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9 Water Resources

Chapter 9 evaluates potential impacts of the Contra Costa Mosquito and Vector Control District's (CCMVCD; the District) Integrated Mosquito and Vector Management Plan (IMVMP) implementation on water resources. Results of the evaluation are provided at the programmatic level. Section 9.1, Environmental Setting, presents an overview of the physical properties and environmental settings; and contains federal regulations, state regulations, and local ordinances and regulations that are applicable to the Program. Section 9.2, Environmental Impacts and Mitigation Measures, presents the following::

> Environmental concerns and evaluation criteria: A determination of whether the Program alternatives would cause any potentially significant impacts to regional hydrologic resources

> Discussion of methods and assumptions, including findings from the Ecological and Human Health Risk Assessment, which is included as Appendix B

> Discussion of potential impacts of the Program alternatives, and recommendations for mitigation, if required, for those impacts

> Cumulative impacts summary

> A summary of estimated environmental impacts to hydrologic resources

> Monitoring of recommended mitigation measures

9.1 Environmental Setting

9.1.1 California's Hydrologic and Geomorphic Regions

The hydrologic resources of California can be divided into regions based on several hydrologic characteristics. The California Water Plan divides California into 10 hydrologic regions. These regions are delineated based upon the state's major drainage basins. Each region has distinct precipitation characteristics and water bodies.

Hydrologic regions over the District Program Area include portions of the Sacramento River and San Francisco Bay regions. The Program Area also overlaps a small portion of the San Joaquin River hydrologic regions. The District's Service Area and lands in adjacent counties comprise the District's Program Area, and the hydrologic regions with important water features for the District are shown on Figure 9-1. Description of surface water and groundwater characteristics for the differing hydrologic regions relied on *California Water Plan, Update 2009* and *California Water Plan, Update 2013, Advisory Committee Review Draft* (CDWR 2009a-c, 2013a-d

9.1.1.1 San Francisco Bay Hydrologic Region

The San Francisco Bay Hydrologic Region (Bay Region) occupies approximately 4,500 square miles, from Tomales Bay in Marin County to southern Santa Clara County, and inland to the confluence of the Sacramento and San Joaquin Rivers near Collinsville. The eastern boundary follows the crest of the Coast Range where the highest peaks are more than 4,000 feet above mean sea level (CDWR 2013b). This region includes portions of Marin, Sonoma, Napa, Solano, San Mateo, Santa Clara, Contra Costa, and Alameda counties.

Principle watersheds in the Bay Region include Tomales Bay, Corte Madera Creek, Novato Creek, Petaluma River, Sonoma Creek, Napa River, Wildcat Creek, San Pablo Creek, Green Valley Creek, Suisun Creek, Walnut Creek, San Mateo Creek, San Francisquito Creek, Guadalupe River, Coyote Creek, Alameda Creek, San Lorenzo Creek, and San Leandro Creek watersheds. These watersheds drain into Suisun, San Pablo, North San Francisco, and South San Francisco bays, or directly into the Pacific Ocean. For example, the Guadalupe River and Coyote and Alameda creeks drain from the Coast Range and flow northwest into San Francisco Bay. The Napa River originates in the Mayacamas Mountains at the northern end of Napa Valley and flows south into San Pablo Bay. Sonoma Creek begins in mountains within Sugarloaf State Park and flows south through Sonoma Valley into San Pablo Bay.

A large proportion of the nine counties that surround the San Francisco Bay is urbanized. As a result, many creeks have been confined to underground culverts beneath the developed regions. While many larger creeks remain open, they often have been heavily modified to run in concrete channels to optimize flood conveyance and provide flood protection. Ownership of Bay Area streams is a patchwork of public title, public easements, and private ownership that complicates policies and jurisdiction over, or maintenance responsibility for, urban streams. Many Bay Area stream reaches have, in fact, no established public jurisdiction or maintenance responsibility (RMC 2006).

Tidal marshes occur throughout much of the fringe of the San Francisco Bay, from the lowest extent of vascular vegetation to the top of the intertidal zone (at the maximum height of the tides). Tidal marsh also exists in the tidal reaches of local rivers and streams. Tidal marshland was once more extensive and was estimated to be 190,000 acres; however, development in the region has decreased the amount of tidal marshland to approximately 40,000 acres. A large effort has recently been undertaken to restore these ecosystems as high-quality wetlands have been shown to moderate the effect of floods, improve water quality, help maintain shipping channels, and provide habitat to numerous species (USEPA 1999).

Like most of Northern California, the climate in the Bay Region largely is governed by weather patterns originating in the Pacific Ocean. About 90 percent of the annual precipitation falls between November and April. The North Bay receives about 20 to 25 inches of precipitation annually. In the South Bay, east of the Santa Cruz Mountains, annual precipitation is only about 15 to 20 inches because of the rain shadow effect. Temperatures in the Bay Region generally are cool, and fog often resides along the coast. The inland valleys receive warmer, Mediterranean-like weather (average summer high temperatures are about 80 degrees Fahrenheit). The gap in the rolling hills at Carquinez Strait allows cool air to flow from the Pacific Ocean into the Sacramento Valley. Most of the interior North Bay and the northern parts of the South Bay are influenced by this marine effect. By contrast, the southern interior portions of the South Bay experience very little marine air movement (CDWR 2013b).

Land use in the Bay Region is diverse. Residents live in urban, suburban, and rural areas. Some of these areas are on natural floodplains, which historically were used for agriculture. Agriculture accounts for 21 percent of the Bay Region's land area, most of which is in the North and Northeast Bay in Napa, Marin, Sonoma, and Solano counties. Santa Clara and Alameda counties also have significant agricultural acreage at the edge of urban development (CDWR 2013b).

The region has many significant water management challenges: sustaining water supply, water quality, and the ecosystems in and around San Francisco Bay; reducing flood damages and adapting to impacts from climate change. Numerous government agencies and water districts deliver, treat, and regulate water in the Bay Region. Many planning organizations identify present and future challenges in the region such as land use, housing, environmental quality, economic development, wetlands, water quality, water reliability, stormwater management, flood protection, watershed management, groundwater management, fisheries, and ecosystem restoration (CDWR 2013b).

Groundwater basins underlie approximately 1,400 square miles or 30 percent of the Bay Region and account for about 15 percent of the region's average annual water supply. The Bay Region has 25 identified groundwater basins, as shown on Figure SFB-3 (CDWR 2013b) The Santa Clara Valley, Livermore Valley, Westside, Niles Cone, Napa-Sonoma Valley, and Petaluma Valley are heavily used groundwater basins (CDWR 2013b).

Figure 9-1 Program Area and California Hydrologic Regions with Major Water Bodies Contra Costa Mosquito & Vector Control District

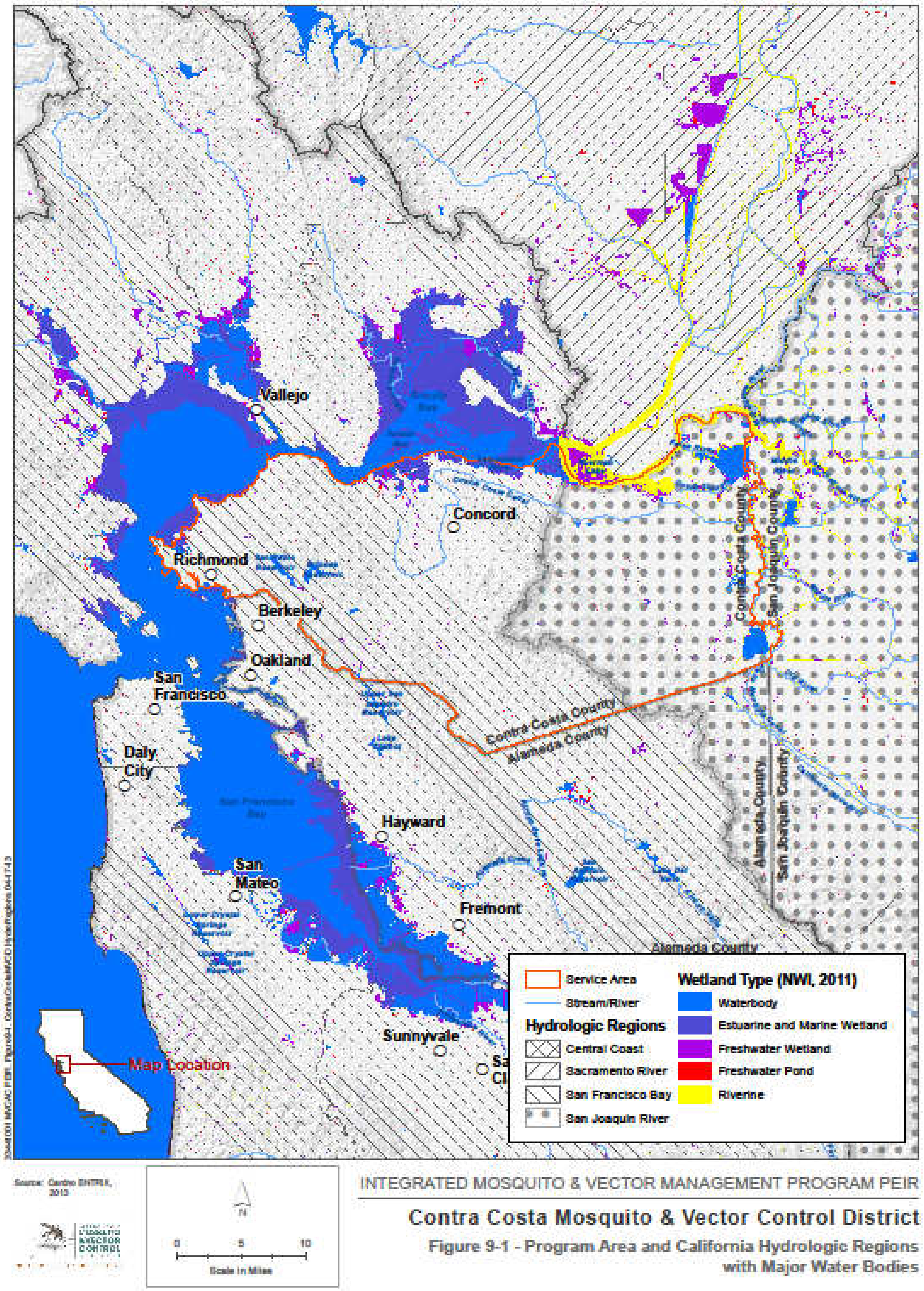

Figure 9-1 BACK

Ongoing surface water quality issues exist in the Bay Region. Pollutants from urban and rural runoff include pathogens, nutrients, sediments, and toxic residues. Some toxic residues are from past human activities such as mining; industrial production; and the manufacture, distribution, and use of agricultural pesticides. These residues include mercury, PCBs, selenium, and chlorinated pesticides. Emerging pollutants in the region include flame retardants and pharmaceuticals.

San Francisco Bay and a number of the streams, lakes, and reservoirs in the Bay Region have elevated mercury levels, as indicated by elevated mercury levels in fish tissue. The major source of the mercury is historic mercury mining and mining activities in the Sierra Nevada and coastal mountains. Large amounts of contaminated sediments were discharged into the Bay from Central Valley streams and local mines in the Bay Area. Significant impaired water bodies include the Bay, the Guadalupe River in Santa Clara County (from New Almaden Mine discharges), and Walker Creek in Marin County (from Gambonini Mine discharges). The SFBRWQCB has adopted total maximum daily loads (TMDLs) for mercury in the Bay, Guadalupe River, and Walker Creek (CDWR 2013b).

Water agencies in the region have relied on importing water from the Sierra Nevada for nearly a century to supply their customers. Water from the Mokelumne and Tuolumne rivers accounts for about 38 percent of the region's average annual water supply. Water from the Delta via the federal Central Valley Project and the State Water Project accounts for another 28 percent. Approximately 31 percent of the average annual water supply is from local groundwater and surface water, and 3 percent is from miscellaneous sources. Population growth and concerns over diminishing water quality have led to the development of local surface water supplies, recharge of groundwater basins, and incorporation of conservation guidelines (CDWR 2013b).

