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Programmatic Environmental Assessment for the Eradication of European Grapevine Moth (*Lobesia botrana*) in California

Environmental Assessment
March 2011

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Table of Contents

I. Purpose and Need for Action

A. Introduction

The European grapevine moth (EGVM), *Lobesia botrana* (*L. botrana*) **(**Denis & Schiffermuller) (Lepidoptera: Tortricidae) is a significant pest of berries and berry-like fruits in Europe, the Mediterranean, southern Russia, Japan, the Middle East, Near East, Chile, and Northern and Western Africa (Moreau et al., 2010). Although EGVM attacks many hosts (such as olives, pomegranate, persimmon, rosemary, and stone fruits) (appendix A), grapes are the primary host and may be the most economically vulnerable commodity within California agriculture (USDA–APHIS, 2010a). In October 2009, EGVM was detected for the first time in the United States in a commercial vineyard in Napa County, California. Since that detection, over 40,000 traps to capture EGVM adult males have been placed in California to determine the extent of the infestation. As of September 2010, EGVM adults have been found in several grape-producing counties in California, including Fresno, Mendocino, Merced, Monterey, Napa, San Joaquin, Santa Clara, Santa Cruz, Solano, and Sonoma Counties.

The moth feeds on flowers and berries, and is particularly damaging to grape production. Third-generation larvae are the most damaging, feeding on ripening grapes and exposing them to further damage via fungal infections, most prominently *Botrytis cinerea*, commonly known as bunch rot, which is a grey mold that causes grapes to turn brown and rot. This generally leads to loss of the entire grape cluster (Doll, 2010), as those penetrated by a larva will rot, and the rot may spread to adjacent grapes (Fermaud and Le Menn, 1992).

EGVM can have two to four generations per year, depending on climatic conditions. Females can lay up to 160 eggs per cycle. In each generation, EGVM goes through four life stages—egg, larva, pupa, and adult moth. A single generation can be completed within 30 to 32 days. Spring and summer pupation takes place inside a rolled up leaf, and in the winter in protected areas, such as under bark, in soil crevices, or leaf litter (Venette, 2003). Female moths can fly distances of 80 to 100 meters in search of egg-laying (oviposition) sites, but males may fly further in search of females (Blake, 2010). Because of its relatively short flight distance, EGVM populations tend to spread slowly by natural means with the artificially rapid spread of EGVM into new areas requiring human-assistance due to transportation of EGVM infested materials. EGVM larvae pose the greatest threat to California vineyards. Newly hatched larvae are highly mobile and immediately begin feeding on grapes and grape flowers, causing the grapes to become unmarketable (Cooper et al., 2010).

B. Purpose

The U.S. Department of Agriculture (USDA), Animal and Plant Health Inspection Service (APHIS) is proposing to provide support to the California Department of Food and Agriculture (CDFA) to implement a program for the eradication of EGVM. APHIS is responsible for taking actions to exclude, eradicate, and/or control plant pests under the Plant Protection Act (7 United States Code (U.S.C.) 7701 et seq.). This environmental assessment (EA) analyzes the environmental impacts associated with the proposed eradication program that are considered reasonably foreseeable. This EA has been prepared consistent with the National Environmental Policy Act of 1969 (NEPA) (42 U.S.C. 4321 et seq.) and APHIS' NEPA implementing procedures (7 Code of Federal Regulations (CFR) part 372). The availability of this EA and a 30-day comment period will be announced by publishing a notice on the APHIS Web site, and/or local newspapers. All comments received will be transmitted, together with any analyses, responses, and recommendations to the APHIS decision maker who will then take appropriate action (7 CFR §372.9). Should the agency's analysis result in a finding of no significant impact (FONSI), or should major changes in the proposed program be prompted by comments, or if any other source affords additional analysis of this action, it will be announced in the same manner as the notice of availability.

C. Need for EGVM Eradication Program

Grapes are the primary host of EGVM and may be the most economically vulnerable commodity within California agriculture. California is the top grape-producing State in the United States, with a total market value of over $3.9 billion (USDA–APHIS, 2010a). Within the 46 counties that are included in the scope of this EA, the economic impacts of EGVM, (including direct costs related to control of spread and quarantine compliance) may be substantial (USDA–APHIS, 2010a). All 46 counties contain some form of grape production. Based on current economic models in eight of the regulated counties, the livelihood of about 10,000 farms that produce EGVM-regulated products valued at $2.7 billion could be threatened. If EGVM were to spread throughout California, the impact could be felt by as many as 22,000 farms that produce EGVM-regulated products valued at a total of $5.6 billion (USDA–APHIS, 2010a).

In 2010, Canada and Mexico implemented restrictions on grape and secondary host material from California. Although it is difficult to comprehensively assess the impact of the provisional regulatory protocol on international trade and interstate commerce, industry and government representatives agree that without action, California growers may lose the ability to export all EGVM-regulated products (USDA–APHIS, 2010a). Canada halted stone fruit imports from the quarantine area for

approximately 45 days starting in May, which resulted in an estimated 250,000 to 350,000 boxes of stone fruits diverted to the domestic market. Without the regulatory protocol to certify the safety of these products, the resulting loss of trade could have been substantial; in Fresno County alone, as many as 2.5 million boxes of stone fruits may have been diverted from their intended market. On September 1, 2010, Mexico removed the temporary restriction on EGVM-regulated products (imposed on the regulated counties in their entirety), and began allowing imports of table grapes from nonregulated areas and imports of stone fruits from all areas in these California counties.

D. Scope of Analysis

This EA will evaluate the potential human health and environmental impacts of the different management activities that are in place to control EGVM with a goal towards eradication. The management activities that are available are based on recommendations from an International Technical Working Group (ITWG), consisting of scientists from government and academia from the United States, Europe, and South America (ITWG, 2010). Currently, a quarantine exists in portions of eight counties in California to eliminate the movement of regulated material to other areas where EGVM does not exist. Survey efforts in 46 of the 58 counties are currently ongoing to determine the extent of EGVM in California (appendix B). This EA will assess program activities throughout the 46-county survey area in the event that the quarantine, or other program activities, should expand due to EGVM detections in new areas.

E. Public Involvement/Outreach

In March 2010, a joint information center was formed by the California Department of Food and Agriculture (CDFA), USDA–APHIS, and others, such as industry representatives, to coordinate stakeholder information across jurisdictions, including Federal, State, and local authorities, tribal partners, the private sector, and nongovernment organizations. The outreach effort has included brochures, radio and print ads, factsheets, Web sites, videos, press releases, and individual stakeholder meetings (CDFA, 2010a). Between March and July, over 59 separate meetings were conducted and facilitated by either county (Sonoma, Napa, Kern, Lake, Mendocino, Fresno, and Solano) or State (CDFA) agricultural commissioners. Napa County has implemented a community relations plan to provide EGVM information to elected officials, media, residents, environmental/neighborhood groups, agricultural industry and retail nursery staff via its "Kick The Moth Out!" campaign. This work was implemented via printed materials, Web content, meetings, and

participation at community events, including farmer's markets. Furthermore, Napa County officials have distributed approximately 44,000 postcards, 50,000 door hangers, and 50 lawn signs.

II. Alternatives

This EA will analyze two alternatives. The no action alternative will assess the potential impacts of the EGVM program in the absence of APHIS' financial and technical support, specifically, the impacts resulting from a reduction in survey activities; the potential impacts associated with an uncoordinated approach to eradication in noncommercial areas, and the potential use of more broad spectrum pesticides that may result from an uncoordinated program. Voluntary commercial controls in vineyards would continue, as well as the Federal quarantine. Under the preferred alternative, APHIS would provide financial and technical support and work cooperatively with CDFA and other stakeholders to maintain eradication activities described under the no action alternative section, including EGVM survey activities, the Federal quarantine, and noncommercial controls. In addition, commercial vineyards would continue voluntary controls.

A. No Action

Under the no action alternative, APHIS would continue to enforce the Federal Quarantine (pertaining exclusively to commercial growers) to prevent the human-assisted spread of EGVM through the movement of host material, requiring postharvest fumigation of all grapes from EGVM-positive vineyards and those within 200 meters of the vineyard. In addition, commercial growers who find EGVM in their vineyards or other crops would make applications of selective control products based on recommendations from the University of California Cooperative Extension (UCCE) regarding registered products in California (table 1). Efforts, such as surveying and noncommercial controls, could potentially occur; however, without APHIS' support in cooperation with CDFA, the consistency in application of all management measures would be subject to funding shortfalls.

1. Regulated Establish-ments Under Federal Quarantine

In June 2010, APHIS issued a Federal Order that included measures to control the human-assisted transport and spread of EGVM into noninfested areas by restricting the movement and requiring appropriate control of regulated articles that could host EGVM. Currently, all production and retail establishments within the quarantine area sign an APHIS/CDFA cooperative compliance agreement. These compliance agreements outline requirements for the intrastate and interstate movement of regulated articles from within an EGVM quarantine area. The requirements include—

1) inspections prior to the first shipment of EGVM host material and every 30 days thereafter by an APHIS-certified inspector;

2) "special handling" of grapes and olives prior to shipment which will inhibit EGVM development during shipment (i.e., fruit and/or flower removal and disposal);

3) nondormant host material must be treated with an approved treatment; dormant host material must be treated with a hot water dip for at least 5 minutes at 127 °F;

4) emergency containment plans, should any nursery stock be found to be infected;

5) approved plans for handling "green waste" (all plant material including cuttings, flowers, and fruit of EGVM hosts);

6) proper maintenance of all inspection and shipping records; and

7) compliance training for all employees.

Commodities harvested from vineyards and orchards within 200 meters of a positive detection of EGVM must be treated with an APHIS-approved post-harvest treatment prior to shipment to ensure that any EGVM that may be in the shipment are not present before transportation outside of the quarantine zone. At present, the only APHIS-approved treatment is postharvest fumigation using methyl bromide. The effects of methyl bromide treatments were evaluated previously in an EA and that analysis is incorporated by reference (USDA–APHIS, 2010b).

2. Voluntary Control in Commercial Vineyards

Currently, commercial vineyards are voluntarily applying chemical pesticides. Several active ingredients effective against EGVM have been identified by UCCE (table 1). Commercial growers repeat applications at intervals as specified on the label.

Several insecticides are available for use; however, five insecticide classes make up greater than 97 percent of all the commercial acres that were treated for EGVM in 2010 (figure 1). In addition to pheromones, insecticides in the insect growth regulator (IGR), *Bacillus*, diamide, and spinosyn chemical class were the dominate insecticides used with the IGR, methoxyfenozide, and the diamide insecticide, chlorantranilprole, being the primary insecticides of choice. Spinosad and *Bacillus thuringiensis* var. *kurstaki* (Btk) represent the spinosyn and *Bacillus* classes, respectively, and both have labels for use in organic production.

Table 1. UCCE-Recommended Insecticides for the Eradication of EGVM.

