



## CALIFORNIA DEPARTMENT OF FOOD AND AGRICULTURE

### **OFFICIAL NOTICE FOR THE CITIES OF REDLANDS, YUCAIPA, MENTONE, HIGHLAND, LOMA LINDA, AND SAN BERNARDINO PLEASE READ IMMEDIATELY**

#### **AMENDMENT TO THE PROCLAMATION OF EMERGENCY PROGRAM FOR THE ORIENTAL FRUIT FLY**

Between September 18, 2023 and January 4, 2024, the California Department of Food and Agriculture (CDFA) confirmed that 658 oriental fruit flies (OFFs), *Bactrocera dorsalis* (Hendel) group, were trapped in the cities of Redlands, Yucaipa, Mentone, Highland, Loma Linda, and San Bernardino in San Bernardino County. Based on these detections, pest biology, information from the CDFA Bactrocera Science Advisory Panel (BacSAP), recommendations provided by the CDFA Primary State Entomologist, and the CDFA's "Action Plan for Methyl Eugenol Attracted Fruit Flies including Oriental Fruit Fly *Bactrocera dorsalis* (Hendel)," CDFA concludes that an infestation of OFF exists in the area.

OFF feeds on over 230 fruits and vegetables, including citrus, tomatoes, peppers, and stone fruit. The adult female OFFs lay eggs in host fruits and vegetables. When these eggs hatch, the larvae feed in the fruit or vegetable flesh and destroy it. This pest threatens not only the significant agricultural industry of California, but also home and community gardens, which are an often critical source of fresh fruits and vegetables to disadvantaged people in the state. Besides direct impacts to fruits and vegetables and increased costs associated with controlling this fly (costs that would be passed on to the consumer), there are regulatory impacts that pose a grave threat to California agriculture. California currently enjoys a "free from" status with regard to OFF. If OFF were to become established in California, the United States Department of Agriculture would have the authority to quarantine the entire state of California. Other nations that currently import California fruits and vegetables would very likely impose additional restrictions on this produce or source it from other producing nations. In other words, California would likely lose market access. In summary, establishment of OFF in California would change the agricultural landscape of California, and, given that California contributes 60% of the nation's fresh fruits and vegetables, irrevocably alter the United States' agricultural sector. In addition, the environment and human health in California are at risk: Native plants are hosts and increased pesticide use over large areas would be an expected consequence of establishment of OFF in California.

Therefore, OFF presents a significant, clear, and imminent threat to the natural environment, agriculture and economy of California. Unless emergency action is taken, there is high potential for sudden future detections in San Bernardino and Riverside counties.

The current OFF infestation, based on the sites where flies have been found, extends approximately nine miles at its greatest extent. 658 flies have been trapped. The size of this infestation, in combination with the numerous additional fruit fly projects currently active in California (projects that are also demanding resources and personnel), makes prompt eradication absolutely critical.

In accordance with integrated pest management principles, the CDFA has evaluated possible eradication methods and determined that there are no cultural or biological methods available to eliminate OFF from this area. This Proclamation of Emergency Program is valid until July 21, 2025, which takes into account the amount of time necessary to carry out the treatment plan across three life cycles of OFF as required by the treatment protocol for OFF, with an additional year to account for the likelihood of additional flies being found in the spring of 2024 (this will automatically extend the required control and delimitation activities according to protocol). The

development rate of OFF is dependent on temperature, and a degree-day model is used to estimate the duration of an OFF life cycle. In cooler weather, development is slower and the length of time required for a life cycle is greater. Calculation of the duration of life cycles is used for timing of control, delimitation, and regulatory activities. The third life cycle from the OFF detected on January 4, 2024 is expected to be complete on July 21, 2024. The large number of OFF that continue to be detected at the present time suggest that flies will continue to be found until at least February 2024, when the first life cycle from the most recent finds is expected to be complete. OFF found at that time would automatically push the timeline for detection, eradication, and quarantine activities forward.

The CDFA will employ chemical control as the primary tool and will additionally use physical control via host fruit removal when there is evidence that a breeding population exists on a property. All activities will be limited to the emergency program area. The emergency program area is equivalent to the OFF quarantine area, which originates from a radius of 4.5 miles from all current detections, with the final boundary being determined by use of roads and other features for clarity. The 4.5-mile quarantine radius is an internationally accepted standard. It is used for all USDA fruit fly quarantines and is based, in part, on the natural dispersal capacity of fruit flies.

