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5 Biological Resources – Terrestrial

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

- Environmental concerns and evaluation criteria: A discussion of whether the Program alternatives would cause any potentially significant impacts to terrestrial resources and addressing concerns from the public scoping
- Discussion of methods and assumptions, including findings from Appendix B, Ecological and Human Health Assessment Report
- Discussion of the 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 terrestrial resources

Aquatic resources are addressed in Chapter 4.

5.1 Environmental Setting

The Program Area is defined as the Contra Costa Mosquito and Vector Control District (CCMVCD) Service Area and adjacent counties (see Figure 2-1 in Chapter 2). The following section provides background information on the terrestrial resources that may be present and an overview of the regulatory setting with respect to management of terrestrial species.

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

Background information on hazards, toxicity, and exposure is provided in Section 5.2.2.2.

5.1.1 Terrestrial Resources within the Program Area

The District Service Area is located in Contra Costa County, and the Program Area addressed in this report also includes the four surrounding counties: Alameda, Sacramento, San Joaquin and Solano. This area encompasses a range of terrestrial habitats and a diverse array of wildlife and plants. Fish, amphibian and aquatic reptile species are included as aquatic species and discussed in Section 4. The zoogeographic provinces are described in Appendix A, Biological Resources Technical Report.

To facilitate the evaluation of impacts and impact avoidance measures by habitat type, a consistent set of habitat types was developed for terrestrial areas (Table 5-1). Terrestrial habitat types were based on those developed as part of the San Francisco Bay Area Upland Habitat Goals Project (Bay Area Open Space Council 2011). The aquatic and wetland habitats defined in Section 4 are also discussed in this section to address potential impacts to terrestrial species found in association with those aquatic habitats.

Table 5-1 Terrestrial Habitat Types

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

Source: Goals Project 1999

The ecoregion provinces (McNab and Avers 1996) have been used to describe the areas where the Program activities and treatments would be implemented and are shown on Figure 5-1. The ecoregion provinces are described in Appendix A.

Control activities may also be provided in areas adjacent to the District's Service Area upon request of the adjacent jurisdictions to protect the health and safety of residents in adjacent jurisdictions. Actions that would be taken outside of the District's Service Areas are the same types of actions undertaken within the Service Area and in similar types of habitats or sites.

Each of these habitat types may be affected by one or more of the Program alternatives, as indicated in Table 5.2. The Program alternatives are described in Chapter 2, and the BMPs that would be applied to avoid and minimize potential impacts to these habitat types are provided in Table 5-3.

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

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

Figure 5-1 Terrestrial Ecoregion Provinces

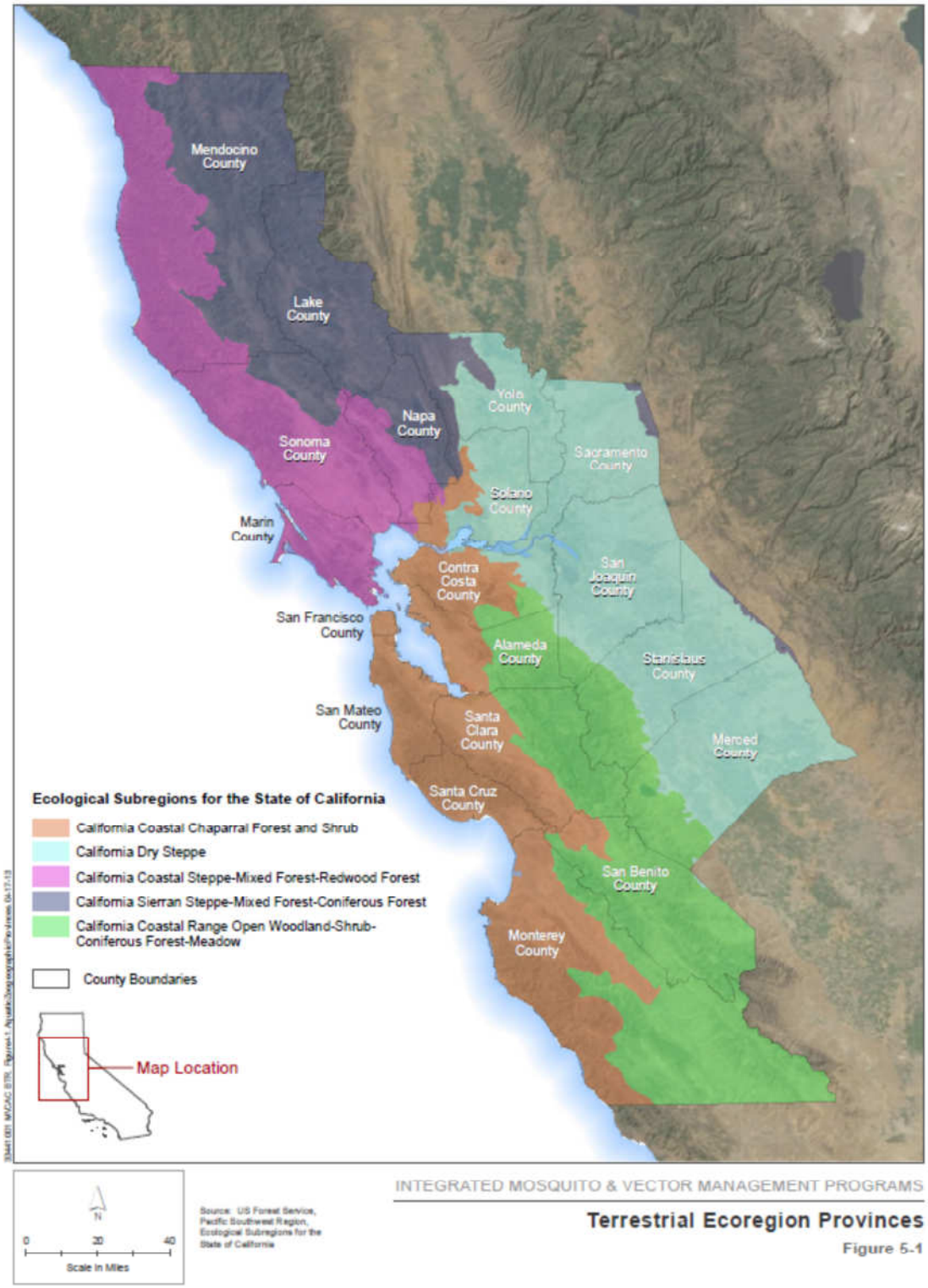

Figure 5-1 BACK

5.1.2 Special Status Species

A number of special status species are found in the Program Area and vicinity. Special status species are those that are listed as endangered, threatened, or candidate species under the federal Endangered Species Act, endangered or threatened under the California Endangered Species Act, or listed as species of special concern by the state. Brief life-history descriptions for special status species as well as their presence or absence within the Program Area are presented in (Table 4-3, California Natural Diversity Database Occurrences Plant Species in Contra Costa Mosquito and Vector Control District and its Adjacent Program Areas and in Table 4-4, California Natural Diversity Database Occurrences Animal Species in Contra Costa Mosquito and Vector Control District and its Adjacent Program Areas) which also shows the habitat types these species are likely to use. All species were included in these tables in Chapter 4, to conserve space, as a number of species occur in both wetland and upland habitat types.

5.1.3 Regulatory Setting

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

5.1.3.1 Federal

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

This law includes provisions for protection and management of species that are federally listed as threatened or endangered and designated critical habitat for these species. This law prohibits “take” of federally listed species, except as authorized under an incidental take permit or incidental take statement. The USFWS is the administering agency for this authority for freshwater species. The NMFS is the administering agency for anadromous species.

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

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

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

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

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

These sections of the Clean Water Act of 1977 (CWA) provide for the protection of wetlands. The administering agency for the above authority is the US Army Corps of Engineers (USACE). Under CWA Sections 301 and 502, any discharge of dredged or fill materials into "waters of the United States," including wetlands, is forbidden unless authorized by a permit issued by the USACE pursuant to Section 404. These permits are an essential part of protecting streams and wetlands. Wetlands are vital to the ecosystem in filtering streams and rivers and providing habitat for wildlife. The US Environmental Protection Agency (USEPA) is the federal agency responsible for water quality management and

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

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

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

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

5.1.3.1.6 Federal Insecticide, Fungicide, and Rodenticide Act

FIFRA defines a pesticide as “any substance intended for preventing, destroying, repelling, or mitigating any pest.” FIFRA requires USEPA registration of pesticides prior to their distribution for use in the US, sets registration criteria (testing guidelines), and mandates that pesticides perform their intended functions without causing unreasonable adverse effects on people and the environment when used according to USEPA-approved label directions. FIFRA defines an "unreasonable adverse effect on the environment" as "(1) any unreasonable risk to man or the environment, taking into account the economic, social, and environmental costs and benefits of the use of the pesticide, or (2) a human dietary risk from residues that result from a use of a pesticide in or on any food inconsistent with the standard under Section 408 of the Federal Food, Drug, and Cosmetic Act (21 USC 346a)."
FIFRA regulates only the active ingredients of pesticides, not inert ingredients, which manufacturers are not required to reveal. However, toxicity studies conducted under FIFRA are required to evaluate the active ingredient and the entire product formulation, through which any potential additive or synergistic effects of inert ingredients are established.

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

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

Of the 66 pesticides listed in the injunction, the District may employ esfenvalerate, methoprene, and permethrin for vector control. Esfenvalerate may be used for yellow-jacket and wasp control in response to public complaints. Methoprene may be used for larval mosquito control, and permethrin may be used for adult mosquito control. However, vector control programs are exempt. Specifically, for applications of a pesticide for purposes of public health vector control under a program administered by a public entity, the injunction does not apply. The District may use the following herbicides listed in the injunction: glyphosate, imazapyr, and triclopyr. Where used for vegetation management for control of mosquito-breeding habitat, the injunction would not apply. If these herbicides were to be used for invasive species management to assist other agencies or landowners, then the injunction generally applies until such time that the material has been reviewed by USEPA and USFWS determines that it does not apply or the following “exceptions for invasive species and noxious weed programs” can be met:

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

b. You do not apply the pesticide within 15 feet of aquatic breeding critical habitat or non-breeding aquatic critical habitat within critical habitat areas, or within 15 feet of aquatic features within non-critical habitat sections subject to the injunction; and

c. Application is limited to localized spot treatment using hand-held devices; and

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

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

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

5.1.3.2 State

5.1.3.2.1 Porter-Cologne Water Quality Control Act of 1970

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

5.1.3.2.2 California Fish and Game Code Section 1600 et seq.

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

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

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

5.1.3.2.4 California Fish and Game Code §3503

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

5.1.3.2.5 California Fish and Game Code §3503.5

This law prohibits take, possession, or destruction of any bird of prey (birds in the order of Falconiformes or Strigiformes), except as otherwise provided by the Fish and Game Code or regulation adopted pursuant thereto. The administering agency is the CDFW.

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

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

5.1.3.2.7 California Fish and Game Code Section 5650

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

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

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

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

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

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

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

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

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

5.1.4 Habitat Conservation Plans and Natural Community Conservation Plans

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

The California legislature first passed the California Natural Community Conservation Planning Act in 1991, then updated and superseded it in 2003. The primary objective of the NCCP program is to

conserve natural communities at the ecosystem level, while accommodating compatible land use. It focuses on the long-term stability of wildlife and habitat and seeks to avoid controversy and delays associated with species listings.

CEQA requires that an EIR consider whether a project would conflict with the provisions of an adopted HCP, NCCP, or other approved local, regional, or state habitat conservation plan. A number of HCPs and NCCPs are in effect or under development within the Program Area (Table 4- 5). They are described in Chapter 4, Section 4.1.4. Listings of these documents on the USFWS and CDFW websites were reviewed, and ten plans were identified. The District is not signatory to these HCPs or NCCPs, but will comply with the provisions of these documents when their vector control activities occur within the boundaries of an existing HCP or NCCP or those that may be developed during the Program lifetime. The District's activities have little overlap with the activities covered under these HCPs (mostly urban development and infrastructure project ongoing operations and maintenance) except for the Bay Delta Plan's measure for management and control of mosquitoes, as detailed in Chapter 4, Section 4.1.4.

5.2 Environmental Impacts and Mitigation Measures

This section identifies the environmental issues and concerns associated with the Program alternatives and presents the significance criteria used to evaluate the likely impacts of the various Program alternatives on terrestrial resources under CEQA. The significance criteria establish thresholds to determine whether an impact rises to a level that is biologically significant. The environmental issues describe the mechanisms by which such impacts might occur. Mitigation measures to reduce potentially significant impacts to less than significant are listed after each potentially significant but mitigable impact with additional explanation of the measure provided in Section 5.2.11 Mitigation and Monitoring.

5.2.1 Evaluation Concerns and Criteria

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

5.2.1.1 Environmental Concerns

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

Concerns identified during public scoping include the following, which are addressed as elements of the broader issues explained above:

- Discuss potential impacts on insect pollinators/bees from chemicals in treatment applications.
- Describe the effects of all chemicals that are used and/or proposed for use on wildlife and natural ecosystems, including insect prey, birds, mammals, fish, vegetation, and site topography. The loss of

prey for birds is a particular concern. Also, consider unwanted effects of the "inactive" portion of the pesticides. What effects will the carrier portion of the chemicals have on the environment?

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

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

- Pesticides can also kill the natural predators of mosquitoes, which can have difficulty in recovery from pesticides.

- Pesticide efficacy attenuation and possible long-term resistance is an issue for all chemically based mosquito control programs. It is addressed by the use of different control methods and different agents over time where possible (BMP and IVM techniques are designed to identify these issues early and modify applications as appropriate and feasible).
- Note that the Program Area includes potential habitat for several California and federally threatened and other special status plant and wildlife species and, as such, comprehensive biological studies should be implemented.

- Coordinate with CDFW, CNDDB (CDFW 2012), USFWS, and USFWS' Information, Planning, and Conservation planning tool to identify special status plant and wildlife species. If impacts are found to be significant, the PEIR should identify adequate mitigation measures to reduce impacts to lower levels.

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

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

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

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

5.2.1.2 Significance Criteria

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

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

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

c. Have a substantial adverse effect on federally protected wetlands as defined by CWA Section 404, (including but not limited to, marsh, vernal pool, coastal, etc.) through direct removal, filling, hydrological interruption, or other means.
d. Interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors or impede the use of native wildlife nursery sites.
e. Conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance.

5.2.2 Evaluation Methods and Assumptions

5.2.2.1 Evaluation Methods

Impacts are evaluated with regard to desired special status terrestrial species, using the criteria described above as environmental topics. Potential impacts were assessed using available information on the types of control and treatment as described in Chapter 2, Program Description, and assuming that all applicable BMPs as described in Chapter 2, Table 2-9, and repeated herein in Table 5-3, (based on *Best Management Practices for Mosquito Control in California* [CDPH and MVCAC 2012]), the Statewide General NPDES Permit for Biological and Residual Pesticide Discharges to Waters of the US from Spray Applications (SWRCB Water Quality Order No. 2011-0004-DWQ; NPDES No. CAG 990007; Spray Applications Permit); and District-specific BMPs, as indicated in the PAPs and Aquatic Weed Control Permits (APAPs), , are implemented. The BMPs most applicable to minimizing and/or avoiding impacts to terrestrial resources are repeated in Table 5-3, which also indicates the habitat types in which those BMPs will be applied. This assessment considers the physical and biological connections between treatment areas and terrestrial ecosystems. This information was evaluated in the context of the Program alternatives and the existing environment under baseline conditions in 2012 in the Program Area as described in Section 5.1.1.

The detailed BMPs described in Table 5-3 can be placed into several categories. These categories include:

1. *Agency Communication* includes periodic discussion with resource agencies, refuge managers and other land managers about topics such as: planning, specific site issues, special status species occurrence, opportunities for source reduction, observations made by District staff (e.g., wildlife, trespass/unauthorized equipment use) and activities to be implemented. It also includes the District obtaining any required permits and reporting regarding existing permits, periodic check-in calls, and other calls as needed, when unanticipated circumstances arise.
2. *Environmental Training* includes environmental awareness training provided to all field staff regarding environmental resource issues, recognition and documentation of sensitive environmental resources in the field, and BMPs to avoid or minimize impacts to those resources. This category includes both general training, training to avoid or eliminate the spread of weeds, and special status species or habitat specific training provided to District staff by USFWS, CDFW, or other appropriately trained persons approved by these agencies.
3. *Pretreatment Screening* involves a pretreatment assessment of pesticide treatment locations for environmentally sensitive resources to determine appropriate treatment, access routes and other BMPs to be applied for that location. This category may include a pretreatment site visit to confirm information used in the screening.
4. *Disturbance Minimization* includes:
    a) avoiding environmentally sensitive areas as much as practical,
    b) using existing access routes where ever possible, whether on foot or in a vehicle
    c) minimizing use of offroad vehicles as much as possible, and driving slowly when they are used
    d) being observant and working carefully to avoid or minimize disturbance
    e) using hand tools rather than mechanized tools as much as practical for all vegetation clearing (including clearing of access ways) or physical control treatments

5. *Habitat or Species-specific BMPs* includes BMPs targeted to a specific habitat type or species (e.g., tidal marshes or salt marsh harvest mouse). These BMPs include measures specific to those habitat types or species including diurnal or seasonal limitations on specific project activities, specific controls on the types of activities or how they are carried out. Specific measures are those documented in Table 5-3.
6. *Alternative-specific BMPs* relate specifically to the implementation of a particular treatment (Physical Control, Vegetation Management, Chemical Control). These may overlap many of the BMPs described above, but also include alternative-specific measures to protect environmental resources, based on the type of activity to be conducted (e.g., protection of soil surface, minimization of turbidity under the Physical Control Alternative, adherence to label directions, treating only during periods with acceptable weather conditions, and employing appropriate buffers for Chemical Control).

These categories are not inclusive of all the BMPs in Chapter 2 and Table 5-3, nor are they intended to replace those more specific BMPs. These categories are provided to facilitate the discussion of the impact evaluations through the end of this chapter. Table 5-3 lists all of the BMPs for Program implementation by alternative and habitat types that are relevant to biological resources and determinations of impact significance. In practical terms, the District treats terrestrial areas with the same care and sensitivity to plants and wildlife that it does for aquatic and wetland habitats.

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

- Impacts to special status species
- Impacts to riparian habitats or other sensitive natural communities
- Impacts to federally protected wetlands
- Impacts to movement of native resident or migratory fish or wildlife species.
- Conflicts with local policies
- Conflicts with provisions of HCP, NCCP, or other approved habitat conservation plan

Impacts are evaluated with regard to desired terrestrial plant and animal (e.g., native and listed species) communities, and effects on food supply for wildlife, using the CEQA criteria described above (Section 5.2.1.2). Potential impacts were assessed using available information on the types of control and treatment and the toxicity of the various chemicals used, the treatment descriptions, and the physical and biological connections between treatment areas and terrestrial ecosystems. This information was evaluated in the context of the Program alternatives and the existing environment under baseline conditions in the Program Area as described in Section 5.1.1. Note that Chapter 6, Ecological Health, specifically addresses potential impacts to nontarget ecological receptors but is not focused on terrestrial habitat types. The potential impacts of the nonchemical alternatives are based on the type and location of habitats treated and the magnitude and frequency of treatment. The potential impacts of the chemical alternatives were evaluated based on the magnitude and duration of the treatments and the toxicity and application information presented in Chapter 6, Ecological Health, and Appendix B, Ecological and Human Health Risk Assessment. The evaluation of all alternatives considered the life histories of the different listed species and ecological interactions including impacts to the terrestrial food chain.

The pesticide application scenarios that result in reasonable efficacy with minimal unwanted estimated risk are preferred and are the basis of IPM approaches and BMPs the District employs. BMPs are contained in Chapter 2, Section 2.9 and associated with habitat types in which they would be applied in Table 5-3. Each of the pesticides and herbicides identified as warranting further evaluation in Appendix B (as a subset of all pesticides and herbicides in use) are known to exhibit at least one parameter that appears to have a significant role in the resulting potential or perceived risk.

5.2.2.2 Assumptions

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

- Site-specific evaluation of terrestrial resource impacts is not within the scope of this programmatic evaluation. Rather, the analysis uses habitat types likely ot be affected by any of the alternatives as the basis for evaluation.
- The programmatic evaluation is based on the current proposed control methods and is subject to change based on future needs (see Section 1.8).
- The BMPs listed in Table 5-3 will be implemented by District staff as appropriate to the type of activity under the Program alternatives.

This terrestrial resources evaluation does not incorporate any assumptions about which alternative treatment strategy or strategies (options) would be applied in any given area. Therefore, each Program alternative is considered as a stand-alone option, although the Program may include multiple alternative treatments within a given area (i.e., physical controls followed by larvicide application). Guidelines used to trigger a particular alternative based on vector abundance and other variables are included in District-specific operating procedures. This evaluation assumes that important parameters such as sediment half-life are dependent on the specific conditions at the time of pesticide application; therefore, the values listed herein serve as reference values.

