrologic attributes. This alternative would not result in any ground disturbing activity, and therefore would not result in any removal, filling or hydrologic interruption of federally protected wetlands. Any disruption of migration patterns would be due to the presence of personnel and machinery in the environment. In all cases this would be a very short-term occurrence, generally not more than a few hours in any given location, and therefore this effect would be minimal and 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.

This alternative would not affect any natural habitats or result in the presence of District personnel or equipment in natural habitats. Therefore, it would not affect the quantity or distribution of habitats, such as riparian areas, marshes, lakes or ponds, seasonal wetlands, or habitat types. This alternative would not affect the composition of their vegetative community. This alternative would not result in any ground disturbing activity, and therefore would not result in any removal, filling or hydrologic interruption of federally protected wetlands. This alternative would have no effect on the movement of wildlife and would not affect wildlife migration corridors or nursery area.

The county and city general plans and their goals pertaining to natural resources are generally consistent with the CEQA criteria regarding impacts on species and habitats. Any impacts identified for these CEQA criteria would also be relevant to the county and city goals. The project would not affect trees more than 4 inches diameter breast height and therefore would not conflict with any tree ordinances.

Several HCPs or NCCPs were identified whose action area is within Alameda County, the primary service area, or in adjacent counties. District activities are typically not among those covered by these HCPs. Therefore the District activities would not be in conflict with the provisions of any HCP, NCCP or other approved local, regional, or state approved conservation plan.

4.2.7.5 Impact Determinations

Impact AR-26. The Chemical Control Alternative, with the BMPs identified in Table 4-6, 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 in local or regional plans, policies, or regulations, or by the CDFW or USFWS. Non-persistent, chemicals proven to have low toxicity to non-target organisms would be applied in strict accordance with label directions, and BMPs, including those relating to worker environmental awareness training, disturbance minimization measures, and Applications of Pesticides, Surfactants, and/or Herbicides would be applied, as would appropriate habitat and species-specific BMPs. These practices make it highly unlikely that this alternative would result in adverse effects to special status species.

Impact AR-27. The Chemical Control Alternative, with the BMPs identified in Table 4-6, would have a **no impact** on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, regulations, or by the CDFW or USFWS. The chemicals considered under the Chemical Control Alternative would not affect riparian habitats or other sensitive natural communities.

Impact AR-28. The Chemical Control Alternative would not result in the direct removal, filling, or hydrological interruption of federally protected wetlands as defined by Section 404 of the Clean Water Act, (including but not limited to, marsh, vernal pool, coastal, etc.). This alternative would have a have **no impact** on these resources.

Impact AR-29. The Chemical Control Alternative 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.

Impact AR-30. The Chemical Control Alternative would have **no impact** on local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance, as none have been identified.

Impact AR-31. The Chemical Control Alternative has **no impact** on HCPs or NCCPs as it would not conflict with the provisions of any adopted HCP, NCCP, or other approved local, regional or state habitat conservation plan.

4.2.8 Cumulative Impacts

Cumulative impacts on aquatic resources are discussed in Section 13.2. The determination is whether a proposed project's incremental contribution to a cumulative impact results in a potentially "considerable" (i.e., significant) cumulative impact is summarized herein.

The following is a summary of the Program impacts that could become cumulatively considerable with other impacts in the region. To make this determination, consideration is given to the combined contribution of Program impacts considered together with impacts that exist outside of the Program Area.

4.2.8.1 Regional Fisheries Trends

4.2.8.1.1 Pelagic Organism Decline (POD)

POD refers to the recent (2002–present) steep decline of pelagic fishes (i.e., fish that occupy open-water habitats) within the Bay-Delta estuary (Armor et al. 2005; CDWR and CDFG 2007; Sommer 2007; Baxter et al. 2010). This environmental issue has emerged as one of overwhelming concern in the Delta.

In the portion of the District bordering the San Francisco Bay, the Physical Control and Vegetation Management alternatives would contribute to landscape habitat modifications, while the Chemical Control Alternative would contribute to contaminants.

> The District's Physical Control and Vegetation Management alternatives are limited to small areas of highly modified habitat. These areas are not primary habitat for POD species. Because the areas where these activities occur are very small relative to the overall area of wetlands in the region, these activities are not expected to have any substantive effect on food production for POD species. Therefore, these alternatives do not contribute substantially to POD.