As explained above, the detections of OFF require immediate action to address the imminent threat to California's natural environment, agriculture and economy. Therefore, the Secretary is invoking Public Resources Code Section 21080(b)(4) to carry out immediate emergency action to prevent the aforementioned loss and damage to California's resources.

The treatment plan for the OFF infestation will be implemented as follows:

- **Chemical Control:** The male attractant technique (MAT) will be used to eliminate all sexually-mature male OFFs. MAT applies small bait stations using STATIC™ Spinosad ME, which is a pre-mixed solution containing the attractant methyl eugenol and an organically registered pesticide spinosad, mixed into a waxy time-release matrix (SPLAT®). The methyl eugenol lures male flies to the bait stations, where the flies ingest the insecticide as they feed. The flies are killed when they feed at the stations. In each square mile within the eradication boundary, a targeted density of 300 evenly spaced five-to ten-milliliter bait stations are applied to utility poles, street trees, and other unpainted surfaces using pressurized tree marking guns mounted on specially modified trucks. The bait stations are placed six to eight feet above the ground. The size of the eradication area is defined as that area within 1.5 miles of each detection site, and adjusted to create a nine-square-mile block marked by existing features, such as roads. Applications are repeated every two weeks for one life cycle if no quarantine is triggered (typically two to three months), and for two life cycles if a quarantine is triggered (typically four to six months). Life cycle durations are dependent on temperature.
- **Chemical Control:** If evidence that a breeding population exists on a property (i.e., immature stages, mated female, or multiple adults are detected) and property owners consent to it, foliar bait treatments shall be used within 200 meters of each detection site in order to mitigate the spread of OFF by eliminating those adult life stages not directly affected by MAT (i.e., females and sexually immature males). Foliar bait ground treatments are a protein bait spray that contains an organic formulation of the pesticide spinosad (GF-120 NF Naturalyte® Fruit Fly Bait), and are repeated every seven to 14 days for one life cycle of the fly (typically two to three months, dependent on temperature).

Please visit the CDFA website to learn more about the treatment process at <http://www.cdfa.ca.gov/plant/videos/spinosad/>.

- **Chemical Control:** On properties where immature stages are detected, host fruit is removed, and property owner consent for chemical treatment is obtained, a soil drench labeled for use in California will be applied. The product(s) used will contain an active ingredient known to be effective against fruit flies. Prior to soil drench treatments, the active ingredient and precautionary measures will be described at [https://www.cdfa.ca.gov/plant/PDEP/treatment/treatment\\_maps.html](https://www.cdfa.ca.gov/plant/PDEP/treatment/treatment_maps.html) and will be provided directly to consenting owners.
- **Physical Control:** If evidence that a breeding population exists on a property (i.e., immature stages, mated female, or multiple adults are detected), all host fruit from each detection site and all properties within a minimum of 100 meters of each detection site shall be removed and disposed of in a landfill and/or waste facility or a deep pit, trench, or other style of hole dug on site in accordance with regulatory protocols. Fruit removal will occur at the beginning of the project, but may be repeated if additional flies are detected.
- **Physical Control:** If, within a 60-day period, any immature stages or mated females are detected at five or more sites within a mile of each other, host fruit will be removed within a 0.5 mile (half-mile) of each of the detected immature stages and/or mated females and disposed of in a landfill and/or waste facility or buried in a deep pit, trench, or other style of hole dug on site in accordance with regulatory protocols.

### **Public Information:**

For MAT applications in public areas, notification is given to the general public via mass media outlets such as newspapers, press releases, the CDFA departmental website, and/or community-specific social media.

Residents whose property will be treated via foliar bait sprays, host fruit removal, or soil drench will be notified in writing at least 48 hours in advance of any treatment, in accordance with the Food and Agricultural Code (FAC) sections 5771-5779. Following the treatments, completion notices will be left with residents detailing precautions to take and post-harvest intervals applicable to any fruit on the property.

Treatment information is posted at [http://cdfa.ca.gov/plant/PDEP/treatment/oriental\\_ff.html](http://cdfa.ca.gov/plant/PDEP/treatment/oriental_ff.html). Press releases, if issued, are prepared by the CDFA information officer and the county agricultural commissioner, in close coordination with the project leader responsible for treatment. Either the county agricultural commissioner or the public information officer serves as the primary contact to the media.