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

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

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

> Most products sold as herbicides and pesticides are evaluated herein both for the active ingredient and for the adjuvants and surfactants used to make the product more useful. When multiple products are used in a vector control application, the impacts are weighed against the proximity and timing of each application. If products with similar or different active ingredients are applied simultaneously, it is likely that the net effect could be the sum of the total active ingredient that is available for uptake by the vector. However, for vector control applications, materials with the same active ingredient are not applied simultaneously at a given site. The need for reapplication of mosquito larvicides or adulticides is surveillance driven and performed per the label directions. The District can apply larvicide materials

with different active ingredients during a single application. This type of application is necessary if multiple hatches of mosquito larvae occur and results in mosquito populations occurring at different stages of the life cycle. An example of this occurs when liquid Bti and methoprene are applied simultaneously. When this occurs the combination of the material is called Duplex, and the mixture of the materials and active ingredients is provided for on the product labels. Another example for the District includes the application of a liquid trans allethrin and phenothrin spray product to minimize the hazard of approaching a yellow jacket nest. Situations that would produce a residual exposure adequate to cause harm to humans would not occur unless the application(s) were inappropriate or the timing of applications is inappropriately close. Actual applications do not generally occur that close together unless there is a problem with treatment effectiveness. A material is applied followed by post treatment inspection to determine effectiveness. Only if the vector population has not been sufficiently suppressed would the District go back into the area and reapply a pesticide.

Assumptions related to the analysis of hazards, toxicity, and exposure for chemical treatment methods are explained below, including the definition of key terms. The ecological food-web concept is explained as well, and it is addressed primarily in Section 6.2.2, Evaluation Methods and Assumptions.

Appendix B provides the results of review and evaluations of pesticide (insecticides, herbicides) active ingredients and adjuvants the District currently uses or proposes for use (along with others the District has not selected for use). A comprehensive literature review was conducted to evaluate environmental fate and general toxicity characteristics for the active ingredients and adjuvants. The results of the assessment were used to rank the potential for adverse effects to human health and the environment. Chemical and application characteristics such as the likelihood of exposure for nontarget species and habitats, the potential for drift, and the possible transport and fate of the chemical in various media (i.e., air, surface water/groundwater, soil) were considered in the assessment. Those active ingredients that appear to exhibit either a higher level of risk or have specific use patterns warranting further research are listed in Table 6-5 (in Section 6.2.7).

Table 5-3 Contra Costa Mosquito and Vector Control District BMPs to Avoid / Minimize Environmental Impacts by Alternative

Best Management Practice (BMP)	Alternative						Upland Habitats							Aquatic and Wetland Habitats								
	Surveillance	Physical Control	Vegetation Management	Bio Control	Chemical Control	Other	Coniferous Forest	Deciduous Forest	Shrublands	Grasslands	Serpentine	Coastal Dunes	Tree Holes	Creeks and Rivers	Riparian Corridor	Ponds and Lakes (includes stock and golf ponds that have natural bottoms)	FW Marsh/Seeps	Seasonal Wetlands (includes Vernal Pools)	Lagoon	Tidal Marsh and channels	Water and Wastewater Management Facilities	Artificial Containers, Temporary Standing Waters and Ornamental Ponds
A. General BMPs																						
1. District staff has had long standing and continues to have cooperative, collaborative relationships with federal, state, and local agencies. The District regularly communicates with agencies regarding the District's operations and/or the necessity and opportunity for increased access for surveillance, source reduction, habitat enhancement, and the presence of special status species and wildlife. The District often participates in and contributes to interagency projects. The District will continue to foster these relationships, communication, and collaboration.	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
2. In particular, District staff will regularly communicate with resource agency staff regarding vector management operations, habitat, and flora and fauna in sensitive habitats. Such communications will include wildlife studies and occurrences of sensitive species in areas that may be subject to vector management activities.	X	X	X	*	X	X	X	X	X	X	X	X	X	X	X	X			X	X	X	X
3. When walking or using small equipment in marshes, riparian corridors, or other sensitive habitats, existing trails, levees and access roads will be used whenever possible to minimize or avoid impacts to species of concern and sensitive habitats. Specific care will be taken when walking and performing surveillance in the vicinity of natural and manmade ditches or sloughs or in the vicinity of tidal marsh habitat.	X	X	X	*[10]	X	X								X	X	X	X	X	X	X		
4. District staff has received training from USFWS and CDFW biologists regarding endangered species, endangered species habitat, and wildlife/wildlife habitat recognition and avoidance measures. District supervisory staff frequently engages staff on these subjects. For example, District staff has become familiar with Ridgeway's rail call recordings to invoke avoidance measures if these calls are heard in the field. District staff is trained to be observant, proceed carefully, and practice avoidance measures if needed when accessing areas that may serve as bird nesting habitat (e.g., watch for flushing birds that may indicate a nest is nearby). Emphasis will be placed on species and habitats of concern where vector management activities might occur (e.g. SMHM, RR, special status plants,	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X

[10] (*)means not available at this time. Should a viable biocontrol agent become available, evaluation of BMP measures would occur and be implemented.

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vernal pools, tidal marsh, etc.). These training sessions will be included as a part of the required safety training records that are kept by vector control agencies.																						
5. Conduct worker environmental awareness training for all treatment field crews and contractors for special status species and sensitive natural communities that a qualified person (e.g., District biologist) determines to have the potential to occur on the treatment site. Conduct the education training prior to starting work at the treatment site and upon the arrival of any new worker onto sites with the potential for special status species or sensitive natural communities.	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
6. District staff will work with care and caution to minimize potential disturbance to wildlife while performing surveillance and vector treatment/population management activities (see 1 through 5 above).	X	X	X	*	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
7. Identify probable (based on historical experience) treatment sites that may contain habitat for special status species every year prior to work to determine the potential presence of special status flora and fauna using the CNDDB, relevant Habitat Conservation Plans (HCPs), NOAA Fisheries and USFWS websites, Calfish.org, and other biological information developed for other permits. Establish a buffer of reasonable distance, when feasible, from known special status species locations and do not allow application of pesticides/herbicides within this buffer without further agency consultations. Nonchemical methods are acceptable within the buffer zone when designed to avoid damage to any identified and documented rare flora and fauna.	X	X	X	*	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
8. Vehicles driving on levees to travel through tidal marsh or to access sloughs or channels for surveillance or treatment activities will travel at speeds no greater than 10 miles per hour to minimize noise and dust disturbance.	X	X	X		X	X														X		
9. District staff will implement site access selection guidelines to minimize equipment use in sensitive habitats including active nesting areas and to use the proper vehicles for on-road and off-road conditions.	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
10. Properly train all staff, contractors, and volunteer help to prevent spreading weeds and pests to other sites. The District headquarters contains wash rack facilities (including high-pressure washers) to regularly (in many cases daily) and thoroughly clean equipment to prevent the spread of weeds.	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		
11. Operation of noise-generating equipment (e.g., chainsaws, wood chippers, brush-cutters, pickup trucks) will abide by the time-of-day restrictions established by the applicable local jurisdiction (i.e., City and/or County) if such noise activities would be audible to receptors (e.g., residential land	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X

Table 5-3 Contra Costa Mosquito and Vector Control District BMPs to Avoid / Minimize Environmental Impacts by Alternative

Best Management Practice (BMP)	Alternative						Upland Habitats							Aquatic and Wetland Habitats								
	Surveillance	Physical Control	Vegetation Management	Bio Control	Chemical Control	Other	Coniferous Forest	Deciduous Forest	Shrublands	Grasslands	Serpentine	Coastal Dunes	Tree Holes	Creeks and Rivers	Riparian Corridor	Ponds and Lakes (includes stock and golf ponds that have natural bottoms)	FW Marsh/Seeps	Seasonal Wetlands (includes Vernal Pools)	Lagoon	Tidal Marsh and channels	Water and Wastewater Management Facilities	Artificial Containers, Temporary Standing Waters and Ornamental Ponds
uses, schools, hospitals, places of worship) located in the applicable local jurisdiction. Shut down all motorized equipment when not in use.																						
12. For operations that generate noise expected to be of concern to the public, the following measures will be implemented: – Measure 1: Provide Advance Notices. A variety of measures are implemented depending on the nature and magnitude of the activities, including press releases, social media, District websites, hand-delivered flyers, posted signs, emails, and/or phone alerts. Public agencies and elected officials also may be notified of the nature and duration of the activities, including the local Board of Supervisors or City Council, environmental health and agricultural agencies, emergency service providers, and airports. – Measure 2: Provide Mechanism to Address Complaints. The District staff is available during regular business hours to respond to service calls and may staff phone lines to address concerns during nighttime operations.	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
13. The District will perform public education and outreach activities.	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
14. Engine idling times will be minimized either by shutting equipment and vehicles off when not in use or reducing the maximum idling time to 5 minutes. Clear signage will be provided for workers at all access points. Correct tire inflation will be maintained in accordance with manufacturer's specifications on wheeled equipment and vehicles to prevent excessive rolling resistance. All equipment and vehicles will be maintained and properly tuned in accordance with manufacturer's specifications. All equipment will be checked by a certified visible emissions evaluator if visible emissions are apparent to onsite staff.	X	X	X	X	X	X																
B. Tidal Marsh Specific BMPs																						
1. District staff will continue to implement the measures in the USFWS's "Walking in the Marsh: Methods to Increase Safety and Reduce Impacts to Wildlife/Plants". District staff will receive annual training and review of this document to remain up to date and current on this document and its methodologies for protecting sensitive species and the marsh habitat.	X	X	X	*	X														X	X		
2. District will minimize the use of equipment (e.g., ARGOs) in tidal marshes and wetlands. When feasible and appropriate, surveillance and control work will be performed on-foot with handheld equipment. Aerial treatment (helicopter and	X	X	X	*	X	X													X	X		

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Best Management Practice (BMP)	Alternative						Upland Habitats							Aquatic and Wetland Habitats								
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fixed wing) treatments will be utilized when feasible and appropriate to minimize the disturbance of the marsh during pesticide applications. When ATVs (e.g., ARGOs) are utilized techniques will be employed that limit impacts to the marsh including: slow speeds; slow, several point turns; using existing levees or upland to travel through sites when possible; use existing pathways or limit the number of travel pathways used.																						
3. District will minimize travel along tidal channels and sloughs in order to reduce impacts to vegetation used as habitat (e.g., clapper rail nesting and escape habitat).	X	X	X		X														X	X		
4. District staff will minimize the potential for the introduction and spread of spartina, perennial pepperweed and other invasive plant species by cleaning all equipment, vehicles, personal gear, clothing, and boots of soil, seeds, and plant material prior to entering the marsh, and avoiding walking and driving through patches of perennial pepperweed to the maximum extent feasible.	X	X	X	*	X	X								X[1]		X[1]	X[1]	X[1]	X	X		
5. When feasible, boats will be used to access marsh areas for surveillance and treatment of vectors to further reduce the risk of potential impacts that may occur when using ATVs to conduct vector management activities.	X	X	X	*	X														X	X		
6. The District currently references and provides staff training relevant to the USFWS "Walking in the Marsh: Methods to Increase Safety and Reduce Impacts to Wildlife/Plants" guidelines (USFWS undated). – District staff is trained to walk carefully in the marsh and to continuously look ahead of themselves to avoid potential wildlife disturbance (e.g., carefully make observations in their surroundings to detect flushing birds and nests). Specific care is taken when walking and performing surveillance in the vicinity of natural and manmade ditches or sloughs or in vicinity of cord grass habitat (e.g., rack line). – When walking in marshes District staff utilizes existing trails when possible (i.e., deer trails and other preexisting trails).	X	X	X	X	X	X	X[2]	X[2]	X[2]	X[2]	X[2]	X[2]		X[2]			X[2]	X[2]	X	X		
C. Salt Marsh Harvest Mouse (SMHM)																						
1. Activities (surveillance, treatment, source reduction) within or adjacent to harvest mouse habitat will not occur within two hours before or after extreme high tides of 6.5 feet National Geodetic Vertical Datum (NGVD) or above as measured at the Golden Gate Bridge (corrected for time and tide height for the site) or when the marsh plain is completely inundated because suitable upland refugia cover is limited and potentially disturbance-creating activities	X	X	X	*	X	X													X	X		

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Best Management Practice (BMP)	Alternative						Upland Habitats							Aquatic and Wetland Habitats								
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could prevent mice from reaching available cover.																						
2. Vegetation removal is limited to the minimum amount necessary to allow for surveillance, treatment, and vector habitat reduction (vegetation management) to minimize or avoid loss of SMHM. Similarly, excavation, fill, or construction activities will also be limited to the minimum amount necessary to minimize/avoid loss of SMHM.	X	X	X		X														X	X		
3. Vegetation clearing will be conducted systematically within the project area to ensure that SMHM are encouraged to move toward remaining vegetation and are not trapped in islands of vegetation subject to removal and far from suitable cover.		X	X																X	X		
4. Each day, 30 minutes before commencement of vector habitat management (physical control, vegetation management), observations will be conducted for the presence of SMHM in the work area by staff trained by USFWS personnel in the safe and effective methods for observing SMHM.		X	X	*	X														X	X		
5. To the extent feasible, physical control, vegetation management and other vector habitat reduction activities will be conducted between December 1 and February 28 (outside of the SMHM breeding season). Surveillance, chemical control, biological control, and public education activities occur year-round and are therefore carefully coordinated with resource agencies to minimize potential impacts to SMHMs and their habitats.		X	X		X														X	X		
6. When walking in the marsh, existing trails will be used whenever possible. Specific care will be taken when walking and performing surveillance in the vicinity of natural and manmade ditches or sloughs or in the vicinity of tidal marsh habitat to avoid potential disturbance of SMHM.	X	X	X	*	X	X													X	X		
7. District staff will receive training on measures to avoid impacts to SMHM.	X	X	X	*	X	X													X	X		
8. If SMHM nests or adults are encountered during vector management activities, avoidance measures will be immediately implemented and findings will be reported to the appropriate resource agency.	X	X	X	*	X	X													X	X		
D. Ridgeway's Rail (RR)																						
1. Activities (surveillance, treatment, source reduction) within or adjacent to Ridgeway's Rail habitat will not occur within two hours before or after extreme high tides of 6.5 feet National Geodetic Vertical Datum (NGVD) or	X	X	X	*	X	X													X	X		

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Best Management Practice (BMP)	Alternative						Upland Habitats							Aquatic and Wetland Habitats								
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above as measured at the Golden Gate Bridge (corrected for time and tide height for the site) or when the marsh plain is completely inundated because suitable upland refugia cover is limited and potentially disturbance-creating activities could prevent clapper rails from reaching available cover.																						
2. Vegetation removal is limited to the minimum amount necessary to allow for surveillance, treatment, and vector habitat reduction (vegetation management) to minimize or avoid loss of RR. Similarly, excavation, fill, or construction activities will also be limited to the minimum amount necessary to minimize/avoid loss of RR.	X	X	X		X														X	X		
3. To the extent feasible, physical control, vegetation management and other vector habitat reduction activities will be conducted between September 1 and January 31 (outside of the RR breeding season). Surveillance, chemical control, biological control, and public education activities occur year-round and are therefore carefully coordinated with resource agencies to minimize potential impacts to RRs and their habitats.		X	X		X														X	X		
4. District staff will notify the appropriate resource agency prior to entering potential RR habitats and will regularly coordinate with the resource agency(ies) on the locations of breeding RRs and avoid breeding RRs to the extent feasible. Any observations of adverse effects to RRs will be reported by District staff.	X	X	X	X	X														X	X		
5. When walking in the marsh District staff will use existing trails whenever possible. Specific care will be taken when walking and performing surveillance in the vicinity of natural and manmade ditches or sloughs or in the vicinity of tidal marsh habitat to avoid potential disturbance of RRs.	X	X	X	*	X	X													X	X		
6. Entry into suitable breeding habitat for clapper rails will be minimized. When entry is required, the preferred method will be by foot. Other entry methods will be based on consultation with the appropriate resource agency.	X	X	X	*	X	X													X	X		
7. District staff will receive training on measures to avoid impacts to RRs	X	X	X	*	X	X													X	X		
8. If RR nests or adults are encountered during vector management activities, avoidance measures, as provided during training from the resource agencies, will be immediately implemented and findings will be reported to the appropriate resource agency.	X	X	X	*	X	X													X	X		

Table 5-3 Contra Costa Mosquito and Vector Control District BMPs to Avoid / Minimize Environmental Impacts by Alternative

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E. California Least Tern (CLT)																						
1. District staff will notify the appropriate resource agency prior to entering potential CLT habitats between April 15 and August 31 (breeding season) and will regularly coordinate with the resource agency(ies) on the locations of breeding CLTs and avoid breeding CLTs to the extent feasible. Any observations of adverse effects to CLTs will be reported by District staff.	X				X							X										
2. Entry into suitable breeding habitat for CLT will be minimized. When entry is required, vehicle speed will be reduced to 5mph and peripheral paths will be utilized to the extent feasible. Other entry methods will be based on consultation with the appropriate resource agency.	X				X							X										
3. District staff will receive training on measures to avoid impacts to CLTs	X				X							X										
4. If CLT nests or adults are encountered during mosquito management activities, avoidance measures, as provided during training from the resource agencies, will be immediately implemented and findings will be reported to the appropriate resource agency.	X				X							X										
F. Western Snowy Plover (WSnPl)																						
1. District staff will notify the appropriate resource agency prior to entering potential WSnPl habitats between March 1 and September 15 (breeding season) and will regularly coordinate with the resource agency(ies) on the locations of breeding WSnPls and avoid breeding WSnPls to the extent feasible. Any observations of adverse effects to WSnPls will be reported by District staff.	X				X							X										
2. Entry into suitable breeding habitat for WSnPl will be minimized. When entry is required, vehicle speed will be reduced to 5mph and peripheral paths will be utilized to the extent feasible. Other entry methods will be based on consultation with the appropriate resource agency	X				X							X										
3. District staff will receive training on measures to avoid impacts to WSPs	X				X							X										
4. If WSnPl nests or adults are encountered during mosquito management activities, avoidance measures, as provided during training from the resource agencies, will be immediately implemented and findings will be reported to the appropriate resource agency.	X				X							X										

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G. California Tiger Salamander (CTS)																						
1. Trucks and ARGOs will be restricted to established roads and berms in vernal pool areas. Only small ATVs (e.g. Polaris) will be utilized near vernal pools.	X				X					X								X				
2. Methoprene, monomolecular films, and adulticides will not be used in vernal pool areas.	X				X					X								X				
3. District staff will receive training on measures to avoid impacts to CTS	X				X					X								X				
H. Vernal Pool Tadpole Shrimp (VPTS)																						
1. Trucks and ARGOs will be restricted to established roads and berms in vernal pool areas. Only small ATVs (e.g. Polaris) will be utilized near vernal pools.	X				X													X				
2. Methoprene, monomolecular films, and adulticides will not be used in vernal pool areas.	X				X													X				
3. District staff will receive training on measures to avoid impacts to VPTS	X				X													X				
I. Contra Costa Goldfields (CCG)																						
1. District staff will receive training on the identification, biology and preferred habitat of Contra Costa goldfields	X				X			X		X								X				
2. When possible, project actions to be conducted in areas containing suitable habitat for this species will occur during the time period when CCG is in bloom and identifiable (March-June), so that any CCG plants observed can be avoided and documented.	X				X			X		X								X				
3. District staff will coordinate with CDFW and USFWS regarding the locations of known CCG populations, so that these populations can be avoided. Flagging may be used to identify the boundaries of known CCG populations	X				X			X		X								X				
4. Trucks and ARGOs will be restricted to established roads and berms in vernal pool areas. Only small ATVs (e.g. Polaris) will be utilized near vernal pools. When feasible, mosquito management activities will be conducted on foot using hand equipment.	X				X			X		X								X				

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Best Management Practice (BMP)	Alternative						Upland Habitats							Aquatic and Wetland Habitats								
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J. Soft Bird's Beak																						
1. District staff will receive training on the identification, biology and preferred habitat of soft bird's beak.	X	X	X	*	X	X													X	X		
2. When possible, project actions to be conducted in areas containing suitable habitat for this species will occur during the time period when soft bird's beak is in bloom and identifiable (July-November), so that any soft bird's beaks plants observed can be avoided and documented.	X	X	X	*	X	X													X	X		
3. District staff will coordinate with Napa-Sonoma Marshes Wildlife Area (CDFW) and San Pablo Bay National Wildlife Refuge regarding the locations of known soft bird's beak populations, so that these populations can be avoided. Flagging will be used to identify the boundaries of known soft bird's beak populations.	X	X	X	*	X	X													X	X		
4. When possible, vector management activities will be conducted on foot using hand equipment.	X	X	X	*	X	X													X	X		
K. Vegetation Management																						
1. Consultations will be made with the appropriate resource agency to discuss proposed vegetation management work, determine potential presence of sensitive species and areas of concern, and any required permits.		X	X											X	X	X	X	X	X	X		
2. Vegetation management work performed will typically be by hand, using hand-held tools, to provide access to vector habitat for surveillance, and when needed control activities. Tools used include machetes, small garden-variety chain saw, hedge trimmers and "weed-eaters".		X	X											X	X	X	X	X	X	X		
3. District will consult and coordinate with resource agencies as well as have all necessary permits prior to the commencement of work using heavy equipment (e.g., larger than handheld/garden variety tools such as small excavators with rotary mowers) in riparian areas.		X	X											X	X	X	X	X	X	X		
4. Minor trimming of vegetation (e.g., willow branches approximately three inches in diameter or less, blackberry bushes, and poison oak) to the minimum extent necessary will occur to maintain existing paths or create access points through dense riparian vegetation into vector habitat. This may include minor trimming of overhanging limbs, brush and blackberry thickets that obstruct the ability to walk within creek channels. Paths to be		X	X												X							