Drinking water in the Bay Region ranges from high-quality Mokelumne and Tuolumne river water to variable-quality Delta water, which constitutes about one-third of the domestic water supply. Purveyors that depend on the Delta for all or part of their domestic water supply can meet drinking water standards, but still need to be concerned about microbial contamination, salinity, and organic carbon.

The Bay Region generally receives very little snow, so floodwaters originate primarily from intense rainstorms. The northern portion of the region receives more precipitation and floods more often than the southern portion. Flooding occurs more frequently in winter and spring and can be intense with a short duration in small watersheds with steep terrain. Local flooding tends to occur when large, widespread storms fall on previously saturated watersheds that drain into local valleys. The greatest flood damages occur in the lower reaches of streams when floodwaters spill onto the floodplain and spread through urban neighborhoods (CDWR 2013b).

Drought, overdraft, and pollution have impaired portions of 28 groundwater basins in the Bay Region. The basins face a perpetual threat of contamination from spills, leaks, and discharges of solvents, fuels, and other pollutants. Contamination affects the supply of potable water and water for other beneficial uses. Some municipal, domestic, industrial, and agricultural supply wells have been removed from service due to the presence of pollution, mainly in shallow groundwater zones. Overdraft can result in land subsidence and saltwater intrusion, although active groundwater management has stopped or reversed the saltwater intrusion (CDWR 2013b).

A variety of historical and ongoing industrial, urban, and agricultural activities and their associated discharges have degraded groundwater quality, including industrial and agricultural chemical spills, underground and aboveground tank and sump leaks, landfill leachate, septic tank failures, and chemical seepage via shallow drainage wells and abandoned wells. The region has over 800 groundwater cleanup cases, about half of which are related fuel spills from leaking underground tanks. In many cases, the groundwater is treated and discharged to surface waters via storm drains (CDWR 2013b).

9.1.1.2 San Joaquin River Hydrologic Region

The San Joaquin River Hydrologic Region is generally located in the northern portion of the San Joaquin Valley. The region includes approximately half of the Sacramento-San Joaquin River Delta, including those areas that are in Contra Costa, Alameda, and San Joaquin counties. The region also contains portions of Alpine, Amador, Benito, El Dorado, Fresno, Sacramento, and San Joaquin counties; and all of Calaveras, Madera, Mariposa, Merced, Stanislaus, and Tuolumne counties. The San Joaquin River is the principal river in the region, and all other streams in the region are tributary to it (CDWR 2013b).

Average annual precipitation varies considerably, ranging from about 22 inches in the north to about 6.5 inches in the southwest. Additionally, snowfall occurs in the higher elevations of the Sierra Nevada. The snow serves as stored water before it melts and is a typically a major contributor to eastern San Joaquin Valley water supplies. Summers are hot and dry in both the valley and upland areas. Winters are usually mild, but temperatures may at times drop below freezing (CDWR 2013b).

The vegetation and topography also are highly variable, ranging from forested lands in the Sierra Nevada; chaparral communities, oak woodlands, riparian habitat, and grass savannas in the Sierra Nevada and Diablo Range foothills and rangelands; and riparian areas in the Delta and along rivers, streams, lakes, and ponds. The valley floor is primarily in agricultural use but has pockets of urbanized areas. Wetlands are present in private waterfowl hunting areas and federal- and state-managed wildlife refuges and wildlife management areas. Vernal pools are located primarily along the valley’s edges. The wetlands, rivers, and upland areas support a number of federal- and state-listed wildlife and plant species (CDWR 2013b).

Many agricultural and municipal users receive water supply from large irrigation districts. Water use is first met by surface water supplies, primarily high-quality water from the tributaries of the San Joaquin River. Where insufficient surface water exists, imported surface water is delivered primarily through the Central Valley Project, but smaller amounts are also delivered from the State Water Project. Local groundwater is pumped where insufficient surface water is available or where needs can be met by groundwater. Each of these water supplies is strained by a variety of factors. Surface water supplies are stressed by increased local demands, environmental requirements, and restoration needs. Imported supplies are increasingly limited due to drought, legal actions, and other compliance requirements. Average annual groundwater extraction also has been shown to frequently exceed the sustainable aquifer yield (CDWR 2013b).

9.1.1.3 Sacramento River Hydrologic Region

The Sacramento River Hydrologic Region comprises the entire drainage area of the Sacramento River within California and its tributaries. The region is bounded by the Sierra Nevada on the east, the Coast Ranges on the west, the Cascade and Trinity Mountains on the north, and the Sacramento-San Joaquin River Delta on the south. It extends from Chipps Island in Solano County north to Goose Lake in Modoc County.

The northernmost part of the region is primarily high desert plateau, characterized by cold, snowy winters with only moderate rainfall and hot, dry summers. The mountainous parts in the north and east typically have cold, wet winters. The runoff from snow in the mountains serves as a water supply during the summer. The Sacramento Valley floor has mild winters with less precipitation and hot, dry summers. Annual regional precipitation generally increases from south to north and west to east. The snow and rain that fall in this region form part of the overall water supply for the entire state (CDWR 2013a).

Portions of the Sacramento River corridor have been altered by land development. Habitat has been fragmented, the fishery has been altered by factors such as railroad construction and mining, and natural geomorphic processes have been altered by water development projects such as dams in a manner that reduced spawning habitat and fragmented riparian systems. The dams, however, also create conditions more favorable to salmon by increasing the flexibility of cold water releases and providing increased flows during summer months (CDWR 2013a).

A complex water rights system is used to manage surface water supplies in this region. Many who receive water do not directly hold a water right to divert from a stream; rather, they receive water as a contractor from a water district, the State Water Project, or the Central Valley Project, which are covered by water rights held by the state and federal governments for the benefit of their contractors. Surface water availability in the Central Valley depends on primarily on hydrologic conditions but also on the type of contract, operational needs of the Sacramento Valley and the Bay-Delta, and other policies for water allocation. A water right is not a guarantee that water will be available (CDWR 2013a).

Groundwater is also an important supply for irrigation, municipal, and domestic uses, contributing to about 31 percent of the total water supply. Most groundwater is used for agricultural purposes, meeting about one-third of agricultural water demands. Groundwater use increases during dry periods when surface supplies are reduced, causing declines in groundwater levels of between 10 and 30 feet in some places. Depending on the amount, timing, and duration of groundwater level decline, nearby well owners may need to deepen wells or lower pumps to regain access to groundwater. Land subsidence associated with groundwater pumping also has occurred in the North American and Yolo subbasins (CDWR 2013a).

9.1.1.2 Existing Water Quality

Statewide and regional surface water monitoring has identified pesticides in surface waters and sediments throughout the Program Area and vicinity. A query of water quality data available through the California Environmental Data Exchange Network (CEDEN) water quality database revealed detectable quantities of several chemicals that the District will use and several additional chemicals of the same class (i.e., pyrethroids). See Tables 2-1 through 2-6 for a list of all chemicals the District uses.

The following is a summary of CEDEN data from 1993 to 2012 regarding the concentrations of these chemical constituents when detected and the water bodies in which they were discovered (CEDEN 2013). In addition to the CEDEN data, the list below includes Water Year 2012 Regional Monitoring Coalition pesticide results (BASMAA 2013). The Regional Monitoring Coalition was formed to implement the monitoring program required by the Municipal Regional Stormwater NPDES Permit (Order R2-2009-0074) issued by the SFBRWQCB. In consideration of their more frequent usage and potentially greater toxicity compared with other commonly applied pesticides used in this geographic region, monitoring of the class of pesticides known as pyrethroids was conducted by the Regional Monitoring Coalition to explore potential causes of toxicity to *Hyalella azteca* in sediments. Based on monitoring results, BASMAA (2013) concluded that it is likely that pyrethroids caused toxicity in water year 2012.

- The concentration of all permethrin isomers detected in the water column of the Hayward Industrial Storm Drain ranged from 1.57 to 285 ng/L. Sunnyvale East Channel, Guadalupe River, and Lower Marsh Creek sediments contained concentrations ranging from 3.81 to 20.9 µg/kg. Cis- and trans-permethrin isomers were detected in Central Bay, Grizzly Bay, Lower South Bay, San Pablo Bay (Pinole Point), South Bay, and Suisun Bay sediments in concentrations ranging from 0.10 to 1.32 µg/kg. Cis- and trans- isomers were also detected in Coyote Creek, Redwood Creek, San Leandro Creek, and Tembladero Slough sediments in concentrations 0.12 to 25.6 µg/kg. Only the cis- isomer of permethrin was detected in Guadalupe Creek, Laurel Creek, Salinas River, and San Mateo Creek sediments in concentrations ranging from 3.22 to 11.1 µg/kg. Trans-permethrin was the only isomer detected in Lagunitas Creek and the Pajaro River sediments in concentrations ranging from 4.06 to 4.52 µg/kg.

Additional queries were made to the USEPA's ECOTOX database to compare regional water quality data to available ecological toxicity data (See Table 9-1). The toxicology data is expressed in LC50.[1] The LC50 value is used as a standard measure of toxicity for evaluation and comparison of chemicals. Chemicals with lower LC50 values are more toxic. The LC50 values in Table 9-1 are populated from the lowest available constituent concentrations in which a 50 percent die-off for the test species is observed (USEPA 2013b). LC50 values are not available for sediment. Freshwater and saltwater values are provided where available.

A 2010 study performed by the CDPR analyzed the presence of pyrethroid insecticides in California's surface waters from urban areas. The most frequently detected pyrethroids were bifenthrin followed by permethrin and cyfluthrin. These pyrethroids are found in many common household insecticides. Bifenthrin and cyfluthrin, which the District does not use, were detected with the highest concentrations in both water and sediment. Over 8 percent water samples of bifenthrin and cyfluthrin exceeded the acute toxicity benchmarks for fish and over 12 percent water samples of cyfluthrin and permethrin exceeded those for aquatic invertebrates (CDPR 2010b).

[1] LC50 refers to the lethal concentration of a chemical (amount of chemical in a volume of food, water or air) that that would kill 50 percent of a group of test animals exposed to the chemical for a defined exposure time.

Table 9-1 Pesticide Concentrations in Surface Water and Sediment throughout the Program Area and Vicinity (1993 to 2012)

	Sediment		Water			
Pesticide	**Concentration (µg/kg)**	**LC50 (µg/kg)**	**Concentration (ng/L)**	**LC50 (ng/L)**	**Standard Test Species**	**Exposure Time**
Allethrin	0.238 - 5.61	*	NA	1,800	Coho Salmon (*Oncorhynchus kisutch*)	96-hour exposure in Freshwater Medium
Bifenthrin	0.204 - 38.2	*	0.18 - 272	9	Scud (*Hyalella Azteca*)	96-hour exposure in Freshwater Medium
				3	Opossum Shrimp (*Americamysis bahia*)	96-hour exposure in Saltwater Medium
Chlorpyrifos	0.004 - 2.054	*	0.004 - 2.054	0.3	Scud (*Hyalella Azteca*)	96-hour exposure in Freshwater Medium
				29	Opossum Shrimp (*Americamysis bahia*)	96-hour exposure in Saltwater Medium
Cinerin (Pyrethrin)	NA	*	3.76 - 79.9	920	Scud (*Gammarus fasciatus*)	96-hour exposure to Pyrethrin in Freshwater Medium
				84	Opossum Shrimp (*Americamysis bahia*)	96-hour exposure to Pyrethrin in Saltwater Medium
Lambda-cyhalothrin	0.065 - 6.03	*	3.53 - 6.07	30	Zebra Danio (*Danio rerio*)	72-hour exposure in Freshwater Medium
				3	Opossum Shrimp (*Americamysis bahia*)	96-hour exposure in Saltwater Medium
Esfenvalerate / Fenvalerate	0.163 - 60.8	*	*	11	Water Flea (*Ceriodaphnia dubia)*	96-hour exposure to Esfenvalerate in Freshwater Medium
Permethrin	3.81 - 20.9	*	1.57 - 285	0.007 (umol/L)	Channel Catfish (*Ictalurus punctatus*)	96-hour exposure in Freshwater Medium
				4	Amphipod (*Eohaustorius estuarius*)	48-hour exposure in Saltwater Medium

Table 9-1 Pesticide Concentrations in Surface Water and Sediment throughout the Program Area and Vicinity (1993 to 2012)

	Sediment		Water			
Pesticide	**Concentration (µg/kg)**	**LC50 (µg/kg)**	**Concentration (ng/L)**	**LC50 (ng/L)**	**Standard Test Species**	**Exposure Time**
Cis- and Trans-Permethrin Isomers	0.10 - 25.6	*	*	465	Water Flea (*Ceriodaphnia dubia)*	96-hour exposure to Cis-Permethrin in Freshwater Medium
Phenothrin	0.988 - 4.81	*	*	140	Rainbow Trout (*Oncorhynchus mykiss*)	96-hour exposure in Freshwater Medium
				21	Opossum Shrimp (*Americamysis bahia)*	96-hour exposure in Saltwater Medium

*No Data Available

9.1.2 Regulatory Setting

The Program includes components under the jurisdiction of federal, state, and local agencies. Applicable regulations are summarized below and include aspects related to both surface water and groundwater. The primary focus of this regulatory summary is the water quality aspects related to the Program alternatives. Because the Program will not cause changes to natural precipitation patterns, runoff, or groundwater infiltration, changes to water quantity are not anticipated.