Trade Name (Chemical Name)	Insecticide Class
Intrepid 2F® (methoxyfenozide)	Insect growth regulator
Dipel DF® and Biobit®	*Bacillus* microbial insecticide
Altacor® (chlorantraniliprole), Belt® (flubendimide)	Diamide pesticide
Avaunt® (indoxacarb)	Sodium channel blocker
Entrust®, Success® (spinosad), Delegate® (spinetoram)	Spinosyn
Danitol® (fenpropathrin), Baythroid® (beta-cyfluthrin), Brigade® (bifenthrin), Renounce® (cyfluthrin), Tombstone® Helios® (cyfluthrin)	Pyrethroid
Lannate® (methomyl), Sevin XLR® (carbaryl), Sevin 80S® /80 WSP® (carbaryl)	Carbamate
Imidan® (phosmet)	Organophosphate

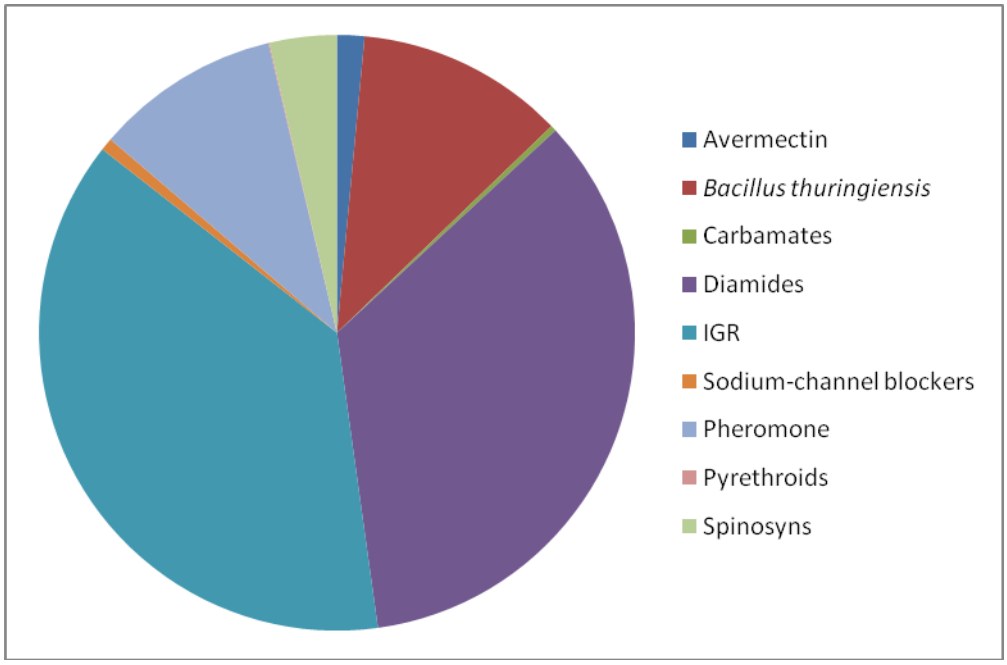

Figure 1. Pesticide use by chemical class for EGVM on grapes in Napa County, California, 2010.

Pesticide use data prior to EGVM from Napa County shows that all products, with the exception of the pheromone and chlorantraniliprole, are used on grapes, as well as other applications, such as nurseries (CDPR, 2010). The lack of pheromone use is related to no EGVM detections prior

to 2009, and chlorantraniliprole is a recently registered insecticide which is just beginning to be used on grapes and other applications.

3. Survey

A systematic survey program to detect the presence and distribution of EGVM in California is in place in 46 counties and monitored by the CDFA in coordination with USDA–APHIS. The EGVM program uses red paper Delta traps baited with an EGVM-specific pheromone lure that will attract male moths. Traps are hung from vine cordon wires, trap support poles, or by trap hangers at vegetation levels of plants at the specified density of 25 traps per square mile in commercial grape production areas throughout the State. Additional traps may be deployed in urban areas of the State at existing trap sites for other pests (e.g., fruit flies, gypsy moth) at a density of 5 traps per square mile. County or State employees inspect these traps biweekly from February through November in Southern California, and from March through October in Northern California.

As of October 11, 2010, a total of 100,959 adult EGVM were detected within 10 counties. Of the total, 100,831 were detected in Napa County composing greater than 99 percent of the total number moths (table 2).

Table 2. European Grapevine Moth Detections by County in 2010.

County	Total Adult EGVM Detected (February–October 2010)
Fresno	11
Mendocino	36
Merced	4
Monterey	1
Napa	100,831
San Joaquin	2
Santa Clara	3
Santa Cruz	1
Solano	11
Sonoma	59

Survey is also a critical component in the deregulation of areas under quarantine.

4. Quarantine and Noncommercial Control

Control options for live plants in production and retail nurseries under quarantine are similar to those proposed for noncommercial controls. In the event that live plants are shipped and a chemical control is needed, a foliar application of spinosad, Btk, methoxyfenozide, or chlorantraniliprole alone or in conjunction with a pheromone dispenser at the nursery may be used. Organic spinosad and Btk formulations are also available for organic applications. Application of these products should be timed with the appropriate life stage of EGVM to ensure effective control.

In noncommercial controls (e.g., residential, right-of-ways, and natural or wilderness areas) several options are available. Control applications in these areas is critical to eliminate source areas for EGVM which could then re-infest previously treated commercial areas. Controls for noncommercial properties include the preferred method of hand removal of fruit and/or host plant material, or mating disruption using pheromone dispensers, and/or a ground treatment with Btk, spinosad, or methoxyfenozide. An application using an organic Btk formulation is the preferred chemical control method if a chemical application is requested. These applications will be made by CDFA personnel who will work with property owners on a voluntary basis to decide the most appropriate control option.

a. Fruit Removal

Properties within 500 meters of an EGVM detection would have to remove all flowers and fruit from grapevines and olive plant flowers in order to deprive EGVM larvae of a food source. Olive fruit are exempt from this requirement. Periodic visits during the growing season by EGVM program staff may be necessary to verify that the vines remain flowerless and fruitless, and to remove any later developing flowers or fruit.

b. Pheromone Dispensers

The EGVM pheromone formulation, Isomate®- EGVM, has been made available by the manufacturer in the form of pheromone-infused mating disruption dispensers, which are small, flexible tubes containing the pheromone and are affixed to host material (USDA–APHIS, 2010c). Under the preferred alternative, the dispensers would be used at a density of 200 per acre in commercial areas. The use of these dispensers in some of the counties under quarantine last year was previously analyzed under a categorical exclusion. This type of treatment is most effective against established populations if it is combined with a control that also targets the immature stages; therefore, it is recommended to be used as the sole control only in areas where EGVM populations are low.

The minimum contiguous area over which mating disruption is to be applied is 10 acres to ensure adequate coverage of the application. In riparian or other small properties surrounded by vineyards, the surrounding vineyards are being treated with dispensers to achieve a minimum 10-acre contiguous coverage, which requires a minimum 100-meter radius from the property. The dispensers are affixed to vegetation or other objects. Residential use of pheromone dispensers will only be used with consent and a notification in writing regarding their use.

c. Foliar Applied Insecticide Treatments

Several insecticide products are available for use to control EGVM (see table 1); however, the current recommended control of nursery stock, under the preferred alternative, for live grape vines and olive plants include Btk, methoxyfenozide, spinosad, and chlorantraniliprole because of their efficacy against EGVM larvae and their lower risk when compared to broad spectrum insecticide alternatives. Control applications would be applied within all areas that are under regulation to a distance of 500 meters (ITWG, 2010). Multiple applications may be required in heavily infested areas, and would be separated by a period of several months during the winter with control applications occurring primarily April through late July to overlap with the first and second generation EGVM. In residential control applications, if the property owner wants to keep their grapes, the program would make a ground application preferably with Btk, but may also use spinosad or methoxyfenozide. Btk may require additional applications due to its comparatively lower residual toxicity when compared to spinosad or methoxyfenozide. Property owners will be notified in writing 24 hours prior to application.

B. Preferred Alternative

The preferred alternative evaluated in this EA is for APHIS to provide additional support to CDFA and other stakeholders in the eradication of EGVM by providing regulatory and funding support for certain aspects of the program discussed in the no action alternative. Survey and monitoring for EGVM would continue throughout the 46 California counties to determine the potential spread of EGVM, as well as identify areas to be removed from quarantine. APHIS would also provide support to maintain the current quarantine. In addition, APHIS would provide funding to CDFA to facilitate control options in noncommercial areas. These areas would include residential, right of way, and natural or wilderness areas that fall within the 500-meter radius of an EGVM detection. Control options in noncommercial areas would be the same as those currently being used. Host fruit or flower removal or, in some cases, host plant removal would be the preferred alternative. In certain cases, property owners may prefer a chemical application which would occur on a voluntary basis, as described above.

III. Affected Environment

This section presents the baseline conditions of socio-economic and environmental resources that may be affected by EGVM eradication activities. APHIS uses this information as the basis against which potential impacts of the program are evaluated. The program area encompasses the 46 counties in which the EGVM survey program occurs, and where subsequent control measures would occur should a detection be confirmed. Due to the large geographic area potentially impacted for this program, and the wide variety of socio-economic and environmental features throughout the area, the affected environment section is presented herein as a summary of current conditions regarding land use, air quality, water quality, ecological resources, and other relevant pest program information. It also provides references to more detailed site-specific conditions in each of the areas evaluated.

A. Land Use

California has approximately 27.5 million acres of farmland upon which EGVM host plants could grow. In 2009, California reported over $34.8 billon in agricultural revenue, of which $4.4 billon were from grapes (CDFA, 2010b). Currently, over 400 different commodities are grown in the State on more than 81,500 farming operations. Appendix C provides more detailed land use data for each of the 46 counties of California considered in this EA, as well as the reported the gross income for the leading agricultural production crops. Of the top three commodities produced in each county, 16 of the 46 counties list grapes (USDA/NASS, 2009). The high production levels of regulated products (i.e. table grapes, wine, raisins, olives, and stone fruits) throughout the State and, specifically, in the areas currently under an APHIS-established quarantine could denote a major economic challenge to California agriculture and, in turn, U.S. consumption and exports of these products. With 90 percent of grape production in the United States, California is by far the largest grape-producing State.

B. Air Quality

Five air quality basins occur within the proposed area for the EGVM program. These include the San Francisco Bay, North Central, San Joaquin Valley, South Coast, and the Sacramento Valley Basins. Specific information regarding air quality impairment for these basins is discussed in detail in an environmental impact report (ENTRIX, 2009). Current impacts within these basins are related to exceeding air quality standards for several compounds, including ozone, carbon monoxide, particulate matter, nitrogen oxide, and sulfur dioxide. Significant contributions to these standards are typically not related to pesticide application; however,

there are concerns regarding pesticide transport from the area of application to other areas where environmental impacts have been noted. Pesticide transport from agricultural areas within the Central Valley of California to the Sierra Nevada Mountain range have been reported prompting concerns related to impacts on amphibian populations (Bradford, et al., 2011; Lenoir, et al., 1999).

C. Water Quality

Important to the analyses of the potential effects of no action and program alternatives presented within this document is an accounting of the hydrologic characteristics of the potentially affected areas within different regions and their regulatory status.

The California Water Plan–Bulletin 160–05, Update 2005 divides California into 10 hydrologic regions, 7 of which occur within the 46 counties proposed for potential EGVM management activities. Details regarding each region within the survey area are summarized in other documents for the North Coast, San Francisco Bay, Central Coast, South Coast, Sacramento River, San Joaquin River, and Tulare Lake Hydrologic Regions (DWR, 2005; ENTRIX, 2009). The regions are delineated based upon the State's major drainage basins. Each region has distinct precipitation characteristics and waterbodies that channel or retain runoff. Multiple surface waterbodies within the current survey area are listed as impaired under the Clean Water Act Section 303(d). Reasons for impairment vary widely with inorganic chemicals, such as heavy metals, to organic compounds, such as pesticides, being the causative agents. Nonchemical impairments, such as sedimentation, have also been noted for some waterbodies (appendix D).

Ground water quantity and quality varies between hydrologic regions. Impairments to ground water quality are also variable with threats from brackish and saltwater intrusion in the North and Central Coast Hydrologic Region to inorganic and organic contamination in many of the other hydrologic regions. Inorganic contamination with total dissolved solids, nitrates, and some minerals are reported in the San Francisco and Sacramento Hydrologic Regions. Organic contamination from agricultural pesticides occurs in the San Joaquin and Tulare Lake Hydrologic Regions in areas where soil permeability allows vertical movement of some pesticides. The use of ground water to meet urban and agricultural needs varies between hydrologic regions, from a low of 20 percent in the San Joaquin region to greater than 80 percent in the central coastal region (ENTRIX, 2009).