The Chemical Control Alternative includes the use of pyrethroid pesticides, which have been linked to POD. The District may use pyrethroid pesticides as part of an IPM approach, where application of pyrethroids is several levels down in the selection of control measures, so the use of pyrethroids is limited. If pyrethroids are used, the District preferentially uses pyrethroids with limited persistence in the environment, The District would only use pyrethroids over aquatic habitats under rare circumstances and always in ULV applications, which results in the minimal effective amounts of these chemicals. Thus, the Chemical Control Alternative does not contribute substantially to the concentrations of pyrethroids in the environment or to the POD.

> The Surveillance and Biological Control Alternatives involve access, monitoring, and control activities with very limited potential to impact POD.

Therefore, all of the Program alternatives have a **less-than-significant cumulative impact on POD**.

4.2.8.1.2 Salmonid Population Trends

Salmonid population trends were evaluated in a number of 5-year status reviews completed by NOAA Fisheries in 2011 (NOAA Fisheries 2011 a-f). These reviews indicated that most populations of salmonids showed some evidence of decline. However, based on the status reviews for these species, the principal factors resulting in their listing include:

> Loss, degradation, simplification, and fragmentation of habitat caused by a variety of activities including logging, road construction, urban development, mining activities, agriculture, ranching, and recreation

> Reduction or elimination of habitat or blocked access to habitat caused by water storage, withdrawal, conveyance and diversion facilities for agriculture, flood control, and domestic and hydropower purposes

> Point and nonpoint sources of pollution

> Loss of riparian habitats

The Physical Control and Vegetation Management alternatives could contribute to the first and last factors, while the Chemical Control Alternative could contribute to the third factor. These activities generally occur over small areas and have little impact on primary salmonid habitat. The BMPs that would be implemented as a part of these alternatives substantially reduce these potential effects, so that the resultant effect is less than significant at the Program level, and does not contribute substantially to the total amount of habitat loss for salmonids in the region. The Surveillance and Biological Control Alternatives involve access, monitoring, and control activities with no potential to impact salmonids. Therefore, all of the Program alternatives have a **less-than-significant cumulative impact on salmonid population trends**.

4.2.8.2 Program Alternatives

The Surveillance Alternative's maintenance of access routes and the sampling/monitoring of mosquito populations have less-than-significant impacts on aquatic habitats, native fish or aquatic invertebrates, special status species, or HCPs and NCCPs. This alternative, along with the Biological Control Alternative's use of mosquitofish in artificial/man-made waterbodies are not cumulatively considerable given their minimal disruption to natural habitats. Consequently, the focus of the analysis below is on the Physical Control, Vegetation Management, and Chemical Control Alternatives.

4.2.8.2.1 Physical Control Alternative

The draining or filling of shallow-water habitats in natural areas under the Physical Control Alternative would be cumulative with historic and ongoing impacts to these habitats from other land management practices including flood control, urbanization, and channelization. The majority of such activities occurring as part of the action would occur in artificial environments such as drainage ditches, retention ponds, etc.

Activities affecting wetlands are subject to permitting requirements from a variety of agencies including the USACE, SWRCB or RWQCBs, CDFW, BCDC, and others. However, wetlands continue to be affected by urban and agricultural development, roadwork, and other activities (California Natural Resources Agency 2010), an existing significant cumulative impact. The District's activities within this context do not contribute substantially to the cumulative effects of other activities within the region in part due to the constraints of required permits. Therefore, the Program would have a **less-than-significant cumulative impact on the amount or quality of aquatic habitat**.

4.2.8.2.2 Vegetation Management Alternative

The vegetation within and around aquatic habitats is an important component of the aquatic ecosystem, as described in Section 4.2.5.

Invasive weeds can disrupt native habitats. They compete with and may displace native plants, which may interfere with ecosystem functions, by altering and reducing the food resources available to primary and secondary consumers. Weed control activities the District(s) may perform would be cumulative with those performed by other entities. These activities would focus on areas with dense concentrations of weeds and not on individual weed plants distributed broadly in otherwise natural habitats. Thus, weed control activities may affect native plants, as these species may lie within treatment areas, but the effects on individuals of native species are minimized, and the overall effect is likely beneficial, as native species will have less competition in treated areas and, thus, would be expected to be more successful. Therefore, there is not an existing significant cumulative impact to native habitats. The District's incremental activities associated with the **control of invasive weeds would not be cumulatively considerable or less than significant**.

4.2.8.2.3 Chemical Control Alternative

The uses of pesticides under the Chemical Control Alternative would be cumulative with uses of pesticides by agricultural, industrial, governmental, and residential users, an existing significant cumulative impact. Contaminants and pesticides have been hypothesized to contribute to declines in fish populations. The

District's relative contribution to the loads of such concentrations is small compared with other users. The District preferentially uses nonchemical alternatives and when using chemical alternatives, uses chemicals that are not persistent in the environment. As such, the District's Chemical Control Alternative does not contribute substantively to pesticide and herbicide loads in the aquatic environment. The Chemical Control Alternative has a **less-than-significant cumulative impact on herbicide and pesticide loads**.