9.1.2.1 Federal

Federal Clean Water Act (33 United States Code Section 1251 et seq.)

The USEPA is the federal agency responsible for water quality management and administers the federal Water Pollution Control Act Amendments of 1972 and 1987, collectively known as the Clean Water Act (CWA). The CWA establishes the principal federal statutes for water quality protection. It was established with the intent "to restore and maintain the chemical, physical, and biological integrity of the nation's water, to achieve a level of water quality which provides for recreation in and on the water, and for the propagation of fish and wildlife." Several key CWA sections guide the regulation of water pollution in the US:

- Section 208, Water Quality Control Plans. This section requires the preparation of local water quality control plans throughout the nation. Each water quality control plan covers a defined drainage area. The primary goal of each water quality control plan is to attain water quality standards established by the CWA and the state governments within the defined area of coverage. Minimum content requirements, preparation procedures, time constraints, and federal grant funding criteria pertaining to the water quality control plans are established in Section 208. The USEPA has delegated preparation of the water quality control plans to the individual states. More information is provided below in the state regulatory setting section.
- Section 303(d) Water Quality Limited Surface Waters. This section requires each state to provide a list of impaired waters that do not meet or are expected not to meet state water quality standards as defined by that section. It also requires the state to develop TMDLs from the pollution sources for such impaired water bodies. Table 9-2 lists pesticide-impaired surface waters and TMDL status in the Program Area. Because pyrethroids have been implicated in sediment toxicity, those impairments are also included in Table 9-2. See the state regulatory setting section (Section 9.1.2.2) for description of the Diazinon and Pesticide-Related Toxicity in Urban Creeks TMDL.
- Section 401, Water Quality Certifications. This CWA section requires that, prior to the issuance of a federal license or permit for an activity or activities that may result in a discharge of pollutants into waters of the US (see Section 404 discussion, below), the permit applicant must obtain a certification from the state in which the discharge would originate. A state certification indicates that the proposed activity or activities would not result in a violation of applicable water quality standards established by federal or state law, or that no water quality standards apply to the proposed activity. The SWRCB and/or the nine RWQCBs administer the certification program in California.
- Section 402, NPDES. The NPDES requires permits for pollution discharges (except dredge or fill material) into waters of the US, such that the permitted discharge does not cause a violation of federal and state water quality standards. Biological and residual pesticides discharged into surface waters constitute pollutants within the meaning of the CWA and require coverage under an NPDES permit. NPDES permits define quantitative and/or qualitative pollution limitations for the permitted source and control measures that must be implemented to achieve the pollution limitations. Pollution control measures are often referred to as BMPs. In California, NPDES permits are issued by the SWRCB or the RWQCBs.

Table 9-2 Section 303(d) Pesticide and Sediment Toxicity Limited Surface Waters

Water Body	Pollutants	Primary Stressors	TMDL Completion Dates
Kellogg Creek	Escherichia coli (E. coli), Dissolved Oxygen, Salinity, Sediment Toxicity, Unknown Toxicity	Unknown Source	2021
Kirker Creek	Pyrethroids, Toxicity, Trash	Channelization, Urban Runoff-Erosion and Sedimentation, Surface Runoff, Unknown Source, Illegal Dumping, Urban Runoff/Storm Sewers	2007–2021
Marsh Creek (Marsh Creek Reservoir to San Joaquin River)	Diazinon, Escherichia coli (E. coli), Mercury, Sediment Toxicity, Unknown Toxicity	Agriculture, Unknown Source, Urban Runoff/Storm Sewers, Resource Extraction	2007–2021

Source: SWRCB 2011b

> <u>Section 404, Discharge of Dredge and Fill Material.</u> Section 404 assigns the USACE with permitting authority for proposed discharges of dredged and fill material into waters of the US, defined as "…waters which are currently used, or were used in the past, or may be susceptible to use in interstate or foreign commerce, including all waters which are subject to the ebb and flow of the tide; territorial seas and tributaries to such waters." The USACE typically considers all natural drainages with defined beds and banks to be waters of the US. Section 404 establishes procedures by which the permitting agency is to review, condition, approve, and deny permit requests. Per the regulations, permitting agencies are responsible to conduct public noticing and provide the opportunity for public hearings during the review of each permit request. This responsibility includes informing the USFWS and/or NMFS of each permit request. Consultation with the USFWS and/or NMFS is required for proposed discharges that could affect species protected by the federal Endangered Species Act. Measures that are required by the USFWS and/or NMFS to minimize impacts to federally protected species must be included as conditions of the permit. The USACE also authorizes, with limited application requirements and associated delay, certain activities with minimal adverse effects on the environment, under nationwide permits. Currently, 50 nationwide permits exist, of which about half require preconstruction notification, which USACE reviews to verify the activity qualifies for the nationwide permit.

9.1.2.1.1 Federal Insecticide, Fungicide, and Rodenticide Act

The FIFRA was first passed in 1947 to establish labeling provisions and procedures for registering pesticides with the USDA. It was rewritten in 1972 and has since been amended several times. In its current form, FIFRA mandates that USEPA regulate the use and sale of pesticides to protect human health and preserve the environment. Registration with the USEPA assures that pesticides will be properly labeled and that, if used in accordance with specifications, they will not cause unreasonable harm to the environment. Pesticide use in California is also regulated by the CDPR and local County Agricultural Commissioners.

9.1.2.1.2 California Toxics Rule

The USEPA has developed water quality criteria for priority toxic pollutants and other provisions for water quality standards to be applied to inland surface waters, enclosed bays, and estuaries in California. This rule was developed to address a gap in California's water quality standards that was created when the state's water quality control plans containing water quality criteria for priority toxic pollutants were overturned in 1994. The established numerical standards were deemed necessary to protect human health and the environment. The rule includes ambient aquatic life criteria for 23 priority toxic pollutants, ambient human health criteria for 57 priority toxics, and a compliance schedule.

9.1.2.1.3 Safe Drinking Water Act of 1974

With the passage of the federal Safe Drinking Water Act of 1974, the USEPA established and enforced mandatory nationwide minimum standards. California adopted its own Safe Drinking Water Act in 1976 that gave California Department of Health Services (now CDPH) responsibility for the administration of the federal Safe Drinking Water Act in California. Under this program, the USEPA has delegated primary responsibility for setting and enforcing drinking water standards to the CDPH. CDPH has two approaches to standards for drinking water quality. The first approach is to safeguard public welfare by limiting the level of specific contaminants that can impact public health. These limits are identified as Primary MCLs and are specific concentrations that cannot be exceeded for a given constituent in surface water or groundwater.

9.1.2.1.4 Rivers and Harbors Act

The Rivers and Harbors Act (RHA) of 1899 prohibits the unauthorized alteration or obstruction of any navigable waters of the US. As defined by the RHA, navigable waters include all waters that are:

- Historically, presently, or potentially used for interstate or foreign commerce
- Subject to the ebb and flow of tides

Regulations implementing RHA Section 10 are coordinated with regulations implementing CWA Section 404. The RHA specifically regulates:

- Construction of structures in, under, or over navigable waters
- Deposition or excavation of material in navigable waters
- All work affecting the location, condition, course, or capacity of navigable waters

The USACE administers the RHA. If a proposed activity falls under the authority of RHA Section 10 and CWA Section 404, the USACE processes and issues a single permit. For activities regulated only under RHA Section 10, such as installation of a structure not requiring fill, permit conditions may be added to protect water quality during construction.

Program activities are not anticipated to affect any facilities that would be regulated under the RHA.

9.1.2.2 State

9.1.2.2.1 Porter-Cologne Act

The Porter-Cologne Act (California Water Code Section 13000) is the principal law governing water quality regulation in California. It establishes a comprehensive program to protect water quality and the beneficial uses of water. The Porter-Cologne Act applies to surface waters, wetlands, and groundwater, and to both point and nonpoint sources of pollution. Pursuant to the Porter-Cologne Act, it is the policy of the State of California that:

- The quality of all the waters of the state shall be protected.
- All activities and factors affecting the quality of water shall be regulated to attain the highest water quality within reason.
- The state must be prepared to exercise its full power and jurisdiction to protect the quality of water in the state from degradation.

Pursuant to the Porter-Cologne Act, the responsibility for protection of water quality in California rests with the SWRCB. The SWRCB administers federal and state water quality regulations for California’s ocean waters and also oversees and funds the state’s nine RWQCBs. The RWQCBs prepare water quality control plans, establish water quality objectives, and carry out federal and state water quality regulations and permitting duties for inland water bodies, enclosed bays, and estuaries within their respective regions. The Porter-Cologne Act gives the SWRCB and RWQCBs broad powers to protect water quality by regulating waste discharge to water and land and by requiring cleanup of hazardous wastes.

9.1.2.2.2 State Antidegradation Policy

The SWRCB adopted the Statement of Policy with Respect to Maintaining High Quality Water in California (Resolution No. 68-16) on October 28, 1968. This policy is generally referred to as the "Antidegradation Policy" and it protects surface water and groundwater where existing water quality is higher than the standards set by the Water Quality Control Plan (or Basin Plan) to protect beneficial use of the waters. Under the Antidegradation Policy, any action that can adversely affect water quality in surface water or groundwater:

> Must be consistent with the maximum benefit to the people of the state.

> Must not unreasonably affect present and anticipated beneficial use of such water.

> Must not result in water quality less than that prescribed in water quality plans and policies.

9.1.2.2.3 Safe Drinking Water Act 1976

California adopted its own Safe Drinking Water Act in 1976 that gave California Department of Health Services the responsibility for the administration of the federal Safe Drinking Water Act in California. This responsibility was then moved to the CDPH. The first approach is to safeguard public welfare by limiting the level of specific contaminants that can impact public health. These limits are identified as Primary MCLs and are specific concentrations that cannot be exceeded for a given constituent. The second approach is a treatment technique that is based on distribution system sampling in comparison to an action level. If the action level is exceeded in more than 10 percent of the samples, then additional treatment is required of the water supplier. Currently, treatment technique limits apply only to copper and lead. CDPH also has established Secondary MCLs that regulate constituents that affect water quality aesthetics (such as taste, odor, or color). Generally, CDPH uses the Secondary MCLs as guidelines.

Another component of the California Safe Drinking Water Act is the requirement of Cal-EPA's Office of Environmental Health Hazard Assessment to develop PHGs for contaminants in California's publicly supplied drinking water. PHGs are concentrations of drinking water contaminants that pose no significant health risk if consumed for a lifetime, based on current risk assessment principles, practices, and methods. This office establishes PHGs pursuant to Health & Safety Code Section 116365© for contaminants with MCLs and for those for which CDPH will be adopting MDLs. Public water systems use PHGs to provide information about drinking water contaminants in their annual Consumer Confidence Reports. Certain public water systems must provide a report to their customers about health risks from a contaminant that exceeds its PHG and about the cost of treatment to meet the PHG, and hold a public hearing on the report.

9.1.2.2.4 Section 401 Water Quality Certification

CWA Section 401 certification is required for any permit or license issued by a federal agency for any activity that may result in a discharge into waters of the state to ensure that a proposed project will not violate state water quality standards. This water quality certification is part of the 1974 CWA, which allows each state to have input into projects that may affect its waters (USEPA 2013c).