D. Ecological Resources

The EGVM program area occurs over a large portion of California. Of the 46 counties currently included in the surveillance area, all or portions of the five ecoregions within the State are potentially affected. The five ecoregions include the California Dry Steppe; California Coastal Chaparral, Forest, and Scrub; California Coastal Steppe, Mixed Forest, and Redwood Forest Province; California Coastal Range, Open Woodland-Shrub-Coniferous Forest-Meadow Province, and the Sierra Steppe Mixed Coniferous Forest-Alpine Meadow Province. The characteristics of each of the provinces are summarized in a California Environmental Impact Report for the unrelated Light Brown Apple Moth and herein incorporated by reference only to provide a description of each ecoregion (ENTRIX, 2009).

Ecologically, California is one of the most diverse places on earth with elevations ranging from -282 feet in the Badwater Basin of Death Valley to over 14,494 feet at the peak of Mount Whitney, the highest peak in the lower 48 States. Habitats within California support a wide variety of fish and wildlife resources, a number of which are only found within the State. The State is home to a number of endemic species, including 2,387 plant species (Loarie et al, 2008), 312 native bird species, over 70 native inland fish species (Moyle and Cech, 1988), native amphibians, native reptiles, crustaceans, and invertebrate species. Of these, the majority are currently federally listed as threatened or endangered and/or by the State as sensitive, endangered, or threatened. The most common threat to these species is habitat loss or modification primarily due to agricultural conversion, flood protection, and development pressures.

Development and agriculture have vastly changed California's native landscapes and the species dependent on them. Since California's settlement in the mid 1700s, over 90 percent of all of its wetlands have been lost to agriculture, mining, reclamation projects, or urban development (FWS, 2010a; USGS, 2006a). As such, the ranges and distributions of numerous aquatic and aquatic-dependent species have been dramatically altered.

The EGVM program area covers a vast portion of California's Pacific Flyway, an annual migratory route for millions of birds. In the Sacramento and San Joaquin Valleys, agricultural lands are often managed to conserve migratory birds through a series of National Wildlife Refuges, Joint Ventures, the Central Valley Joint Venture Conservation Program, California Riparian Bird Conservation Program, and other joint ventures administered by the U.S. Fish and Wildlife Service (FWS) (FWS, 2010b) in cooperation with numerous State, Federal, local, and nongovernmental partners. One such effort includes California's Audubon Important Bird Conservation Areas program. The EGVM program area contains 116 of

145 important bird conservation areas (IBCA) (Audubon California, 2009). These IBCAs provide essential breeding, feeding, wintering, and migratory habitats for numerous birds that utilize the diverse ecology of the State. Sizes range from a few acres to thousands of acres, and often have multiple land ownerships.

1. Sacramento–San Joaquin Delta

A large portion of the EGVM program area falls within the Sacramento–San Joaquin Delta (SSJD), the largest delta on the west coast. The Sacramento–San Joaquin Delta drains over 40 percent of the entire surface area of the State, providing more than 50 percent of its water. Of the water produced in the system, more than 80 percent is dedicated to agriculture (USGS, 2005).

For the last 16 years, 25 State and Federal agencies have been working to restore SSJD through CALFED Bay Delta Accord. CALFED is a collaborative effort of State and Federal regulators and administrators responsible for various management compartments of SSJD, including a consortium of stakeholders and regulators that have jurisdiction over ecological resources within SSJD. For the last several years, CALFED and associated academia have been investigating a widespread phenomenon dubbed "pelagic organism decline" which is decimating the aquatic food chain in SSJD, as well the San Francisco Bay and its estuary. SSJD provides water to more than two-thirds of the people of California (CALFED at http://calwater.ca.gov/). The many demands on the water resources of SSJD include agriculture, domestic, and conveyance to both farmers in the southern San Joaquin Valley and the people of the Los Angeles Basin, some 350 miles south of the delta. Over 16 native fish rely on SSJD for survival. Several of those species are listed as either threatened or endangered under the Endangered Species Act of 1973 (ESA), as amended.

2. Salmon Recovery

California is home to 32 taxa of salmonids, 20 of which (62 percent) are endemic to the State (Moyle et al., 2008). To date, there are 10 evolutionary significant units (ESUs) of Pacific salmon and steelhead listed by the National Marine Fisheries Service (NMFS) as either threatened or endangered. FWS manages inland, landlocked salmonids, three of which are currently listed under ESA. Historically, salmon and steelhead were abundant in all of the coastal and major river systems within the State of California. Today, NMFS manages individual population segments within hydrological units to maximize recovery efforts. From 2000 through 2009, NMFS has invested over $121 million in salmon recovery efforts in the State of California (NMFS, 2010). The majority of these funds are spent restoring degraded habitat and opening passage to historically occupied watersheds that have been blocked by reclamation and agricultural water developments.

3. Habitat Conservation Efforts

In an effort to minimize the impacts of ongoing demands on remaining wildlands within the State, FWS and NMFS, in cooperation with the California Department of Fish and Game and voluntary applicants, are currently engaged in numerous efforts aimed at conserving federally and State listed species on remaining open spaces within the State. To date, these efforts are generally pursued through section 10 of the Federal ESA and the California Endangered Species Act's Natural Community Conservation Planning Act processes, covering over 9 million acres within the State (CDFG, 2011).

Other ongoing land conservation planning efforts are pursued through FWS' Partners for Fish and Wildlife Program. In California, FWS Partners Program assists private landowners and other interested parties with habitat restoration in wetland and riparian areas, as well as managing and removing invasive species. To date, over 62,000 acres have been restored (FWS, 2010a).

In addition, the Fish Friendly Farming Program operates in four of the 46 EGVM program counties (Napa, Sonoma, Mendocino, and Solano) and provides an incentive-based program for growers to develop and adopt environmentally beneficial farming practices. Participating landowners prepare plans that are reviewed and certified by NMFS, the Regional Water Quality Control Board, and/or county agricultural commissioners. The plans provide comprehensive and detailed best management practices to restore habitat for aquatic dependent species in the region. Since 1999, landowners in the four-county area have enrolled over 100,000 acres of farmland in the program; currently, 29,000 acres are certified as Fish Friendly (NMFS, 2009).

E. Other APHIS–PPQ Program Activities Within the Quarantine/Survey Area

Within the current EGVM State interior quarantine boundary, there is overlap with ongoing CDFA/APHIS pest programs addressing invasive pests of grapes and olives; namely, light brown apple moth and glassy winged sharpshooter. In addition, APHIS has other activities that deal with invasive pests on other commodities that may occur in the EGVM quarantine and larger survey area. Funding, as well as regulation of other programs that APHIS supports within the quarantine and survey area, includes Asian citrus psyllid, gypsy moth, fruit fly, and grasshopper and Mormon cricket management and control programs. Additionally, weed management areas have been established that bring together private landowners with local, State, and Federal partners to jointly manage and eradicate invasive plants. CDFA also has pest management programs that are designed to monitor and, in some cases, apply specific control options in areas that may co-occur with potential EGVM activities. Monitoring activities, such as those for the false codling moth or controls for beet

curly top virus, are programs that have, or may occur, within localized areas found within the survey area of EGVM. These programs use control measures that are not part of the EGVM program, but should be considered in the analysis to determine the potential for cumulative impacts.

IV. Environmental Consequences

A. No Action

The no action alternative identified in this EA is the continuation of current activities without APHIS' support for the program. Under this alternative, certain management activities may not be able to continue due to lack of funding. In particular, surveying efforts to determine the extent of scope and distribution of EGVM, as well as removal of areas from quarantine would be diminished. Also, noncommercial controls would be reduced leaving areas where EGVM host material could serve as a source for reinfestation of commercial areas and counties currently not affected.

A lack of an integrated multifaceted pest management approach to managing EGVM would result in a greater probability of spread to other areas of the State, and possibly outside of California over time. A reduction in the ability to effectively survey for EGVM would reduce the ability to detect EGVM and respond quickly to the need for control and to minimize the potential spread, as well as delay the deregulation of areas that are currently under quarantine. Areas under quarantine would remain under quarantine for a longer period of time and require additional applications of foliar applied insecticides or fumigation to prevent the reintroduction of EGVM. The long-term need for management of EGVM and its eventual spread to other areas would result in economic impacts related to increased costs to manage EGVM, as well as potential impacts to international trade and interstate commerce. Costs to control EGVM in Napa County in 2010 were estimated to be $7.7 million for voluntary grower applications of conventional, organic, and pheromone treatments (USDA–APHIS, 2010a). These costs, as well as costs for additional survey and quarantine would be expected to increase if EGVM spreads to other areas. The establishment of EGVM in California could result in additional controls including foliar applications and fumigation of regulated commodities for extended periods of time.

Another outcome from an expansion of EGVM is the potential for additional pesticide applications in commercial and noncommercial areas. Currently, growers and the county agricultural commissioners work closely with the State and APHIS to monitor EGVM and time applications of pesticides so as to maximize pesticide efficacy. Products, such as Btk, spinosad, methoxyfenozide and chlorantraniliprole are the primary

products used in foliar applications with pheromone dispensers; however, their efficacy is directly related to making applications at the appropriate life stage. The success of this approach is seen in the large reduction in EGVM populations, especially in Napa County in 2010. Compared to other available chemistries, these products have low use rates and offer comparatively lower risks to human health and the environment. Increased distribution of EGVM intra- and interstate would make it more difficult to coordinate eradication activities.

The lack of a comprehensive and coordinated program to control at the preferred life stage of EGVM with lower risk pesticides, plus the potential for reinfestation, could result in the increased use of broad spectrum foliar insecticides. Several alternative chemistries for leafroller control, such as EGVM, are registered by the EPA and approved by the California Department of Pesticide Regulation for use in nursery treatments and commercial vineyards; however, these products are broad spectrum and may pose a greater environmental risk than the products currently being recommended for use. Products in the carbamate, organophosphate, and pyrethroid insecticide class could see an increase in use because they are effective to a broader range of the EGVM life stages. These products may increase pesticide loading into the environment in commercial applications because some of the products, in particular the organophosphates and carbamates, have higher use rates when compared to the currently used program pesticides. In addition, some of these products, such as the organophosphates and carbamates, are related to concerns regarding impacts to listed species, and have been linked to impaired watersheds, and may contribute to pelagic organism decline. In addition, the broad spectrum activity of these chemistries makes them less suitable in applications where protection of beneficial insects is a priority and may pose greater risk to ecological resources. For example, pyrethroid insecticides that provide broad spectrum insect control may pose greater risks to aquatic organisms due to their comparatively higher toxicity to aquatic vertebrates and invertebrates. The possibility of increased pesticide use in noncommercial areas, such as residential areas, is less clear; however, those property owners who want to keep their grapes would need to make some type of pesticide application. Increased frequency of application in these situations may result in increased pesticide loading and environmental risk, depending on the type of treatment.

The environmental consequences of eradication-related activities that are currently being conducted by CDFA, and could be supported by APHIS, are discussed below.

1. EGVM Survey

Currently, CDFA, as well as the county agricultural commissioners (CAC), conduct survey efforts that monitor EGVM throughout the 46 counties currently under evaluation. The EGVM program uses red paper Delta traps baited with a pheromone lure that will attract male moths. Recommendations from the ITWG report suggest that trapping intensity should be increased from 16 to 25 traps per square mile, and that surveys in residential and noncommercial areas in regulated areas be increased to levels comparable to trapping efforts in commercial vineyards (ITWG, 2010). Survey is recommended to begin before first flight and continue throughout the flight season which occurs in early spring. In addition to the utility of survey as a means to delimit the population of EGVM, it is also important in the deregulation of an area, as well.