4.2.9 Environmental Impacts Summary

Table 4-9 provides a summary of the environmental impacts of the Program alternatives on aquatic resources. Discussion of these impacts is provided in the preceding sections.

Table 4-9 Summary of Alternative Biological Aquatic Impacts

Impact Statement	Surveillance	Physical Control	Vegetation Management	Biological Control	Chemical Control
Effects on Biological Resources – Aquatic					
Impact AR-1. The Surveillance Alternative 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 in local or regional plans, policies, or regulations, or by the CDFW, NOAA Fisheries, or USFWS. This alternative would not directly affect these species, as described above. 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. No mitigation is required.	LS	na	na	na	na
Impact AR-2. The Surveillance Alternative would have a **less-than-significant** impact on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, regulations, or by the CDFW or USFWS. 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. No mitigation is required.	LS	na	na	na	na
Impact AR-3. The Surveillance Alternative would have a **less-than-significant** impact on federally protected wetlands as defined by Section 404 of the Clean Water Act, (including but not limited to, marsh, vernal pool, coastal, etc.) through direct removal, filling, hydrological interruption, or other means. 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. No mitigation is required.	LS	na	na	na	na
Impact AR-4. The Surveillance Alternative 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

Table 4-9 Summary of Alternative Biological Aquatic Impacts

Impact Statement	Surveillance	Physical Control	Vegetation Management	Biological Control	Chemical Control
Impact AR-5. The Surveillance Alternative would have **no impact** on local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance, as none have been identified.	N	na	na	na	na
Impact AR-6. The Surveillance Alternative have **no impact** on HCPs or NCCPs as **it** would not conflict with the provisions of any adopted HCP, NCCP, or other approved local, regional or state habitat conservation plan.	N	na	na	na	na
Impact AR-7. The Physical Control Alternative, with the BMPs identified in Table 4-6, 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 in local or regional plans, policies, or regulations, or by the CDFW or USFWS. Regular coordination with resource agencies, worker environmental awareness training, disturbance minimization measures, and application of habitat and species-specific BMPs as appropriate make it unlikely that this alternative would result in adverse effects to special status species. No mitigation is required.	na	LS	na	na	na
Impact AR-8. The Physical Control Alternative, with the BMPs identified in Table 4-6, would have a **less-than-significant** impact on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, regulations, or by the CDFW or USFWS. Very little physical control work would be conducted in riparian habitats or other sensitive natural communities. No mitigation is required.	na	LS	na	na	na
Impact AR-9. The Physical Control Alternative would have a **less-than-significant** impact on federally protected wetlands as defined by Section 404 of the Clean Water Act, (including but not limited to, marsh, vernal pool, coastal, etc.) through direct removal, filling, hydrological interruption, or other means. The Physical Control alternative 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 U.S. Army Corps of Engineers, CDFW, BCDC, and the Regional Water Quality Control Board. No mitigation is required.	na	LS	na	na	na

Table 4-9 Summary of Alternative Biological Aquatic Impacts

Impact Statement	Surveillance	Physical Control	Vegetation Management	Biological Control	Chemical Control
Impact AR-10. The Physical Control Alternative 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. This alternative would likely benefit the movement of fish and other aquatic species, as it would deepen channels and improve flow.	na	N	na	na	na
Impact AR-11. The Physical Control Alternative would have **no impact** on local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance, as none have been identified.	na	N	na	na	na
Impact AR-12. The Physical Control Alternative would have **no impact** on HCPs or NCCPs as it would not conflict with the provisions of any adopted HCP, NCCP, or other approved local, regional or state habitat conservation plan.	na	N	na	na	na
Impact AR-13. Physical control measures for other vectors would have **no impact** on aquatic habitats, native fish or aquatic invertebrates, or special status fish species.	na	N	na	na	na
Impact AR-14. The Vegetation Management Alternative, with the BMPs identified in Table 4-6, 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 in local or regional plans, policies, or regulations, or by the CDFW, NOAA Fisheries, or USFWS. This work would be conducted in coordination with land owners or land managers and resource agencies, and all necessary permits would be acquired before work was implemented. BMPs relating to worker environmental awareness training, disturbance minimization measures, and application of habitat and species-specific BMPs, as appropriate, make it unlikely that this alternative would result in adverse effects to special status species. No mitigation is required.	na	na	LS	na	na