9.1.2.2.5 Water Quality Control Plan

The Water Quality Control Plans (or Basin Plans) of all nine of the RWQCBs and the California Ocean Plan (prepared and implemented by the SWRCB) collectively constitute the State Water Quality Control Plan. These plans are the RWQCB's master water quality control planning documents. They designate beneficial uses and water quality objectives for waters of the state, including surface waters and groundwater and also include programs of implementation to achieve water quality objectives. According to the requirements of the CWA and the California Porter-Cologne Act, each Basin Plan has been designed to support the intentions of the CWA and the Porter-Cologne Act by (1) characterizing the water resources within a region, (2) identifying beneficial uses that exist or have the potential to exist in each water body, (3) establishing water quality objectives for each water body to protect beneficial uses or allow their restoration, and (4) providing an implementation program that achieves water quality objectives. Implementation program measures include monitoring, permitting, and enforcement activities. The Basin Plans include numeric site-specific water quality objectives and narrative objectives for toxicity, chemical constituents, and tastes and odors. The narrative toxicity objective states: "*All waters shall be maintained free of toxic substances in concentrations that produce detrimental physiological responses in human, plant, animal, or aquatic life*."

9.1.2.2.6 Diazinon and Pesticide-Related Toxicity in Urban Creeks TMDL

Resolution R2-2005-0063 amended the Basin Plan for the San Francisco Bay region to establish a Water Quality Attainment Strategy and TMDL for Diazinon and pesticide-related toxicity in the Bay Area region creeks. As Diazinon use was phased out in 2004, alternatives began to pose water quality concerns and pyrethroids in particular were identified as the likely cause of sediment toxicity in some Bay Area urban creeks. To account for pesticide use changes over time, the Basin Plan amendment includes generic pesticide-related toxicity targets to comply with the narrative toxicity objective. When pesticide-related toxicity occurs in urban creek water, creeks do not meet the narrative toxicity objective as stated above in *Water Quality Control Plan*. When pesticide-related toxicity occurs in sediment, the creeks also do not meet the narrative sediment objective, which states: "Controllable water quality factors shall not cause a detrimental increase in the concentrations of toxic pollutants in sediments or aquatic life." Management actions designed to reduce the impacts of pesticide-related toxicity are outlined within the TMDL and Water Quality Attainment Strategy and are currently underway via Provision C.9 of the Municipal Regional NPDES Permit (BASMAA 2013).

9.1.2.2.7 California Pesticide Regulatory Program

CDPR regulates the sale and use of pesticides in California. CDPR is responsible for reviewing the toxic effects of pesticide formulations and determining whether a pesticide is suitable for use in California through a registration process. Although CDPR cannot require manufacturers to make changes in labels, it can refuse to register products in California unless manufacturers address unmitigated hazards by amending the pesticide label. Consequently, many pesticide labels that are already approved by USEPA also contain California-specific requirements. Pesticide labels are application requirements and include instructions informing users how to make sure the product is applied only to target pests including precautions the applicator should take to protect human health and the environment. For example, product labels may contain such measures as restrictions in applications to certain land uses and weather (i.e., wind speed) parameters.

9.1.2.2.8 Cooperative Agreement between the California Department of Public Health and Local Vector Control Agencies

Due to their public health mission, CDPR's Pesticide Regulatory Program provides special procedures for vector control agencies that operate under a Cooperative Agreement with CDPH. The application of pesticides by vector control agencies is regulated by a special and unique arrangement among the CDPH, CDPR, and County Agricultural Commissioners. CDPR does not directly regulate vector control agencies. CDPH provides regulatory oversight for vector control agencies that are signatory to the Cooperative Agreement. Signatories to the agreement use only pesticides listed by CDPH, maintain pesticide use reports, and ensure that pesticide use does not result in harmful residues on agricultural products.

9.1.2.2.9 Pesticide Permits

In response to a Sixth Circuit Court decision in 2009 that the application of pesticides at, near, or over waters of the US that results in discharges of pollutants requires coverage under a NPDES permit, the SWRCB adopted four Pesticide Permits. The following two are applicable to the Program. The Spray

Applications Permit is also relevant to the regulatory setting when the District performs pesticide applications for the CDFA and/or USFS.

> Statewide NPDES Vector Control Permit. Users of specific larvicide and adulticide registered products are required to obtain coverage under the Statewide NPDES Permit for Biological and Residual Pesticide Discharges to waters of the US from Vector Control Applications (SWRCB Water Quality Order No. 2012-0003-DWQ; NPDES No. CAG 990004; Vector Control Permit). Permitted larvicide active ingredients include monomolecular films, methoprene, Bti), Bs, temephos, petroleum distillates, and spinosad. Permitted adulticide active ingredients include malathion, naled, pyrethrin, permethrin, resmethrin, sumithrin, prallethrin, the synergist PBO, etofenprox, and N-octyl bicycloheptene dicarboximide (MGK-264). The permit contains a receiving water limitation for malathion and receiving water monitoring triggers for the other active ingredients. Receiving water monitoring triggers are conservatively based on one-tenth of the LC50 from USEPA's Ecotoxicity Database (LC50 is defined in Section 9.1.1.4). To obtain coverage under the permit, each discharger (typically a vector control district) must submit a Notice of Intent, application fee, and PAP, which is subject to approval by the SWRCB following a 30-day public comment period.

The PAP serves as a comprehensive plan developed by the discharger that describes the project, the need for the project, what will be done to reduce water quality impacts, and how those impacts will be monitored. The PAP must include a description of application and target areas, evaluation of available BMPs, and description of BMPs to be implemented. The PAP must include a discussion of the factors influencing the decision to select pesticide applications for vector control, what pesticide products or types expected to be used and any known degradation byproducts. The PAP also includes the methodology used to determine how much pesticide is needed and how this amount was determined, the methods in which pesticides are to be applied, and any adjuvants or surfactants that will be used.

Permittees must comply with the Vector Control Permit Monitoring and Reporting Program (MRP), which encourages formation of monitoring coalitions. Monitoring requirements include background, event, and post-event sampling for visual, physical, and chemical constituents for each type of aquatic pesticide used. Visual observations are required at 10 percent of all application sites, and physical measurements and chemical samples are required at six sites in each environmental setting (urban, agricultural/rural, and wetland). The District is a member of the MVCAC NPDES Permit Coalition, which is responsible for coordinating all physical measurements and conducting all chemical monitoring required under the Vector Control Permit MRP. Chemical monitoring results that exceed the receiving water limitation for malathion or the receiving water monitoring trigger for other active ingredients must be reported to the SWRCB and RWQCB within 24 hours of identification and again after 5 days. A description of actions to be taken to prevent recurrence of adverse incidents is included in those reports. Annual reports are required by the MVCAC NPDES Permit Coalition and each member district. Member district annual reports are typically limited to submittal of Pesticide Application Logs, which contain specific application details and review of their PAP. The MVCAC NPDES Permit Coalition annual report includes all physical and chemical monitoring data and makes recommendations for modifications to the MRP, if appropriate.

> Statewide NPDES Aquatic Weed Control Permit. The Statewide General NPDES Permit for the Discharge of Aquatic Pesticides for Aquatic Weed Control in waters of the US (SWRCB Water Quality Order No. 2004-0009-DWQ; NPDES No. CAG 990005; Aquatic Weed Control Permit) addresses the discharge of aquatic pesticides related to the application of 2,4-D, acrolein, copper, diquat, endothall, fluridone, glyphosate, imazapyr, sodium carbonate peroxyhydrate, and triclopyr-based aquatic pesticides to surface waters for the control of aquatic weeds. Covered discharges include over-applied or misdirected pesticide products and pesticide residues but do not include stormwater discharges or return flows from irrigated agriculture. Aquatic pesticides that are applied to application areas within waters of the US in accordance with FIFRA label requirements and Use Permit restrictions are not considered pollutants. The permit contains receiving water limitations for 2,4-D, acrolein, copper,

diquat, endothall, fluridone, glyphosate, and nonylphenol. To obtain coverage under the permit, a discharger must submit a Notice of Intent, application fee, and a vicinity map to the appropriate RWQCB. Effluent limitations contained in the Aquatic Weed Control Permit are narrative and include requirements to develop and implement an APAP.

The APAP must describe appropriate BMPs, including compliance with all pesticide label instructions, and a monitoring plan that meets the requirements of the permit MRP. Monitoring requirements include background, event, and post-event sampling for visual, physical, and chemical constituents at 10 percent of all application sites for each type of aquatic pesticide used for each type of site (flowing water and nonflowing water). Annual reports must summarize monitoring data and address the effectiveness of the APAP to reduce or prevent the discharge of pollutants associated with aquatic pesticide applications. Other specific requirements of the APAP include a description of the water body(ies) or water body systems being controlled and a description of what weed(s) are being controlled and why. The APAP also serves as a discussion of control tolerances (i.e., how much growth can occur before action is necessary) and of the factors influencing the decision to use aquatic pesticides in regards to those tolerances (pros and cons). The types of pesticides and adjuvants that are used and the methodology used to determine the amount of product to be applied are also detailed within an APAP. Finally, the APAP should have a description of application and treatment areas within the system and, if applicable, a list of gates or control structures and their inspection schedule to ensure they are not leaking.

The Aquatic Weed Control Permit is currently being revised. Draft SWRCB Order No. 2013-XXXX-DWQ adds imazamox and penoxsulam as active ingredients, requires a 30-day public comment period of the APAP, adds a dissolved oxygen receiving water limit, and adds receiving water monitoring triggers for imazamox, imazapyr, penoxsulam, sodium carbonate peroxyhydrate, and triclopyr. The draft permit also modifies the MRP, adds 24-hour and 5-day reporting requirements in the event of an exceedance of a receiving water limit or receiving water monitoring trigger, and clarifies other permit language. The updated permit is expected to be adopted by the SWRCB in Spring 2013.

> Statewide NPDES Spray Applications Permit. 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) addresses spray applications of insecticides and herbicides by CDFA and USFS. Under the permit, CDFA is covered for applications of acetamiprid, aminopyralid, *Bacillus thuringiensis*, subspecies *kurstaki* (*Btk*), carbaryl, chlorsulfuron, clopyralid, cyfluthrin, dinotefuran, glyphosate, imazapyr, imidacloprid, malathion, naled, nuclear polyhedrosis virus (NPV), pheromone, pyrethrins, Spinosad A and D, triclopyr butoxyethyl ester (BEE), and triclopyr triethylamine salt (TEA). USFS is covered for applications of biological control agents, which is a subset of the CDFA active ingredients.

The permit contains a receiving water limitation for malathion and receiving water monitoring triggers for many of the other active ingredients. To obtain coverage under the permit, the discharger must submit a Notice of Intent, application fee, and a project- or program-specific PAP to the SWRCB. The PAP must describe the application area, appropriate BMPs for each pesticide project, an evaluation of possible alternatives to pesticide use, and a monitoring plan. The PAP must also include an Off-Target Drift Management Plan. Monitoring requirements include background and event monitoring for visual, physical, and chemical parameters at frequencies similar to the Vector Control Permit. Annual reports must summarize sampling results and recommend improvements to the monitoring program, BMPs, and PAP.

9.1.2.3 Local

A compilation of local ordinances and regulations (or chapters within which they can be found) for counties within the District Service Areas is provided in Table 9-3.

Table 9-3 List of County General Plan Pesticide and Water Quality Policies

County	Name of Code/Plan	Element Title, Chapter and Section
Alameda	Castro Valley General Plan	Natural Hazards and Public Safety, Chapter 10
Alameda	East County Area Plan	Land Use, Public Services and Facilities, Environmental Health and Safety
Alameda	Eden Area General Plan	Land Use – Chapter 3, Public Facilities and Services – Chapter 6
Alameda	Countywide General Plan	Safety Element– Chapter 2, Hazardous Materials
Contra Costa	Contra Costa County General Plan	Conservation Element, Chapter 8, 8-22
Solano	Solano County General Plan	Health and Safety Element, HS.I-58

Sources: Alameda County Community Development Agency 2000, 2010, 2012; Contra Costa County 2005; Solano County 2008

9.1.2.3.1 County Agricultural Commissioners

In addition to federal and state oversight, County Agricultural Commissioners in California also regulate the sale and use of pesticides and issue Use Permits for applications of pesticides that are deemed as restricted materials by CDPR. County Agricultural Commissioners collect pesticide use reports from the District and other users of pesticides, investigate incidents and illnesses, and conduct annual inspections.