Table 5-3 Contra Costa Mosquito and Vector Control District BMPs to Avoid / Minimize Environmental Impacts by Alternative

Best Management Practice (BMP)	Alternative						Upland Habitats							Aquatic and Wetland Habitats								
	Surveillance	Physical Control	Vegetation Management	Bio Control	Chemical Control	Other	Coniferous Forest	Deciduous Forest	Shrublands	Grasslands	Serpentine	Coastal Dunes	Tree Holes	Creeks and Rivers	Riparian Corridor	Ponds and Lakes (includes stock and golf ponds that have natural bottoms)	FW Marsh/Seeps	Seasonal Wetlands (includes Vernal Pools)	Lagoon	Tidal Marsh and channels	Water and Wastewater Management Facilities	Artificial Containers, Temporary Standing Waters and Ornamental Ponds
maintained will not be a cut, defined corridor but rather a path maintained by selective trimming of overhanging or intrusive vegetation. Paths to be maintained will range in width from three to 6 feet across.																						
5. Downed trees and large limbs that have fallen due to storm events or disease will be cut only to the extent necessary to maintain existing access points or to allow access to vector habitats.		X	X												X							
6. Vegetation management work will be confined to September 1 to January 31 to minimize potential impacts to special status species, especially breeding birds. When work is expected to occur between February 1 and August 31 (nesting season), additional consultations will occur with appropriate resource agencies to help identify locations of active nests of raptors or migratory birds as well as any additional protection measures that will need to be implemented prior to commencement of work.		X	X												X	X	X	X	X	X		
7. Every effort will be made to complete vegetation management in riparian corridors prior to the onset of heavy rains. Maintenance work to be done in early spring will be limited to trimming of access routes to new willow shoots, poison oak, blackberries, and downed trees that block these paths.		X	X												X							
8. District staff will work with care and caution to minimize potential disturbance to wildlife, while performing vegetation management activities within or near riparian corridors.		X	X											X	X	X	X	X	X	X		
9. Within suitable habitat for California Freshwater Shrimp (*Syncaris pacifica*), no in-channel vegetation will be removed, trimmed, or otherwise disturbed. District staff will work with resource agencies to determine locations of suitable habitat for California Freshwater Shrimp and receive written authorization to proceed prior to commencement of vegetation management activities.		X	X											X	X							
10. If suitable habitat necessary for special status species is found, including vernal pools, and if nonchemical physical and vegetation management control methods have the potential for affecting special status species, then the District will coordinate with the CDFW, USFWS, and/or NMFS before conducting control activities within this boundary or cancel activities in this area. If the District determines no suitable habitat is present, control activities may occur without further agency consultations.		X	X											X	X	X	X	X	X	X		
11. When using heavy equipment for vegetation management, District staff (and contractors) will minimize the area that is affected by the activity and employ all appropriate measures to minimize and contain turbidity. Heavy equipment will not be operated in the water and appropriate containment and cleanup		X	X											X	X	X	X	X	X	X		

Table 5-3 Contra Costa Mosquito and Vector Control District BMPs to Avoid / Minimize Environmental Impacts by Alternative

Best Management Practice (BMP)	Alternative						Upland Habitats							Aquatic and Wetland Habitats								
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systems will be in place on site to avoid, contain, and clean up any leakage of toxic chemicals.																						
L. Maintenance / Construction and Repair of Tide Gates and Water Structures in Waters of the U.S.																						
1. District staff will consult with appropriate resource agencies (USACE, USFWS, CDFW, NMFS, BCDC, Regional Water Quality Control Board) and obtain all required permits prior to the commencement of ditch maintenance or construction within tidal marshes.		X												X		X	X	X	X	X	X	
2. Work plans for the upcoming season proposed work as well as a summary of the last season' completed work will be submitted for review and comment to USACE, USFWS, NMFS, CDFW, BCDC and the Regional Water Quality Control Board no later than July 1 of each year for which work is being proposed. The work plan will include a delineation of all proposed ditching overlain on topographic maps at a minimum of 1" = 1000' scale, with accompanying vicinity maps. The plan will also indicate the dominant vegetation of the site, based on subjective estimates, the length and width of the ditches to be maintained, cleared or filled, and the estimated date the work will be carried out.		X												X		X	X	X	X	X	X	
3. All maintenance work will be done at times that minimize adverse impacts to nesting birds, anadromous fish, and other species of concern, in consultation with USFWS, NMFS, and CDFW. Work conducted will, whenever possible, be conducted during approved in water work periods for that habitat, considering the species likely to be present. For example, tidal marsh work will be conducted between September 1 and January 31, where possible and not contraindicated by the presence of other sensitive species. Similarly, in water work in waterbodies that support anadromous fish, work will be conducted between July 1 and September 30.[11]		X												X		X	X	X	X	X	X	
4. Care will be taken to minimize the risk of potential disruption to the indigenous aquatic life of a waterbody in which ditch maintenance is to take place, including those aquatic organisms that migrate through the area.		X												X		X	X	X	X	X	X	

[11] Dates are from District's USACE. Regional Permit 4, July 31, 2007.

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5. Staging of equipment will occur on upland sites.		X												X		X	X	X	X	X	X	
6. Mats or other measures taken to minimize soil disturbance (e.g., use of low ground pressure equipment) when heavy equipment is used.		X												X		X	X	X	X	X	X	
7. All projects will be evaluated prior to bringing mechanical equipment on site, in order to identify and flag sensitive sites, select the best access route to the work site consistent with protection of sensitive areas, and clearly demarcate work areas.		X												X		X	X	X	X	X	X	
8. Measures will be taken to minimize impacts from mechanical equipment, such as hand ditching as much as possible; reducing turns by track-type vehicles, taking a minimum number of passes with equipment, varying points of entry, driving vehicles at low speed, and not driving on open mud and other soft areas.		X												X		X	X	X	X	X	X	
9. Discharges of dredged or fill material into tidal waters will be minimized or avoided to the maximum extent possible at the project site and will be consistent with all permit requirements for such activity. No discharge of unsuitable material (e.g., trash) will be made into waters of the United States, and material that is discharged will be free of toxic pollutants in toxic amounts (see section 307 of the Clean Water Act) . Measures will be taken to avoid disruption of the natural drainage patterns in wetland areas.		X												X		X	X	X	X	X	X	
10. Discovery of historic or archeological remains will be reported to USACE and all work stopped until authorized to proceed by the appropriate regulatory authorities/resource agencies.		X												X		X	X	X	X	X	X	
11. Ditching that drains high marsh ponds will be minimized to the extent possible in order to protect the habitat of native salt pan species.		X																	X	X		
12. No spoils sidecast adjacent to circulation ditches will exceed 8 inches above the marsh plain to minimize risk of colonization of spoils by invasive, nonnative plants and/or the spoils lines from becoming access corridors for unwanted predators (e.g., dogs, cats, red fox). Sidecast spoil lines exceeding 4 inches in height above the marsh plain will extend no more than 6 feet from the nearest ditch margin. Any spoils in excess of these dimensions will be hydraulically redispersed on site (e.g., by rotary ditcher), or removed to designated upland sites (per conditions of resource agency issued permits). Sidecast spoil lines will be breached at appropriate intervals to prevent local impediments to water circulation.		X																	X	X		
13. If review of the proposed work plan by USACE, USFWS, or CDFW		X																	X	X		

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determines the proposed maintenance is likely to destroy or damage substantial amounts of shrubby or sub-shrubby vegetation (e.g., coyote brush, gumplant) on old sidecast spoils, the District will provide a quantitative estimate of the extent and quality of the vegetation, and provide a revegetation plan for the impacted species prepared by a biologist/botanist with expertise in marsh vegetation. The Corps approved revegetation plan will be implemented prior to April 1 of the year following the impacts.																						
14. Small ditch maintenance work will be performed by hand, whenever possible, using handheld shovels, pitch forks, etc., and small trimmers such as "weed-eaters". (Note: the majority of small ditch work performed by the District is by hand.)		X														X	X	X	X	X	X	
15. Work will be done at low tide (for tidal areas) and times of entry will be planned to minimize disruption to wildlife.		X												X	X	X	X	X	X	X	X	
16. In marshes which contain populations of invasive nonnative vegetation such as pepperweed or introduced spartina, sidecast spoils will be surveyed for the frequency of establishment of these species during the first growing season following deposition of the spoils. The results of the surveys will be reported to the USACE, USFWS and CDFW. If it is determined the sidecasting of spoils resulted in a substantial increase in the distribution or abundance of the nonnative vegetation which is detrimental to the marsh, the District will implement appropriate abatement measures after consultation with the USACE, USFWS and CDFW.		X																	X	X		
17. When possible (i.e., with existing labor and vehicles), refuse such as tires, plastic, and man-made containers found at the work site will be removed and properly discarded.		X	X											X		X	X	X	X	X	X	
M. Applications of Pesticides, Surfactants, and/or Herbicides																						
1. District staff will conduct applications with strict adherence to product label directions that include approved application rates and methods, storage, transportation, mixing, and container disposal.			X	*	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
2. District will avoid use of surfactants when possible in sites with aquatic nontargets or natural enemies of mosquitoes present such as nymphal damselflies and dragonflies, dytiscids, hydrophilids, corixids, notonectids, ephydrids, etc. Surfactants are a least preferred method but must be used with pupae. Use a microbial larvicide (Bti, Bs) or IGR (e.g., methoprene) instead or another alternative if necessary.			X		X								X	X	X	X	X	X	X	X	X	X

Table 5-3 Contra Costa Mosquito and Vector Control District BMPs to Avoid / Minimize Environmental Impacts by Alternative

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3. Materials will be applied at the lowest effective concentration for a specific set of vectors and environmental conditions. Application rates will never exceed the maximum label application rate.			X	*	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
4. To minimize application of pesticides, application of pesticides will be informed by surveillance and monitoring of vector populations.			X		X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
5. District staff will follow label requirements for storage, loading, and mixing of pesticides and herbicides. Handle all mixing and transferring of herbicides within a contained area.			X		X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
6. Postpone or cease application when predetermined weather parameters exceed product label specifications, when wind speeds exceed the velocity as stated on the product label, or when a high chance of rain is predicted and rain is determining factor on the label of the material to be applied.			X	*	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
7. Applicators will remain aware of wind conditions prior to and during application events to minimize any possible unwanted drift to water bodies, and other areas adjacent to the application areas.			X	*	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
8. Spray nozzles will be adjusted to produce larger droplet size rather than smaller droplet size. Use low nozzle pressures where possible (e.g., 30 to 70 pounds per square inch). Keep spray nozzles within a predetermined maximum distance of target weeds or pests (e.g., within 24 inches of vegetation during spraying). Adjusting droplet size would only apply to larvicides, herbicides and non-ULV applications. Use ULV sprays that are calibrated to be effective and environmentally compatible at the proper droplet size (about 10-30 microns).			X	*	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
9. Clean containers at an approved site and dispose of at a legal dumpsite or recycle in accordance with manufacturer's instructions if available.			X	*	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
10. Special Status Aquatic Wildlife Species: – A CNDDB search was conducted in 2012, updated in 2014, and the results incorporated into this PEIR. District staff communicates with state, federal, and county agencies regarding sites that have potential to support special status species. Many sites where the District performs surveillance and control work have been visited by staff for many years and staff are highly knowledgeable about the sites and habitat present. If new sites or site features are discovered that have potential to be habitat for special status species, the appropriate agency or landowner is contacted and communication initiated.			X	*	X									X		X	X	X	X	X	X	

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– Use only pesticides, herbicides, and adjuvants approved for aquatic areas or manual treatments within a predetermined distance from aquatic features (e.g., within 15 feet of aquatic features). Aquatic features are defined as any natural or man-made lake, pond, river, creek, drainage way, ditch, spring, saturated soils, or similar feature that holds water at the time of treatment or typically becomes inundated during winter rains. – If suitable habitat for special status species is found, including vernal pools, and if aquatic-approved pesticide, herbicide, and adjuvant treatment methods have the potential for affecting the potential species, then the District will coordinate with the CDFW, USFWS, and/or National Marine Fisheries Service (NMFS) before conducting treatment activities within this boundary or cancel activities in this area. If the District determines no suitable habitat is present, treatment activities may occur without further agency consultation.																					
11. District staff will monitor sites post-treatment to determine if the target vector or weeds were effectively controlled with minimum effect to the environment and nontarget organisms. This information will be used to help design future treatment methods in the same season or future years to respond to changes in site conditions.			X	*	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
12. Do not apply pesticides that could affect insect pollinators in liquid or spray/fog forms over large areas (more than 0.25 acres) during the day when honeybees are present and active or when other pollinators are active. Preferred applications of these specific pesticides are to occur in areas with little or no honeybee or pollinator activity or after dark. These treatments may be applied over smaller areas (with hand held equipment), but the technician will first inspect the area for the presence of bees and other pollinators. If pollinators are present in substantial numbers, the treatment will be made at an alternative time when these pollinators are inactive or absent.			X		X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
13. The District will provide notification to the public (24 – 48 hours in advance if possible) and/or appropriate agency(ies) when applying pesticides or herbicides for large-scale treatments (e.g., fixed-wing aircraft or helicopters) that will occur in close proximity to homes, heavily populated, high traffic, and sensitive areas. The District infrequently applies or participates in the application of herbicides in areas other than District facilities.			X	*	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X

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N. Hazardous Materials and Spill Management																						
1. Exercise adequate caution to prevent spillage of pesticides during storage, transportation, mixing or application of pesticides. Report all pesticide spills and cleanups (excepting cases where dry materials may be returned to the container or application equipment).			X	*	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
2. Maintain a pesticide spill cleanup kit and proper protective equipment at the District's Service Yard and in each vehicle used for pesticide application or transport.			X	*	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
3. Manage the spill site to prevent entry by unauthorized personnel. Contain and control the spill by stopping it from leaking or spreading to surrounding areas, cover dry spills with polyethylene or plastic tarpaulin, and absorb liquid spills with appropriate absorbent materials.			X	*	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
4. Properly secure the spilled material, label the bags with service container labels identifying the pesticide, and deliver them to a District/Field Supervisor for disposal.			X	*	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
5. A hazardous spill plan will be developed, maintained, made available, and staff trained on implementation and notification for petroleum-based or other chemical-based materials prior to commencement of vector treatment activities.	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
6. Field-based mixing and loading operations will occur in such a manner as to minimize the risk of accidental spill or release of pesticides.			X		X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X

5.2.2.2.1 Hazardous Material

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

5.2.2.2.2 Toxicity and Exposure

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

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

However, these, and other, coordinated and focused laboratory tests are designed to document the effects of the chemical using a continuous, controlled, laboratory exposure that does not realistically reflect the likely patchy exposures typical of District field application scenarios. As such, the toxicity information generated using laboratory tests (and some limited filed tests) are intended as an overview of potential issues that might be associated with maximum direct exposures to develop and recommend guidance for use that should provide maximum exposure levels of applications that are protective of ecological health. These guidelines include numerous ‘safety margins” in the toxicity calculations that are intended to provide adequate efficacy to target organisms while not adversely impacting humans or nontarget plant and animal species. In some instances, the regulatory guidance may include additional suggestions for protective application to assure no significant impact on nontarget species and humans.

Although laboratory toxicity testing focuses on tiered concentrations of chemical exposure, the results of these tests produce a series of toxicity estimates of concentrations less than those that produce mortality. Extrapolation of these data is used to generate estimates of chronic toxicity or possible effects of lower doses that may result in sublethal effects such as reproduction or metabolic changes. In reality, these low-dose exposures need to be sustained over longer periods (and usually at higher concentrations) than are relevant to typical application scenarios for vector control including multiple applications in an area such as a wetland.

Although the regulatory community uses this basic information to provide a relative comparison of the potential for a chemical to result in unwanted adverse effects and this information is reflected in the approved usage labels and material safety data sheets (MSDSs), in actual practice, the amounts applied

in the District's Program Area are substantially less than the amounts used in the laboratory toxicity studies. Because of the large safety factors used to develop recommended product 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). Impacts may occur to some nontarget organisms. Although numerous precautions (BMPs) and use of recommended application guidance is intended to provide efficacy without adverse effects to nontarget organisms, misapplication or unexpected weather conditions may still result in effects on some nontarget organisms in the exposure area. This potential impact is ameliorated/mitigated by careful use of BMPs, advance planning, and intensive staff training by the District.

5.2.2.2.3 Chemistry, Fate, and Transport

The toxicity of a chemical is also affected by various biological, chemical, and physical parameters that affect the behavior of a compound in the environment and its potential toxicity. The chemistry, fate, and transport of a compound must be analyzed to fully estimate potential exposure to a given receptor. The fate and transport of a compound is determined by the physical and chemical properties of the compound itself and the environment in which it is released. Thus, the following characteristics of a compound must be evaluated: its half-life in various environmental media (e.g., sediment, water, air); photolytic half-life; lipid and water solubility; adsorption to sediments and plants; and volatilization. Environmental factors that affect fate and transport processes include temperature, rainfall, wind, sunlight, water turbidity, dissolved oxygen concentrations, and water and soil pH. Information pertaining to these parameters allows evaluation of how compounds may be transported between environmental media (e.g., from sediments to biota), how a compound may be degraded into various breakdown products, and how long a compound or its breakdown products may persist in different environmental media. Appendix B provides a discussion of the environmental fate of the pesticide active ingredients and other chemicals associated with specific pesticide formulations used or that may be used in the District's Vegetation Management and Chemical Control Alternatives (along with chemicals not used by the District but potentially used by other districts).

5.2.2.2.4 Ecological Food Webs

While it is important to evaluate the potential adverse impacts of a pesticide application to potentially affected nontarget species, it is neither feasible nor practical to evaluate those potential impacts to all of the food webs present in the ecosystems under consideration. An ecological food web is represented in the illustration representing some of the multitude of possible biotic and food uptake interactions in an ecosystem. Figure 5-2 depicts a highly simplified food web. In an ecological system each level in the food web is occupied by dozens or hundreds of species, with consumers using those resources (in this case species from a lower trophic level) in different ways depending on availability and competition for those resources. Their utilization of these resources shifts by time of day and season, and multiple resources being used simultaneously or alternatively. If the availability of one resource decreases, the consumer can generally replace that with another resource. Each of the possible connections between species is also associated with other interactions, such as competitive release, where the abundance of a species increases in response to the decline in a competitor's abundance, or competitive interactions between consumers where one consumer can use a particular resource better than its competitor. These interactions can be the result of higher levels of animal species organization (trophic) or paired interactions between individuals that result in added, positive associations (symbiotic) for both species.

Although ecological food webs could be used to describe the complex system interactions that might be associated with District application scenarios, it is neither feasible nor practical to evaluate those potential impacts using a food-web approach. The numerous, complex interactions in typical food webs would be fraught with uncertainty and complex animal associations and, as such, difficult to confidently assess relevant impacts. Because of these constraints and complexity, it would be neither practical nor productive to attempt to predict food-web interactions for each of the numerous application scenarios the District uses.

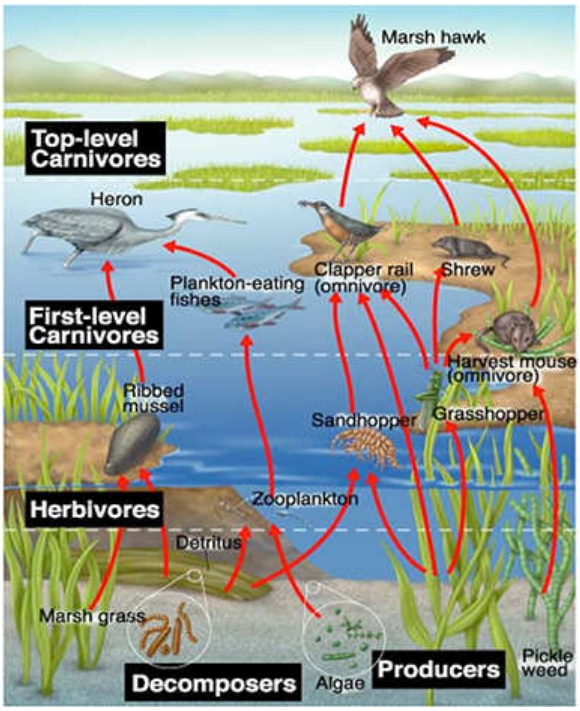

Figure 5-2 Ecological Food Web Concept

It is appropriate, however, to use a food-web analysis to identify and consider the first level of potentially adverse effects to nontarget species that might result from a pesticide application. This information is used to assure a minimal impact to nontarget species and is typically a part of the material safety data sheet (MSDS) and Toxicology profiles, providing the basis for the more reasonable, technically feasible approach to consider the possible nontarget impacts prior to use and the compatibility of each proposed pesticide in the overall approach to the typical vector control chemical application performed by the District..