The pheromone is not considered to be a hazard to human health. Effects of the pheromone are discussed in more detail below in the control options for quarantine enforcement and noncommercial areas. The pheromone used in the traps is not a hazard to ecological resources (USDA–APHIS, 2011). The pheromone is species-specific, and will selectively attract male EGVM. There is the possibility that traps will capture some nontarget invertebrates. The collection of other nontarget insects in traps is a function of trap design, placement, and color as opposed to a response to the pheromone itself (Mitchell et al., 1989; Gross and Carpenter, 1991; Clare et al., 2000). The impact of these traps to invertebrate populations is not expected to be significant based on survey data from other leafroller monitoring programs (CDFA, 2007). Some incidental captures of Lepidoptera and some other insects can occur; however, the majority of the insects collected to date have been male EGVM. The potential for impacts will also vary based on the density of traps. On a county level basis, trap numbers vary widely. For example, trap numbers by county range from 6 to approximately 8,400 traps. A majority of the counties have few traps, with over half of the 46 counties having less than 150 traps in the entire county. Approximately 80 percent of all traps currently are in 11 of the 46 counties and are related to the location of the quarantine.

2. Quarantine and Noncommer-cial Control

Activities that may be funded or regulated by APHIS, in cooperation with CDFA, include quarantine enforcement activities as well as noncommercial controls where fruit and/or flower removal is the preferred option of control. In some nursery situations live grape vine or olive plant controls can also be avoided by only moving those plants outside of the quarantine when they are dormant. However, in the case of shipping live plants that are not dormant and are moved intra- or interstate outside of the quarantine, these may require a chemical application. Also, in noncommercial settings where fruit removal is not an option, based on property owner preference, a voluntary application of a registered insecticide may be needed if the property falls within the 500-meter radius of a positive EGVM detection. In addition to foliar controls, there is the potential that there could also be control with

pheromone dispensers. Dispensers could be used alone or in combination with one of the preferred foliar applications. The combination of mating disruption and the selective use of the proposed foliar insecticides have been shown to be an effective method of control for EGVM (ITWG, 2010). These products and their environmental risk are summarized below, and are discussed in more detail in an ecological risk assessment that was prepared for this program (USDA–APHIS, 2011).

a. Fruit and Host Plant Removal

In areas with little host material, APHIS, in cooperation with CDFA, can choose to remove the host material from an area. This would involve removal by hand or machine, and would not utilize any chemical controls. Removal may occur in quarantine areas, such as nurseries and noncommercial areas, and are not expected to have any impacts to human health or ecological resources. Human health impacts are also not expected with this type of control in noncommercial settings. In noncommercial settings, the removal of fruit may reduce the availability of food for some terrestrial wildlife that feed on the fruit; however, these impacts are expected to be minor because the area of fruit removal is very small and wildlife typically have foraging ranges outside of an individual plant. In addition, most terrestrial vertebrates have varied diets and will have other food items available for foraging. Impacts on environmental quality from the removal of these other host materials are expected to be negligible. No application of chemicals or extensive ground disturbance would be expected from fruit or host removal; therefore, impacts to soil and water quality would not be expected.

b. Pheromone Dispensers

The EGVM pheromone belongs to a group of compounds known as straight chain lepidopteran pheromones that serve as a chemical cue attracting male moths to females of the same species for reproduction. Lepidopteran pheromones are a unique mixture of short chain hydrocarbons, similar to fatty acids, with one of several functional groups (i.e., acetate, alcohol, and aldehyde). In the case of EGVM, the female emits a pheromone blend that has been identified as (E,Z)-7,9-Dodecadien-1-yl acetate, which is the primary constituent that provides species-specificity to ensure attraction of the male EGVM for reproduction (El-Sayed et al., 1999; Witzgall et al., 2005). The identification and synthesis of these types of pheromones have been successfully used as a means to provide species-specific suppression of target insect populations, including leafrollers, such as EGVM (Suckling and Shaw, 1992; Suckling and Shaw, 1995; Carde and Minks, 1995; Plettner, 2002; Welter et al., 2005; Witzgall et al., 2008).

This type of insect control acts by releasing a synthetic version of the naturally produced pheromone into the atmosphere which can reduce reproduction by either creating false plumes that male moths will follow, mask, or camouflage the natural plumes released by the female moths, or through decreased sensitivity of male moths to the pheromone due to high background concentrations (Stelinski, 2007). Release of synthetic pheromone into target areas will be implemented using the formulation Isomate®-EGVM, which is a dispenser that contains the EVGM pheromone and is registered for use in organic production. The dispenser is composed of an aluminum wire and a small plastic tube that contains the pheromone formulation (USDA–APHIS, 2011). Using the wire, the dispensers are attached by hand to a tree or other object at a rate of 200 dispensers per acre (equivalent to 38.36 grams per acre (g ai/acre). The EGVM pheromone can volatilize into the atmosphere for approximately 120 to 180 days before removal and possible replacement. Applications would be made voluntarily in commercial vineyards or in nurseries, and in some noncommercial areas based on property owner consent.

(1) Human Health

The straight chain lepidopteran pheromones have low toxicity to mammals based on the available data for this group of compounds. Based on the available acute mammalian toxicity data for approximately 10 structurally similar lepidopteran pheromones, the median lethal oral dose ($LD_{50,}$ i.e., the dose required to kill 50 percent of a test population) for rats would be considered practically nontoxic with values ranging from greater than 5 grams per kilogram (g/kg) to greater than 34.6 g/kg (Touhey 1990; Weatherston and Stewart, 2002; EPA, 2007). Acute dermal toxicity is also considered low with LD_{50} values ranging from greater than 2 g/kg to 20.25 g/kg based on study results from nine acetate based straight chain lepidopteran pheromones. Inhalation hazards are also low based on results compiled from three studies that show the median lethal concentration ($LC_{50,}$ i.e., the concentration required to kill 50 percent of a population) values range from 3.3 to 33.2 milligrams per liter (mg/L) (Touhey, 1990; Inscoe and Ridgway, 1992; Weatherston and Stewart, 2002).

Chronic toxicity data is limited for straight chain lepidopteran pheromones as the U.S. Environmental Protection Agency (EPA) waives these types of studies based on their low acute toxicity and the low potential for long-term exposure. Available subchronic and developmental mammalian toxicity studies have shown no mutagenic, carcinogenic, or developmental effects for all tested pheromones (Touhey, 1990). Daughtrey et al. (1990) dosed rats daily 5 days per week for 13 weeks with tridecyl acetate at doses ranging from 0.1 to 1.0 g/kg/day. The calculated no observable effect level (NOEL) was found to be 0.1 g/kg/day based on a slight increase in liver weight, which is consistent with long-term dosing.

The California Office of Environmental Health and Hazard Assessment (OEHHA) evaluated the human health risk of the Isomate®-EGVM formulation and found that the product was not expected to pose a risk to human health. This conclusion was based on the low toxicity of the pheromone and other ingredients as well as the low concentrations of pheromone that would occur during its release from the dispenser (OEHHA, 2010).

(2) Ecological Resources

The Isomate®-EGVM formulation proposed for use in this program is not expected to have adverse impacts to ecological resources. The low aquatic toxicity of these types of pheromones, including this particular formulation, as well as the proposed use pattern, suggest that exposure to fish and aquatic invertebrates, even under unrealistic exposure conditions, would not result in impacts to aquatic resources or their habitat or food sources (USDA–APHIS, 2011). Impacts to terrestrial wildlife are also not expected to be significant given the very low toxicity of the pheromones to mammals, birds, and terrestrial invertebrates. Median lethality values for mammals and birds exceed the highest test concentration suggesting they are practically nontoxic to terrestrial vertebrates (Weatherston and Stewart, 2002). The low toxicity and low potential for exposure suggest populations would not be impacted due to direct toxicity, or from loss of habitat or food items (USDA–APHIS, 2011).

(3) Air and Water Quality

Pheromone dispensers will discharge the pheromone into the surrounding atmosphere and are not expected to result in a decline in air quality. Concentrations released are extremely low and would not result in any impairment of air quality or impacts to human health or the environment. Water quality will not be impacted by the placement of pheromone dispensers, as proposed in this program. The use of dispensers eliminates the possibility of the pheromone impacting water quality because no runoff or drift can occur. Pheromones are volatile, insoluble in water, and susceptible to degradation; current label language does not allow application or disposal to water.

c. Spinosad

Spinosad is a broad spectrum insecticide that contains two active ingredients, spinosyn A and spinosyn D. Spinosyn is a metabolite of the soil-borne bacteria, *Saccharapolyspora spinosa*, which has demonstrated insecticidal activity (Thompson et al., 2000). Spinosad is registered as a reduced-risk pesticide by EPA–Office of Pesticide Programs, and is listed by the Organic Material Review Institute (OMRI) for use in organic production. It has insecticidal ability against some butterflies and moths

(Lepidoptera), thrips (Thysanoptera), flies (Diptera), termites (Isoptera), wasps, ants, bees (Hymenoptera), and some beetles (Coleoptera) (Cleveland et al., 2002). Spinosad is proposed for use in two formulations, Success® and Entrust®, which control a wide variety of pests on multiple crops.

(1) Human Health

Spinosad has low toxicity to mammals based on acute LD_{50} values of 3,738 mg/kg and >2,000 mg/kg for male and female rats, respectively. The dermal and inhalation toxicity is also low, with a dermal LD_{50} value of >2,000 mg/kg in the rat, and an inhalation acute LC_{50} value of >5.18 mg/L in the rabbit (EPA, 1998a). Based on longer term studies, spinosad has not been shown to be carcinogenic, mutagenic, neurotoxic or a reproductive toxicant. Metabolism studies revealed that spinosyn A and D have similar routes of excretion, and are metabolized in a similar manner with most of the material excreted within 48 hours.

Quantitative human health risk assessments conducted for similar use patterns as those proposed in this program suggest that risk to human health and associated subgroups is not expected to result in adverse effects (ENTRIX, 2009; EPA, 2006). Exposure scenarios for multiple population subgroups in occupational and nonoccupational exposure scenarios were evaluated based on exposure from oral, dermal, and inhalation doses and, in some cases, in aggregate to determine potential risk. Conservative assumptions regarding exposure from these scenarios and the reference doses estimated from the available toxicity data demonstrates low risk.

(2) Ecological Resources

Spinosad also has low toxicity to wild mammals and birds based on the available toxicity data (USDA–APHIS, 2011). Toxicity to terrestrial invertebrates has shown a range of sensitivities based on the test species and exposure route (Miles and Eelen, 2006; Kim et al., 2006). Spinosad has comparatively lower toxicity to predatory mites and other beneficial insects, such as predatory bugs (Hemiptera), flies, beetles and spiders (Miles and Eelen, 2006). Parasitic wasps appear to be more sensitive to spinosad when compared to predatory insects (Miles and Eelen, 2006; Williams et al., 2003). Spinosad is highly toxic to honey bees and bumble bees, based on oral and contact studies (EPA, 1998a; Morandin et al., 2005). Because applications for EGVM could occur during bee activity, following label precautions will reduce the risk. The labels state that the product is toxic to bees for 3 hours following application, and instruct that applications should not be made to blooming, pollen-shedding, or nectar-producing parts of plants during bee foraging periods in order to reduce risks to honey bees (Mayes et al., 2003).

Spinosad is slightly toxic to fish, with carp (*Cyprinus carpio*) being the most sensitive of the species tested (LC_{50}=4.99mg/L) and rainbow trout (*Oncorynchus mykiss*) being the least sensitive (LC_{50}=30mg/L). Acute aquatic invertebrate toxicity is comparable to fish, based on toxicity values for freshwater cladocerans and the estuarine shrimp; however, spinosad is considered highly toxic to the eastern oyster (*Crassostrea virginica*), with a median lethal effective concentration (EC_{50}) value of 0.295 mg/L. Expected aquatic concentrations from spinosad use in this program in various waterbodies, including shallow static habitats, are not expected to result in direct risk to fish or any of their habitat or prey (USDA–APHIS, 2011).

Low exposure and the use pattern proposed for spinosad in this program suggest that there is low risk of direct or indirect adverse impacts to terrestrial and aquatic ecological resources. No indirect or direct impacts expected, such as loss of habitat or food items, that terrestrial and aquatic resources would depend on for shelter and food (USDA–APHIS, 2011).