9.2 Environmental Impacts and Mitigation Measures

The water resource impacts evaluation is provided below. The evaluation qualitatively and quantitatively compares the Program's potential water resource impacts to the significance criteria presented in Section 9.2.1, Evaluation Concerns and Criteria. Significant impacts are summarized for each alternative where one or more potential impacts were identified. Mitigation measures are identified for potentially significant but mitigable impacts following the statement of impact. Additional information on the mitigation measures is provided in Section 9.2.1.1.

9.2.1 Evaluation Concerns and Criteria

Impacts are considered significant if the Program actions cause concentrations of Program compounds in receiving water bodies (surface water or groundwater) to exceed established water quality objectives or other applicable water quality standards or promulgated regulations on the local, state, or federal level. Increased concentrations of potential pollutants associated with Program activities within the Program Area would be related to the application of Program materials or implementation of Program activities in the Program Area.

As discussed previously in this PEIR, the Program Area is distributed across the District (and adjacent counties) rather than in a single particular location. The effects on water resources are largely attributable to the post-application movement of those compounds identified for use under the Program alternatives to surface water and/or groundwater. Some Program activities that do not involve applications of compounds could also affect water resources.

Concerns related to water resources issues that were raised during public scoping included the following:

> Consideration of CDPH review and approval of mosquito abatement materials and practices proposed for use on watershed lands.

> Integration of "Source Reduction" strategies with Stream Maintenance Program approaches in Water Agency-owned flood control channels. (Sonoma CWA)

> Need for description and quantification of dredge or fill activities and evaluation of their impacts.

> Impacts of drift from aerial spray and ground applications on water bodies, watersheds, and drinking water supplies.

> Concern for spread of invasive weeds, erosion and sedimentation

While the first two issues are related to Program implementation and coordination with other agencies (who will receive this PEIR), the last three are related to the Physical Control, Vegetation Management, and Chemical Control Alternatives and are addressed in the environmental impact analyses.

This water resource analysis addresses potential impacts to the quality of surface water and groundwater at a programmatic level and does not quantify dredge and fill activities (which could be addressed in the new USACE permit described in Section 2.8.1.3). Because no large-scale consumptive use of water supply is associated with implementation of the Program alternatives, the potential for an impact to water supply would be related to a physical impact to water quality. Additional discussion of the potential for the pesticides to result in exceedance of federal or state agency surface water quality standards or objectives is contained in Section 6.2, Ecological Health Environmental Impacts.

9.2.1.1 Thresholds of Significance

Applicable regulatory and planning standards discussed above can be used to determine appropriate thresholds of significance for this water resource analysis.

The Program activities are evaluated in accordance with the Hydrology and Water Quality Section IX of the CEQA Environmental Checklist Form, Appendix G. Several of the topic areas represented by the questions from the checklist are not affected by the Program activities, as follows:

Would the Program substantially deplete groundwater supplies or interfere substantially with groundwater recharge such that there would be a net deficit in aquifer volume or a lowering of the local groundwater table level (e.g., the production rate of pre-existing nearby wells would drop to a level which would not support existing land uses or planned uses for which permits have been granted)?	No, Program activities would not impact groundwater supplies or groundwater recharge.
Would the Program substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, in a manner which would result in substantial erosion or siltation on- or off site?	No, Program activities would not substantially change or alter drainage amount, timing, or patterns.
Would the Program substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, or substantially increase the rate or amount of surface runoff in a manner, which would result in flooding on- or off site?	No, Program activities would not substantially change or alter drainage amount, timing, or patterns.
Would the Program create or contribute runoff water, which would exceed the capacity of existing or planned stormwater drainage systems or provide substantial additional sources of polluted runoff?	No, Program activities would not create or contribute additional sources of clean or polluted runoff.

Would the Program place housing within a 100-year flood hazard area as mapped on a federal Flood Hazard Boundary or Flood Insurance Rate Map or other flood hazard delineation map?	No, Program activities would not construct any housing.
Would the Program place within a 100-year flood hazard area structures, which would impede or redirect flood flows?	No, Program activities would not create any structures.
Would the Program expose people or structures to a significant risk of loss, injury or death involving flooding, including flooding as a result of the failure of a levee or dam?	No, Program activities would not expose people or structures to flooding.
Would the Program lead to inundation by seiche, tsunami, or mudflow?	No, Program activities would not cause inundation by seiche, tsunami, or mudflow.

Topic areas that may be impacted by the Proposed Program include the following:

> Would the Program violate any water quality standards or waste discharge requirements?

> Would the Program otherwise substantially degrade water quality?

For the evaluation of these topic areas, impacts from Program activities on the water quality of surface water or groundwater would be considered potentially significant if the Program implementation or activities could cause chemical concentrations to exceed the following criteria:

> Any discharge to the surface water or groundwater that exceeds NPDES permit receiving water limitations

> Any discharge to the surface water or groundwater that exceeds Basin Plan objectives with a focus on the toxicity objective

> Any discharge to the surface water or groundwater that exceeds the MCLs

> Any discharge to surface water or groundwater that exceeds the California Toxics Rule Criteria Maximum Concentrations for human health or for aquatic life

> Any discharge to surface water or groundwater that degrades the water quality by either affecting beneficial uses or by exceeding any prescribed concentration limits in state water quality plans and policies.

9.2.2 Evaluation Methods and Assumptions

The methodology and assumptions of this water resources impact evaluation for the Program alternatives are provided below.

9.2.2.1 Methodology

The methodology used to prepare this programmatic impact analysis section is as follows:

> Obtain source-specific data for Program-specific chemical constituents.

> Evaluate Ecological and Human Health Risk Assessment (Appendix B) sections related to the Program.

> Compare water quality conditions associated with Program alternatives against threshold criteria.

> Identify water resource impacts and mitigation measures for Program activities that exceed water quality thresholds.

The Human and Ecological Health Risk Assessment Report (Appendix B) reviews and evaluates 42 pesticide (insecticides and herbicides) active ingredients and four adjuvants currently used or proposed for use by the nine Districts in MVCAC's coastal region. Application information, including the target organisms, number of treatments, total amount applied, and specific habitat types was obtained from the Districts. A comprehensive literature review was conducted to evaluate environmental fate and general toxicity characteristics for the active ingredients. The results of the assessment were used to rank the potential for adverse effects to human health and the environment. Chemical and application characteristics such as the likelihood for nontarget species and habitats, the potential for drift, and the possible transport and fate of the chemical in various media (i.e., air, surface water/groundwater, soil) were considered in the assessment. Those active ingredients that appear to exhibit a higher level of risk than others or that are in prevalent use in current Programs (even though they had lower toxicity) include the following products:

- Methoprene for mosquito control (toxicity to aquatic organisms and insects)
- Etofenprox for mosquito control (toxicity to aquatic organisms)
- Bti for mosquito control (prevalent use; public concerns)
- Pyrethrins for mosquito control (prevalent use; includes PBO synergist)
- Resmethrin for mosquito control (prevalent use; includes PBO synergist)
- Vegetable oil (coconut oil)/mix for mosquito control (contains low percentage petroleum distillate)
- Permethrin for mosquito and wasp control (toxicity to aquatic organisms; potential endocrine disruptor)
- Bromadiolone for rodent control (high toxicity to nontarget organisms)
- Difethialone for rodent control (high toxicity to nontarget organisms including mammals, birds, and aquatic organisms)
- Glyphosate for general weed control (prevalent use; possible endocrine disruptor);

9.2.2.2 Assumptions

The following assumptions were used in the assessment of potential water resource impacts from the Program alternatives:

- Site-specific evaluation of water quality impacts are not within the scope of this programmatic evaluation.
- The programmatic evaluation is based on the current proposed mosquito and/or vector control methods and is subject to change.
- Existing baseline ambient water quality data related to Program chemicals are limited for most areas.
- Mitigation measures for specific locations within the Program Area are not provided.

Assumptions related to the analysis of hazards, toxicity, and exposure for chemical treatment methods are explained below, including the definition of key terms.

9.2.2.2.1 Hazardous Material

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

9.2.2.3 Toxicity and Exposure

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

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

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 substantially less than the amounts used in the 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.

9.2.3 Surveillance Alternative

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

These activities do not involve chemical applications to water or soil and require very little interaction with water bodies to collect samples. With the exception of some adult mosquito traps, pesticides are not required for any of the surveillance techniques. Some adult mosquito traps use a Vapona strip infused with dichlorvos in the bottom of the collection jar; this chemical would be contained in the collection device and would not contact nor interact with the environment. Therefore, no impact would occur to surface water or groundwater.

> **Impact WR-1:** The Surveillance Alternative collection devices would not contact nor interact with the environment. **No impact** would occur to surface water or groundwater.

9.2.4 Physical Control Alternative

Physical control for mosquitoes consists of the management of mosquito-producing habitat (including freshwater marshes and lakes, saltwater marshes, temporary standing water, and wastewater treatment facilities) especially through water control and maintenance or improvement of channels, tide gates, levees, and other water control facilities, etc. Physical controls reduce or eliminate mosquito development sites by improving the habitat value for mosquito predators (i.e., providing deepwater sanctuary for larvivorous fish) or by reducing the habitat value for mosquitoes. Because mosquitoes breed in stagnant standing water, the District attempts to reduce these habitats through vegetation management, increased circulation, steepening banks, changes in water quality, or by reducing the duration that standing water is allowed to persist. The specific method employed is based on site- and project-specific considerations, including whether the activity is conducted to prevent mosquito-producing habitat from forming or in response to existing conditions. Characteristics of the site and water body are also considered in planning physical control activities. Vegetation management is based on an IPM approach and is discussed in Section 9.2.5. The District conducts physical control activities, requests/requires landowners and stewards to implement maintenance activities, and advises landowners on source reduction for mosquito habitat.

Three types of physical control practices are implemented:

1. Maintenance activities include removal of sediments from existing water circulation ditches; repair of existing water control structures, removal of debris in natural channels, clearance of brush for access to streams tributary to wetland areas, and filling of existing, nonfunctional water circulation ditches to achieve required water circulation dynamics and restore ditched wetlands.
2. New construction typically involves the creation of new ditches to enhance tidal flow preventing stagnant water.
3. Cultural practices include vegetation and water management (i.e., irrigation practices), placement of culverts or other engineering works, and making other physical changes to the lands.

The District performs these physical control activities in accordance with all appropriate environmental regulations and in a manner that generally maintains or improves habitat values for desirable species. Physical control activities can be relatively minor, typically consisting of up to 10,000 to 20,000 linear feet of ditch maintenance per year, and are often covered by the District's 5-year USACE and BCDC regional wetlands permits (Section 2.8.1.3). Filling or periodically draining artificially ponded areas such as ornamental ponds and irrigation ponds can be cost-effective and environmentally acceptable; however, these methods are not appropriate strategies in natural areas, large permanent water bodies, or in areas set aside for stormwater or wastewater retention. Consequently, the District does not usually undertake physical control projects in freshwater bodies including marshes and ponds. In saline and brackish marsh habitat, physical control measures are typically designed to reduce salt-marsh mosquito production through enhancement of the frequency and duration of tidal inundation or through other water management strategies.

Physical control activities for other vectors such as rates, mice, raccoon, skunk, and opossum are based on the District's site inspections. They may include education of property owners on sanitation, exclusion, and rodent proofing. The District may also remove the vector, typically by trapping methods.

Construction of water control facilities and changes in water management strategies could affect existing drainage patterns and water quality locally. However, physical control activities would be designed to increase water circulation, which can increase dissolved oxygen and reduce water temperatures, improving these water quality conditions locally. Changing water circulation patterns can also increase localized areas of scour due to increased water velocities, particularly near structures. Water control facilities (e.g., tide gates, levees) are designed to minimize scour near the structure for long-term stability. Potential increases in turbidity in the water body would be limited to during and immediately after the action and would not extend beyond the vicinity of the area being improved. Changes to groundwater conditions such as water quality or recharge would not occur.