Pesticides can kill natural predators of vectors. For example, the District's activities associated with the Physical Control and Vegetation Management Alternatives would help allow these predators to access habitats where mosquito larvae are present. When chemical control is used to manage mosquitoes, it generally is used at levels that are below the effects thresholds for other organisms especially insects and invertebrate predators, as described above. Although mosquito pesticides may also affect invertebrate predators (e.g., dragonflies), recovery of predator populations is usually rapid as the predator populations extend beyond the application areas and will rapidly replace any lost individuals. In general, the pesticides used for mosquito control exhibit low or no toxicity to birds or mammals. Limited information is available regarding toxic effects to reptile or terrestrial amphibian mosquito predators.

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

5.2.3 Surveillance Alternative

Surveillance activities involve monitoring the abundance of adult and larval mosquitoes, field inspection of mosquito habitat, testing for the presence of antibodies specific to encephalitis virus in domestic and wild fowl, collection and testing of ticks, small rodent trapping and disease testing, and/or response to public service requests regarding vectors such as mosquitoes and yellow jackets.

Mosquito populations are monitored through the use of traps, inspections, and sampling in mosquito habitats. Known and suspected habitats are anywhere that water can collect, be stored, or remain standing for more than a few days, including, but not limited to, catch basins, stormwater detention systems, residential communities, parks, ornamental ponds, unmaintained swimming pools, seeps, seasonal wetlands, tidal and diked marshes, wastewater ponds, sewer

plants, winery waste/agricultural ponds, managed waterfowl ponds, canals, creeks, treeholes, and flooded basements. Ticks are collected along trails and tested for disease. Rodents may be collected during inspections for population density assessment, for disease testing, and in response to the identification of unusually large populations of rodents as a result of citizen complaints. If preexisting roads and trails are not available, low ground pressure ATVs may be used to access sites. Offroad access is minimized and used only when roads and trails are not available.

5.2.3.1 Impacts to Special Status Species

The Surveillance alternative may cause small impacts to special status species of upland and wetland habitats in the vicinity of aquatic ecosystems when the District is required to maintain paths and clearings to access surveillance sites and facilitate sampling. These impacts are kept to the minimum amount necessary to minimize potential ingress of predators into these habitats. Such maintenance may include clearing small amounts of vegetation to retain footpaths up to 3 feet wide, or ATV/ARGO paths up to 6 feet wide. However, the vast majority of access routes are via preexisting roads, trails, and walkways, and do not require clearing by the District. Some trails do require periodic trimming or clearing by the District. Occasionally new access routes may be required to assess a vector source. This process will often consist of personnel picking their way through natural openings in the vegetation to the source, but in some cases (i.e., heavy growth of blackberries or poison oak) a trail may need to be created. Where such clearing is required, it is generally done with hand tools. No trimming of vegetation greater than 4 inches diameter at breast height would be conducted. Trail maintenance activities would be conducted usually in the fall, when potential impacts to special status species would be minimized. However, lighter trail maintenance activities (trimming back small branches or fronds hanging over the access route) may occasionally occur during other times of year. These activities are of small size with limited duration and noise effects and new access routes would be minimal; therefore, indirect impacts to special status species in terrestrial habitats would be inconsequential.

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

The Surveillance Alternative may also result in disturbance to special status species as District personnel are traveling to and from surveillance sites. These access-related impacts would be minimized by adherence to the BMPs indicated in Table 5-3, in particular those BMPs requiring discussing activities regularly with regulatory agencies or wildlife refuge managers, staying on existing access routes wherever possible, maintaining and implementing training from USFWS and CDFW personnel regarding special status species, and being aware of the environment and minimizing noise disturbance when working in the field.

In addition, when working in tidal marshes, the District will implement all Tidal Marsh-specific BMPs, as well as those for salt marsh harvest mouse, Ridgeway's rail, and soft bird's beak, where these species are potentially present, as determined through online database searches and discussion with refuge managers, CDFW, or USFWS personnel. This BMP implementation will include continuing to follow the measures provided in the USFWS' Walking in the Marsh;" employing seasonal and daily activity restriction periods, wherever practical; minimizing travel along tidal channels and sloughs; limiting vegetation removal to the minimum amount necessary; and other BMPs, as indicated in Table 5-3. Through the implementation of these BMPs, substantial impacts to habitat would be avoided, and little to no impact to special_status species would occur.

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

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

5.2.3.2 Impacts to Habitat

The Surveillance alternative may cause small impacts to upland and wetland habitats in the vicinity of aquatic ecosystems when the District is required to maintain paths and clearings to access surveillance sites and facilitate sampling. Such maintenance may include clearing small amounts of vegetation to retain footpaths up to 3 feet wide, or ATV/ARGO paths up to 6 feet wide. However, the vast majority of access routes are via preexisting roads, trails, and walkways, and do not require clearing by the District. Some trails do require periodic clearing by the District. Occasionally new access routes may be required to assess a vector source. This will often consist of personnel picking their way through natural openings in the vegetation to the source, but in some cases (i.e., heavy growth of blackberries or poison oak) a trail may need to be created. Where such clearing is required, it is done with hand tools. No trimming of vegetation greater than 4 inches diameter breast height would be conducted. Most of the heavier trail maintenance activities, especially those using weed trimmers, small chainsaws, or other motorized equipment, usually would be conducted in the fall, when potential impacts to special status species (associated with disturbance of breeding habitat) would be minimized. However, lighter trail maintenance activities (trimming back small branches or fronds hanging over the access route) may occasionally occur during other times of year. These activities are of small size with limited duration and noise effects and new access routes would be minimal; therefore, indirect impacts to terrestrial habitats would be inconsequential.

Surveillance activities would not affect the quantity or distribution of habitats, such as riparian areas, marshes, lakes or ponds, seasonal wetlands, or other habitat types identified in local or regional plans or listed by CDFW and USFWS. This alternative would not affect the composition of their vegetative communities, as very limited numbers of plants would be pruned or removed over a very small area. Most surveillance occurs along access routes that are already established, that would usually be cleared periodically, during the fall to minimize impacts, to maintain access, as necessary. Surveillance activities might result in some physical damage to habitat or associated vegetation from foot traffic and vehicle use in areas without marked trails to access areas for potential vector inspections. Where new access routes are required they would have only a very small effect on habitat in areas where surveillance occurs. Surveillance would not result in any removal, filling or hydrologic interruption of federally protected wetlands as defined by Section 404 of the Clean Water Act, (including but not limited to, marsh, vernal pool, coastal, etc.).

The District has long-standing cooperative and collaborative relationships with CDFW, professional biologists and property owners with regard to access and mosquito surveillance in association with vernal pools and other sensitive habitats. The District receives environmental awareness training from resource agency staff (e.g., CDFW and USFWS) and professional biologists with respect to minimizing the potential for impacts to sensitive habitats (e.g., vernal pools) and associated special status species. For example, when using ATVs to perform mosquito surveillance in the proximity of vernal pools, District staff stay outside of the margin of the vernal pools (delineated by the change from wetland to upland

vegetation types), and do not operate ATVs within the actual vernal pool. The District may cross hydrological connections, i.e., swales between vernal pools when necessary and with permission from regulatory agencies. When possible, District staff performs mosquito surveillance on foot with hand equipment, or by operating ATVs in upland areas away from the pools and walking from the ATV to the pools to perform mosquito surveillance (e.g., using a long hose reel based on the ATV). When it is necessary to use an ATV for mosquito surveillance in proximity to vernal pools, the District utilizes low ground pressure vehicles. District staff operates ATVs at slow speeds on sites containing vernal pools, and remains observant while operating equipment and walking in and amongst vernal pool habitat.

Impact TR-2. The Surveillance Alternative would have a **less-than-significant** impact on any riparian habitat or other sensitive natural community. No mitigation is required.

Impact TR-3. The Surveillance Alternative would have a **less-than-significant** impact on federally protected wetlands as defined by Section 404 of the Clean Water Act. No mitigation is required.

5.2.3.3 Impacts to Migration and Movement

The Surveillance Alternative would not result in any ground disturbing activity and, therefore, would not result in any removal, filling or hydrologic interruption of federally protected wetlands. Any disruption of migration patterns would be due to the presence of personnel and machinery in the environment. In all cases this occurrence would be very short term, generally not more than a few hours in any given location. Therefore, this effect would be minimal, would have little or no effect on the movement of wildlife, and would not affect wildlife migration corridors or nursery areas, as no physical disturbance would occur.

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

5.2.3.4 Conflict with Local Policies

The county and city general plans and their goals and policies pertaining to open space and natural resources are protective of terrestrial resources and focused on conservation of existing resources including land for wildlife and wildlife movement, native vegetation, and natural beauty and on integrated pest management for agricultural lands. Surveillance activities would not result in the conversion of natural habitats to other land uses or in the long-term or permanent dislocation of plant and animal species from natural areas except indirectly for mosquitoes and vectors of disease and discomfort. The Surveillance Alternative would not affect trees more than 4 inches diameter breast height and, therefore, would not conflict with any tree ordinances.

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

5.2.3.5 Conflict with Conservation Plans

HCPs or NCCPs identified within Contra Costa County, the primary Service Area are identified in Table 4-5. District activities are typically not among those covered by these HCPs. When performing work, the District would operate in compliance with their practices and permits, including compliance with all active HCP/NCCPs. The District regularly communicates with and works collaboratively with representatives from resource agencies such as RWQCB, USEPA, USACE, CDFW, and USFWS. The District receives training from resource agency staff and professional biologists (e.g., CDFW, USFWS) to minimize impacts and conducts annual field training for field staff regarding precautionary and avoidance measures related to sensitive habitats (e.g., vernal pools) and associated special status species. Therefore, the District activities would not be inconsistent with the provisions of any HCP, NCCP or other approved local, regional, or state approved conservation plan.

Impact TR-6. The Surveillance Alternative would have a **less-than-significant** impact on any adopted HCP, NCCP, or other approved local, regional or state habitat conservation plan.

5.2.4 Physical Control Alternative

The Physical Control Alternative would be a continuation of existing activities using applicable techniques, equipment, vehicles, and watercraft. Physical control for mosquitoes consists of the management of aquatic areas that provide mosquito-producing habitat (including freshwater marshes and lakes, saltwater marshes, temporary standing water, vernal pools, and wastewater treatment facilities) especially through water control and maintenance or improvement of channels, tide gates, levees, and other water control facilities. The potential effects of physical control on habitats are described below. The District may also advise landowners and homeowners about the importance of dumping/inverting of containers holding water, avoiding creation of stagnant ponds, controlling vegetation against structures, exclusionary practices (e.g., sealing and screening), and limiting harborage, food, and water resources. Physical control measures for rodents and other vectors would be limited to providing advice for restricting ingress of rodents into structures or decreasing habitat for vectors near residences. Physical controls are not implemented for yellow jackets or ticks beyond minimizing water and food sources and vegetation management. In situations where any potential exists for sensitive habitats or special-status species to be present, the District provides information and contact data for resource agencies and potential permits

5.2.4.1 Impacts to Special Status Species and Habitats

The District would not conduct extensive physical control measures in upland habitat types, but may affect terrestrial species that occur in wetland habitat types. This work in creeks, rivers, ponds, lakes, marshes, and other wetlands may require permits from the USACE, RWQCB, CDFW, USFWS, NOAA Fisheries, and others. Work would not begin until all required permits are obtained. The potential effects of this alternative on these habitats and species are described below.

5.2.4.1.1 Coniferous Forest

The general lack of surface water in coniferous forests (dominated by cone-bearing trees with needles, which include pines, firs and redwoods, and excluding treeholes) usually does not facilitate the appropriate habitat to support mosquitoes. This habitat does support a variety of special-status species including purple martin, raptors and other avian species (afforded protection under USFWS and CDFW), pallid bat, Sonoma tree vole, western red bat, fisher - West Coast DPS as well as special-status plants. The Physical Control Alternative would have no impact on special-status species, since this alternative would not occur in this habitat except for treeholes which are listed as a separate habitat type..

5.2.4.1.2 Deciduous Forest

The general lack of standing surface water in deciduous forests (dominated by trees that drop leaves annually including buckeyes, some oaks and maples) usually does not facilitate the appropriate habitat to support mosquitoes except for treeholes. This habitat does support a variety of special-status species, as well as special-status plants. The Physical Control Alternative would have no impact on special-status species or their habitat, since this alternative would not occur in this habitat.

5.2.4.1.3 Shrublands

The general lack of standing surface water in shrublands (dense to moderate stands of coyote brush, ceanothus, poison oak, sage, sagebrush, chamise and diverse other shrubs with grassy openings) usually does not facilitate the appropriate habitat to support mosquitoes. This habitat does support a variety of special-status,as well as special-status plants. The Physical Control Alternative would have no impact on special-status species or their habitat, since this alternative would not occur in this habitat.

5.2.4.1.4 Grasslands

The general lack of standing surface water in grasslands (grasslands dominated by annual grasses, with varying amounts of native perennials) usually does not facilitate the appropriate habitat to support mosquitoes. This habitat does support a variety of special-status species, as well as special-status plants The Physical Control Alternative would have no impact on special-status species or their habitat, since this alternative would not occur in this habitat.

5.2.4.1.5 Serpentine

The general lack of standing surface water in serpentine soils (shrublands and grasslands on serpentine soils and rock) usually does not facilitate the appropriate habitat to support mosquitoes. This habitat does support a variety of special-status as well as an abundance of special-status plants. The Physical Control Alternative would have no impact on special-status species or their habitat, since this alternative would not occur in this habitat.

5.2.4.1.6 Coastal Dunes

The general lack of standing surface water in coastal dunes (sandy soils with some active sand movement that supports low stands of diverse native perennials and beach grass) usually does not facilitate the appropriate habitat to support mosquitoes. This habitat does support a variety of special-status species as well as special-status plants. The Physical Control Alternative would have no impact on special-status species or their habitat, since this alternative would not occur in this habitat.

5.2.4.1.7 Treeholes

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

5.2.4.1.8 Creeks and Rivers and Riparian Corridors

Because their rapid currents do not provide suitable habitat for mosquitoes, creeks and rivers generally do not support substantial numbers of mosquitoes, although, some mosquitoes can be found in slow eddies and back channels, or in pools isolated on the banks as flows recede. Creeks and rivers and the surrounding riparian forest may support special-status or special-status plants, as indicated in Tables 4-3 and 4-4. Accessing the site to complete the work during the avian nesting season would be avoided or minimized by implementation of the BMPs in Table 5-3. Habitat alterations to drain such areas will be avoided to the maximum extent possible due to instream special-status species addressed in Chapter 4. The District does not routinely conduct this type of activity, but it may be required in some circumstances. The potential effects of this alternative would be avoided or minimized through implementation of the BMPs in Table 5-3, including those relating to resource agency communication, environmental training, and pretreatment screening (see BMP A7). The habitat and species-specific BMPs in Table 4-6 may also be applied, including seasonal avoidance measures. Furthermore, BMP G3 requires that maintenance work will be done at times that minimize adverse impacts to nesting birds, anadromous fish, and other species of concern, in consultation with USFWS, NMFS, and CDFW. With implementation of these BMPs, the effects of the physical control alternative would be less than significant..

5.2.4.1.9 Ponds and Lakes

The freshwater habitats that could be treated include the margin of reservoirs and ponds (including artificial ponds such as golf course ponds or stock ponds with natural bottoms). These areas are generally man-made habitats, but they may support special-status species as well as special-status plants on the margins. This potential effect would be avoided and minimized by the BMPs in Table 5-3 relating to resource agency communication, environmental training, and pretreatment screening (BMP A7). Furthermore, BMP G3 requires that maintenance work will be done at times that minimize adverse impacts to nesting birds, anadromous fish, and other species of concern, in consultation with USFWS, NMFS, and CDFW. With resource agency consultation and implementation of BMPs, the effects of the physical control alternative would be less than significant.

5.2.4.1.10 Freshwater Marsh/Seeps

Freshwater marsh and seeps may provide ideal habitat for mosquito breeding due to their substantial areas of shallow water, limited circulation and emergent vegetation. These areas may potentially support a number of special status plants and animals as indicated in Tables 4-3 and 4-4. Physical control in these areas would have the same potential effects as described for lake and pond habitats and would be avoided or minimized by the BMPs in Table 5-3 relating to resource agency communication, environmental training, and pretreatment screening (BMP A7). Furthermore, BMP G3 requires that maintenance work will be done at times that minimize adverse impacts to nesting birds, anadromous fish, and other species of concern, in consultation with USFWS, NMFS, and CDFW. With resource agency consultation and implementation of BMPs, the effects of the physical control alternative would be less than significant.

5.2.4.1.11 Seasonal Wetlands (includes Vernal Pools)

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

Vernal pools, a specific type of seasonal wetland, often support a unique assemblage of endemic plant and animal species, many of which have been identified as special-status species by federal and state agencies (see Tables 4-3 and 4-4). The District receives environmental awareness training from resource agency staff (e.g., CDFW, USFWS) and professional biologists to minimize impacts and conducts annual field training for field staff regarding precautionary and avoidance measures related to sensitive habitats (e.g., vernal pools) and associated special status species. When using ATVs to perform mosquito control in the proximity of vernal pools, District staff stay outside of the margin of the vernal pools (delineated by vegetation change from wetland to upland), and never operate ATVs within wetland vegetation or the actual vernal pool. When possible, District staff performs mosquito control on foot with hand equipment, or by operating ATVs in upland areas away from the pools and walking from the ATV to the pools to perform mosquito control. When it is necessary to use an ATV for mosquito control in proximity to vernal pools, the District utilizes low ground pressure vehicles. District staff operates ATVs at slow speeds on sites containing vernal pools, and remains observant while operating equipment and walking in and amongst vernal pool habitat.

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

5.2.4.1.12 Lagoon

Lagoons, located at the mouths of creeks or rivers where they enter the ocean or bay, but isolated from the receiving waterbody by a berm, are indirectly influenced by the tide, which may cause freshwater to back up within the lagoon, and may also allow water to percolate through the berm, with the direction of such movement depending on water levels on either side of the berm. As a result, lagoons often contain a lens of freshwater at the surface and brackish water at the bottom. Thus, lagoons may support species from both creeks and rivers, and from the receiving waterbodies. Lagoons are an important feeding area for special-status birds including bald eagles. Lagoons would support mosquitoes in areas of reduced circulation, often associated with emergent vegetation. Physical control in lagoons would include reconnecting isolated areas to the main lagoon. The BMPs in Table 5-3 especially regulatory agency consultation and BMP G3, would be applied to avoid or minimize impacts to environmental resources. With implementation of these BMPs, the effects of the Physical Control Alternative on resources within the lagoon would be less than significant.

5.2.4.1.13 Tidal Marsh and Channels

Tidal marsh and tidal channel habitats occur along the margins of San Francisco, San Pablo, and Suisun bays and are subject to tidal action.

They are typically bounded by levees and water control structures. The San Francisco Bay-Delta once supported vast tracts of freshwater, brackish, and saline marsh habitat. The vast majority of these marsh habitats have been converted to human uses such as farming, industrial uses, and urban development. Some of the remaining marsh lands are maintained and operated to provide habitat for wildlife or as private or public duck clubs. These wetlands can be important sources of mosquitoes seasonally.

Physical measures to control mosquitoes in these areas include maintenance of ditches and water control structures, removal of debris and weeds, clearance of brush for access to areas to be treated, and filling of nonfunctional water circulation ditches. Other measures include retaining water on the surface of the area, and rotational impoundment monitoring, which reduces mosquito populations by increasing the frequency with which suitable habitats are inundated and drained. The District advises landowners and property managers that these actions may require discussion with CDFW, NOAA Fisheries, or the USFWS and that these agencies should be contacted before work is initiated. Although the district has not conducted this type of work in recent years it may in the future.

These physical control activities would be subject to the BMPs described in Table 5-3, relating to resource agency communication, environmental training, and pretreatment screening. The tidal marsh specific BMPs would also be employed including conducting this work during appropriate seasons and times of day (e.g., when the tide is out and when Ridgeway's rail, California black rail, San Pablo song sparrow, saltmarsh common yellow throat, salt marsh harvest mouse and other special-status species are not nesting), making sure staff have appropriate training when working in the marsh, and minimizing the use of mechanical equipment where practical. Channels that have substantial tidal flow and inundation would not support mosquitoes and, thus, would not need to be maintained. The disturbance associated with the Physical Control Alternative would be short term and temporary and with resource agency communication

and the implementation of the BMPs described in Table 5-3 would not substantially affect special-status species.