Information concerning the OFF project shall be conveyed directly to local and State political representatives and authorities via letters, emails, and/or faxes.

For any questions related to this program, please contact the CDFA toll-free telephone number at 800-491-1899 for assistance. This telephone number is also listed on all treatment notices.

Enclosed are the findings regarding the treatment plan, work plan, map of the treatment area, integrated pest management analysis of alternative treatment methods, and a pest profile.

Attachments

## FINDINGS OF AN EMERGENCY FOR THE ORIENTAL FRUIT FLY

Between September 18, 2023 and January 4, 2024, the California Department of Food and Agriculture (CDFA) confirmed that 658 oriental fruit flies (OFFs), *Bactrocera dorsalis* (Hendel) group, were trapped in the cities of Redlands, Yucaipa, Mentone, Highland, Loma Linda, and San Bernardino in San Bernardino County. These detections indicate that a breeding population exists in the area. Unless emergency action is taken, then there is high potential for sudden future detections in San Bernardino and Riverside counties. The OFF is a devastating pest of a wide variety of important fruit, vegetables, and native plants.

In order to determine the extent of the infestation, and to define an appropriate response area, an additional survey took place, centered on the detection sites. Based on the survey data, and findings and recommendations from the CDFA *Bactrocera* Science Advisory Panel (BacSAP), the Primary State Entomologist, the CDFA's "Action Plan for Methyl Eugenol Attracted Fruit Flies including Oriental Fruit Fly *Bactrocera dorsalis* (Hendel)," and County Agricultural Commissioner representatives who are knowledgeable on OFF, I have determined that OFF poses a statewide imminent danger to the environment and economy.

The results of the additional survey also indicated that the local infestation is amenable to CDFA's OFF response strategies, which include chemical treatments and removal of host fruit. These options were selected based upon minimal impacts to the natural environment, biological effectiveness, minimal public intrusiveness, and cost.

The OFF is an invasive insect originating in Asia, and has been accidentally introduced into a number of Pacific Islands, including Hawaii. It is a member of a closely related group of species, known as the OFF group, which are difficult to distinguish based on individual specimens. Several of the group species are major fruit and vegetable pests, and collectively members of the OFF group are known to attack over 230 types of fruits and vegetables. Important California crops at risk include pome and stone fruits, citrus, dates, avocados, and many vegetables, particularly tomatoes and peppers. Damage occurs when the female lays eggs in the fruit. These eggs hatch into larvae, which tunnel through the flesh of the fruit, making it unfit for consumption.

A life cycle is an estimate of insect phenology based on a heat degree day temperature-driven model. Warmer temperatures lead to faster lifecycles, while colder temperatures slow development. Daily minimum and maximum temperatures are collected from nearby regional data stations and used to calculate estimated temperature value curves. These temperature curves are used to project the length of fly lifecycles against established models specific to the OFF. Because three life cycles of OFF, starting with the detection on January 4, 2024, are not projected to be complete until July 21, 2024, and future sudden future detections are likely to occur in spring of 2024 (which would automatically push forward delimitation, eradication, and quarantine activities) the Proclamation of Emergency Program is valid until July 21, 2025.

This pest presents a significant and imminent threat to the natural environment, agriculture and economy of California. Invasive fruit flies are internal feeders of fruit, and their presence therefore makes the fruit unfit for consumption. There is a loss of marketability and ability to ship food to other states and nations. The combined 2020 gross production value of host commercial commodities potentially affected by OFF was over \$19.33 billion. The permanent establishment and spread of this pest would result in increased production and postharvest costs to safeguard commercial fruit from infestation, increased pesticide applications on both production agriculture and residential properties to mitigate damage, and lost economic activity and jobs from trade

restrictions imposed by the United States Department of Agriculture (USDA) and foreign trade partners. Disadvantaged populations will experience reduced food supplies due to impacts to residential and community gardens. This decision to proceed with treatment is based upon a realistic evaluation that it will be possible to eliminate OFF from this area and prevent its spread using currently available technology in a manner that is based on an action plan developed in consultation with the Pest Prevention Committee of the California Agricultural Commissioners and Sealers Association, the USDA, and scientists on the BacSAP. The state believes that eradication is still possible. The first California OFF detections occurred in Orange and Santa Barbara counties in 1960, and since that time, multiple re-introductions have been delimited and successfully eradicated.