Removal of sediments from existing water circulation ditches has the potential to temporarily approach or exceed turbidity water quality objectives in nearby downstream receiving waters. However, the physical control activities are short in duration (typically less than 1 day), are localized to site-specific areas, and are transitory in location. Therefore, this temporary and transitory potential impact to surface water or groundwater is less than significant.

> **Impact WR-2**: The Physical Control Alternative's activities to modify water circulation, remove sediment, and maintain water control facilities to reduce habitat conditions for mosquito production would have a **less-than-significant** impact on water resources and no mitigation is required.

9.2.5 Vegetation Management Alternative

District staff's direct vegetation management generally consists of activities to reduce the mosquito habitat value of sites by improving water circulation or access by fish and other predators, or to allow District staff's access to standing water for inspections and treatment. The District uses hand tools, other mechanical means, or herbicide applications to thin or remove vegetation. These activities primarily occur in aquatic habitats to assist with the control of mosquitoes but are also implemented in terrestrial habitats to help with the control of other vectors. The District may also perform vegetation management to assist other agencies and landowners with the management of invasive/nonnative weeds. These actions are typically performed under the direction of the concerned agency, which also maintains any required permits.

Herbicides the District uses are listed in Table 2-1 along with information regarding the timing/season of application, method of application, and types of sites where they are applied. Section 4.6 of the Ecological and Human Health Risk Assessment (Appendix B) includes descriptions of each herbicide and information on their environmental fate and toxicity. All herbicides are applied in strict conformance with label requirements, which have been approved by CDPR for use in California. Pesticide labels are legal requirements and include instructions telling users how to apply the product and precautions the applicator should take to protect human health and the environment. In addition, aquatic herbicides are applied in conformance with the APAP as required by the NPDES Aquatic Weed Control Permit.

In some instances, the water quality objective that establishes a minimum concentration for dissolved oxygen may not be met, such as when aquatic weeds killed by herbicides decompose rapidly and consume dissolved oxygen in the process.

Some herbicide applications also have the potential to approach or exceed the narrative toxicity water quality objective or the numeric water quality objective or receiving water monitoring trigger for the specific active ingredient. Herbicides that are not labeled for aquatic use and are subject to spray drift or surface water runoff may cause acute or chronic toxicity. Herbicides and adjuvants the District uses are grouped below based on toxicity to fish and aquatic invertebrates. They are discussed in more detail in Appendix B, Ecological and Human Health Risk Assessment.

9.2.5.1 Mechanical Removal of Vegetation

Mechanical and hand removal of vegetation from aquatic habitats has the potential to temporarily approach or exceed turbidity water quality objectives in downstream receiving waters. However, the vegetation control activities are short in duration (typically less than 1 day), are localized to site-specific areas, and are transitory in location. Therefore, this temporary and transitory potential impact to surface water is less than significant. No impact to groundwater is associated with these activities.

> **Impact WR-3:** Mechanical removal of vegetation from aquatic habitats would have a **less-than-significant** impact to surface water and **no impact** to groundwater resources.

9.2.5.2 Registered Herbicides or Adjuvants with Relatively Low Toxicity to Fish and Aquatic Invertebrates

Glyphosate is a nonselective, post-emergent, and systemic herbicide registered for use in agricultural and nonagricultural areas. It is used to control emergent foliage, but is not effective on submerged or mostly submerged foliage. Glyphosate is highly water-soluble, but binds tightly to soil and sediments. It has a low tendency to run off when applied to land because of strong adsorption to soil particles and it has a low potential to move to groundwater. Glyphosate degrades in soil in about a month. It has low toxicity to fish and aquatic invertebrates. Using BMP approaches, applications of glyphosate can be used safely when an adequate buffer to water sources is maintained.

The District would apply all herbicide formulations in strict conformance with their APAPs (if applicable) and label requirements, which have been approved by CDPR for use in California. Standard BMP application techniques, maintaining adequate buffer zones, and using care during herbicide applications would minimize adverse effects. If downstream water bodies are not already impacted by these chemical active ingredients (i.e., glyphosate), application of this herbicide would have a less-than-significant impact to surface water or groundwater resources when applied in accordance with label instructions. The district does not currently use glyphosate but may use in the future.

> **Impact WR-4:** Application of the herbicide glyphosate would have a **less-than-significant** impact to surface water and groundwater resources and no mitigation is required.

9.2.6 <u>Biological Control Alternative</u>

Biological control of mosquitoes involves the intentional use of vector pathogens, parasites, and predators to reduce the mosquito population. It is one of the principal components of the IPM approach followed by MVCAC member agencies, in which the emphasis is on source reduction and control of mosquitoes in their immature stages. Mosquito pathogens include an assortment of viruses and bacteria. Mosquito parasites are not generally available commercially for mosquito control at present. Mosquito predators are represented by insects, fish, birds, and bats that consume larval or adult mosquitoes as prey. Although the District supports the presence of a variety of species, only mosquitofish (*Gambusia affinis*) are commercially available to use at present.

Mosquitofish are reared at the District hatchery where wastewater discharge has the potential to convey nutrients, sediments, and other potential pollutants to storm drains, downstream receiving waters, and groundwater. If the wastewater is discharged to a sanitary sewer, the potential pollutants may be removed by the wastewater treatment plant. If the wastewater is discharged to land as irrigation water, natural degradation would provide some treatment via chemical, biological, and physical processes that occur as the wastewater flows over and percolates through the soil. Because the volume and frequency of discharges are relatively minor (wastewater is discharged to sanitary sewer), the impact of this alternative to surface water and groundwater is less than significant.

> **Impact WR-5:** The Biological Control Alternative's production of mosquitofish limits wastewater discharges to the sanitary sewer or upland areas. Therefore, the production of mosquitofish would have a **less-than-significant** impact on surface water and groundwater resources and no mitigation is required.

Because mosquitofish may potentially impact red-legged frog and tiger salamander populations, the public's use of mosquitofish is limited to man-made water features such as ornamental fish ponds, water troughs, water gardens, fountains, and unused swimming pools where their migration into habitats used by special-status species is limited.

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

Because the potential environmental impacts of mosquito pathogens the District applies are generally similar to those of chemical pesticide applications, these chemicals are evaluated under the Chemical Control Alternative (Section 9.2.7).

High populations of mosquitofish in a water body could increase nutrient concentrations, causing algal blooms and a subsequent drop in dissolved oxygen. However, because mosquitofish use is limited to man-made water features that are hydrologically isolated from receiving waters, their impact to surface water is less than significant. Because the connection between these man-made water bodies and natural surface waters or groundwater is limited or nonexistent, the impact of this alternative is less than significant.

> **Impact WR-6:** The Biological Control Alternative's use of mosquitofish is limited to man-made water features that are hydrologically-isolated from receiving waters. Therefore, the use of mosquitofish would have a **less-than-significant** impact on surface water and groundwater resources and no mitigation is required.

9.2.7 Chemical Control Alternative

Chemical control consists of the application of chemicals to directly reduce populations of vectors that pose a risk to public health (herbicides are discussed in Section 9.2.5, Vegetation Management Alternative.). The majority of chemical control tools are used for mosquito abatement. As part of their IPM program, the District prioritizes the least toxic materials available for control of the larval stages, focusing on bacterial larvicides, growth regulators, and surface films rather than OPs or pyrethroids. Control of adult mosquitoes may become necessary under some circumstances, such as in the event of a disease outbreak (documented presence of infectious virus in active host-seeking adult mosquitoes), or lack of access to larval sources and habitats leading to the emergence of large numbers of biting adult mosquitoes. OP insecticides may be used in rotation with pyrethrins or pyrethroids to avoid the development of resistance. The active ingredients currently used for control of adult mosquitoes have been deliberately selected for lack of persistence and minimal effects on nontarget organisms when applied in accordance with label guidelines for ULV mosquito control.

The District also uses insecticides to control populations of ground-nesting yellow jackets and ticks. This activity is generally triggered by public requests rather than as a result of regular surveillance activities. The District does not treat yellow jacket nests that are located inside or on a structure; instead, the resident is encouraged to contact a private pest control company. Likewise, residents complaining of honeybee swarms or hives are referred to the Contra Costa County Beekeepers Association for a referral list of beekeepers. If a District technician deems it appropriate to treat stinging insects, they will apply the insecticide directly within the nest to avoid drift or harm to other organisms. Alternatively, they will place tamper-resistant traps or bait stations, selective for the target insect in the immediate environment. Chemicals used in the traps are contained and do not interact with the environment.

The District's rat population control program includes limited use of rodenticides in response to resident requests. Rodent baits containing first and second generation anticoagulants are typically placed in secure bait stations or at underground sites such as sewers, storm drains, or catch basins. In sewer baiting, bait blocks containing bromadiolone are often suspended by wire above the water line. For rodent burrows, fumigants or anticoagulant dust is blown into the burrows.

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

All chemical active ingredients and adjuvants the District currently uses are reviewed and evaluated in the Ecological and Human Health Risk Assessment (Appendix B). The following sections evaluate groups of chemicals based on their target organism or life stage.

9.2.7.1 Mosquito Larvicides

Larvicides are used to manage immature life stages of mosquitoes including larvae and pupae in aquatic habitats. Temporary aquatic habitats are usually targeted because permanent water bodies generally support natural mosquito predators such as fish. The larvicides are applied using ground application equipment and rotary aircraft. Applications may be repeated at any site at recurrence intervals ranging from annually to weekly.

9.2.7.1.1 Biological Agents

Bs is a bacterial larvicide that is applied to irrigation ditches, floodwater, standing ponds, woodland pools, pastures, tidal water, fresh- or saltwater marshes, and stormwater retention areas. It damages and paralyzes the gut of mosquito larvae that ingest the spores. Although dormant Bs spores may persist in the environment for several weeks to months and the δ-endotoxins generally persist for 2 to 4 weeks following application, the δ-endotoxins degrade rapidly in sunlight and are degraded by soil microorganisms. Bs does not percolate through the soil and readily binds to sediments. It is highly selective for mosquitoes and is not toxic to nontarget species, including birds, mammals, fish, and invertebrates in amounts that effectively control mosquito larvae. For these reasons, Bs should not result in adverse effects to surface water or groundwater.

Bti is applied in a similar manner and often in combination with Bs. Bti toxins may persist in soil for several months, yet a half-life for typical Bti products on foliage is approximately 1 to 4 days due to rapid degradation in sunlight. Toxicity is minimal to nonexistent to nontarget avian, freshwater fish, freshwater aquatic invertebrates, estuarine and marine animals, arthropod predators/parasites, honeybees, annelids, and mammalian wildlife at the label use rates of registered Bti active ingredients. For these reasons, Bti should not result in adverse effects to surface water or groundwater.

Spinosad is a biologically derived insecticide produced from the fermentation of *Saacharopolyspora spinosa*, a naturally occurring soil organism. It activates the central nervous system of insects through interaction with neuroreceptors and causes mortality through continuous stimulation of the insect nervous system. Spinosad degrades quickly in sunlight in both aqueous and soil environments. It adsorbs strongly to soil particles where it is quickly metabolized by soil microorganisms under aerobic conditions and is therefore unlikely to leach into groundwater. Spinosad is practically nontoxic to birds and mammals but is slightly to moderately toxic to fish and most aquatic invertebrates. However, low amounts typically used for mosquito control would not likely pose a significant risk to potential ecological receptors. For these reasons, spinosad should not result in adverse effects to surface water or groundwater. The District would apply all biological pathogen larvicides in strict conformance with their PAP and the label requirements, which have been approved by CDPR for use in California.

Proper application of methods using BMPs should not result in adverse effects and use of these larvicides would have a less-than-significant impact to surface water and groundwater resources.

> **Impact WR-7:** Application of the biological agents Bs, Bti, and spinosad would have a **less-than-significant** impact to surface water and groundwater resources and no mitigation is required.