5.2.4.1.14 Water and Wastewater Management Facilities

Wastewater treatment facilities may provide nesting habitat for special-status avian species since such facilities may lie close to suitable habitats in streams or the San Francisco Bay Delta system. The extent to which these species may enter these facilities is unknown. Because of the limited number of such facilities, the limited use of such facilities by special-status species, and the application of the BMPs described in Table 5-3, physical control measures are not anticipated to substantially affect avian species. Maintenance activities could result in the short term disturbance of special status animals due to human presence and the noise associated with the activity. This disturbance is only anticipated to last a few hours. Animals may move away from the disturbance while it was ongoing, but would likely return to the area shortly after the activity ceases. Such work would be conducted outside of bird nesting season, wherever practical. If work needed to be done during the nesting season, nest surveys would be conducted prior to initiating work, and suitable buffers would be established around any active nests while performing the work.

Septic systems and their associated leach fields may provide habitat for special status avian species associated with riparian and emergent vegetation as indicated in Table 4-4, under freshwater marsh/seeps and riparian forest, although their presence would be dependent on suitable vegetation and other habitat conditions, generally not associated with septic systems.

Industrial waste ponds generally contain waste from industrial processes and wash water from cleaning equipment. These ponds generally do not provide suitable habitat for special status species, as they are highly managed and often suffer low water quality. The County Department of Environmental Management and, in some cases, the RWQCB controls the management of these ponds. The District provides input relating to controlling mosquitoes and other vectors associated with the ponds and industrial operations. Physical control is not typically undertaken in industrial waste ponds, although it is possible that it could be required under unusual circumstances. Because of the poor quality habitat provided and because physical control activities would rarely be conducted in these waste ponds, little likelihood of impacts to special status species exists.

Flood control channels and ditches may support special-status species where they have suitable physical and vegetative structure. Physical management activities would be designed to reduce ponding of water within these areas. The application of the BMPs in Table 5-3, particularly those pertaining to resource agency communication, pretreatment screening, and environmental training, will avoid impacts to any special status species that might occur in these habitats.

5.2.4.1.15 Artificial Containers, Temporary Standing Waters and Ornamental Ponds

Artificial containers do not provide habitat for special status terrestrial species. Thus, physical control of artificial containers (ensuring that these containers do not hold water for a sufficient period to support mosquito larvae or provide harborage to other vector organisms) would have no impact on these species or their habitat.

Temporary standing waters refers to water ponding on an upland habitat because of rainfall or irrigation for a period of two weeks or less which is insufficient to provide habitat for most species including seasonal wetland and vernal pool species.

Ornamental ponds are small ponds with artificial bottoms. These ponds do not provide habitat for special status aquatic or terrestrial species.

5.2.4.1.16 Impacts Determinations for Special Status Species and Habitats

Impact TR-7. The Physical Control Alternative, with the BMPs identified in Table 5-3, would have a **less-than-significant** impact either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special status No mitigation is required.

Impact TR-8. The Physical Control Alternative, with the BMPs identified in Table 5-3, would have a **less-than-significant** impact on any riparian habitat or other sensitive natural community. No mitigation is required.

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

5.2.4.2 Effects on Movement and Migration

Physical changes in the habitat would result that have the potential to affect wildlife migration. However, these changes would tend to enhance migration, opening routes, not closing them. Furthermore, this effect would occur within restricted areas and would not substantially alter migratory pathways or success. Additional disruption of migration patterns may occur due to the presence of personnel and machinery in the environment. In all cases this occurrence would be short term, generally not more than a few days in any given location and, therefore, this effect would be minimal and would have little effect on the movement of wildlife.

Impact TR-10. The Physical Control Alternative would have a **less-than-significant impact** on the movement of any native resident or migratory fish or wildlife species. Nor would it impact any native resident or migratory wildlife corridors or impede the use of native wildlife nursery sites. No mitigation is required.

5.2.4.3 Conflict with Local Policies

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

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

5.2.4.4 Conflict with Conservation Plans

HCPs or NCCPs identified within Contra Costa County, the primary Service Area are identified in Table 4-5. District activities are typically not among those covered by these HCPs. When performing work, the District would operate in compliance with their practices and permits, including compliance with all active HCP/NCCPs. The District regularly communicates with and works collaboratively with representatives from resource agencies such as RWQCB, USEPA, USACE, CDFW, and USFWS. The District receives training from resource agency staff and professional biologists (e.g., CDFW, USFWS) to minimize impacts and conducts annual field training for field staff regarding precautionary and avoidance measures related to sensitive habitats (e.g., vernal pools) and associated special status species. Therefore, the District activities would not be inconsistent with the provisions of any HCP, NCCP or other approved local, regional, or state approved conservation plan.

Impact TR-12. The Physical Control Alternative would have a **less-than-significant** impact on any adopted HCP, NCCP, or other approved local, regional or state habitat conservation plan. No mitigation is required.

5.2.5 Vegetation Management Alternative

The District performs vegetation management to facilitate access to vector habitat, improve efficiency and effectiveness of mosquito control operations, and as a source reduction measure. For projects that result in materials (including plant materials, soils or sediments, or herbicides) entering the water or that occur in sensitive wetland habitat, permits may be required from the USACE, RWQCB, CDFW, USFWS, NOAA Fisheries, BCDC, and others. Work would not begin until all required permits are obtained. The District uses hand tools (e.g., shovels, pruners, chainsaws, and weed-whackers) and heavy equipment where necessary for vegetation removal or thinning and sometimes applies herbicides to improve surveillance or reduce vector habitats. These activities primarily occur in or adjacent to aquatic habitats to assist with the control of mosquitoes. Vegetation management in upland habitats would be restricted to providing access to surveillance and treatment areas through patches of dense vegetation, or in those rare cases when larger equipment is needed for physical vegetation removal. The District may also perform vegetation management to assist other agencies and landowners with the management of invasive/nonnative vegetation. These actions are typically performed under the direction of the concerned agency, which also maintains any required permits.

5.2.5.1 Physical Vegetation Management

Nonherbicide or physical vegetation removal actions may involve reducing standing vegetation using equipment. The use of weed-whackers, small chainsaws, pruners, or shovels may lead to physical injury of terrestrial plants and animals in the treatment area. Manual removal is the primary method of vegetation removal and would not be anticipated to affect substantial patches of vegetation in the affected area. Skid steers are typically used at a small number of sites to mow access paths in dense stands of cattails in seasonal wetlands and retention basins and, infrequently, in riparian habitat to mow access paths through dense stands of blackberry and poison oak to facilitate surveillance and the application of larvicides. This work is typically done in the fall to minimize potential impacts to special-status species by avoiding the breeding season for birds and other species. The District will ensure that all required permits are in place before vegetation management activities are undertaken. Short-term (a few days to a week) increases in noise could result from the operation of heavy equipment under this alternative. The District is in communication with resource agencies prior to performing this type of work.

Use of heavy equipment for vegetation management could affect larger areas but would not affect a large enough area to change the quality or functionality of the habitat for nontarget species. Areas of vegetation managed with heavy equipment would generally not be larger than a few acres. The District applies BMPs F1 through F11 from Table 5-3 to reduce these impacts by (1) identifying sensitive species locations, if any, in the treatment area prior to commencing any vegetation removal actions, and (2) limiting the extent of heavy equipment use to minimize the area affected (Section 2.9.2). If work is being conducted in tidal marshes, the BMPs specific to tidal marshes (B1 through B6), and those for salt marsh harvest mouse (C1 through C8), Ridgeway's rail (D1 through D8), and soft birds' beak (E1 through E4) would also be implemented. The potential impact on wildlife would be minimal at most, as the animals would be expected to return to their selected habitats within a few hours after the cessation of the noise sources for most of the physical application techniques the District currently uses.

5.2.5.2 Herbicides

The District may use herbicides to control vegetation in and around mosquito habitats to improve surveillance and reduce suitable mosquito habitats. The herbicides the District uses are discussed in detail in Appendix B and are listed in Table 5-4.

Table 5-4 Herbicide Control Options for Mosquito Abatement as Discussed in Appendix B

Active Ingredient	Appendix B
Glyphosate	Section 4.6.2
2,4-D	Section 4.6.4

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

Certain herbicides are nonselective and broad-spectrum (e.g., imazapyr, sulfometuron methyl, DCPA, metolachlor), while others are selective for certain plants (e.g., 2,4-D, bentazon, oryzalin, dithiopyr, pendimethalin). Herbicides function by inhibiting growth but do so in a multitude of ways. For example, sulfometuron methyl retards or stops root and shoot development; oryzalin inhibits cell division during seed germination; and 2,4-D increases cell-wall plasticity, biosynthesis of proteins, and the production of ethylene, resulting in uncontrolled cell division and growth that damages vascular tissue (USEPA 2005). Most of the herbicides are moderately persistent in soil and water (for each herbicide's half-life in soil and water, please refer to Appendix B).

Almost all of the herbicides the District uses exhibit low or no toxicity to mammals, birds, and terrestrial invertebrates. For detailed toxicity information see Appendix B. In addition, BMPs are applied to minimize the impact of herbicide use on nontarget terrestrial plants, including special-status plants. In particular, Districts take action to minimize drift of sprays to nontarget areas by carefully considering weather variables such as wind velocity and direction and chance of precipitation.

The herbicides that were identified for further evaluation (glyphosate, diuron, and benfluralin) in Appendix B are discussed in further detail below.

5.2.5.2.1 Glyphosate

The District may use glyphosate on a limited, infrequent basis for vegetation management in vector habitats and for site access. Although some recent concerns have been expressed about possible sublethal effects of glyphosate products (e.g., endocrine disruption in humans, see Chapter 7, Section 7.2.5.1), it is virtually nontoxic to mammals and practically nontoxic to birds, fish, and invertebrates on an acute basis. Claims that glyphosate is destroying bee and butterfly populations have not been substantiated. The use of glyphosate to control milkweed, which is a severe problem for farmers, but a host plant for some species of butterfly, may be connected to loss of foraging vegetation and, thereby, indirectly impacting butterfly populations. However, this effect is an indirect effect and glyphosate is not actually toxicity to the butterflies. With BMPs and targeted application techniques, glyphosate can be used safely when an adequate buffer (>15 feet) to water sources is maintained or when a formulation specifically designed for use in aquatic environments (e.g., Aquamaster) is used. In terrestrial systems, glyphosate is immobile and breaks down relatively quickly via microbial processes. Some reports of sub-lethal effects on disease resistance, biological diversity, enzyme activity, and increased use of genetically engineered foods are interesting but without clear mechanisms that can be related directly to glyphosate (Gertsberg, 2011).

When herbicide application BMPs are applied, the potential impact of glyphosate on special status species or other nontarget plants is greatly reduced. The District also makes every effort to minimize treatments that could affect milkweed, a plant important to Monarch butterfly populations. These BMPs include using targeted, small-scale treatments and taking actions to minimize drift and runoff post-application.

5.2.5.3 Adjuvants

An adjuvant is any compound that is added to an herbicide (or pesticide) formulation or tank mix to facilitate the mixing, application, or effectiveness of that herbicide. Adjuvants can either enhance activity of an herbicide's active ingredient (activator adjuvant) or offset any problems associated with spray application, such as adverse water quality or wind (special purpose or utility modifiers). Activator adjuvants include surfactants, wetting agents, sticker-spreaders, and penetrants. The environmental fate and toxicity of adjuvants the District may use are described in detail in Appendix B and listed in Table 5-5. A subset of the adjuvants available for District use was identified for further examination based upon historical use patterns and toxicity (Appendix B, Table 1-1).

Table 5-5 Adjuvants Employed for Insect/Weed Abatement as Discussed in Appendix B

Active Ingredient	Appendix B
APEs	Section 4.7.1
Polydimethylsiloxane Fluids	Section 4.7.2
Modified Plant Oil/Methylated Seed Oil	Section 4.7.3
Lecithins	Section 4.7.4

Alkylphenol ethoxylates (APEs) include a broad range of chemicals that tend to bind strongly to particulates and persist in sediments. Nonylphenol and short-chain nonylphenol ethoxylates are moderately bioaccumulative and extremely toxic to aquatic organisms. Aside from use in agricultural herbicide mixtures, APEs are commonly present in detergents, cleaners, food packaging, and cosmetics. The acute toxicity of APEs to mammals is low. Some think they may be possible estrogen-mimics. Although these chemicals have been used in numerous common household products (generally regulated by the FDA), the USEPA has recently recommended that this suite of chemicals be evaluated further due to their widespread use (past and present). Current information about APEs is based on FDA evaluations; regardless, USEPA has speculated that they may pose risk to nontarget terrestrial organisms (USEPA 2010). However, this speculation has not been substantiated; and given the limited use of herbicides by the District, in general, and the application of BMPs, the District's use of herbicides with APEs would not be expected to cause any substantive harm to the environment.

Polydimethylsiloxanes are insoluble in water and typically sorb to particulates. Degradation time varies depending on moisture in soils. These chemicals appear to be relatively nontoxic to most organisms, but data are lacking. Although toxicity and environmental fate information for these products is limited, the District's use of application BMPs to reduce the transfer of polydimethylsiloxanes to nontarget areas (i.e., targeted applications), would minimize unwanted adverse effects.

Plant derived oils are of two types: triglycerides or methylated seed oils. Triglycerides are essentially oil-surfactant hybrids, and are generally called seed oils. Modified plant oils and methylated seed oils are essentially nontoxic to most organisms, including plants. Although toxicity and environmental fate information for these oils is scarce, using current BMP application techniques to reduce the transfer of modified vegetative oils to nontarget areas post-application (i.e., targeted applications) and based on their other approved uses, these products should not result in unwanted adverse effects to nontarget terrestrial organisms.

Little is known about the toxicity or environmental fate of lecithins. Lecithins are naturally occurring phospholipids in biological cell membranes (Bakke 2007). Although toxicity and environmental fate information for these products is limited, using application BMPs including application at the lowest effective concentration for a specific set of vectors and environmental conditions, use of lecithins should not result in unwanted adverse effects to nontarget terrestrial organisms.

5.2.5.4 Impacts to Special Status Species and Habitats

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

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

5.2.5.4.1 Coniferous Forest

The general lack of surface water in coniferous forests (dominated by cone-bearing trees with needles, which include pines, firs and redwoods, and excluding treeholes) usually does not facilitate the appropriate habitat to support mosquitoes and, therefore, vegetation management would not be conducted in this habitat. However, access routes may be needed through this habitat to reach areas that do support mosquito and vector breeding habitat. This access would generally be via existing access routes, but may require some vegetation removal along the route. This habitat does support a variety of special-status species as well as special-status plants. This access activity would be done in coordination with landowners or land managers and resource agencies, as well as following the BMPs described in Table 5-3 relating to environmental training, pretreatment screening, disturbance minimization, avian nesting season, habitat and species-specific BMPs, and applicable vegetation management-specific BMPs (F1 through F11). This activity would result in less-than-significant impacts to special status species associated with coniferous forest habitat from the Vegetation Management Alternative.

5.2.5.4.2 Deciduous Forest

The general lack of standing surface water in deciduous forests (dominated by trees that drop leaves annually including buckeyes, some oaks and maples) usually does not facilitate the appropriate habitat to support mosquitoes except for treeholes and, therefore, vegetation management activity would not be conducted in this habitat. However, access routes may be needed through this habitat to reach areas that do support mosquito and vector breeding habitat. This access would generally be via existing access routes, but may require some vegetation removal along the route. This habitat does support a variety of special-status as well as special-status plants. This access activity would be done in coordination with landowners or land managers and resource agencies, as well as following the BMPs described in Table 5-3 relating to environmental training, pretreatment screening, disturbance minimization, avian nesting season, habitat and species-specific BMPs, and vegetation management -specific BMPs. This activity would result in less-than-significant impacts to special-status species associated with deciduous forest from the Vegetation Management Alternative.

5.2.5.4.3 Shrublands

The general lack of standing surface water in shrublands (dense to moderate stands of coyote brush, ceanothus, poison oak, sage, sagebrush, chamise and diverse other shrubs with grassy openings) usually does not facilitate the appropriate habitat to support mosquitoes and, therefore, vegetation management would not be conducted in this habitat. However, access routes may be needed through this habitat to reach areas that do support mosquito and vector breeding habitat. This access would generally be via existing access routes, but may require some vegetation removal along the route. This habitat does support a variety of special-status as special-status plants. This activity would be done in coordination with landowners or land managers and resource agencies, as well as following the BMPs described in Table 5-3 relating to

environmental training, pretreatment screening, disturbance minimization, avian nesting season, habitat and species-specific BMPs, and Vegetation Management Alternative specific BMPs. This activity would result in less-than-significant impacts to special-status species associated with shrublands habitat from the vegetation management alternative.

5.2.5.4.4 Grasslands

The general lack of standing surface water in grasslands (grasslands dominated by annual grasses, with varying amounts of native perennials) usually does not facilitate the appropriate habitat to support mosquitoes and, therefore, vegetation management would not be conducted in this habitat. However, access routes may be needed through this habitat to reach areas that do support mosquito and vector breeding habitat. This access would generally be via existing access routes, but may require some vegetation removal along the route. This habitat does support a variety of special-status species as well as special-status plants. This access activity would be done in coordination with landowners or land managers and resource agencies, as well as following the BMPs described in Table 5-3 relating to environmental training, pretreatment screening, disturbance minimization, avian nesting season, habitat and species-specific BMPs, and vegetation management-specific BMPs. This activity would result in less-than-significant impacts to special status species associated with grassland habitat from the Vegetation Management Alternative.

5.2.5.4.5 Serpentine

The general lack of standing surface water in serpentine soils (shrublands and grasslands on serpentine soils and rock) usually does not facilitate the appropriate habitat to support mosquitoes and, therefore, vegetation management would not be conducted in this habitat. However, access routes may be needed through this habitat to reach areas that do support mosquito and vector breeding habitat. This access would generally be via existing access routes, but may require some vegetation removal along the route. This habitat does support a variety of special-status as well as an abundance of special status. This access activity would be done in coordination with landowners or land managers and resource agencies, as well as following the BMPs described in Table 5-3 relating to environmental training, pretreatment screening, disturbance minimization, avian nesting season, habitat and species-specific BMPs, and vegetation management-specific BMPs. This activity would result in less-than-significant impacts to special status species associated with serpentine soils and outcroppings habitat from the Vegetation Management Alternative.

5.2.5.4.6 Coastal Dunes

The general lack of standing surface water in coastal dunes (sandy soils with some active sand movement that supports low stands of diverse native perennials and beach grass) usually does not facilitate the appropriate habitat to support mosquitoes and, therefore, vegetation management would not be conducted in this habitat. However, access routes may be needed through this habitat to reach areas that do support mosquito and vector breeding habitat. This access would generally be via existing access routes, but may require some vegetation removal along the route. This habitat does support a variety of special-status as well as special-status. This activity would be done in coordination with landowners or land managers and resource agencies, as well as following the BMPs described in Table 5-3 relating to environmental training, pretreatment screening, disturbance minimization, avian nesting season, habitat and species-specific BMPs, and vegetation management-specific BMPs. This activity would result in less-than-significant impacts to special-status species associated with coastal dunes habitat from the Vegetation Management Alternative.

5.2.5.4.7 Treeholes

Standing water in treeholes (cavities in branches and trunks of live trees or snags that may provide habitat for a variety of species) may facilitate the appropriate habitat to support mosquitoes. Treeholes

support a variety of special-status species including purple martin and a variety of cavity nesting avian species including owls (afforded protection under USFWS and DCFW), and western red bat, pallid bat, and other bat species. Vegetation management activities primarily involves minor hand trimming to allow access for monitoring, physical control (e.g., use of an absorbant material, see Section 5.2.4.1.7), and sometimes hand chemical treatment (e.g. methoprene pellets) of those treeholes that are less than 12 feet above ground level and typically in trees that are not on steep slopes and other difficult to access areas. Management of treehole breeding mosquitoes using the physical and vegetation management alternatives is very limited as many of the trees with treeholes are in areas of steep terrain that is not easily or safely accessible. Vegetation management that is performed would be done in coordination with landowners or land mangers and resource agencies, as well as following the BMPs described in table 5-3. Therefore, less than significant impacts would occur to special status species associated with treeholes from the Vegetation Management Alternative.

5.2.5.4.8 Creeks and Rivers and Riparian Corridors

Because their rapid currents do not provide suitable habitat for mosquitoes, creeks and rivers generally do not support substantial numbers of mosquitoes, although, some mosquitoes can be found in slow eddies and back channels, or in pools isolated on the banks as flows recede. Creeks and rivers and the surrounding riparian forest may support special-status as well as special-status plants, as indicated in Tables 4-3 and 4-4. Vegetation that requires management would typically be confined to channel margins and backwaters with slow currents. This management activity would be done in coordination with landowners or land managers and resource agencies, as well as following the BMPs described in Table 5-3 relating to environmental training, pretreatment screening, disturbance minimization, avian nesting season, habitat and species-specific BMPs, and vegetation management -specific BMPs. This activity would result in less-than-significant impacts to special-status species associated with creeks, rivers, streams and the associated riparian forests.