The CDFA has evaluated possible treatment methods in accordance with integrated pest management (IPM) principles. As part of these principles, I have considered the following treatments for control of OFF: 1) physical controls; 2) cultural controls; 3) biological controls; and 4) chemical controls. Upon careful evaluation of each these options, I have determined that it will be possible to address the imminent threat posed by OFF using currently available technology in a manner that is recommended by the BacSAP.

Based upon input from the BacSAP, the Primary State Entomologist, USDA experts on OFF, and County Agricultural Commissioner representatives who are knowledgeable on OFF, I find there are no cultural or biological control methods that are both effective against OFF and allow CDFA to meet its statutory obligations, and therefore it is necessary to conduct physical and chemical control methods to abate this threat. As a result, I am ordering that male attractant treatments, consisting of methyl eugenol, a pesticide (spinosad), and a time-release matrix be applied to utility poles and street trees to eliminate this infestation. Additionally, in the event of evidence of a breeding population on a property, foliar bait spray treatments will be applied to host trees using ground-based equipment, host fruit removal will occur, and (at properties where immature stages are detected) drenches will be applied to soil in the vicinity of host trees.

### **Sensitive Areas**

The CDFA has consulted with the California Department of Fish and Wildlife's California Natural Diversity Database for threatened or endangered species, the United States Fish and Wildlife Service, the National Marine Fisheries Service, and the California Department of Fish and Wildlife when rare and endangered species are located within the treatment area. Mitigation measures for rare and endangered species will be implemented. The CDFA shall not apply pesticides to bodies of water or undeveloped areas of native vegetation. All treatment shall be applied to residential properties, common areas within residential development, non-agricultural commercial properties, and rights-of-way.

### **Work Plan**

The emergency program area originates from a radius of 4.5 miles from all current detections, with the final boundary being determined by use of roads and other features for clarity. Within this, the proposed treatment area encompasses those portions of San Bernardino and Riverside Counties which fall within a 1.5-mile radius around each property on which an OFF has been detected and any subsequent detection sites within the program boundaries. The Proclamation

of Emergency Program is valid until July 21, 2025, which is the amount of time necessary to carry out the treatment plan across three life cycles of OFF and address detections in spring 2024 as required by the treatment protocol for OFF with an extra year to account for expected additional finds in the spring of 2024, which would extend the project. A map of the project boundaries is attached. The work plan consists of the following elements:

1. Delimitation. Traps will be placed in a 4.5-mile radius from each detection site to delimit the infestation and to monitor post-treatment OFF populations. The cardboard Jackson sticky trap is baited with the attractant methyl eugenol mixed with the pesticide naled (Dibrom® 8 Emulsive), and the McPhail trap is an invaginated glass flask baited with Torula yeast and borax in water. The Jackson trap is strongly attractive to sexually maturing males, while the McPhail trap is attractive to both sexes of the fly. Jackson traps and McPhail traps will each be placed at a density of 25 per square mile within a 0.5-mile radius of each detection site, and Jackson traps will be placed at a density of five per square mile in the remaining delimitation area going out to 4.5 miles from each detection site. Additional traps may be added to further delimit the infestation and to monitor the efficacy of treatments. These traps will be serviced on a regular schedule for a period equal to three OFF generations beyond the date of the last OFF detected. In addition, host fruit may be sampled for the presence of eggs and larvae in a 200-meter radius around each detection property.
2. Treatment. Any OFF detections within the original and/or expanded eradication area(s) will be treated according to the following protocol.
  - The male attractant technique (MAT) will be used to eliminate all sexually-mature male OFFs. MAT applies small bait stations using STATIC™ Spinosad ME, which is a pre-mixed solution containing the attractant methyl eugenol and an organically registered pesticide spinosad, mixed into a waxy time-release matrix (SPLAT®). The methyl eugenol lures male flies to the bait stations, where the flies ingest the insecticide as they feed. The flies are killed when they feed at the stations. In each square mile within the eradication boundary, a targeted density of 300 evenly spaced five- to ten-milliliter bait stations are applied to utility poles, street trees, and other unpainted surfaces using pressurized tree marking guns mounted on specially modified trucks. The bait stations are placed six to eight feet above the ground. The size of the eradication area is defined as that area within 1.5 miles of each detection site, and adjusted to create a nine-square-mile block marked by existing features, such as roads. Applications are repeated every two weeks for one life cycle if no quarantine is triggered (typically two to three months), and for two life cycles if a quarantine is triggered (typically four to six months). Life cycle durations are dependent on temperature.
  - If evidence that a breeding population exists on a property (i.e., immature stages, mated female, or multiple adults are detected) and property owners consent to it, foliar bait treatments will be used within 200 meters of each detection site in order to mitigate the spread of OFF by eliminating those adult life stages not directly affected by MAT (i.e., females and sexually-immature males). The foliage of host trees and shrubs within 200 meters of each detection site will be treated with an organic formulation of spinosad bait spray (GF-120 NF Naturalyte® Fruit Fly Bait) using hand spray or hydraulic spray equipment. Treatments are repeated every seven to 14 days for one life cycle of the fly