9.2.7.1.2 Hydrocarbon Esters

Methoprene is an insect growth regulator that is applied at very low concentrations for mosquito control in the form of briquettes, pellets, sand granules, and liquid. It consists of two enantiomers: S-methoprene and R-methoprene, with S-methoprene being the biologically active enantiomer. Fate and transport characteristics of the s-enantiomer and the mixture are similar, but toxicity differs. Methoprene readily binds to suspended solids in the water column and soils. It rapidly degrades by photolysis and is metabolized in soil under both aerobic and anaerobic conditions. Although it may exhibit toxicity to fish and aquatic invertebrates, as well as nontarget insects including moths, butterflies, and beetles, methoprene is considered the least toxic of all larvicide alternatives, especially at concnetrations allowed for mosquito control..

These products would have a less-than-significant impact to surface water or groundwater resources when applied in accordance with the recommended BMP application techniques described in their PAP and product label requirements.

> **Impact WR-8:** Application of methoprene would have a **less-than-significant** impact to surface water and groundwater resources and no mitigation is required.

9.2.7.1.3 Surfactants

The District would avoid use of surfactants, when possible, in sites with aquatic nontarget species or natural enemies of mosquitoes present such as nymphal damselflies and dragonflies, dytiscids, hydrophilids, corixids, notonectids, and ephydrids. Although surfactants can be used with pupae, microbial larvicides (e.g., Bti, Bs) or insect growth regulators (e.g., methoprene) are often used with other earlier life stages (Table 9-3, BMP E2) to prevent development of pupae and minimize use of surfactants.

Specially derived aliphatic solvents (e.g., mineral oils and aliphatic petroleum hydrocarbons) are used to form a coating on top of water to drown larvae, pupae, and emerging adult mosquitoes. Petroleum distillates can be more effective than monomolecular films but break down much more rapidly (2 to 3 days). They have low water solubility and high sorption to organic matter. They are practically nontoxic to most nontarget organisms. Using BMP application techniques, these products should not result in adverse effects to water quality conditions in surface water or groundwater.

The District would apply all surfactant larvicides in strict conformance with their PAP and the label requirements, which have been approved by CDPR for use in California. Proper application using BMPs should not result in adverse effects and use of these chemicals would have a less-than-significant impact to surface water or groundwater resources.

> **Impact WR-9:** Application of the surfactant larvicides alpha-isooctadecyl-omega-hydroxypoly (oxyethylene), mineral oils, and aliphatic petroleum hydrocarbons would have a **less-than-significant** impact to surface water and groundwater resources and no mitigation is required.

9.2.7.1.4 Temephos

Temephos is the only OP larvicide used and is sometimes used in rotation with bacterial pathogens to prevent resistance. Temephos is not labeled for use in agricultural lands or pasture and the District limits its use to man-made sources such as tire piles, utility vaults, and cemetery urns. It provides effective control in water with high levels of decaying organic matter. Temephos is extremely hydrophobic with low solubility and, therefore, is unlikely to leach to groundwater. It adsorbs rapidly to organic material in water and binds strongly to soils where it breaks down via photolysis and microbial degradation. It is slightly to moderately toxic to mammals and fish, but only when applied at rates much higher than needed for mosquito larval control.

However, it is highly toxic to nontarget aquatic invertebrates and therefore is rarely used. When applied in strict conformance with label requirements and the District's PAP, use of temephos would have a less-than-significant impact on surface water or groundwater resources.

> **Impact WR-10:** Application of temephos would have a **less-than-significant** impact to surface water and groundwater resources and no mitigation is required.

9.2.7.2 Mosquito Adulticides

The use of adulticides to control mosquitoes is the method of control of last resort in the District's IPM program. Adulticides are only applied when other tools are not available and when specific criteria are met, including species composition, population density, proximity to human populations, and/or human disease risk. The active ingredients currently in use have been deliberately selected for lack of persistence and minimal effects on nontarget organisms when applied in strict conformance to label instructions for ULV mosquito control. Adulticides are applied using ground application equipment or rotary aircraft and following strict conformance with label requirements and BMPs described in the District's PAP.

9.2.7.2.1 Pyrethrins and Pyrethroids

The District uses pyrethrins and pyrethroids to control adult mosquitoes and yellow jacket wasps. Pyrethrins are naturally occurring products distilled from the flowers of Chrysanthemum species. Pyrethroids are synthetic compounds that are chemically similar to the pyrethrins, but have been modified to increase their stability and activity against insects, while minimizing their effect on nontarget organisms. First generation or "Type I" photosensitive pyrethroids include d-allethrin, phenothrin (sumithrin), prallethrin, resmethrin, and tetramethrin. Typically, these pyrethroids are used indoors and around residential areas. The newer second-generation pyrethroids are mostly "Type II" pyrethroids. The active ingredients that fall into this group include deltamethrin, esfenvalerate, lambda-cyhalothrin, and permethrin. Type II pyrethroids are more toxic than Type I pyrethroids because they are less photosensitive and persist longer in the environment. Etofenprox is a synthetic pyrethroid-like chemical, differing in structure from pyrethroids in that it lacks a carbonyl group and has an ether moiety, whereas pyrethroids contain ester moieties. Pyrethrins and pyrethroids act by causing a persistent activation of the sodium channels on insect neurons.

Pyrethrins and pyrethroids quickly adsorb to suspended solids in the water column and partition into the sediment. They adsorb strongly to soil surfaces, and are generally considered immobile in soils and, therefore, are unlikely to leach to groundwater (USEPA 2006c). These materials are relatively nontoxic to mammals and birds, but are highly toxic to fish and invertebrates. The major route of degradation is through photolysis in both water and soil. Pyrethrins and pyrethroids may be persistent in environments free of light, and pyrethroids as a class have been implicated in 303(d) listings of sediment toxicity in urban creeks (BASMAA 2013). However, the ULV applications common to mosquito control and the limited use at yellow jacket nests encourage dissipation rather than persistence in the environment.

Insecticides containing pyrethrins and pyrethroids usually also contain PBO as a synergist. PBO interferes with the insect's ability to detoxify pyrethrins and pyrethroids, thus enhancing the product's effectiveness. PBO has low toxicity to mammals but is a possible endocrine disruptor and is included in the final list of chemicals for screening under USEPA's Endocrine Disruptor Screening Program. It is moderately to highly toxic to fish and is highly toxic to aquatic invertebrates. PBO is moderately mobile in soil and water but degrades rapidly in the environment by photolysis and through metabolism by soil microbes. Although it degrades rapidly, release of PBO to the environment may "activate" persistent pyrethroids that are already present in the sediment. However, PBO would have a less-than-significant impact on surface water or groundwater when applied using ULV techniques, label requirements, and BMPs described in the District's PAP.

> **Impact WR-11:** Application of the synergist PBO would have a **less-than-significant** impact to surface water and groundwater resources and no mitigation is required.

The District applies pyrethrins in terrestrial and aquatic environments for wide-area mosquito abatement using ULV techniques. They are also used locally to treat yellow jacket nests. Pyrethrins quickly adsorb to suspended solids in the water column and adsorb strongly to soil surfaces making them immobile in soils and unlikely to leach into groundwater. They degrade via photolysis and are likely to persist under anaerobic conditions. Pyrethrins have low to moderate acute toxicity to mammals but are practically nontoxic to birds. They are very highly toxic to freshwater fish and invertebrates. Several studies have shown that pyrethrins applied using ULV techniques do not accumulate in water or sediment following repeated applications. These studies also determined that no toxicity is associated when exposure is limited to the amounts used when following ULV protocols for mosquito control (Lawler et al. 2008; Amweg et al. 2006). Pyrethrins would have a less-than-significant impact on surface water or groundwater when applied using ULV techniques, in accordance with label requirements, and using BMPs as described in the District's PAP.

> **Impact WR-12:** Application of pyrethrins would have a **less-than-significant** impact to surface water and groundwater resources and no mitigation is required.

Permethrin is a Type I synthetic pyrethroid that is usually combined with synergists such as PBO to control adult mosquitoes using ULV techniques and for yellow jacket control. It is hydrophobic and tends to partition to soil and sediment. Its primary degradation pathways include photolysis and aerobic metabolism and it may be persistent in environments free of light. Permethrin is slightly toxic to humans and has been included in the final list of chemicals for screening under USEPA's Endocrine Disruptor Screening Program. It has low toxicity to mammals and is practically nontoxic to birds, but is very highly toxic to fish, aquatic invertebrates, and honeybees.

Permethrin formulations are applied following District BMPs and used in strict conformance with label requirements such as aquatic habitat buffer zones. Permethrin has a strong repellent effect in the environment, which reduces toxic effects to bees under field conditions (Appendix B). Pesticides that could affect insect pollinators will not be applied in liquid or spray/fog forms over large areas (more than 0.25 acre) during the day when honeybees are present and active or when other pollinators are active (BMP H12). When applied in accordance with ULV label instructions, studies have shown rapid dissipation, low persistence, and no observed aquatic fish and invertebrate toxicity following aerial ULV applications (Appendix B). Although one study found higher levels of permethrin on the surface microlayer of the waterbody, corresponding water samples did not contain detected residues, and higher surface microlayer concentrations were not correlated with toxic effects in the waterbody. When applied directly to ground nests of yellow jacket wasps or around residences or parks for tick abatement, the product is used with careful techniques such as controlled applications to very small, localized areas.

Permethrin use is restricted to situations when it is absolutely necessary and in ULV applications that are designed to have the ingredients degrade rapidly and, thus, reduce the potential for impacts to nontarget ecological receptors. When District BMPs are implemented and when materials are applied according to the District's PAP using ULV techniques, the application of permethrin would have a less-than-significant impact on surface water or groundwater, including locations where receiving waters are 303(d) listed for pyrethroids or sediment toxicity because of the study results reported above (from Appendix B).

> **Impact WR-13:** Application of permethrin would have a **less-than-significant impact** to surface and groundwater resources and no mitigation is required.

Resmethrin is a Type I synthetic pyrethroid that is usually combined with synergists such as PBO to control adult mosquitoes in tree holes and using ULV techniques. Resmethrin has a high affinity to bind to soils, sediments, and organic carbon and it degrades rapidly when exposed to light. When not subject to photolysis, it may be environmentally persistent. Resmethrin has low toxicity to mammals but has been included in the final list of chemicals for screening under USEPA's Endocrine Disruptor Screening Program. It is moderately toxic to birds and highly toxic to fish and aquatic invertebrates. Despite its relatively high toxicity and potential for persistence, studies have shown rapid dissipation, low persistence, and no observed aquatic fish and invertebrate toxicity following aerial ULV application (Appendix B). When District BMPs are implemented and materials are applied according to the District's PAP using ULV techniques, the application of resmethrin would have a less-than-significant impact on surface water or groundwater.

> **Impact WR-14:** Application of resmethrin would have a **less-than-significant impact** to surface and groundwater resources and no mitigation is required.

Etofenprox is a pyrethroid-like insecticide that is used as a mosquito adulticide and is available in formulations that do not contain PBO. It is virtually insoluble in water and stable to hydrolysis but is rapidly degraded by photolysis. Residues of etofenprox are not likely to persist in the environment. It has low toxicity to mammals but is highly toxic to fish and aquatic invertebrates. Based on toxicity and environmental fate, etofenprox would not result in substantial adverse effects to surface water or groundwater when applied following District BMPs and used in accordance with label requirements and the District's PAP. Use of etofenprox would have a less-than-significant impact on surface water or groundwater.

> **Impact WR-15:** Application of etofenprox would have a **less-than-significant** impact to surface water and groundwater resources and no mitigation is required.

9.2.7.2.2 Organophosphates

Naled is an OP insecticide and is used in rotation with pyrethrins or pyrethroids to avoid the development of resistance. Naled is the most commonly used material for this purpose but the District uses it infrequently.

Naled has low water solubility but is mobile in soils with low organic matter content. It is moderately toxic to mammals, fish, and aquatic invertebrates but degrades readily in water, under sunlight, in soil under aerobic and anaerobic conditions, in air, and on plants. Dichlorvos, a breakdown product of naled, and itself a registered pesticide, may be present in toxic concentrations after naled is no longer detectable. Dichlorvos is very highly toxic to birds and freshwater fish and insects, including honeybees. It has high water solubility and degrades primarily through volatilization and aerobic soil metabolism. With a half-life of about 0.9 day, the degradation of dichlorvos is rapid but slower than that of its parent naled (USEPA 2006d). It does not persist in surface water and, because of breakdown by soil micro-organisms, is unlikely to leach to groundwater. Naled and other OPs are important chemicals that help control resistance of alternative products such as pyrethrins and pyrethroids. Due to the toxicity of its breakdown product dichlorvos, but its importance in the District's IVMP, use of naled is significant and unavoidable. There is no feasible mitigation.