(3) Air and Water Quality

Based on its chemical properties, spinosad is not considered to be a compound that would volatilize into the atmosphere (USDA–APHIS, 2011). Some impacts to air quality would be expected as drift during a ground application; however, it would be confined to the area of application and would quickly diminish as the droplets adhere to vegetation and soil. These impacts would be isolated to small areas within organic or nonorganic nurseries or in a noncommercial area. Spinosad impacts to ground and surface water quality are expected to be minimal based on the proposed use pattern and environmental fate of spinosad.

Spinosyn A is considered soluble at 89.4 mg/L, while spinosyn D is comparatively insoluble at 0.49 mg/L. In soil, spinosyn A has a relatively short half-life ranging from 9.4 to 17.3 days, while spinosyn D has a soil half-life of 14.5 days. Spinosyn A and D are not considered mobile as they readily bind to soil and would not be susceptible to runoff in water or movement into ground water. In field dissipation studies, the half-lives for spinosyn A were short with a reported range of 0.3 to 0.5 days. In aquatic environments, spinosyn A and D are considered stable to hydrolysis at all relevant pH values; however, photodegradation in water results in a half-life of less than a day for spinosyn A and D.

d. *Bacillus thuringiensis* var. *kurstaki* (Btk)

Btk is a naturally derived soil bacteria that produces protein crystals which are endotoxins with activity against certain insects (EPA, 1998b). The endotoxin must be ingested by the insect and several physiological responses must occur for toxicity to occur. The crystal protein must be

solubilized by the highly alkaline midgut (pH 10–11) in the insect where it is activated and binds to certain types of cells in the midgut. The toxin creates pores in the midgut which causes lysis, and results in starvation or septicemia in the insect (Whalon and Wingred, 2003). The two formulations that are proposed for use are Dipel® DF and Biobit® in either organic noncommercial applications or organic and nonorganic nursery applications using ground equipment.

(1) Human Health

Mammalian toxicity studies testing the technical active ingredient and the formulated product of Btk have reported low acute oral, dermal, and inhalation toxicity, and pathogenicity (EPA, 1998b; USDA–FS, 2004). These laboratory studies have also been supported by epidemiology studies that revealed no direct human health effects from Btk applications. Results from laboratory and epidemiology studies indicate that Btk is not a carcinogen, mutagen, or a reproductive toxicant (EPA, 1998b; USDA–FS, 2004). Btk is not considered an eye or skin irritant and is nonsensitizing to the skin.

Human health risk assessments that quantify the potential risk to various population subgroups, including children, as well as workers under different agricultural and nonagricultural application scenarios have shown that Btk does not pose a risk to human health (USDA–FS, 2004; ENTRIX, 2009; EPA, 1998b; WHO, 1999). Btk has been used in large scale broadcast applications to control various lepidopteran pests in the United States, Canada, and New Zealand. Epidemiology studies of these applications have been used to evaluate the effects related from these treatments to the general public, as well as workers making the applications. In general, no short- or long-term effects have been noted in the general population from these treatments. There have been some reports of skin sensitization in workers who handle the concentrated material; however, no pathogenicity was noted. These results support previous risk assessments that demonstrate the low risk of Btk applications to the humans; however, the results from these studies do not represent the use patterns proposed for Btk in the EGVM program. The effects measured in the epidemiology studies were from broadcast applications over large populated areas, compared to the EGVM program where preferable organic Btk applications may occur in some nursery operations within the quarantine or possibly to some noncommercial areas with property owner consent. In both cases, applications are made by ground equipment to host material either within the nursery or within a 500-meter radius of a positive EGVM detection. These applications are only made if fruit or flower removal is not feasible. The proposed use of Btk in the EGVM program greatly reduces the potential for exposure when compared to those use patterns evaluated in the epidemiology studies.

(2) Ecological Resources

Btk toxicity to wild mammals and birds is very low with no effects observed at a range of test concentrations (USDA–APHIS, 2011). Btk also has low toxicity to most terrestrial invertebrates, including beneficial insects; however, impacts to nontarget larval lepidopteran would be expected to occur in areas of treatment. Even within the lepidopteran group that contains butterflies and moths, sensitivities can be highly variable (Peacock et al., 1998). These impacts are reduced based on the use of ground applications which will reduce the amount of drift compared to aerial applications. Exposure is also reduced by making applications directly to host plant material. The lack of impacts to most invertebrates and the small areas of application will ensure that no impacts to bird and mammal food sources will occur.

Btk has low acute toxicity based on laboratory studies testing freshwater and saltwater species. In all cases, the calculated LC_{50} value was above the highest test concentration used in the study (USDA–APHIS, 2011). Btk has low toxicity to *Daphnia magna* in 21-day studies with EC_{50} values between 5 and 50 mg/L, while other aquatic invertebrate groups, such as mayflies, stoneflies, copepods, and mysid shrimp appear to be tolerant of Btk when exposed to concentrations well above those expected in the environment. Results from laboratory studies are supported by field data that suggest minimal effects to aquatic invertebrates from Btk use (USDA–APHIS, 2011). Based on the low toxicity to aquatic vertebrates and invertebrates, no direct effects are expected to these populations of organisms. This includes any indirect or food chain impacts as Btk uses are not expected to impact prey items that aquatic organisms use.

(3) Air and Water Quality

Btk is not expected to impact air quality in areas where it may be used. The spores are not considered to be volatile and Btk would only occur in the air during the time of any ground treatment. Ground applications directed towards vegetation ensure that any drift that could occur will be minimized and short-lived. Btk persistence in terrestrial environments is dependent upon light, moisture, and temperature. Increased exposure to light, higher temperature, and moisture decrease the viability of Btk. In addition, the persistence of Btk is dependent upon whether the emphasis is on the spores or the biologically active endotoxin. Reported half-lives for spores in water can range from a few days to greater than a month, while soil half-lives have been shown to be as long as 200 days (Menon and Mestral, 1985; Hendriksen and Hansen, 2002). The active endotoxin has a much shorter half-life than the spores due to sensitivity to ultraviolet light, and it breaks down rapidly on foliage with reported foliar half-lives ranging from a few hours to approximately 4 days (Behle et al., 1997; EPA, 1998b; WHO, 1999). Btk is not considered to be mobile and,

therefore, would not be expected to occur in ground or surface water. In addition, the small areas of control and applications directly to foliage would reduce the potential for any horizontal or vertical transport through the soil to surface or ground water from the site of application.

e. Methoxyfenozide

Methoxyfenozide is an insect growth regulator (IGR) that causes disruption of the molting process in insects by serving as a mimic for the insect hormone, 20-hyrodoxyecdysone. Activity appears to be specific to lepidopteran pests where it is consumed by the larvae inhibiting further development. The formulated product, Intrepid®, is currently registered for use as a foliar treatment on a variety of crops and nonagricultural uses.

(1) Human Health

Methoxyfenozide, and the formulated product Intrepid®, have low acute oral, dermal, and inhalation risk to mammals. Available data regarding acute effects demonstrate no toxicity at a range of concentrations, including the highest concentration selected in the study (PMRA, 2004). Use of the concentrated formulation is not reported as irritating to the eyes or skin, and it is not considered a skin sensitizer during brief exposures (Dow AgroSciences, 2008). Methoxyfenozide is not considered to be carcinogenic, teratogenic, mutagenic, or neurotoxic based on results from multiple laboratory toxicity studies (PMRA, 2004). Effects on endocrine organs and hematological parameters, such as increased methemoglobin, have been noted in studies but only at very high doses from dietary exposures that are not expected from the proposed use in this program.

Published quantitative human health risk assessments for a range of methoxyfenozide-treated commodities show that all population subgroups, including infants, are at low risk from methoxyfenozide. Dietary risks were based on effects measured in a 2-year chronic study using the NOEL (10.2 mg/kg/day) with an added uncertainty factor of 100 (EPA, 2009).

(2) Ecological Resources

Methoxyfenozide toxicity to wild mammals and birds is low based on available data. In mammals, the active ingredient and formulated material are considered practically nontoxic from oral, dermal, and inhalation exposures (USDA–APHIS, 2011). Toxicity to pollinators is also low while effects to beneficial insects are variable, depending on the type of insect. Applications in nursery settings, or in other areas, are not expected to result in adverse risk to mammals or birds, or the habitat and prey that they depend on for reproduction (USDA–APHIS, 2011). Any effects to terrestrial invertebrates will be localized to the small application

area, and will only occur to specific sensitive species at the appropriate life stage, such as Lepidopteran larvae.

Toxicity to fish, after methoxyfenozide exposure, is low with no lethal or sublethal effects noted at concentrations at, or below water solubility (USDA–APHIS, 2011). Toxicity to aquatic invertebrates is more variable, with the freshwater midge being the most sensitive species to methoxyfenozide (EC_{50} = 0.62 mg/L) and the toxicity to other test species ranging from 1.2 to 12.85 mg/L (EPA, 2010). Chronic toxicity can be of concern in repeated applications due to the persistence of methoxyfenozide and its sublethal effects to aquatic invertebrates. The label for Intrepid® requires a 25-foot application buffer from aquatic habitats which will significantly reduce drift and risk (USDA–APHIS, 2011). The method of application proposed for use in this program and the label restrictions will result in aquatic residues that would not be expected to have direct or indirect impacts to fish or amphibians, as well as their habitat and prey items (USDA–APHIS, 2011).

(3) Air and Water Quality

Applications of methoxyfenozide are not expected to have any impacts to air quality due to low volatility and use rates. Some material will be present in the air during application as drift; however, this will be localized and will decrease rapidly. Methoxyfenozide is stable in water with aquatic half-lives typically greater than 1 year. It has moderate solubility and does not bind readily to soil; therefore, it may be susceptible to runoff into aquatic habitats. Label language requires a 25-foot application buffer from all aquatic habitats which will result in a greater than 85 percent reduction of methoxyfenozide to water resources (USDA–APHIS, 2011).

f. Chlorantraniliprole

Chlorantraniliprole is a recently registered insecticide that works by activating insect ryanidine receptors which impair muscle regulation and cause paralysis in insects (EPA, 2008). The product is currently registered for a variety of crops, as well as for some turf and ornamental uses, to control moths/butterflies and some beetles. Chlorantraniliprole has been shown to be highly effective against eggs and larval of EGVM (Ioriatti, et al., 2009). The formulation proposed for use in this program is Altacor®, which is a water-dispersible granule that is mixed with water prior to making foliar applications.

(1) Human Health

Chlorantraniliprole has low acute and chronic toxicity to mammals. Acute median lethality values from oral, dermal, and inhalation exposures are

very low for chlorantraniliprole, as well as the proposed formulation, with no toxicity noted at all test concentrations, including the maximum level tested (EPA, 2008; DuPont, 2010). The formulated material is not considered a skin or eye irritant, and it is not a skin sensitizer. Based on short- and long-term studies, chlorantraniliprole is not considered to be mutagenic, carcinogenic, teratogenic, neurotoxic, or immunotoxic at a range of test concentrations (EPA, 2008). NOEL occurred at high doses and were generally 500 mg/kg/day or greater in subchronic and chronic studies, suggesting very low mammalian toxicity.

Quantitative risk assessments based on conservative dietary exposures to food and water residues show wide margins of safety for all subgroup populations, including infants. Similar margins of safety are also observed in quantitative risk assessments for worker exposure, as well (EPA, 2008). The wide margins of safety are based on the low acute and chronic toxicity that have been reported for chlorantraniliprole and it's relatively low use rate when compared to other insecticides.

(2) Ecological Resources

Chlorantraniliprole has low toxicity to wild mammals and birds based on available toxicity data (USDA–APHIS, 2011). Acute and chronic toxicity to birds is low, with acute toxicity values exceeding the highest concentrations tested. Low toxicity and the proposed use pattern demonstrate low risk to populations of wild mammals and birds. Indirect risks to terrestrial vertebrate populations from the loss of terrestrial invertebrates that serve as a food source would not be expected due to the lack of broad spectrum activity of chlorantraniliprole to insects, and the methods of application proposed for this use. Ground based applications will reduce potential impacts to terrestrial invertebrates to areas in, and immediately adjacent to, application sites. Label requirements for drift management will also reduce the potential for off-site transport. Although impacts to Lepidoptera are expected in application areas, these areas are not expected to be larger than the foraging range for most terrestrial vertebrates, and other invertebrates would be available that are not sensitive to chlorantraniliprole.