5.2.5.4.9 Ponds and Lakes

The freshwater habitats that could be treated include the margin of reservoirs and ponds (including artificial ponds such as golf course ponds or stock ponds with natural bottoms). These areas are generally man-made habitats, and they may support special-status terrestrial species such as yellow-headed blackbird and additional avian species (afforded protection under USFWS and CDFW), as well as special-status plants on the margins.

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

This potential impact would be avoided and/or minimized by the BMPs in Table 5-3 relating to resource agency communication, environmental training, and pretreatment screening. Vegetation management-specific BMPs will be applied. Furthermore, work conducted will, whenever possible, be conducted during approved “in water” work periods for that habitat, considering the species likely to bepresent. With these BMPs implemented, the effects of vegetation management on ponds and lakes would be less than significant.

5.2.5.4.10 Freshwater Marsh/Seeps

Freshwater marsh and seeps may provide ideal habitat for mosquito breeding due to their substantial areas of shallow water, limited circulation and emergent vegetation. These areas may potentially support a number of special status terrestrial plants and animals as indicated in Tables 4-3 and 4-4. Vegetation management in these areas would have the same potential effects as described for lake and pond habitats and would be avoided and/or minimized by the BMPs in Table 5-3 relating to resource agency communication, environmental training, and pretreatment screening. Furthermore, work conducted will, whenever possible, be conducted during approved "in water" work periods for that habitat, considering the species likely to be present. With these BMPs implemented, the effects of vegetation management on freshwater marsh and seeps would be less than significant.

5.2.5.4.11 Seasonal Wetlands (includes Vernal Pools)

Seasonal wetlands (defined in Section 5.2.4.1.11), including vernal pools, may also support substantial stands of emergent vegetation, although these areas are typically not inundated for long enough periods to support dense stands of vegetation preferred by mosquitoes. As a result, these areas are unlikely to be subject to vegetation management actions. Seasonal wetlands may support special-status as well as special-status plants, as indicated in Tables 4-3 and 4-4. While the District would not operate equipment including ATVs within vernal pools, the District may cross hydrological connections (i.e., swales) between vernal pools when necessary and with permission from regulatory agencies. The District regularly communicates with and works collaboratively with representatives from agencies such as RWQCB, USEPA, USACE, CDFW, and USFWS. The District receives environmental awareness training from resource agency staff and professional biologists (e.g., CDFW, USFWS) to minimize impacts and conducts annual field training for field staff regarding precautionary and avoidance measures related to sensitive habitats (e.g., vernal pools) and associated special status species.

The Vegetation Management Alternative would not result in the direct removal, filling, or hydrological interruption of federally protected wetlands as defined by CWA Section 404 (including, but not limited to, marsh, vernal pool, coastal, etc.). It may result in the removal of minor amounts of vegetation in these areas. All work in wetlands would be subject to additional permitting by the USACE, USFWS, CDFW, BCDC, RWQCB, and others.

If vegetation management activities are required, potential effects would be avoided and/or minimized by the BMPs in Table 5-3 relating to resource agency communication, environmental training, and pretreatment screening. Vegetation management-specific BMPs would be applied. With these BMPs implemented, the effects of vegetation management on seasonal wetlands would be less-than-significant.

5.2.5.4.12 Lagoon

Lagoons would support mosquitoes in areas of reduced circulation, often associated with emergent vegetation, supporting a number of special-status species as identified in Tables 4-3 and 4-4, including many of the marsh and riparian species listed previously. Vegetation management in lagoons would be subject to the BMPs in Table 5-3 to avoid or minimize impacts to environmental resources. With these BMPs, the effects of the Vegetation Management Alternative on biological resources within lagoons would be less-than-significant.

5.2.5.4.13 Tidal Marsh and Channels

Vegetation management activities are conducted in coordination with landowners or land managers and the resource agencies and generally focus on the removal of nondesired species. Tidal marshes may support a number of special status plants (Table 4-3), and animals (Table 4-4). Vegetation removal in tidal marshes is done in accordance with the BMPs identified in Table 5-3, relating to resource agency coordination, environmental training, pretreatment screening, disturbance minimization BMPs, as well as Vegetation Management Alternative, tidal marsh and the species-specific BMPs. With these BMPs, the effects of the

Vegetation Management Alternative on biological resources within tidal marshes would be less-than-significant.

5.2.5.4.14 Water and Wastewater Management Facilities

Vegetation management activities may occur in coordination with the owners or operators of wastewater treatment facilities or septic systems. These facilities may provide nesting habitat for special-status avian species such as short eared owl and northern harrier hawk since such facilities may lie close to suitable habitats in streams or the San Francisco Bay Delta system. The extent to which these species may enter these facilities is unknown. Septic systems and their associated leach fields may provide habitat for special status avian species, particularly those that nest in riparian or emergent vegetation. Because of the limited number of such facilities and the very limited use of such facilities by special_status species, vegetation management measures would have a less-than-significant impact on terrestrial special_status species and would be minimized with the implementation of the BMPs in Table 5-3.

5.2.5.4.15 Artificial Containers, Temporary Standing Waters, and Ornamental Ponds

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

Temporary standing waters refer to water ponding on an upland habitat because of rainfall or irrigation. Temporary standing waters contain water for short periods of time, i.e., less than two weeks, which would preclude those waters from being suitable habitat for most species, including seasonal wetland and vernal pool species.

Ornamental ponds are small ponds with artificial bottoms. These habitats do not provide habitat for special status aquatic or terrestrial species. Therefore, no impact would occur to special status species from the vegetation management alternative in these habitats.

5.2.5.4.16 Impact Determinations for Special Status Species and Habitats

Impact TR-13. The Vegetation Management Alternative, with the BMPs identified in Table 5-3, would have a **less-than-significant** impact either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special status species No mitigation is required.

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

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

5.2.5.4.17 Effects on Movement and Migration

This alternative could have a small effect on the migration of wildlife and movement and migration corridors. The removal of small areas of vegetation would not substantially affect movement corridors, but the presence of personnel and equipment may result in short-term avoidance of active work areas. In all cases this occurrence would be short term, generally not more than a few days in any given location. Work that may be performed would be conducted in coordination with landowners and/or managers and resource agencies, and all necessary permits would be required before work was implemented. Therefore, this effect would be minimal and would have little impact on the movement of wildlife, wildlife migration corridors, or nursery areas, as little to no physical disturbance would occur.

Impact TR-16. The Vegetation Management Alternative would have a **less-than-significant impact** on the movement of any native resident or migratory fish or wildlife species. Nor would it impact any native resident or migratory wildlife corridors or impede the use of native wildlife nursery sites. No mitigation is required.

5.2.5.4.18 Conflict with Local Policies

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

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

5.2.5.4.19 Conflict with Conservation Plans

HCPs or NCCPs identified within Contra Costa County, the primary Service Area are identified in Table 4-5. District activities are typically not among those covered by these HCPs. When performing work, the District would operate in compliance with their practices and permits, including compliance with all active HCP/NCCPs. The District regularly communicates with and works collaboratively with representatives from resource agencies such as RWQCB, USEPA, USACE, CDFW, and USFWS. The District receives training from resource agency staff and professional biologists (e.g., CDFW, USFWS) to minimize impacts and conducts annual field training for field staff regarding precautionary and avoidance measures related to sensitive habitats (e.g., vernal pools) and associated special status species. Therefore, the District activities would not be inconsistent with the provisions of any HCP, NCCP or other approved local, regional, or state approved conservation plan.

Impact TR-18. The Vegetation Management Alternative would have a **less-less-than** significant impact on any adopted HCP, NCCP, or other approved local, regional or state habitat conservation plan. No mitigation is required..

5.2.6 Biological Control Alternative

Biological control of vectors involves the intentional use of vector pathogens, parasites, and predators to reduce the vector population. Its emphasis, as it currently exists in the District's IMVMP, is on the use of mosquitofish to control immature mosquitoes in waterbodies that are not connected to natural waterbodies such as ornamental ponds and artificial containers. Currently, no commercial biological control agents or products are available for wasp, yellow jacket, tick, and rodent control. The District does not employ predators (e.g., cats) for rodent control.

5.2.6.1 Mosquito Larvae Pathogens

As part of its Biological Control Alternative, the District employs bacterial larvicides that are highly specific to mosquitoes. These biological control agents include Bs, a live bacterial pathogen of mosquitoes; Bti spores and protein crystals, which are nonliving bacterial by-products that paralyze the gut of larval mosquitoes when ingested; and spinosyns (produced by the bacterium *Saacharopolyspora spinosa*) which affect the insect nervous system causing paralysis and death. Because Bs, Bti and spinosyns are EPA registered and regulated pesticides that can also be applied in a manner similar to chemical pesticides, these materials are evaluated in Section 5.2.7.1.1, Chemical Control Alternative. The environmental fate and toxicity of these control agents is discussed further in Appendix B.

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

Active Ingredient	Appendix B
Bs	Section 4.3.1
Bti	Section 4.3.2
Spinosad	Section 4.3.3

5.2.6.2 Mosquito Predators

Mosquitofish (*Gambusia affinis*) are presently the only commercially available mosquito predators. The District's rearing and stocking of these fish in mosquito habitats is the most commonly used biological control agent for mosquitoes in the world. Used correctly, this fish can provide safe, effective, and persistent suppression in various mosquito sources. However, due to concerns that mosquitofish may potentially impact red-legged frog and tiger salamander populations in natural water bodies, the District limits the use of mosquitofish to artificial water bodies such as ornamental fish ponds, water troughs, water gardens, fountains, and unused swimming pools. These artificial habitats are not included in HCPs/NCCPs.

5.2.6.2.1 Impacts to Special Status Species and Habitats

The use of mosquitofish in a given situation is given careful consideration with regard to the potential ecological consequences of such introductions. The District uses them in selected aquatic environments where they do not pose a threat to natural environments or native fish and amphibians and where they do not directly impact terrestrial habitats or species who would have access to other food sources. Although mosquitoes may serve as one of many types of prey items for some fish, avian insectivores, bats, and small reptiles and amphibians, the reduction of mosquito abundance by mosquitofish over a small area would not affect the predator populations overall, as other prey sources are available.

This alternative would not affect any natural habitats or result in more than a limited presence of District personnel or equipment in natural habitats. Therefore, it would not affect the quantity or distribution of habitats, such as riparian areas, marshes, lakes or ponds, seasonal wetlands, or habitat types. identified in local or regional plans, policies, regulations, or by the CDFW or USFWS. This alternative would not affect the composition of their vegetative communities. This alternative would not result in ground disturbing activity that would result in any removal, filling or hydrologic interruption of federally protected wetlands as defined by CWA Section 404 (including, but not limited to, marsh, vernal pool, coastal, etc.).

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

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

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

5.2.6.2.2 Effects on Movement and Migration

District use of mosquitofish would have no effect on the movement of wildlife and would not affect wildlife migration corridors or nursery areas.

Impact TR-22. The Biological Control Alternative would have **no impact** on the movement of any native resident or migratory fish or wildlife species. Nor would it impact any native resident or migratory wildlife corridors or impede the use of native wildlife nursery sites.

5.2.6.2.3 Conflict with Local Policies

The county and city general plans and their goals and policies pertaining to natural resources are protective of terrestrial resources and focused on conservation of existing resources. Biological control activity with mosquitofish would not result in the conversion of natural habitats to other land uses or in the long-term or permanent dislocation of plant and animal species from natural areas except indirectly for mosquitoes and vectors of disease and discomfort. This alternative would not affect trees and, therefore, would not conflict with any tree ordinances.

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

5.2.6.2.4 Conflict with Conservation Plans

HCPs or NCCPs identified within Contra Costa County, the primary Service Area are identified in Table 4-5. District activities are typically not among those covered by these HCPs. When performing work, the District would operate in compliance with their practices and permits, including compliance with all active HCP/NCCPs. The District regularly communicates with and works collaboratively with representatives from resource agencies such as RWQCB, USEPA, USACE, CDFW, and USFWS. The District receives training from resource agency staff and professional biologists (e.g., CDFW, USFWS) to minimize impacts and conducts annual field training for field staff regarding precautionary and avoidance measures related to sensitive habitats (e.g., vernal pools) and associated special status species. Therefore, the District activities would not be inconsistent with the provisions of any HCP, NCCP or other approved local, regional, or state approved conservation plan.

Impact TR-24. The Biological Control Alternative would have a **less-than-significant** impact on any adopted HCP, NCCP, or other approved local, regional or state habitat conservation plan.

5.2.7 Chemical Control Alternative

The Chemical Control Alternative would be primarily a continuation of existing activities using applicable techniques, equipment, vehicles, watercraft, and aircraft. Chemical control consists of the application of chemicals to directly reduce populations of vectors that pose a risk to public health. The majority of chemical control tools are used for mosquito abatement. As part of their IMVMP, 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. 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 at label rates allowed for ULV mosquito control.

The District also uses insecticides to control populations of ground-nesting yellow jackets. 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 County Agricultural Commissioner's Office for a referral list of beekeepers that will remove or relocate the bee swarm or hive.. If District technicians deem it appropriate to treat stinging insects, they would apply the insecticide directly within the nest to avoid drift or harm to other organisms. Alternatively, although very limited in effectiveness, District staff would 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 rodent management program is primarily limited to site inspections and the provision of advice to property owners and concerned citizens. The District's limited use of rodenticides is a result or surveillance or in response to the identification of high rodent populations as a result of citizen complaints. Abatement methods, outside of public education, focus primarily on the use of first and second generation rodenticides. 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.

The evaluation of each chemical option under the Chemical Control Alternative includes consideration of the HCPs and NCCPs that reflect important aspects of the selection of significance criteria and action thresholds. By focusing on the intent of the HCPs and NCCPs, the evaluation process identifies impacts that may rise to a level that is biologically significant. The environmental issues describe the mechanisms by which such impacts might occur and the species populations likely affected.

Chemical control is a Program tool that consists of the application of non-persistent insecticide products demonstrated to reduce populations of larval or adult mosquitoes and other problem vectors (e.g., yellow jacket wasps). If and when inspections reveal that mosquitoes or other vector populations are present at levels that trigger the District's guidelines for chemical control – based on the vector's abundance, density, species composition, proximity to human settlements, water temperature, presence of predators and other factors – staff will apply pesticides to the site in strict accordance with the pesticide label requirements and the BMPs summarized in Section 5.2.2.1 and listed in Table 5-3. The threshold guidelines for these response triggers are based on previous documentation and monitoring/current surveillance of likely vector outbreaks or expansions of vector populations. Additional response triggers are based on verified vector populations, outbreaks, discomfort and irritation issues for humans and animals, and public concern about vectors.

All chemicals the District uses (Tables 2-2 through 2-6 in Chapter 2) are applied in strict conformance with label requirements, which have been approved by the USEPA and CDPR for use in California when applied with strict adherence to product label requirements and additional BMPs listed in Table 5-3 (in particular, BMPs H1 through H14 and J2). Pesticide labels are legal requirements and include instructions telling users how to apply the product and precautions the applicator should take to protect human health and the environment. In addition, chemicals are applied in conformance with the PAP as required by the NPDES Vector Control Permit. With the application of these BMPs and adherence to label requirements, these chemicals would not result in adverse effects to nontarget terrestrial organisms.

Detailed discussions of the environmental fate and toxicity of these active ingredients are provided in Appendix B. A subset of the pesticides (Table 5-6) available for District use was identified for further examination based upon use patterns and toxicity (Appendix B, Table 1-1). The following discussion groups these chemicals based on their target organism or life stage and discusses these pesticides in reference to impacts to terrestrial nontarget organisms.

Table 5-7 Chemical Control Active Ingredients and Adjuvants Identified in Appendix B

Active Ingredient	Vector	Potential Issue
Methoprene	Mosquitoes	Prevalent use; toxicity to aquatics and insects
Etofenprox	Mosquitoes	Toxicity to aquatic organisms; no synergist required
Bti	Mosquitoes	Prevalent use; public concerns
Pyrethrins	Mosquitoes/yellow jacket wasps	Prevalent use; may have a synergist (PBO)
Resmethrin	Mosquitoes	Requires synergist (e.g., PBO); potential endocrine disruptor
Temephos	Mosquitoes	Organophosphate; broad-spectrum insecticide
Permethrin	Mosquitoes/ yellow jacket wasps	Toxicity to aquatic organisms; potential endocrine disruptor
Plant oils/mineral oils	Mosquitoes (surfactant)	Percentage of petroleum distillate
Bromadiolone	Rats	Toxicity to nontarget organisms including mammals, birds, aquatics
Diphacinone	Rats	Toxicity to nontarget organisms including mammals, birds, aquatics
Difethialone	Rats	Toxicity to nontarget organisms including mammals, birds, aquatics
APEs	Vegetation (adjuvant)	Toxicity to aquatic organisms; moderately bioaccumulative
Glyphosate	Vegetation	Prevalent use; possible endocrine disruptor

See Appendix B, Table 1-1

The District uses a variety of techniques and equipment to apply mosquito larvicides and adulticides, including hand-held sprayers, backpack sprayers and blowers, truck- or ATV-mounted spray rigs, watercraft, and helicopters or other aircraft. Equipment used in small ground applications of liquid formulations include hand-held sprayers (handcans or spray bottles), and backpack sprayers and blowers. Hand-held sprayers (handcans) are standard 1- or 2- or 3-gallon garden style pump-up sprayers used to treat very small isolated areas. Backpack sprayers are either hand pump-up or gas powered for liquid applications and have a 2.5- to 5-gallon tank. When large areas are simultaneously producing mosquito larvae at densities or in levels of abundance, exceeding District treatment guidelines, then the District may use helicopters or other aircraft to apply larvicides (and adulticides). Aerial application of larvicides is a relatively infrequent activity for the District with each application covering from approximately 20 to 1,200 acres. Aerial application by helicopter of liquid and granular larvicides typically occurs during daylight hours and at an altitude above the treatment site of approximately 50 feet or less.

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

wetlands; evaporation ponds and wastewater ponds; and agricultural, residential, commercial, industrial, and recreational areas.

5.2.7.1 Impacts to Special Status Species

The determination of impact significance follows the analyses of all of the chemical treatments for the control purposes: mosquito larvicides, mosquito adulticides, yellow jacket and tick abatement, and rodent abatement.

5.2.7.1.1 Mosquito Larvicides

As part of the Chemical Control Alternative, the District employs bacterial agents that are highly specific to mosquitoes. These controls include the active ingredients Bs (a live bacteria), and Bti and spinosad (bacterial by-products that are toxic to mosquitoes). Larvicides are used to manage immature life stages of mosquitoes (larvae) in aquatic and wetland habitats, as described previously. They are not applied in upland habitats, with the exception of temporary rainwater pools, seeps, and treeholes, where although unlikely, a small amount of spray drift may occur. These habitats may support special-status terrestrial species as indicated in Tables 4-3 and 4-4. The larvicides are applied using ground application equipment, fixed wing aircraft (in the future), and rotary-wing aircraft, as described in Chapter 2 and listed in Table 2-7. District criteria for selecting application methods are predicated upon access, efficiency and effectiveness of application, size of the area to be treated, and the density, abundance, and type of vegetation present at the application site (i.e., the likelihood of success in applying the material to the water of the target area). The potential impact of equipment noise on wildlife would be minimal, as the use of equipment is of short duration and the animals would return to their selected habitats within a few hours at most for application techniques the District currently uses.

The toxicity of Bs, Bti, spinosad, methoprene, temephos, and surfactants is discussed in detail in Appendix B and listed in Table 5-7. The District employs BMPs to reduce the relative potential impacts of these chemical alternatives to nontarget organisms as well as to applicators. Because Bs, Bti, and spinosad are applied to aquatic rather than terrestrial environments to control larval mosquitoes, the potential for exposure of terrestrial organisms is low, although some spray drift could occur.