> **Impact WR-16:** Due to the toxicity of its breakdown product but its importance in the District's IVMP, the application of naled is considered a **significant and unavoidable** impact to surface and groundwater resources.

9.2.7.3 Yellow Jacket/Africanized Honey Bee (AHB) Abatement

Pyrethrins and pyrethroids are applied direct to yellow jack wasp nest openings. The active ingredients the District uses are described under Mosquito Adulticides (Section 9.2.7.2).

9.2.7.3.1 Potassium Salts (AHB)

Potassium salts of fatty acids are commonly referred to as “soap salts.” They penetrate the insect’s body covering and disrupt cell membranes causing the insect to die of dehydration. Potassium salts are not applied directly to water and degrade very quickly in soil. They are practically nontoxic to birds, slightly toxic to fish, and highly toxic to aquatic invertebrates.

These products would have a less-than-significant impact on surface water or groundwater resources when applied using label requirements and BMPs described in the District’s PAP.

> **Impact WR-17:** Application of potassium salts (i.e., “soap salts”) would have a **less-than-significant** impact to surface water and groundwater resources and no mitigation is required.

9.2.7.4 Rodenticides

The District’s limited use of rodenticides is as a result of surveillance and/or in response to the identification of rodent populations as a result of citizen complaints.

9.2.7.4.1 Anticoagulants and Cholecalciferol

The District may use two different groups of anticoagulant rodenticides, known as first generation and second generation rodenticides. First generation rodenticides (e.g., diphacinone) require consecutive multiple doses or feedings over a number of days to be effective. Second generation rodenticides (e.g., bromadiolone, difethialone) are lethal after one dose and are effective against rodents that have become resistant to first generation anticoagulant rodenticides. Secure, tamper-proof bait stations or other accepted methods of rodent baiting are conducted in areas with severe rodent infestations. Other poisons that act through ingestion include cholecalciferol.

Diphacinone and diphacinone salt products are formulated as food baits, water baits, and a tracking powder. Diphacinone technical material has low water solubility and is generally applied as food bait blocks; however, diphacinone salt is highly soluble and is used to prepare water baits for indoor control of rodents. Diphacinone is highly toxic to mammals but only slightly to moderately toxic to fish and aquatic invertebrates. The District uses diphacinone in tree holes, burrows, parks, and/or urban creeks corridors and since it is generally applied as solid bait blocks, exposure to surface water and groundwater would be minimal.

Bromadiolone formulations include meal bait, pellets, ready-to-use place packs, and paraffinized blocks. It is moderately persistent in soils. Bromadiolone is moderately toxic to fish and moderately to highly toxic to freshwater invertebrates. The District uses bromadiolone in and around man-made and natural standing and moving water. When deployed in sewers, bromadiolone blocks are often attached to a string and hung below manhole covers and the bromadiolone is usually wax-encased in block form, which has exceptionally low water solubility and low leaching potential. This method of bait deployment reduces the probability of exposure to surface water and groundwater. Outside of sewers, bromadiolone is typically contained in tamper-proof bait stations, which are most frequently deployed at residential locations per homeowners’ requests, and not near aquatic systems. When used properly, potential for impacting aquatic systems is very limited.

Difethialone is formulated as meal, pellets, blocks, packs or pouches, paste, paraffin blocks, and bait stations. Difethialone adsorbs to suspended solids and sediment and is immobile in soil. Difethialone is highly toxic to mammals, birds, and aquatic organisms including fish. The District uses difethialone in around landscaping, in parks, and in urban creek corridors.

Cholecalciferol is a sterol and its ingestion by mice and rats results in hypercalcemia. Cholecalciferol is formulated as pellets and blocks. It is expected to be essentially insoluble in water and immobile in soil. Although it is highly toxic to target rodents, cholecalciferol is considered of low hazard to nontargets such as birds, dogs, and fish. The District uses cholecalciferol in one product along urban creek corridors, parks, and waterfronts.

Although many of these chemicals that have high toxicity to aquatic organisms (i.e., bromadiolone, difethialone,), these rodenticides generally have minimal exposure to surface water and groundwater due to paraffinization of these materials and the method of bait deployment. Furthermore, these materials often have low solubility. Therefore, application of these chemicals would have a less-than-significant impact to surface water or groundwater resources when applied in accordance with label instructions.

> **Impact WR-18:** Application of diphacinone, bromadiolone, difethialone, and cholecalciferol would have a **less-than-significant** impact to surface water and groundwater resources and no mitigation is required.

9.2.8 Other Nonchemical Control/Trapping Alternative

This alternative includes the trapping of rodents and/or yellow jackets that pose a threat to public health and welfare. For both species, tamper-resistant or baited traps are used which limits the exposure of chemical-containing baits to the environment. Traps may also be used to remove nuisance wildlife such as raccoon, skunk, and opossum. This alternative would have no impact to surface water or groundwater.

> **Impact WR-19:** The Nonchemical Control/Trapping Alternative collection techniques use tamper-resistant or baited traps, which limit the exposure of chemical-containing baits to the environment **no impact** would occur to surface water or groundwater.

9.2.9 Cumulative Impacts

Cumulative impacts to water resources are discussed in Section 13.7. In summary, Several receiving waters in the Program Area are already included on the CWA 303(d) list as impaired by pyrethroids or sediment toxicity, with the likely cause being the use of common household insecticides containing pyrethroids by members of the public, not vector control activities the District conducts. Where receiving waters have been designated as impaired by pyrethroids or sediment toxicity, an existing significant cumulative impact is associated with the combined applications of these pesticides. Mitigation measures WR-21a and WR-21b will ensure that the District minimizes use of more toxic and persistent pyrethroids (permethrin and resmethrin) and will not apply them in a manner that could affect 303(d) listed waters. Therefore, **the District's use of any pyrethroid is contributing in less-than-significant incremental amounts to an existing cumulatively considerable impact to water resources in the Program Area.** No additional impacts were identified in association with the chemical and nonchemical Program alternatives, and **no additional cumulative impacts are anticipated to occur** (i.e., the District's less-than-significant contributions are not triggering a new cumulative impact).

9.2.10 Environmental Impacts Summary

Table 9-4 provides a summary of the identified impacts for each subgroup of practices and chemicals included in the Program. Concerning the OP naled (if ever used), the impact would be significant and unavoidable.

Table 9-4 Summary of Alternative Water Resources Impacts

Impact Statement	Surveillance	Physical Control	Vegetation Management	Biological Control	Chemical Control	Other Nonchemical/ Trapping
Effects on Water Resources						
Impact WR-1: The Surveillance Alternative collection devices would not contact nor interact with the environment. **No impact** would occur to surface water or groundwater.	N	na	na	na	na	na
Impact WR-2: The Physical Control Alternative's activities to modify water circulation, remove sediment, and maintain water control facilities to reduce habitat conditions for mosquito production would have a **less-than-significant** impact on water resources and no mitigation is required.	na	LS	na	na	na	na
Impact WR-3: Mechanical removal of vegetation from aquatic habitats would have a **less-than-significant** impact to surface water and **no impact** to groundwater	na	na	LS, N	na	na	na
Impact WR-4: Application of the herbicide glyphosate would have a **less-than-significant** impact to surface water and groundwater resources and no mitigation is required.	na	na	LS	na	na	na
Impact WR-5: The Biological Control Alternative's production of mosquitofish limits wastewater discharges to the sanitary sewer or upland areas. Therefore, the production of mosquitofish would have a **less-than-significant** impact on surface water and groundwater resources and no mitigation is required.	na	na	na	LS	na	na
Impact WR-6: The Biological Control Alternative's use of mosquitofish is limited to man-made water features that are hydrologically-isolated from receiving waters. Therefore, the use of mosquitofish would have a **less-than-significant** impact on surface water and groundwater resources and no mitigation is required.	na	na	na	LS	na	na
Impact WR-7: Application of the biological agents Bs, Bti, and spinosad would have a **less-than-significant** impact to surface water and groundwater resources and no mitigation is required.	na	na	na	na	LS	na
Impact WR-8: Application of methoprene would have a **less-than-significant** impact to surface water and groundwater resources and no mitigation is required.	na	na	na	na	LS	na

Table 9-4 Summary of Alternative Water Resources Impacts

Impact Statement	Surveillance	Physical Control	Vegetation Management	Biological Control	Chemical Control	Other Nonchemical/ Trapping
Impact WR-9: Application of the surfactant larvicides alpha-isooctadecyl-omega-hydroxypoly (oxyethylene), mineral oils, and aliphatic petroleum hydrocarbons would **have** a less-than-significant impact to surface water and groundwater resources and no mitigation is required.	na	na	na	na	LS	na
Impact WR-10: Application of temephos would have a **less-than-significant** impact to surface water and groundwater resources and no mitigation is required.	na	na	na	na	LS	na
Impact WR-11: Application of the synergist PBO would have a **less-than-significant** impact to surface water and groundwater resources and no mitigation is required.	na	na	na	na	LS	na
Impact WR-12: Application of pyrethrins would have a **less-than-significant** impact to surface water and groundwater resources and no mitigation is required.	na	na	na	na	LS	na
Impact WR-13: Application of permethrin would have a **less-than-significant impact to** surface and groundwater resources and no mitigation is required.	na	na	na	na	LS	na
Impact WR-14: Application of resmethrin would have a **less-than-significant impact** to surface and groundwater resources and no mitigation is required.	na	na	na	na	LS	na
Impact WR-15: Application of etofenprox would have a **less-than-significant** impact to surface water and groundwater resources and no mitigation is required.	na	na	na	na	LS	na
Impact WR-16: Due to the toxicity of its breakdown product but its importance in the District's IVMP, the application of naled is considered a **significant and unavoidable** impact to surface and groundwater resources.	na	na	na	na	SU	na
Impact WR-17: Application of potassium salts (i.e., "soap salts") would have a **less-than-significant** impact to surface water and groundwater resources and no mitigation is required.	na	na	na	na	LS	na

Table 9-4 Summary of Alternative Water Resources Impacts

Impact Statement	Surveillance	Physical Control	Vegetation Management	Biological Control	Chemical Control	Other Nonchemical/ Trapping
Impact WR-18: Application of diphacinone, bromadiolone, difethialone, and cholecalciferol would have a **less-than-significant** impact to surface water and groundwater resources and no mitigation is required.	na	na	na	na	LS	na
Impact WR-19: The Nonchemical Control/Trapping Alternative collection techniques use tamper-resistant or baited traps, which limit the exposure of chemical-containing baits to the environment **no impact** would occur to surface water or groundwater.	na	na	na	na	na	N

LS = Less-than-significant impact
N = No impact
na = Not applicable
SM = Potentially significant but mitigable impact
SU = Significant and unavoidable impact

9.2.11 Mitigation and Monitoring

The District implements label requirements and District BMPs to reduce adverse effects to surface-water and groundwater resources from the applied chemicals during and following pesticide applications. The District applies all chemicals in strict conformance with label requirements that have been approved by CDPR for use in California, including restrictions on application rates and methods, storage, transportation, mixing, and container disposal. As applicable, insecticides are applied in conformance with the PAP, as required by the Vector Control Permit, and herbicide formulations would be applied in conformance with the APAP, as required by the Aquatic Weed Control Permit. The District also implements hazardous materials and spill management control measures to prevent and reduce potential exposure of spilled chemicals to surface-water and groundwater resources.

As none of the impacts to water resources were potentially significant but mitigable, no mitigation is required. However, the District will continue surveillance and monitoring on a routine basis. Sites are monitored post-treatment to determine if the target vector or weeds were effectively controlled with minimum effect to the environment and nontarget organisms. This information is used to help design future treatment methods in the same season or future years to respond to changes in site conditions.

Due to the toxicity of its breakdown product but its importance in the District's IMVMP, the potential application of naled is considered a **significant and unavoidable** impact to surface and groundwater resources.

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