Aquatic toxicity of chlorantraniliprole is variable depending on the organism. Acute and chronic toxicity to fish is low, with acute values above the water solubility (approximately 1.0 mg/L) which would exceed concentrations that could occur in the environment. Toxicity to aquatic invertebrates is variable with the median lethal effect concentrations ranging from 10 parts per billion to greater than 1 part per million (EPA, 2010). Estimating potential chlorantraniliprole concentrations in various aquatic waterbody types and comparing those values to the toxicity data for fish and aquatic invertebrates demonstrates that potential concentrations would not reach levels that would have any direct or

indirect impacts to aquatic organisms or their food and habitat (USDA–APHIS, 2011).

(3) Air and Water Quality

Impacts to air and water quality are expected to be minimal from the proposed use of chlorantraniliprole. Chlorantraniliprole would only be present in the air at the time of application and not volatilize into the atmosphere where it could be transported over a large distance. Applications will be made using ground equipment which will reduce the potential for off-site movement. Chlorantraniliprole is persistent in soil and water with an average half-life of approximately 6 months. Label advisories regarding measures to reduce surface and ground water contamination will reduce the potential for contamination. The surface water advisory includes avoiding applications to soils with a high runoff potential, the use of vegetative filter strips, and avoiding applications prior to storm events.

B. Preferred Alternative

The environmental consequences of the preferred alternative are similar to those described under the no action alternative for those activities APHIS would provide support for in their cooperative efforts with CDFA. These include the survey, quarantine enforcement, and noncommercial controls of property, such as right-of-ways, wilderness areas, and other open areas. APHIS-supported activities would be expected to occur until eradication is complete or other management strategies have been adopted. These activities would include survey efforts, quarantine enforcement activities, and noncommercial controls. Quarantine enforcement and noncommercial controls for EGVM would include the most common method which is fruit/flower or host plant removal or, in certain cases, a voluntary chemical application to grapes when a property owner prefers to maintain their grapes. Differences in environmental consequences between the no action and preferred alternatives relate to the possible duration of the project and the potential to reduce or eliminate certain management activities if eradication efforts are successful. APHIS' support for this program, working in cooperation with CDFA and other stakeholders, will provide resources to ensure that all aspects of the program are carried out which will increase the chance for successful eradication. If successful, eradication will decrease the amount of time areas may be under quarantine, reduce the level of resources and pesticides that may be needed to make EGVM-related applications in commercial and noncommercial areas, reduce the need for extended survey efforts, and provide reduced economic impacts.

V. Cumulative Impacts

Cumulative impacts are those impacts on the environment which result from the incremental impact of a proposed action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time.

For the purposes of this EA, cumulative impacts discussed in this section are discussed in context to whether a fully funded program can move forward with all eradication activities, as recommended by ITWG. As previously discussed, the no action alternative is the existing program that was evaluated in this EA without additional financial or technical support from APHIS. Lack of additional resources from APHIS could result in some aspects of the program not being fully implemented which could result in the increased spread of EGVM into adjacent counties. The lack of a fully integrated program would impair the ability of CDFA and APHIS, and commercial vineyards, to successfully eradicate EGVM. Currently, EGVM detections occur predominantly in Napa County, with a few detections in the surrounding counties.

Expansion of EGVM distribution within California would result in additional quarantine activities (increased methyl bromide and nursery insecticide treatments), as well as increased pesticide use in both commercial vineyard and noncommercial applications. Because EGVM eradication would be less likely to occur, the areas receiving pesticide applications, as well as the duration, would be expected to increase. Current pesticide use by commercial vineyard operators, as well as in quarantine and noncommercial applications use pesticides that have a lower environmental risk than broad spectrum alternatives. The currently recommended products, however, have to be applied at the appropriate life stage of the insect to be effective. As EGVM expands, there may be more reliance on broad spectrum products, especially in commercial settings, because they are more effective at a broader range of pest life stages.

Products in the pyrethroid and organophosphate classes that are currently registered for use against EGVM could have increased use. The impacts from these applications could result in cumulative impacts to water quality. Currently, several impaired waterbodies occur within the current survey and quarantine area, and are listed as impaired due to pyrethroid and organophosphate insecticide use (appendix D). In addition, the phenomenon known as pelagic organism decline (previously discussed in the affected environment) may be linked to pesticide residues in water and sediment and, in particular, pyrethroid and organophosphate insecticides (Werner et al., 2010).

Waterbodies that are impaired for reasons other than pyrethroid and organophosphate insecticide toxicity may also be impacted with increased pesticide use because impacts could be a result of mixture effects. Water quality data in California, as well as the rest of the United States show pesticide mixtures to be a common occurrence in surface water with varying impacts to aquatic organisms (USGS, 2006b). In the Central Valley of California, these mixtures can have additive, or greater than additive, impacts to aquatic organisms (Lydy and Austin, 2004). Little data are available regarding mixture toxicity of methoxyfenozide and chlorantraniliprole primarily due to their recent registrations. Both products are persistent under certain environmental conditions and could be present when other pesticides or contaminants occur. In the presence of pyriproxyfen, spinosad has been shown to have greater than additive effects to mosquito larvae at high concentrations (Darriet and Corbel, 2006). Pyriproxyfen is used on grapes, as well as other commodities, within the current quarantine and in other counties where EGVM survey and quarantine activities occur. Several factors, such as pathogens or other chemical stressors, have been shown to have more than additive effects after exposure to Btk proteins (Then, 2010). There is uncertainty in the evaluation of the risk of mixture effects; however, cumulative impacts are assumed to be minor as the risk to the environment from each individual insecticide is very low (USDA–APHIS, 2011).

Under the preferred alternative, the control measures discussed in this EA would be the only controls that would occur with the exception of commercial vineyards that have a larger number of insecticides for potential use. In noncommercial applications, such as residential areas, right-of-ways, and wilderness areas, the preferred method of control is fruit/flower or host plant removal within the 500-meter radius of an EGVM detection. In isolated cases, there may be a chemical application, preferably with Btk, or perhaps spinosad or methoxyfenozide. Nursery treatments that may require application of one of these insecticides, or chlorantraniliprole, are only expected to occur for those nurseries shipping live plants and where fruit or flower removal is not possible within the current quarantine.

Under the preferred alternative, the use of other broad spectrum insecticides in commercial applications would be minimized as the current use pattern emphasizes the lower risk alternatives. The pesticides currently used for EGVM in noncommercial applications, as well as the majority of commercial producers, are not related to any known water quality issues in California, and are not part of any listing of impairment under Section 303(d) of the Clean Water Act. The use of the currently recommended products (pheromone, spinosad, Btk, methoxyfenozde, and chlorantraniliprole) would be expected to increase as EGVM controls are needed.

The increase in pesticide use that may be attributed to EGVM controls is difficult to determine because applications may occur as a broadcast application, or in greenhouse applications or, in the case of spinosad, as bait. Some of the EGVM products are also used in other APHIS and CDFA programs. For example, spinosad and Btk are used in the Fruit Fly and Gypsy Moth programs. The contribution from proposed uses in the EGVM program are not expected to be significant based on historical use of these products for other programs. Btk treatments for gypsy moth have been very infrequent and occur in small isolated areas (CDFA, 2010c). Historically, fruit fly applications using spinosad have been more frequent and occur over a larger area when compared to gypsy moth. There is the potential for overlap of these programs in the future; however, both chemicals have low risk to the environment when used according to the label directions. The incremental increase in risk is not expected to be significant when incorporating EGVM controls.

In addition to programs that may use similar pesticides, there are other APHIS and CDFA programs that may use pesticides not represented in the EGVM program. Chemical use in these programs is variable depending on whether insect control or weed control is needed, and within each of those groups, which pest being controlled. Also, other programs may make applications that don't coincide with EGVM eradication activities. Available data for other insecticides and herbicides that may be used in other programs and their interactions with the proposed EGVM program products are not well characterized. However, based on what is known about the EGVM products the cumulative impacts of potential EGVM controls occurring in areas where other programs are active are expected to be incrementally small. The available ecological risk assessment demonstrates that the products proposed for use in the EGVM program are not expected to have detrimental impacts to the environment such as water and air quality, or to most fish and wildlife (USDA–APHIS, 2011). As such, the proposed EGVM eradication activities proposed in this EA are not expected to have significant cumulative impacts to current baseline conditions that could impact initiatives, such as migratory bird conservation plans, or aquatic habitat conservation efforts, such as the Fish Friendly Program, and other Federal, State and multi-stakeholder initiatives.

Under the preferred alternative, the potential duration of EGVM controls and geographic range would be expected to be smaller if eradication activities are fully supported. If eradication proves successful, the number of potential pesticide applications in commercial and noncommercial areas would decrease as EGVM populations are eradicated. In addition, survey efforts would be reduced, as well as quarantine enforcement.

VI. Other Considerations

A. Endangered Species Act

Section 7 of the Endangered Species Act and its implementing regulations require Federal agencies to ensure that their actions are not likely to jeopardize the continued existence of federally listed threatened and endangered species or result in the destruction or adverse modification of critical habitat. APHIS is preparing a biological assessment (BA) that evaluates the potential for impacts to listed species under the jurisdiction of the NMFS and FWS. The NMFS BA evaluates the potential for impacts to 10 salmonid Evolutionary Significant Units (ESU) that occur within the 46-county area where surveying activities are ongoing, and potential treatments could occur if the quarantine expands. Three Chinook (Sacramento River Winter Run, California Coastal, and Central Valley Spring Run), two coho (Central California Coastal and South Oregon/N. California), and five steelhead (Southern California, Central Coastal California, South Central California Coast, California Central Valley, Northern California) salmon species were considered.

Effects determinations with mitigations, where appropriate, have been proposed to protect salmonids and their designated critical habitat. Application buffers from salmonid critical habitat have been proposed in the BA as a means to avoid impacts to listed salmonids. Concurrence on the BA from NMFS will also insure compliance with the Magnuson-Stevens Fishery Conservation and Management Act. The FWS BA addresses the potential for impacts to over 280 listed species that have been identified to occur within the current survey and current quarantine area. Effects determinations and mitigation measures have been proposed for those species where co-occurrence between treatments and habitat may occur. Concurrence from the FWS on the BA will ensure that adequate protective measures are in place for the protection of listed species that may co-occur with program activities.

B. Section 106 Considerations

Pursuant to section 106 of the National Historic Preservation Act, APHIS has evaluated the potential for program activities to have adverse impacts to historically and culturally sensitive areas. Approximately 2,400 historical or culturally sensitive properties may exist within the current survey area. In 2010, APHIS sent a letter to the State Historical Preservation officer to begin a dialogue with that office, as well as provide an opportunity to answer any questions regarding management activities. In addition, APHIS evaluated the potential for adverse impacts as they are identified under 30 CFR part 800 (Protection of Historic Properties). Current management activities proposed under the preferred alternative

section of this EA suggest that adverse impacts to historical and cultural properties are not expected.

C. Other Statutes

EO 12898, "Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations," focuses Federal attention on the environmental and human health conditions of minority and low-income communities, and promotes community access to public information and public participation in matters relating to human health or the environment. This EO requires Federal agencies to conduct their programs, policies, and activities that substantially affect human health or the environment in a manner so as not to exclude persons and populations from participation in or benefiting from such programs. It also enforces existing statutes to prevent minority and low-income communities from being subjected to disproportionately high or adverse human health or environmental effects. Management activities are driven by the presence of EGVM, the location of host material, and businesses that move host material into and out of the quarantine. These areas occupy a variety of socio-economic areas within the State. APHIS has reviewed the available toxicology data and available human health risk assessments, as well as prepared an environmental risk assessment that demonstrates adverse impacts are not expected to human health or the environment, such as water and air quality.