Table 5-8 Chemical Control Options for Larval Mosquito Abatement as Discussed in Appendix B

Chemical Classification	Active Ingredient	Appendix B
Bacterial larvicide	Bs	Section 4.3.1
Bacterial larvicide	Bti	Section 4.3.2
Bacterial larvicide	Spinosad	Section 4.3.3
Hydrocarbon ester	Methoprene and s-Methoprene	Section 4.3.4
Organophosphate	Temephos	Section 4.2.2
Surfactant	Alcohol Ethoxylated Surfactant (monomolecular film)	Section 4.3.5
Surfactant	Aliphatic Solvent s (mineral oil, BVA-2)	Section 4.3.6
Surfactant	Plant-Derived Oil/Methylated Seed Oil(CoCoBear)	Section 4.7.3

Bacterial Larvicides (BS, Bti, spinosad)

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

Spinosad is a natural insecticide derived from the fermentation of a common soil microorganism, *Saacharopolyspora spinosa*. Spinosad causes neurologic effects in insects consistent with the general activation of nicotinic acetylcholine receptors, but by a mechanism that is novel among known insecticides (Mayes et al. 2003). Exposure manifests as constant involuntary nervous system impacts ultimately leading to paralysis and death of the insect. Spinosad is highly effective against *lepidopteron* larvae (e.g., butterflies and moths), as well as some *Diptera* (mosquitoes and flies), *Coleoptera* (beetles), Thysanoptera (thrips), and *Hymenoptera* (e.g., bees, wasps) (Mayes et al. 2003). The effects of spinosad on beneficial pollinators such as honeybees are of concern. The District incorporates BMPs that are designed to minimize exposure of bees to spinosad, such as restricting applications to nighttime hours when bees are inactive, covering hives where possible with wet burlap and maintaining buffer zones. Bees and other nontarget insects may contact spinosad residues following applications; however, residues generally are below acute toxicity thresholds to honeybees. Field studies evaluating typical spinosad applications have demonstrated low risk to adult honeybees and little to no effect on hive activity and brood development, provided that the spray residue is allowed to dry for up to 3 hours (Mayes et al. 2003).

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

Hydrocarbon Esters (Methoprene)

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

Methoprene is used as a larvicide and, as such, is not applied to terrestrial environments. Some drift into terrestrial environments may occur when it is applied, but it is almost irrelevant for hand and aerial (e.g., helicopter) applications since treatments are restricted at moderate to high wind speeds. Methoprene is considered one of the more environmentally compatible larvicide options, and the District uses methoprene prevalently during each season of the year. Methoprene is highly effective against mosquitoes at low concentrations (very low volume applications are used when possible) and degrades quickly in the environment, thereby reducing the potential exposure and risk to nontarget organisms. The District applies liquid methoprene to vernal pools infrequently, using Bti products instead and wherever possible. Methoprene may be applied when mosquito populations are abundant in the pools and when mosquitoes have reached the later stages of development (when Bti is less effective). Methoprene may be applied when feasible and when requested by a regulatory agency. The District typically uses Bti and Bs in these environments,. Extended release methoprene products would typically not be used in vernal pool habitats.

Methoprene has high toxicity to nontarget insects such as moths, butterflies, and beetles, but only at much higher concentrations than those used for mosquito control; however, most species of moths, butterflies, and beetles do not occupy aquatic habitats and so would have very limited exposure.

Organophosphate Insecticides

Organophosphates (OPs) are a class of chemicals that kill insects by interfering with their production of the acetylcholinestarase enzyme, resulting in nervous and respiratory system damage. Temephos is the

only OP with larvicidal use and may be used to help manage mosquito resistance to the bacterial larvicides. Temephos is only used in artificial containers (e.g. tire piles, cemetary urns) and infrequently in accessible treeholes. Temephos has extremely low water solubility and binds strongly to soils. It is moderately acutely toxic to mammals and fish, but highly toxic to nontarget aquatic invertebrates (e.g., stoneflies, mayflies). Temephos is applied following label requirements and at low concentrations. It is not expected to have direct impact on terrestrial animals and the use of temephos has declined over time in favor of bacterial larvicides, methoprene, and surface oils (USEPA 2000). Temephos will be phased out after 2015.

Surfactants (Alcohol Ethoxylated Surfactant, Aliphatic Solvents, Plant-Derived Oils)

Surfactants (alcohol ethoxylated surfactants, aliphatic solvents, and plant derived oils) work by making it difficult for mosquito larvae and pupae to attach to the water's surface, causing them to drown. Surfactants affect only the uppermost layer of the water. The use of these materials is employed only when absolutely necessary to prevent emergence of adult mosquito populations and is also a least preferred method for mosquito management. Surfactant applications may also be effective against adult mosquitoes during adult emergence. These treatments are specific to aquatic environments and are not applied to terrestrial environments, although some drift may occur. The toxicity of these materials is discussed more thoroughly in Appendix B and summarized in Table 6-1, Appendix B.

Alcohol ethoxylated surfactants (monomolecular films) could result in reductions to populations of surface-breathing insects (other than mosquitoes) during treatment; however, it is unlikely that these reductions would result in lasting or observable effects on nontarget organisms when applied within product label limits. Monomolecular films are not environmentally persistent and typically degrade within 21 days. In addition, populations recover quickly following recolonization from adjacent and neighboring sites and habitats. The alcohol ethoxylated surface film used historically as a surfactant in California for mosquito control was Agnique. This material is no longer registered for use in California and there are currently no other alcohol ethoxylated surfactants commercially available for mosquito control at this time.

Aliphatic solvents (e.g. mineral oils) are the product of petroleum distillation and, thus, are complex mixtures of long-chain aliphatic compounds. Aliphatic solvents are often used when monomolecular films (alcohol ethoxylated surfactants) are not available or do not provide sufficient mosquito control. They also break down more rapidly (2 to 3 days) and are practically nontoxic to most nontarget organisms. Therefore, mineral oil should not result in adverse ecological effects when applied using District BMPs.

Plant-derived oils, whether vegetable or fruit, can be used for the management of vectors, especially immature mosquitoes. Plant-derived oils are generally of two types: triglycerides or methylated oils. CocoBear Mosquito Larvicide Oil is the only plant-based oil that is currently available for use in the District's Program (also see Section 4.3.6.4 in Appendix B). This product consists mostly of a modified coconut oil (75% or more by volume) combined with 10% by volume mineral oil and a very small amount of nonionic surfactant and other proprietary ingredients. CocoBear is also nonpersistent, becoming ineffective within 1 to 2 days. CoCoBear has no reported significant toxicity to any receptors likely to be exposed during or after use as a larvicide.

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

5.2.7.1.2 Mosquito Adulticides

In addition to chemical control of mosquito larvae, the District may use pesticides for control of adult mosquitoes when other tools are not available and if specific guidelines are met, including species composition, population abundance and/or density (as measured by landing count or other quantitative method), proximity to human populations, and/or human disease risk. Adulticides can be used over vegetated areas preferred by adult mosquitoes (see Section 4.2.7.2) . Treatment of adults is a tertiary line

of defense employed when physical controls and larviciding have not been sufficiently effective. As with larvicides, adulticides are applied in strict conformance with label requirements. Adulticides the District uses are listed in Table 5-8. Because of the ecological sensitivity of vernal pools, the District avoids use of these adulticides in areas with vernal pools. The District will use all available means to avoid use of adulticides over vernal pool habitats. If the use of adulticides were to become necessary within close proximity (relative to swath widths of ULV application equipment) to or over vernal pools, the district will notify USFWS and CDFW of the need. Applications would be performed in strict compliance with label requirements, with use of the appropriate BMPs as listed in Table 5-3, and in consultation with resources agencies and property owners. A detailed discussion of the environmental fate and toxicity of these pesticides is provided in Appendix B. The potential impact on wildlife from noise associated with equipment use would be minimal, as the use of equipment for adulticiding is of short duration and the animals would return to their selected habitats within a few hours at most for application techniques the District currently uses. Adulticides, when used, are usually applied from the ground via truck, ATVs, utility vehicles or handheld devices as an ULV application.

Adulticiding via aircraft, although the least preferred technique, could potentially be utilized in the future to deal with a severe outbreak or risk of mosquito-borne disease transmission. Aerial applications are made using ULV techniques. Aerial application of adulticide may be the only reliable means of obtaining effective control in areas bordered by extensive mosquito production sites with a small, narrow, or inaccessible network of roads, or to cover a very large area quickly in case of unusually severe mosquito outbreaks or vector-borne disease epidemics, Since 1981, the District has conducted an aerial application of adulticides only twice. One application was over waterfront/marsh areas containing an extraordinarily high abundance of mosquitoes testing positive for West Nile virus, while the other was over an irrigated pasture producing a large number of day biting mosquitoes with the ability to travel more than 10 miles from the larval source.

Table 5-9 Chemical Control Options for Adult Insect/Vector Abatement as Discussed in Appendix B

Chemical Classification	Active Ingredient	Vector	Appendix B
Pyrethin	Pyrethrin	Mosquito; yellow jacket	Section 4.1.1
Synthetic Pyrethroid	Phenothrin (sumithrin or d-phenothrin)	Mosquito; yellow jacket	Section 4.1.3
Synthetic Pyrethroid	Deltamethrin	Mosquito; yellow jacket	Section 4.1.5
Synthetic Pyrethroid	Resmethrin	Mosquito	Section 4.1.8
Synthetic Pyrethroid	Permethrin	Mosquito; yellow jacket	Section 4.1.10
Pyrethroid-like	Etofenprox	Mosquito	Section 4.1.11
Synergist	PBO	Mosquito; yellow jacket	Section 4.1.12
Organophosphate	Naled	Mosquito	Section 4.2.1
Potassium Salt	Potassium salts	Yellow jacket	Section 4.4.1

Pyrethrins

The District uses pyrethrin for mosquito and/or yellow jacket wasp control. For yellow jacket control, pyrethrin is applied directly into ground nests and rarely on tree nests. For adult mosquito control, pyrethrins may be applied over a wide range of land uses and habitat types,. However, the District uses pyrethrins only when absolutely necessary due to mosquito abundance and density in an area; and, even then, minimal amounts are applied (via ULV application), thus reducing the potential for impacts to nontarget ecological receptors (BMPs H3, H4, H11). As an additional measure, pyrethrin applications are canceled during less than ideal wind and potential drift conditions (BMP H6). For wasp (yellow jacket and paper

wasps) control, the District applies pyrethrins in minute volumes directly to ground nests and tree nests if necessary, which essentially negates any impact to nontarget species. The District ensures that all applications are made in accordance with label specifications and USEPA and CDPR recommendations for use with mosquitoes and other vector insects. Pyrethrins readily degrade in water and soil, but may persist under anoxic conditions. They tend to strongly adsorb to soil surfaces and, hence, have low potential to leach into groundwater. Pyrethrins may be highly toxic to fish (freshwater, estuarine, marine) and invertebrates, although exposures would likely be low during and following ULV applications, which are designed to prevent environmental persistence and potential impacts to nontarget ecological receptors.

Pyrethrins have low to moderate acute toxicity to mammals via the oral, dermal, and inhalation routes and are practically nontoxic to birds. When applying to areas larger than 0.25 acres, the risks to nontarget insects such as honeybees are reduced by applying pyrethrins at night and predawn times when bees and other pollinators are inactive (BMP H12). Local beekeepers may further minimize risk of exposure by covering their hives during night application of these chemicals, uncovering them within a few hours after spraying. This coordination has worked satisfactorily for both the beekeepers and the District. Little risk to nontarget terrestrial organisms is expected when this and other BMPs to avoid unwanted drift and potential impacts are implemented.

Synthetic Pyrethroids and Pyrethroid Like Compounds

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

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

Resmethrin

The District would use resmethrin only when no other adulticides are applicable or effective. The District may apply resmethrin to treeholes, residential areas near reclaimed marshes, and industrial areas for mosquito control. ULV applications of resmethrin would be used and this chemical is reserved also for use when circumstances are critical (e.g., an outbreak of vectorborne disease such as West Nile virus). Additionally, resmethrin use is declining in favor of nonresmethrin alternatives. Studies have shown rapid dissipation/low persistence following aerial ULV applications. Resmethrin is moderately toxic to birds and highly toxic to honeybees; however, little risk to nontarget terrestrial organisms is expected when BMPs are applied (BMPs H8 and H12).

Permethrin

The District may use permethrin for mosquito and/or yellow jacket wasp control during spring, summer, and fall. Permethrin products are used in reclaimed marshes and around residences, and are applied directly to yellow jacket ground nests. Permethrin has low toxicity to mammals and is practically nontoxic to birds. It is highly toxic to honeybees; however, this pesticide is generally used with careful and strict BMP techniques such as using very small, localized applications. When used appropriately, little risk to nontarget terrestrial organisms is expected.

Etofenprox

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

Etofenprox is generally applied during the nighttime and predawn hours when sensitive receptors such as honeybees are not active. Based on toxicity, environmental fate, and usage patterns, etofenprox, using BMPs, is not likely to result in adverse impacts to nontarget terrestrial organisms.

Synergist (Piperonyl Butoxide)

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

PBO degrades relatively rapidly in soil and water and, therefore, does not tend to persist in the environment. PBO may be highly toxic to some species of fish and aquatic invertebrates and is being evaluated as a possible endocrine disruptor. However, it is of low toxicity to terrestrial receptors such as mammals and honeybees. ULV applications of adulticides containing PBO are used only when necessary and applicable and in conjunction with BMPs for the co-applied pesticides.

Pesticides can kill natural predators of mosquitoes. The District's activities associated with the Physical Control and Vegetation Management Alternatives would help allow these predators to access habitats where mosquito larvae are present. When chemical control is used to manage mosquitoes it is generally used at levels that are below the effects thresholds for other insects, as described above. Although mosquito pesticides may also affect invertebrate predators (e.g., dragonflies), recovery of predator populations is usually rapid as the predator populations extend beyond the application areas and will rapidly replace any lost individuals. In general, the pesticides used for mosquito control exhibit low or no toxicity to birds or mammals. Little information is available regarding toxic effects to reptile or terrestrial amphibian mosquito predators.

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

Organophosphates

Naled, not currently used by the district, may be used in rotation with pyrethrins or pyrethroids for control of adult mosquitoes to avoid the development of resistance. In addition to use for controlling adult mosquitoes, naled also has indoor and outdoor general use, and is used on food and feed crops, farms, dairies, pastureland, and in greenhouses and over standing water (CDPR 2010a). Naled tends to degrade

quickly in surface waters especially following ULV applications. It has low water solubility and is mobile in some soils. Drift is almost irrelevant for hand and some aerial (e.g., helicopter) applications since treatments are restricted during moderate to high winds. In addition, spray setbacks are established to reduce spray drift for agricultural uses. The Districts strictly adhere to their BMPs and product label requirements, including the restriction of naled application to targets outside adequate buffer zones around permanent water bodies to reduce runoff and impacts to aquatic organisms. It is moderately toxic to mammals and birds.

Naled has been associated with mortality of honeybees when residue levels exceed 2,000 µg/m^2 following typical ULV applications in Florida (Zhong et al. 2004). The District sprays during the evening when bees are inactive; however, bees tend to cluster outside around the entrance to the hive during the evening. To further minimize potential effects on nontarget pollinators, the District avoids spraying pesticides anywhere within a pre-determined proximity to bee hives. Naled is currently used very infrequently by the District.

5.2.7.1.3 Yellow Jacket and Tick Abatement

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

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

Pyrethrin and pyrethroid-based chemicals are typically used against ground-nesting yellow jackets. Examples of pesticides the District might employ to control yellow jackets and ticks in residential or upland environments are allethrin, deltamethrin, esfenvalerate, lambda-cyhalothrin, phenothrin, pyrethrin, and tetramethrin. The potential environmental impacts of these materials are minimal due to the fact that they are applied directly to the underground nest and to vegetation supporting ticks in a localized area. This application method prevents drift and further reduces the potential for inadvertent exposure of nontarget and special status species to these materials. These chemicals would be applied in strict accordance with label directions and District BMPs, including those relating to worker environmental awareness training, disturbance minimization measures, and "Applications of Pesticides, Surfactants, and/or Herbicides," will be applied, as will appropriate habitat and the selected species-specific BMPs for access to sites to conduct treatment from the ground. The pesticides the District uses to control yellow jacket populations are shown in Table 2-4, for tick control in Table 2-5, and in Table 5-9 and those active ingredients selected for further review in Appendix B have been discussed previously.

The District typically does not engage in tick control activities, but could in the event of a tick-borne disease outbreak. In such an event, the District would employ pyrethroid-based and other chemicals.

Pyrethrin

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

Pyrethroids and Pyrethroid-like Compounds

Pyrethroid insecticides are synthetic compounds that are chemically similar to the pyrethrins but have been modified to increase stability and activity against insects. First generation or "Type I" photosensitive pyrethroids include d-allethrin, phenothrin (sumithrin), prallethrin, resmethrin, and tetramethrin. Typically, these pyrethroids are used indoors and around residential areas. The newer second-generation pyrethroids are mostly "Type II" pyrethroids. The active ingredients that fall into this group include deltamethrin, esfenvalerate, and permethrin. Permethrin use is restricted to situations when it is absolutely necessary and in ULV applications that are designed to degrade rapidly and, thus, reduce the potential for impacts to nontarget ecological receptors. Type II pyrethroids are more toxic (than Type I pyrethroids) because they are less photosensitive and persist longer in the environment. Most pyrethroids and pyrethroid-like compounds are of low toxicity to birds and mammals, but of high toxicity to honeybees.

The potential impacts to terrestrial habitats through reduction of the amount or quality of habitat available, to native terrestrial plant or animal populations through direct mortality, or to special status species for a number of pyrethroid or pyrethroid-like compounds are discussed above under mosquito adulticides (Section 5.2.7.1.2). When used for yellow-jackets, the use would be confined to a single nest, and for a localized area for ticks, not over a large area for either, as discussed for mosquito adulticiding. Lambda-cyhalothrin was identified as a candidate for further evaluation in Appendix B and is discussed in detail below.

5.2.7.1.4 Rodent Abatement

The District developed a rat population management program that relies heavily on public education to serve residents in the Service Area to minimize habitat and reduce food sources. Baiting is discouraged due to the potential secondary effects on predators and scavengers of the baited rodents. The District's limited use of rodenticides is a result of surveillance or in response to the identification of high rodent populations as a result of citizen complaints. Table 5-9 lists the pesticides the District uses or may use for control of rats. The District conducts rodent baiting at underground sites such as sewers, storm drains, or catch basins. Secure bait stations or other accepted methods of rodent baiting are conducted in areas with severe rodent infestations. In sewer baiting, bait blocks containing bromadiolone (a second generation, single-feeding anticoagulant rodenticide) may be used. The block would be suspended by wire above the water line to encourage rodent feeding.

Table 5-10 Chemical Control Options for Rodent Abatement as Discussed in Appendix B

Chemical Classification	Active Ingredient	Appendix B
First-generation anticoagulant	Diphacinone	Section 4.5.2
Second-generation anticoagulant	Bromadiolone	Section 4.5.4
Other	Bromethalin	Section 4.5.5
Sterol	Cholecalciferol	Section 4.5.7

Anticoagulant Rodenticides

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

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

All anticoagulant rodenticides are highly acutely toxic to mammals and birds. Exposure may occur through direct ingestion of the active ingredient in bait or by secondary ingestion (i.e., consumption of poisoned prey by scavengers or predators). Residential treatments involve bait station deployment following the rodenticide label instructions. Bait stations are both tamper-proof and are anchored to treatment locations (e.g., wires, stakes) to ensure that they cannot be dragged away by wildlife. In addition, the wax blocks in bait stations have small openings that prevent the entrance and exposure to nonrodent mammals (e.g., squirrels, skunks, etc.) and do not leach rodenticide material into water. Residents are properly educated regarding the location of deployed tamper-proof bait stations and potential risks to children and pets. The anticoagulant rodenticides (bromadiolone and difethialone) that have been selected for further evaluation in Appendix B and listed in Table 5-10 are discussed below.

Bromadiolone

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

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

Outside of sewers, bromadiolone is typically contained in tamper-proof bait stations, which are most frequently deployed at residential locations per the request of homeowners, and not near aquatic systems, open lands, or woodlands. Residential treatments involve bait station deployment generally within 50 feet of homes. Bait stations are anchored to treatment locations (e.g., wires, stakes) to ensure that they cannot be dragged away by wildlife. This use would not be likely to conflict with HCPs/NCCPs. In addition, bait stations have small openings that prevent the entrance and exposure to nonrodent mammals (e.g., squirrels, skunks, etc.). Residents are properly educated regarding the location of deployed tamper-proof bait stations and potential risks to children and pets.

All anticoagulant rodenticides are highly acutely toxic to mammals and birds. Exposure may occur through direct ingestion of the active ingredient in bait or by secondary ingestion (i.e., consumption of poisoned prey by scavengers or predators). Rodenticides are typically contained in small bait blocks that are placed within bait stations. Bait stations are both tamper-proof and are anchored to treatment locations (e.g., wires, stakes) to ensure that they cannot be dragged away and consumed by wildlife. In addition, bait stations have small openings that prevent the entrance and exposure to nonrodent mammals (e.g., squirrels, skunks, etc.) and also do not leach rodenticide material into water. Affected residents are properly educated regarding the location of deployed tamper-proof bait stations and potential risks to children and pets. The rodenticides bromadiolone, bromethalin and cholecalciferol has been selected for further evaluation in Appendix B, is listed in Table 5-9, and are discussed below.