Table 4-9 Summary of Alternative Biological Aquatic Impacts

Impact Statement	Surveillance	Physical Control	Vegetation Management	Biological Control	Chemical Control
Impact AR-15. The Vegetation Management Alternative, with the BMPs identified in Table 4-6, would have a **less-than-significant** impact on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, regulations, or by the CDFW or USFWS. Very little Vegetation Management work would be conducted in riparian habitats or other sensitive natural communities. No mitigation is required.	na	na	LS	na	na
Impact AR-16. The Vegetation Management Alternative would not result **in** the direct removal, filling, or hydrological interruption of federally protected wetlands as defined by Section 404 of the Clean Water Act, (including but not limited to, marsh, vernal pool, coastal, etc.). It may result in the removal of minor amounts of vegetation in these areas. As such, this alternative would have a have a **less-than-significant** impact on these resources. No mitigation is required.	na	na	LS	na	na
Impact AR-17. The Vegetation Management Alternative 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.	na	na	N	na	na
Impact AR-18. The Vegetation Management Alternative would have **no impact** on local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance, as none have been identified.	na	na	N	na	na
Impact AR-19. The Vegetation Management Alternative would have **no impact** on HCPs and NCCPs as it would not conflict with the provisions of any adopted HCP, NCCP, or other approved local, regional or state habitat conservation plan.	na	na	N	na	na
Impact AR-20. The Biological Control Alternative 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 alternative would be confined to artificial environments that are not connected to natural environments where special status species occur.	na	na	na	N	na

Table 4-9 Summary of Alternative Biological Aquatic Impacts

Impact Statement	Surveillance	Physical Control	Vegetation Management	Biological Control	Chemical Control
Impact AR-21. The Biological Control Alternative, with the BMPs identified in Table 4-6, would have **no impact** on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, regulations, or by the CDFW or USFWS.	na	na	na	N	na
Impact AR-22. The Biological Control Alternative would have **no impact** on federally protected wetlands as defined by Section 404 of the Clean Water Act, (including but not limited to, marsh, vernal pool, coastal, etc.).	na	na	na	N	na
Impact AR-23. The Biological Control Alternative 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.	na	na	na	N	na
Impact AR-24. The Biological Control Alternative would have **no impact** on local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance, as none have been identified.	na	na	na	N	na
Impact AR-25. The Biological Control Alternative would have **no impact** on HCPs or NCCPs as it would not conflict with the provisions of any adopted HCP, NCCP, or other approved local, regional or state habitat conservation plan.	na	na	na	N	na
Impact AR-26. The Chemical Control Alternative, with the BMPs identified in Table 4-6, 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 in local or regional plans, policies, or regulations, or by the CDFW or USFWS. Non-persistent, chemicals proven to have low toxicity to non-target organisms would be applied in strict accordance with label directions, and BMPs, including those relating to worker environmental awareness training, disturbance minimization measures, and Applications of Pesticides, Surfactants, and/or Herbicides would be applied, as would appropriate habitat and species-specific BMPs. These practices make it highly unlikely that this alternative would result in adverse effects to special status species.	na	na	na	na	LS

Table 4-9 Summary of Alternative Biological Aquatic Impacts

Impact Statement	Surveillance	Physical Control	Vegetation Management	Biological Control	Chemical Control
Impact AR-27. The Chemical Control Alternative, with the BMPs identified in Table 4-6, would have a **no impact** on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, regulations, or by the CDFW or USFWS. The chemicals considered under the Chemical Control Alternative would not affect riparian habitats or other sensitive natural communities.	na	na	na	na	N
Impact AR-28. The Chemical Control Alternative would not result in the direct removal, filling, or hydrological interruption of federally protected wetlands as defined by Section 404 of the Clean Water Act, (including but not limited to, marsh, vernal pool, coastal, etc.). This alternative would have a have **no impact** on these resources.	na	na	na	na	N
Impact AR-29. The Chemical Control Alternative 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.	na	na	na	na	N
Impact AR-30. The Chemical Control Alternative would have **no impact** on local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance, as none have been identified.	na	na	na	na	N
Impact AR-31. The Chemical Control Alternative has **no impact** on HCPs or NCCPs as it would not conflict with the provisions of any adopted HCP, NCCP, or other approved local, regional or state habitat conservation plan.	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

4.2.10 Mitigation and Monitoring

The implementation of the alternatives would not result in any significant impacts on aquatic or wetland resources. All impacts are either less-than-significant or none. Therefore, no mitigation is required.

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