(typically two to three months, dependent on temperature).

- On properties where immature stages are detected, host fruit is removed, and property owner consent for the chemical treatment is obtained, a soil drench labeled for use in California will be applied. The product(s) used will contain an active ingredient known to be effective against fruit flies. Prior to soil drench treatments, the active ingredient and precautionary measures will be described at [https://www.cdfa.ca.gov/plant/PDEP/treatment/treatment\\_maps.html](https://www.cdfa.ca.gov/plant/PDEP/treatment/treatment_maps.html) and will be provided directly to consenting owners.
- If evidence that a breeding population exists on a property (i.e., immature stages, mated female, or multiple adults are detected), all host fruit from each detection site and all properties within a minimum of 100 meters of each detection site will be removed and disposed of in a landfill and/or waste facility or buried in a deep pit, trench, or other style of hole dug on site in accordance with regulatory protocols. Fruit removal will occur at the beginning of the project, but may be repeated if additional flies are detected.
- If, within a 60-day period, any immature stages or mated females are detected at five or more sites within a mile of each other, host fruit will be removed within a 0.5 mile (half-mile) of each of the detected immature stages and/or mated females and disposed of in a landfill and/or waste facility or buried in a deep pit, trench, or other style of hole dug on site in accordance with regulatory protocols.

## **Public Information**

For MAT applications in public areas, notification is given to the general public via mass media outlets such as newspapers or press releases.

Residents whose property will be treated via foliar bait sprays, host fruit removal, or soil drench will be notified in writing at least 48 hours in advance of any treatment, in accordance with the Food and Agricultural Code (FAC) sections 5771-5779. Following the treatments, completion notices will be left with the residents detailing precautions to take and post-harvest intervals applicable to any fruit on the property.

Treatment information is posted at [http://cdfa.ca.gov/plant/PDEP/treatment/oriental\\_ff.html](http://cdfa.ca.gov/plant/PDEP/treatment/oriental_ff.html). Press releases, if issued, are prepared by the CDFA information officer and the county agricultural commissioner, in close coordination with the project leader responsible for treatment. Either the county agricultural commissioner or the public information officer serves as the primary contact to the media.

Information concerning the OFF project shall be conveyed directly to local and State political representatives and authorities via letters, emails, and/or faxes.

For any questions related to this program, please contact the CDFA toll-free telephone number at 800-491-1899 for assistance. This telephone number is also listed on all treatment notices.



## **Findings**

Due to the detection of OFF, there exists a significant, clear, and imminent threat to California's natural environment, agriculture, public and private property, and its economy.

Unless emergency action is taken during the life cycles of recently detected OFFs, there is high potential for sudden future detections in San Bernardino and Riverside counties.

The work plan involving physical and chemical control of this pest is necessary to prevent loss and damage to California's natural environment, fruit and vegetable industry, native wildlife, private and public property, and food supplies.

Therefore, I am invoking Public Resources Code Section 21080(b)(4) to carry out immediate emergency action to prevent this loss and damage.

My decision to adopt findings and take action is based on Sections 24.5, 401, 401.5, 403, 407, 408, and 5761-5764 of the Food and Agricultural Code, and title 3 of the California Code of Regulations (CCR) Section 5388.