Bromadiolone

Bromadiolone is generally applied as food bait blocks. This second-generation rodenticide is highly toxic to mammals, including humans, domestic pets, and nontarget mammalian wildlife. Bromadiolone is often found in the tissues of wildlife, including avian and mammalian predators. Mortalities of raptors have been associated with secondary bromadiolone poisoning. See Sections 4.5.4.2 and 4.5.4.3 in Appendix B. The District uses bromadiolone in and around man-made and natural standing and moving water. When deployed in sewers, bromadiolone blocks are sometimes attached to a wire and hung below manhole covers. This method of bait deployment reduces the probability of exposure (by multiple routes) to humans and nontarget wildlife, especially dietary exposure (ingestion route) to ground-foraging birds and mammals. In addition, this rodenticide causes rapid mortality of targeted rats; therefore, poisoned individuals tend to expire in the sewers and not represent prey for secondary consumers in the terrestrial environment.

Outside of sewers, bromadiolone is typically contained in tamper-proof bait stations, which are most frequently deployed at residential locations when high populations of rodents have been identified as a result of citizen complaints, and not near aquatic systems, open lands, or woodlands. Treatments in residential areas involve bait station deployment generally within 50 feet of homes. Bait stations are anchored to treatment locations (e.g., wires, stakes) to ensure that they cannot be dragged away by wildlife. In addition, bait stations have small openings that prevent the entrance and exposure to nonrodent mammals (e.g., squirrels, skunks, etc.). Affected residents are properly educated regarding the location of deployed tamper-proof bait stations and potential risks to children and pets.

Bromadiolone is a single-dose rodenticide that when used properly (such as in the absence of food competition) causes rapid knock-down of rat populations and has very limited potential for impacting aquatic systems and resulting in exposure to humans and nontarget wildlife. If additional issues arise regarding the use of this rodenticide, new, more protective rodenticide bait station alternatives reported by the USEPA could be considered (http://www.epa.gov/pesticides/mice-and-rats/rodent-bait-station.html). Based on toxicity, environmental fate, and usage patterns, bromadiolone, using BMPs, is not likely to result in unwanted adverse impacts to nontarget terrestrial organisms.

Central Nervous System Toxin (Bromethalin)

Bromethalin is used to kill rodents that have become resistant to anticoagulants. Because its name resembles that of the anticoagulant baits bromadiolone and brodifacoum, bromethalin is often mistaken for anticoagulant bait (Dunayer 2003). The mode of action for bromethalin is the uncoupling of oxidative phosphorylation, which leads to decreased cellular ATP production and failure of Na+, K+-ATPase pumps (essentially breaking down the cellular integrity at the cell membrane). Bromethalin is highly toxic to mammals and birds. Some bromethalin products meet the USEPA's new, more protective risk reduction standards. When applied properly by the District, these products present a lower risk of accidental exposure to children, pets, and wildlife. They are applied in tamper-resistant and weather-resistant bait stations, which limit the exposure of nontarget animals (USEPA 2013a) and minimize the potential for conflicts with existing HCPs/NCCPs.

Sterol

Cholecalciferol is a sterol (Vitamin D3) and its ingestion results in hypercalcemia from mobilization of calcium from bone matrix into blood plasma leading to metastatic calcification of soft tissues (Clock-Rust and Sutton 2011). Often, use of this compound requires "pre-baiting" prior to addition of the chemical to rat bait to achieve adequate bait acceptance. Although it is highly toxic to target rodents, cholecalciferol is considered of low hazard to nontargets such as birds or domestic dogs. Cholecalciferol is used infrequently. Residential treatments involve bait station deployment generally within 50 feet of homes. Bait stations are anchored to treatment locations (e.g., wires, stakes) to ensure that they cannot be dragged away by wildlife, and this reduces the potential to impact terrestrial habitats or conflict with HCPs/NCCPs. In addition, bait stations have small openings that prevent the entrance and exposure to nonrodent mammals

(e.g., squirrels, skunks, etc.). Residents are properly educated regarding the location of deployed tamper-proof bait stations and potential risks to children and pets.

5.2.7.2 Impacts to Habitat

The Chemical Control Alternative would not affect the quantity or distribution of habitats, such as riparian areas, marshes, lakes or ponds, seasonal wetlands, or terrestrial habitat types types identified in local or regional plans, policies, regulations, or by the CDFW or USFWS . This alternative would not affect the composition of their vegetative communities, as the pesticides used would not be expected to affect plants or their physical or hydrologic attributes. This alternative would not result in substantial ground disturbing activity, i.e., just temporary site access as described under the Surveillance Alternative, Therefore, the Chemical Control Alternative would not result in any removal, filling or hydrologic interruption of federally protected wetlands (including but not limited to marsh, vernal pool, coastal, etc.).

> **Impact TR-26.** The Chemical Control Alternative would have a **less-than-significant** impact on any riparian habitat or other sensitive natural community.

> **Impact TR-27.** The Chemical Control Alternative would not result in the direct removal, filling, or hydrological interruption of federally protected wetlands as defined by Section 404 of the Clean Water Act and would have a have a **less-than-significant** impact on these resources.

5.2.7.3 Effects on Movement and Migration

Any disruption of migration patterns would be due to the presence of personnel and equipment in the environment. In all cases this occurrence would be very short -term, generally not more than a few hours in any given location and, therefore, this effect would be minimal and would have little effect on the movement of wildlife, wildlife migration corridors, or nursery areas.

> **Impact TR-28.** The Chemical Control Alternative would have a **less-than-significant impact** on the movement of any native resident or migratory fish or wildlife species. Nor would it impact any native resident or migratory wildlife corridors or impede the use of native wildlife nursery sites. No mitigation is required.

5.2.7.4 Conflicts with Local Policies

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

> **Impact TR-29.** The Chemical Control Alternative would have **no impact** on local policies or ordinances protecting terrestrial resources.

5.2.7.5 Conflicts with HCP/NCCPs

HCPs or NCCPs identified within Contra Costa County, the primary Service Area are identified in Table 4-5. District activities are typically not among those covered by these HCPs. When performing work, the District would operate in compliance with their practices and permits, including compliance with all active HCP/NCCPs. The District regularly communicates with and works collaboratively with representatives from resource agencies such as RWQCB, USEPA, USACE, CDFW, and USFWS. The District receives training from resource agency staff and professional biologists (e.g., CDFW, USFWS) to minimize impacts and conducts annual field training for field staff regarding precautionary and avoidance measures related to sensitive habitats (e.g., vernal pools) and associated special status species. Therefore, the

District activities would not be inconsistent with the provisions of any HCP, NCCP or other approved local, regional, or state approved conservation plan.

Impact TR-30. The Chemical Control Alternative would have a **less-than-significant** impact on any adopted HCP, NCCP, or other approved local, regional or state habitat conservation plan.

5.2.8 Other Nonchemical Control/Trapping Alternative

The Other Nonchemical Control/Trapping Alternative is focused on rodents, yellow jackets, and other organisms associated with terrestrial environments and in response to citizen complaints or the identification of vector populations in close proximity to human development. The trapping of rodents is conducted as part of disease surveillance/testing programs and may be utilized for surveillance and egregious situations regarding commensal rodents in the future. Rodent trapping is not and will not be performed routinely as a mass trapping control measure. Trapping of yellow jackets is conducted when these organisms pose a threat to public health and welfare. For yellow jackets, District staff place the tamper-resistant or baited trap(s) primarily at the request of the property owner or manager, although they also advise the landowner that trapping is generally ineffective at population control and that it is better to seek out and treat the nest. The District does not remove rats or yellow jackets that are in or on structures. When these requests for service are made, residents are referred to a directory of private pest control companies. While it is conceivable that nontarget wildlife could be inadvertently trapped, the District conducts limited trapping and employs mechanisms and baits specific to target vectors to reduce the potential impacts to nontarget ecological receptors.

5.2.8.1 Impacts to Special Status Species and Habitats

This alternative would be undertaken under prescribed circumstances in and around developed/urban areas that do not provide good habitat for special-status species identified as a candidate, sensitive, or special status species in local or regional plans, policies, or regulations, or by the CDFW or USFWS . Rodent trapping may also be performed in rural settings to collect blood samples to test for disease. Trapping of yellow jackets would not be expected to have any effect on special status species or their habitats, as these traps are highly localized, self-contained, and inaccessible to these species. Traps for rodents are designed for live trapping of small mammals and baited to attract the target species. These traps are usually not deployed in areas where special-status mammals occur. When trapping is required, the District consults with the CDFW and USFWS and obtains all appropriate permits for trapping. All animals captured, have a blood sample taken for testing and are released. A report of animals captured and released is filed in accordance with permit requirements. These traps are highly unlikely to attract special_status birds, reptiles or amphibians, and even more unlikely to capture special status species. The placement and operation of these traps would not change the amount or physical properties of any type of habitat or alter the hydrology in any way. They would not impair migration or alter migratory corridors or nursery sites.

This alternative would not affect the quantity or distribution of habitats, such as riparian areas, marshes, lakes or ponds, seasonal wetlands, or other habitat types. This alternative would not affect the composition of their vegetative community as the placement of traps and baits would not affect plants. This alternative would not result in any ground disturbing activity and, therefore, would not result in any removal, filling or hydrologic interruption of federally protected wetlands (including but not limited to, marsh, vernal pool, coastal, etc.).

Impact TR-31. The Other Nonchemical Control/Trapping Alternative would have **no impact** either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special status species.

Impact TR-32. The Other Nonchemical Control/Trapping Alternative would have **no impact** on any riparian habitat or other sensitive natural community.

Impact TR-33. The Other Nonchemical Control/Trapping Alternative would have **no impact** on federally protected wetlands as defined by CWA Section 404.

5.2.8.2 Effects on Movement and Migration

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

Impact TR-34. The Other Nonchemical Control/Trapping Alternative would have a **less-than-significant impact** on the movement of any native resident or migratory fish or wildlife species..

5.2.8.3 Conflict with Local Policies

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

Impact TR-35. The Other Nonchemical Control/Trapping Alternative would have **no impact** on local policies or ordinances protecting terrestrial resources.

5.2.8.4 Conflict with Conservation Plans

HCPs or NCCPs identified within Contra Costa County, the primary Service Area are identified in Table 4-5. District activities are typically not among those covered by these HCPs. When performing work, the District would operate in compliance with their practices and permits, including compliance with all active HCP/NCCPs. The District regularly communicates with and works collaboratively with representatives from resource agencies such as RWQCB, USEPA, USACE, CDFW, and USFWS. The District receives training from resource agency staff and professional biologists (e.g., CDFW, USFWS) to minimize impacts and conducts annual field training for field staff regarding precautionary and avoidance measures related to sensitive habitats (e.g., vernal pools) and associated special status species. Therefore, the District activities would not be inconsistent with the provisions of any HCP, NCCP or other approved local, regional, or state approved conservation plan.

Impact TR-36. The Other Nonchemical Control/Trapping Alternative would have a **less-than-significant** impact on the provisions of any adopted HCP, NCCP, or other approved local, regional or state habitat conservation plan.

5.2.9 Impact Determinations

5.2.9.1 Cumulative Impacts

"Cumulative impacts" are defined as "two or more individual effects which, when considered together, are considerable or compound or increase other environmental impacts (CEQA Guidelines Section 15355). Cumulative impacts, as they relate to terrestrial resources, include past, present, and reasonably foreseeable actions that potentially impact terrestrial mammalian and avian wildlife, reptiles, aquatic organisms, nontarget invertebrates and pollinators, and botanical resources. Cumulative impacts can result from individually minor, but collectively significant, projects taking place over a period of time. The determination is whether a proposed project's incremental contribution to a cumulative impact results in a potentially "considerable" (i.e., significant) cumulative impact, and, if so, whether that project's incremental

contribution can be mitigated to a less-than-significant level. The cumulative impacts analysis for terrestrial resources is contained in Section 13.3, and the determinations of cumulatively considerable impacts are summarized here.

The Surveillance, Physical Control, Vegetation Management, Chemical Control, and Other Nonchemical Control Alternatives' impacts to terrestrial resources were determined to be less than significant or in some cases "no impact." The Biological Control Alternative's use of mosquitofish had no impact to terrestrial resources. The key issues for consideration herein are potential effects on beneficial insect pollinators from chemical applications and the potential cumulative impacts associated with the Vegetation Management and Chemical Control Alternatives' less-than-significant impacts.

- **Effects on Pollinators**: Colony collapse disorder (CCD) and the resulting decline in bee populations is an existing significant cumulative impact in the region. In general, while insect abatement activities may affect native pollinators near or adjacent to treatment areas, the District's careful practice of BMPs greatly reduces the potential cumulative impacts to nontarget pollinators. The Program's less-than-significant impacts on insect pollinators related to mosquito and other vector abatement activities would not be cumulatively considerable or significant.
- **Vegetation Management Alternative**: Vegetation/weed control activities the District may perform would be cumulative with those which other entities perform within the Program Area. Vegetation/weed control activities may affect native plants, as these species may lie within treatment areas, but the effects on individuals of native species are minimized, and the overall effect is likely beneficial, as native species will have less competition in treated areas and, thus, would be expected to be more successful. Based on this conclusion, the Program's incremental less-than-significant effects relating to weed abatement activities, when considered with other weed abatement activities in the Program Area, would not be cumulatively considerable or significant.
- **Chemical Control Alternative**: The uses of pesticides under the Chemical Control Alternative would be cumulative with uses of pesticides by agricultural, industrial, governmental, and residential users, an existing significant cumulative impact. The District's relative contribution to the loads of such concentrations is small compared with other users. The District preferentially uses nonchemical alternatives and when using chemical alternatives, uses chemicals that are not persistent in the environment when chemicals are applied. As such, the District's Chemical Control Alternative does not contribute substantially to pesticide and herbicide exposures in the terrestrial environment. The Chemical Control Alternative has a less-than-significant cumulative impact on terrestrial resource exposures to herbicides and pesticides.

5.2.10 Environmental Impacts Summary

The Surveillance, Physical Control, Vegetation Management (including herbicide use), Biological Control, and Other Nonchemical Control/Trapping alternatives are expected to have less-than-significant to no impact on terrestrial resources (Table 5-11). The Chemical Control Alternative (including the mosquito larvicide, mosquito adulticide, yellow jacket wasp, and tick adulticide, rodenticide, and herbicide application scenarios [under existing BMPs]) is expected to have only minimal impacts to nontarget terrestrial resources, and any unforeseen impacts are expected to be less than significant.

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

Impact Statement	Surveillance	Physical	Vegetation Management	Biological Control	Chemical Control	Other Non-Chemical/Trapping
Impact TR-8. The Physical Control Alternative, with the BMPs identified in Table 5-3, would have a **less-than-significant** impact on any riparian habitat or other sensitive natural community. No mitigation is required.	na	LS	na	na	na	na
Impact TR-9. The Physical Control Alternative would have a **less-than-significant** impact on federally protected wetlands as defined by CWA Section 404. No mitigation is required.	na	LS	na	na	na	na
Impact TR-10. The Physical Control Alternative would have a **less-than-significant impact** on the movement of any native resident or migratory fish or wildlife species. Nor would it impact any native resident or migratory wildlife corridors or impede the use of native wildlife nursery sites. No mitigation is required.	na	LS	na	na	na	na
Impact TR-11. The Physical Control Alternative would have **no impact** on local policies or ordinances protecting biological resources.	na	N	na	na	na	na
Impact TR-12. The Physical Control Alternative would have a **less-than-significant** impact on any adopted HCP, NCCP, or other approved local, regional or state habitat conservation plan. No mitigation is required.	na	LS	na	na	na	na
Impact TR-13. The Vegetation Management Alternative, with the BMPs identified in Table 5-3, would have a **less-than-significant** impact either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special status species No mitigation is required.	na	na	LS	na	na	na
Impact TR-14. The Vegetation Management Alternative would have a **less-than-significant** impact on any riparian habitat or other sensitive natural community. No mitigation is required.	na	na	LS	na	na	na
Impact TR-15. The Vegetation Management Alternative would have a **less-than-significant** impact on federally protected wetlands as defined by CWA Section 404s. No mitigation is required.	na	na	LS	na	na	na

Impact Statement	Surveillance	Physical	Vegetation Management	Biological Control	Chemical Control	Other Non-Chemical/Trapping
Impact TR-16. The Vegetation Management Alternative would have a **less-than-significant impact** on the movement of any native resident or migratory fish or wildlife species. Nor would it impact any native resident or migratory wildlife corridors or impede the use of native wildlife nursery sites. No mitigation is required.	na	na	LS	na	na	na
Impact TR-17. The Vegetation Management Alternative would have **no impact** on local policies or ordinances protecting biological resources.	na	na	N	na	na	na
Impact TR-18. The Vegetation Management Alternative would have a **less-less-than** significant impact on any adopted HCP, NCCP, or other approved local, regional or state habitat conservation plan. No mitigation is required.	na	na	LS	na	na	na
Impact TR-19. The Biological Control Alternative would have **no impact** either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special status species.	na	na	na	N	na	na
Impact TR-20. The Biological Control Alternative would have **no impact** on any riparian habitat or other sensitive natural community.	na	na	na	N	na	na
Impact TR-21. The Biological Control Alternative would have **no impact** on federally protected wetlands as defined by CWA Section 404.	na	na	na	N	na	na
Impact TR-22. The Biological Control Alternative would have **no impact** on the movement of any native resident or migratory fish or wildlife species. Nor would it impact any native resident or migratory wildlife corridors or impede the use of native wildlife nursery sites.	na	na	na	N	na	na
Impact TR-23. The Biological Control Alternative would have **no impact** on local policies or ordinances protecting terrestrial resources.	na	na	na	N	na	na

Impact Statement	Surveillance	Physical	Vegetation Management	Biological Control	Chemical Control	Other Non-Chemical/Trapping
Impact TR-24. The Biological Control Alternative would have a **less-than-significant** impact on any adopted HCP, NCCP, or other approved local, regional or state habitat conservation plan.	na	na	na	LS	na	na
Impact TR-25: The Chemical Control Alternative's mosquito larvicides would have a **less-than-significant** impact either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special-status species. No mitigation is required.	na	na	na	na	LS	na
Impact TR-26. The Chemical Control Alternative would have a **less-than-significant** impact on any riparian habitat or other sensitive natural community.	na	na	na	na	LS	na
Impact TR-27. The Chemical Control Alternative would not result in the direct removal, filling, or hydrological interruption of federally protected wetlands as defined by Section 404 of the Clean Water Act and would have a have a **less-than-significant impact** on these resources.	na	na	na	na	LS	na
Impact TR-28. The Chemical Control Alternative would have a **less-than-significant impact** on the movement of any native resident or migratory fish or wildlife species. Nor would it impact any native resident or migratory wildlife corridors or impede the use of native wildlife nursery sites. No mitigation is required.	na	na	na	na	LS	na
Impact TR-29. The Chemical Control Alternative would have **no impact** on local policies or ordinances protecting terrestrial resources.	na	na	na	na	N	na
Impact TR-30. The Chemical Control Alternative would have a **less-than-significant** impact on any adopted HCP, NCCP, or other approved local, regional or state habitat conservation plan.	na	na	na	na	LS	na

Impact Statement	Surveillance	Physical	Vegetation Management	Biological Control	Chemical Control	Other Non-Chemical/Trapping
Impact TR-31. The Other Nonchemical Control/Trapping Alternative would have **no impact** either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special status species.	na	na	na	na	na	N
Impact TR-32. The Other Nonchemical Control/Trapping Alternative would have **no impact** on any riparian habitat or other sensitive natural community.	na	na	na	na	na	N
Impact TR-33. The Other Nonchemical Control/Trapping Alternative would have **no impact** on federally protected wetlands as defined by CWA Section 404.	na	na	na	na	na	N
Impact TR-34. The Other Nonchemical Control/Trapping Alternative would have a **less-than-significant impact** on the movement of any native resident or migratory fish or wildlife species.	na	na	na	na	na	LS
Impact TR-35. The Other Nonchemical Control/Trapping Alternative would have **no impact** on local policies or ordinances protecting terrestrial resources.	na	na	na	na	na	N
Impact TR-36. The Other Nonchemical Control/Trapping Alternative would have a **less-than-significant** impact on the provisions of any adopted HCP, NCCP, or other approved local, regional or state habitat conservation plan.	na	na	na	na	na	LS

5.2.11 Mitigation and Monitoring

Although most of the application scenarios are conducted using strict BMPs and schedules that avoid periods when the nontarget receptors may be more sensitive to stresses (nesting, migration leks[14], known movements between habitats (small mammals and reptiles), the District conducts surveillance and monitoring of results on a routine basis. When the District receives information about vector outbreaks or unwanted population expansions, they are dealt with on a case-by-case basis, yet still following BMPs and acknowledging the HCPs and NCCPs whenever possible and feasible. While the actual amount of the exposure of nontarget species to the active ingredient in each pesticide of concern is generally well below the levels that could result in toxicity in the laboratory test, the results of the pesticide application programs are constantly under surveillance and are monitored for total use, use per acre, timing of applications, and all parameters affecting the program application scenarios. The fate and transport of the chemicals of interest are discussed in detail in Appendix B.

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

[14] A lek is a patch of ground used for communal display in the breeding season by the males of certain birds and mammals.

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