EO 13045, "Protection of Children from Environmental Health Risks and Safety Risks," acknowledges that children, as compared to adults, may suffer disproportionately from environmental health and safety risks because of their developmental stage, greater metabolic activity levels, and behavior patterns. This EO (to the extent permitted by law and consistent with the agency's mission) requires each Federal agency identify, assess, and address environmental health risks and safety risks that may disproportionately affect children. Program activities assessed in this EA do not demonstrate disproportionate risks to children. Based on program activities that APHIS is funding or regulating, the only potential for any risk would be in potential noncommercial controls, such as those that may occur in urban/residential areas within a 500-meter area of an EGVM detection. Controls are only conducted with property owner permission, and the preferred alternative would be fruit/flower or host plant removal. In isolated cases where the application of an insecticide would occur based on property owner request, the approved control options have been shown to have wide margins of safety at much higher rates than what would occur in the proposed program. The preferred foliar applications would utilize organic formulations of Btk or spinosad, or possibly a nonorganic methoxyfenozide, where appropriate. In addition, landowners that request an application will be notified 24 hours prior to application.

VII. Agencies and Persons Consulted

U.S. Department of Agriculture
Animal and Plant Health Inspection Service
Emergency and Domestic Programs
Plant Protection and Quarantine
4700 River Road, Unit 160
Riverdale, MD 20737

U.S. Department of Agriculture
Animal and Plant Health Inspection Service
Policy and Program Development
Environmental and Risk Analysis Services
4700 River Road, Unit 149
Riverdale, MD 20737

U.S. Department of Agriculture
Animal and Plant Health Inspection Service
Plant Protection and Quarantine
650 Capitol Mall
Sacramento, CA 95814

U.S. Fish and Wildlife Service
Region 8
Ecological Services
2800 Cottage Way
Sacramento, CA 95825

National Marine Fisheries Service
Office of Protected Resources
650 Capitol Mall, Suite 5–100
Sacramento, CA 95814
http://swr.nmfs.noaa.gov/sac/index.htm

National Marine Fisheries Service
Office of Protected Resources
777 Sonoma Ave., Room 325
Santa Rosa, CA 95404
http://swr.nmfs.noaa.gov/sroprd.htm

California Department of Food and Agriculture
Plant Health and Pest Prevention Services
1220 N Street
Sacramento, CA 95814

State Historical Preservation Officer
Office of Historic Preservation
Department of Parks & Recreation
P.O. Box 942896
Sacramento, CA 94296–0001

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CDFG—See California Department of Fish and Game

CDPR—See California Department of Pesticide Regulation

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Appendix A. European Grapevine Moth Regulated Articles

- Blackberry, Dewberry (*Rubus* spp)
- Bladder Campion (*Silene vulgaris*)
- Carnation (*Dianthus* spp.)
- European barberry (*Berberis vulgaris*)
- European privet (*Ligustrum vulgare*)
- False baby's breath (*Galium mollugo*)
- Gooseberries and currants (*Ribes* spp.)
- Grape (*Vitis* spp.)
- Jujube (*Ziziphus* jujube)
- Kiwifruit or Chinese gooseberry (*Actinidia chinensis*)
- Old man's beard (*Clematis vitalba*)
- Olive (*Olea europaea*)
- Persimmon (*Diospyros kaki*)
- Pomegranate (*Punica granatum*)
- Red clover (*Trifolium pretense*)
- Rosemary (*Rosmarinus officinalis*)
- Sea squill (*Urginea maritime*)
- Smooth sumac (*Rhus glabra*)
- Spurge flax (*Daphne gnidium*)
- St. John's Wort (*Hypericum calycinum*)
- Stone fruit (plums, peaches, cherries, apricots, nectarines, etc.) (*Prunus* spp.)

- Plant litter, compost, winery/processing or harvesting waste and all other green waste residues of any regulated plant, plant part, or plant product from the planting, growth, pruning, production, harvesting, processing, and conveyances of regulated plants, plant parts, or plant products.

- All farm/vineyard equipment and conveyances used in the planting, growth, pruning, production, harvesting, and processing of regulated plants, plant parts, or plant products.

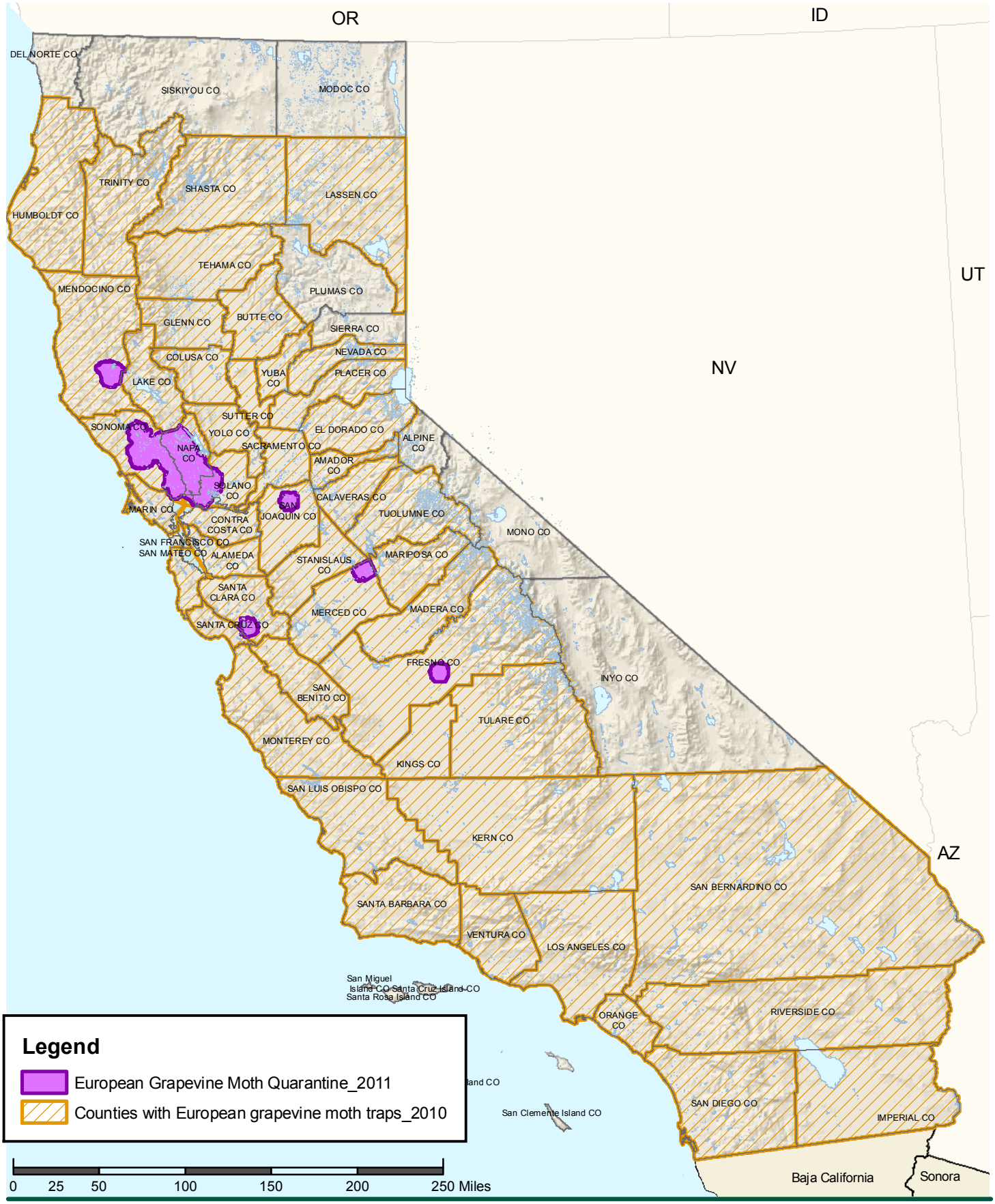
- All living, dead, cut, fallen or other materials or products used in the cultivation, planting, growth, production, harvesting, and processing of regulated plants, plant parts, or plant products.

Appendix B. Map of European Grapevine Moth Survey and Quarantine Area in California

USDA
United States
Department of Agriculture

Quarantine and Traps for European Grapevine Moth
California

APHIS
Animal and Plant
Health Inspection Service



Legend

- European Grapevine Moth Quarantine_2011
- Counties with European grapevine moth traps_2010

0 25 50 100 150 200 250 Miles

USDA, APHIS, PPQ
Western Region GIS Specialist
650 Capitol Mall, Suite 6-400
Sacramento, CA 95814

Coordinate System:
CA Teale Albers, NAD 83
Date Created: February 28, 2011
Time Created: 10:21 hrs PST