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Karen Ross, Secretary

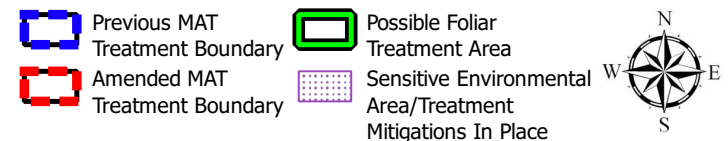
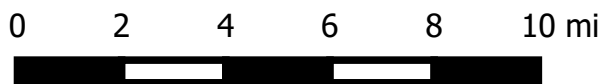
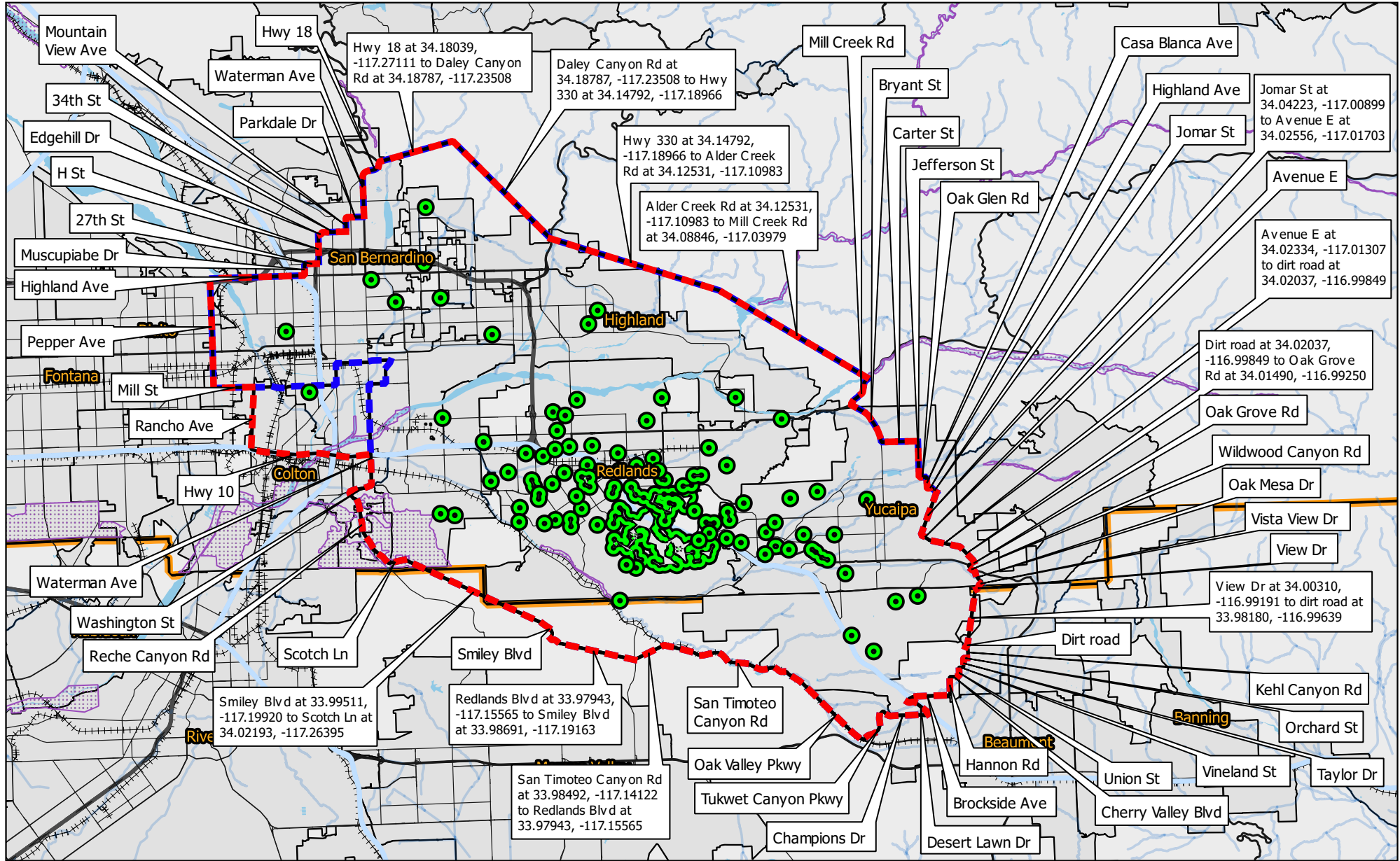
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Date

# Oriental Fruit Fly Eradication Project Amendment

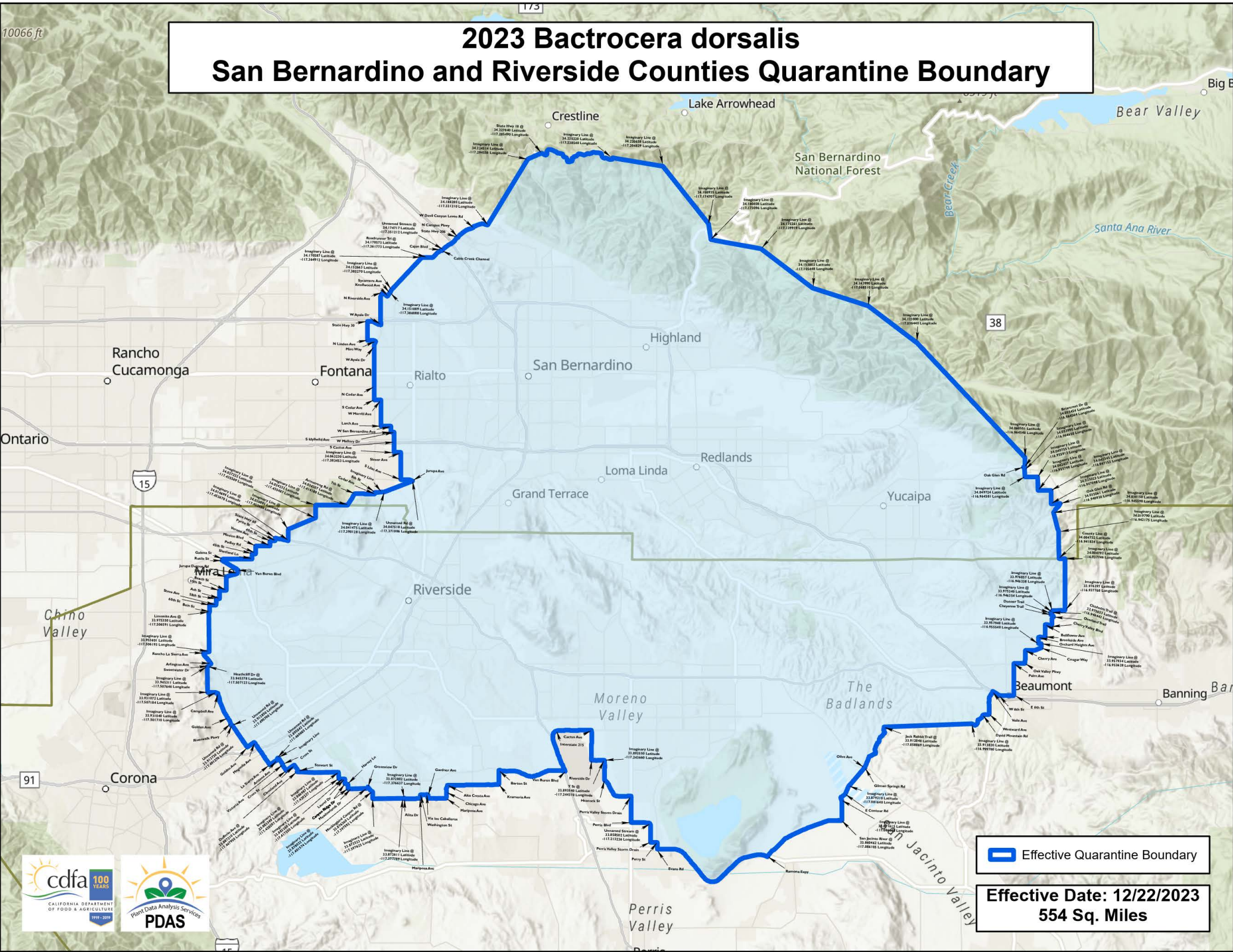
## Redlands, San Bernardino County


### 2024





# 2023 *Bactrocera dorsalis* San Bernardino and Riverside Counties Quarantine Boundary



 Effective Quarantine Boundary

**Effective Date: 12/22/2023**  
**554 Sq. Miles**

**ERADICATION PROJECT WORK PLAN FOR  
METHYL EUGENOL RESPONDING EXOTIC FRUIT FLIES (MEREFF)  
(Includes *Bactrocera correcta*, *Bactrocera dorsalis* group, and *Bactrocera zonata*)**