Data Source:
CA Dept of Food & Agriculture
USDA, APHIS, PPQ

N

Appendix C. Agricultural Land Use (Acres) by County

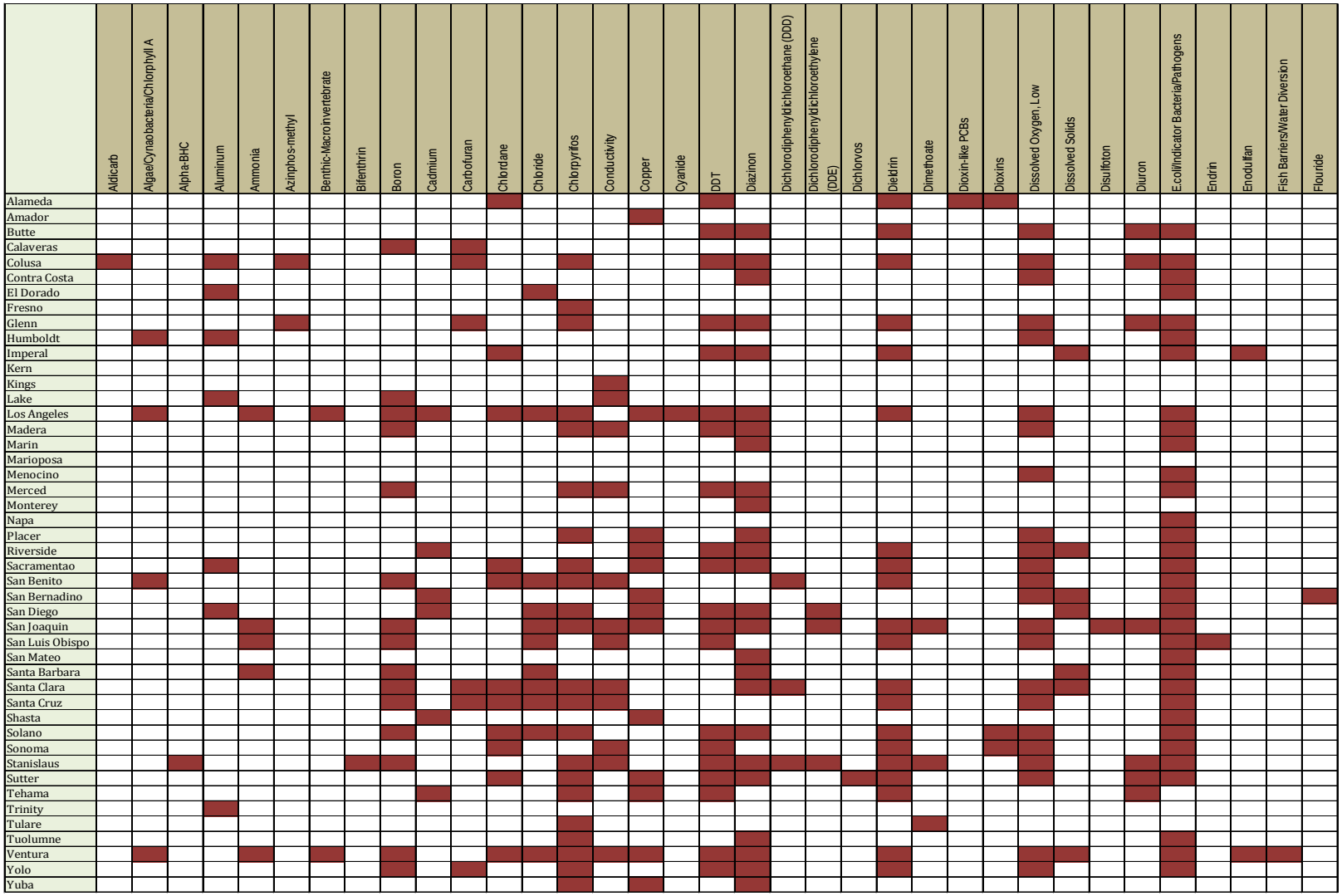
County	Grazing Land	Important Farmland	Urban and Built-up Land	Water Area	Top 3 Leading Commodities (by gross value)
Alameda	244,250	7,689	219,597	53,799	woody ornamentals, wine grapes, cattle & calves
Amador	188,114	10,278	96,659	5,323	wine grapes, calves, pasture (range)
Butte	401,859	240,561	407,974	22,858	rice, almonds, walnuts
Calaveras*					cattle & calves, poultry, wine grapes
Colusa	9,111	555,719	173,653	1,911	rice, almonds, tomatoes
Contra Costa	168,905	90,915	200,432	53,763	corn, cattle & calves, grapes (unspec.)
El Dorado	194,779	65,105	269,703	6,819	apples, cattle & calves, wine grapes
Fresno	826,955	1,376,276	229,272	4,915	grapes (unspec.), almonds, poultry
Glenn	227,390	348,158	267,631	5,950	rice, almonds, dairy
Humboldt*					nursery products (unspec.), milk, cattle & calves
Imperial	0	540,942	486,538	1,029	cattle, alfalfa, wheat
Kern	1,807,069	939,221	2,468,086	9,880	milk, grapes (all), citrus (all)
Kings	257,746	568,103	64,872	62	milk, cotton, cattle & calves
Lake	239,767	47,519	516,764	46,793	wine grapes, pears, nursery products (unspec.)
Los Angeles	229,475	42,007	849,115	3,468	woody ornamentals, bedding plants, alfalfa
Madera	399,500	362,742	92,748	6,055	milk, almonds, pistachios
Marin	89,556	65,920	178,365	44,819	milk, cattle & calves, pasture (range)
Mariposa	403,770	332	78,297	6,047	cattle & calves, pasture (range), livestock & poultry
Mendocino	1,927,016	29,692	86,002	2,135	wine grapes, pears, cattle & calves
Merced	567,391	593,494	87,875	16,859	milk, poultry, almonds
Monterey	1,066,494	234,669	813,714	6,246	lettuce, strawberries, nursery products (unspec.)
Napa	178,957	76,353	228,152	22,396	wine grapes, cattle & calves, nursery products (unspec.)
Placer	24,448	133,922	248,079	5,011	rice, nursery products (unspec.), cattle & calves
Riverside	111,221	433,879	1,337,016	62,350	nursery products (unspec.), milk, poultry & eggs
Sacramento	156,146	213,118	248,671	18,148	wine grapes, milk, nursery products (unspec.)
San Benito	612,456	60,922	214,870	1,140	nursery products (unspec.), row vegetables (unspec.), lettuce
San Bernardino	901,666	25,326	522,106	449	milk, eggs, cattle & calves
San Diego	126,870	223,326	1,803,198	13,298	foliage plants (flowers), woody ornamentals, bedding plants
San Joaquin	142,460	615,696	142,671	11,773	milk, grapes (all), walnuts
SanLuis Obispo	1,183,042	410,539	283,437	10,521	wine grapes, broccoli, strawberries

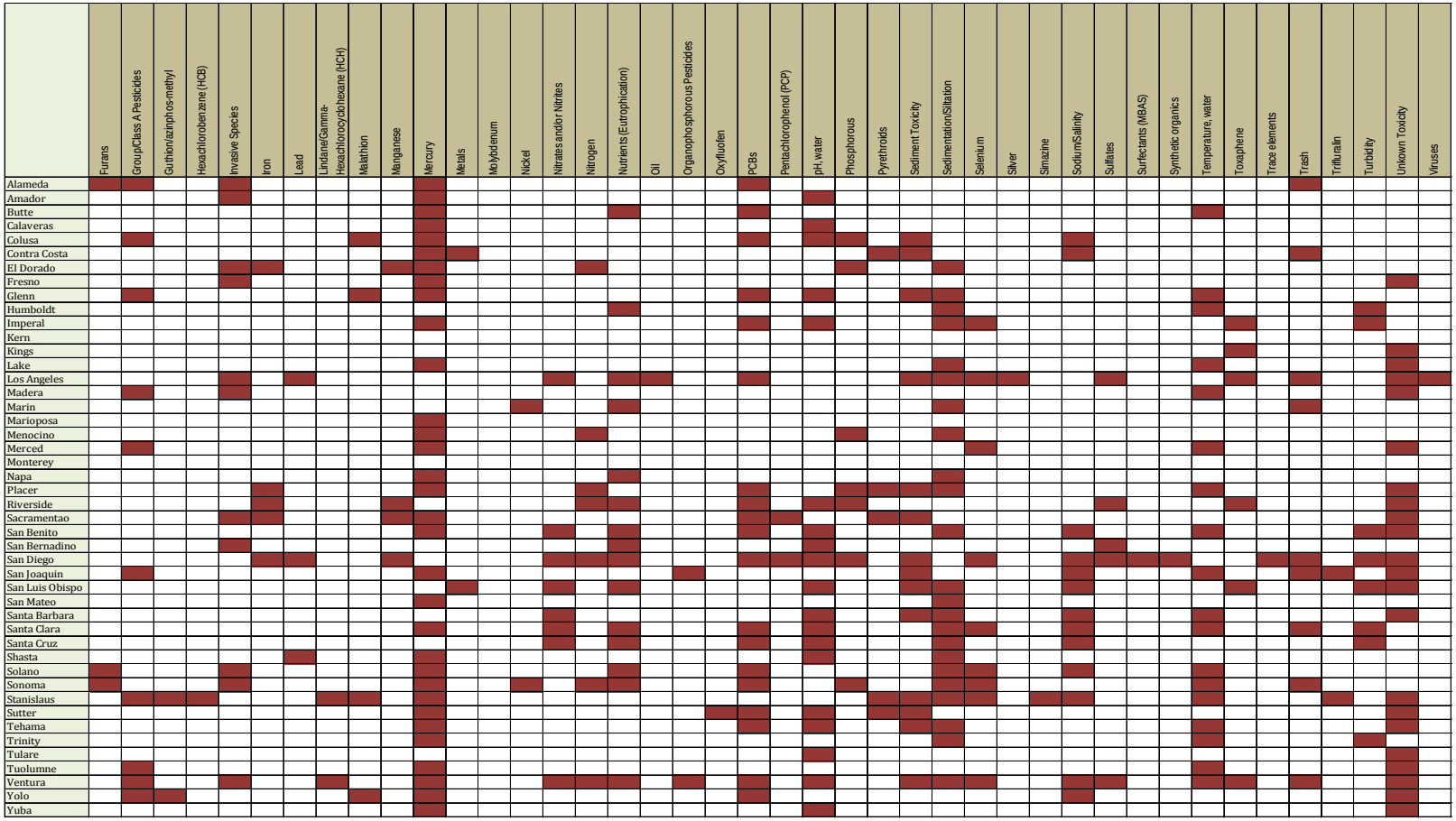
*Data not available;

County	Grazing Land	Important Farmland	Urban and Built-up Land	Water Area	Top 3 Leading Commodities (by gross value)
San Mateo	48,958	5,481	233,278	65,734	flowering plants (potted), nursery products (ornamental), cut flowers
Santa Barbara	581,986	125,353	327,798	4,191	strawberries, broccoli, wine grapes
Santa Clara	390,090	31,293	405,388	8,458	nursery products (unspec.), mushrooms, bell peppers
Santa Cruz	17,953	21,827	245,573	357	strawberries, raspberries, vegetables (unspec.)
Shasta	412,731	22,191	580,414	5,875	forest products (unspec.), hay (unspec.), cattle
Solano	204,518	153,298	171,244	53,311	nursery products (unspec.), alfalfa, tomatoes
Sonoma	419,003	160,218	429,330	17,533	wine grapes, milk, poultry
Stanislaus*			9,516		milk, almonds, poultry
Sutter	52,571	291,068	43,791	1,883	rice, walnuts, plums
Tehama	1,549,799	230,932	52,581	6,182	walnuts, plums, almonds
Trinity*					cattle & calves, pasture (range), wine grapes
Tulare	439,851	864,437	276,923	4,656	milk, oranges, cattle & calves
Tuolumne*					livestock (unspec.), cattle & calves, pasture (range)
Ventura	195,674	122,492	233,844	3,939	strawberries, nursery products (unspec.), lemons
Yolo	157,960	378,083	109,595	7,814	tomatoes, alfalfa, rice
Yuba	141,639	84,949	178,796	6,629	rice, plums, walnuts

*Data not available

Appendix D. Clean Water Act 303(d) Listing of Impairments


Aldicarb
Algae/Cynaobacteria/Chlorphyll A
Alpha-BHC
Aluminum
Ammonia
Azinphos-methyl
Benthic-Macroinvertebrate
Bifenthrin
Boron
Cadmium
Carbofuran
Chlordane
Chloride
Chlorpyrifos
Conductivity
Copper
Cyanide
DDT
Diazinon
Dichlorodiphenyldichloroethane (DDD)
Dichlorodiphenyldichloroethylene (DDE)
Dichlorvos
Dieldrin
Dimethoate
Dioxin-like PCBs
Dioxins
Dissolved Oxygen, Low
Dissolved Solids
Disulfoton
Diuron
E.coli/Indicator Bacteria/Pathogens
Endrin
Endosulfan
Fish Barriers/Water Diversion
Floride
Alameda
Amador
Butte
Calaveras
Colusa
Contra Costa
El Dorado
Fresno
Glenn
Humboldt
Imperial
Kern
Kings
Lake
Los Angeles
Madera
Marin
Marioposa
Menocino
Merced
Monterey
Napa
Placer
Riverside
Sacramentao
San Benito
San Bernadino
San Diego
San Joaquin
San Luis Obispo
San Mateo
Santa Barbara
Santa Clara
Santa Cruz
Shasta
Solano
Sonoma
Stanislaus
Sutter
Tehama
Trinity
Tulare
Tuolumne
Ventura
Yolo
Yuba


Furans
GroupClass A Pesticides
Guthion/azinphos-methyl
Hexachlorobenzene (HCB)
Invasive Species
Iron
Lead
Lindane/Gamma-Hexachlorocyclohexane (HCH)
Melathion
Manganese
Mercury
Metals
Molybdenum
Nickel
Nitrates and/or Nitrites
Nitrogen
Nutrients (Eutrophication)
Oil
Organophosphorous Pesticides
Oxyfluofen
PCBs
Pentachlorophenol (PCP)
pH, water
Phosphorous
Pyrethroids
Sediment Toxicity
Sedimentation/Siltation
Selenium
Silver
Simazine
Sodium/Salinity
Sulfates
Surfectants (MBAS)
Synthetic organics
Temperature, water
Toxaphene
Trace elements
Trash
Trifluralin
Turbidity
Unkown Toxicity
Viruses
Alameda
Amador
Butte
Calaveras
Colusa
Contra Costa
El Dorado
Fresno
Glenn
Humboldt
Imperal
Kern
Kings
Lake
Los Angeles
Madera
Marin
Marioposa
Menocino
Merced
Monterey
Napa
Placer
Riverside
Sacramentao
San Benito
San Bernadino
San Diego
San Joaquin
San Luis Obispo
San Mateo
Santa Barbara
Santa Clara
Santa Cruz
Shasta
Solano
Sonoma
Stanislaus
Sutter
Tehama
Trinity
Tulare
Tuolumne
Ventura
Yolo
Yuba