**DETECTION**

**1. Detection Trapping**

The California Department of Food and Agriculture (CDFA) maintains a cooperative State/County trapping program for the various fruit flies to provide early detection of any infestation in the State. Traps are serviced by either County or State personnel and funded by the Department. The program uses two types of traps: the cardboard Jackson sticky trap baited with the attractant methyl eugenol mixed with the pesticide naled (Dibrom® 8 Emulsive), and the McPhail trap, an invaginated glass flask baited with Torula yeast and borax in water. The Jackson trap is strongly attractive to sexually maturing males, while the McPhail trap is attractive to both sexes of the fly. Traps are hung from branches of host trees at specified densities in susceptible areas of California. County or State employees inspect these traps weekly or bi-weekly throughout the year in southern California and from April or May through October or November in northern California.

**2. Intensive Trapping**

Intensive trapping is triggered after a single fly is caught. Following confirmation of the specimen, trap densities will be increased over an 81-square mile area centered on the detection. Within the next 24 hours, 25 Jackson and McPhail traps are placed in the square mile core around each find. Five Jackson traps are placed in each mile of the remaining delimitation area. Traps in the core will be checked daily during the first week. Traps in the first buffer zone will be serviced every two days; those in the remainder of the delimitation area are checked at least once during the first week. All traps in the delimitation zone will be checked weekly following a week of negative trap catches. Intensive trapping ends after the third complete life cycle following the last fly find. This time period is determined by a temperature-dependent developmental model run by the Pest Detection/Emergency Projects Branch in Sacramento.

**3. Post-Treatment Monitoring**

The success of the eradication program is monitored by intensive trapping levels for three life cycles of the fly after the last fly has been detected. If no flies are caught during that time, trap densities return to detection levels.

**4. Larval Survey**

Fruit on a property where a fly has been trapped may be inspected for possible larval infestation. Small circular oviposition scars are occasionally visible indicating an infested fruit. Fruit on properties adjacent to a trap catch may also be inspected. If two or more flies are trapped close to each other, fruit cutting may be extended to all properties within a 200-meter radius of the finds, concentrating on preferred hosts.

## **TREATMENT**

### **1. Male Attractant Technique**

The male attractant technique (MAT) will be used to eliminate all sexually-mature male MEREFFs. MAT applies small bait stations using STATIC™ Spinosad ME, which is a pre-mixed solution containing the attractant methyl eugenol and an organically registered pesticide spinosad, mixed into a waxy time-release matrix (SPLAT®). The methyl eugenol lures male flies to the bait stations, where the flies ingest the insecticide as they feed. The flies are killed when they feed at the stations. In each square mile within the eradication boundary, a targeted density of 300 evenly spaced five- to ten-milliliter bait stations are applied to utility poles, street trees, and other unpainted surfaces using pressurized tree marking guns mounted on specially modified trucks. The bait stations are placed six to eight feet above the ground. The size of the eradication area is defined as that area within 1.5 miles of each detection site, squared off to create a nine-square mile block, and adjusted to use existing features as boundaries, such as roads. Applications are repeated every two weeks for one life cycle if no quarantine is triggered (typically two to three months), and for two life cycles if a quarantine is triggered (typically four to six months). Life cycle durations are dependent on temperature.

### **2. Foliar Sprays**

If evidence that a breeding population exists on a property (i.e., immature stages, mated female, or multiple adults are detected), the foliage of host trees and shrubs within 200 meters of each detection site will be treated with an organic formulation of spinosad bait spray (GF-120 NF Naturalyte® Fruit Fly Bait) using hand spray or hydraulic spray equipment. Following treatment, completion notices are left with the homeowners detailing precautions to take and post-harvest intervals applicable to any fruit on the property. Treatments are repeated at seven to 14 day intervals for one life cycle of the fly (typically two to three months, dependent on temperature).

### **3. Soil Drench**

On properties where immature stages are detected, host fruit is removed, and property owner consent is obtained, a soil drench labeled for use in California will be applied. The product(s) used will be labeled for use in California and will contain an active ingredient known to be effective against fruit flies.

### **4. Host Fruit Removal**

If evidence that a breeding population exists on a property (i.e., immature stages, mated female, or multiple adults are detected), host removal (fruit stripping) may be used in conjunction with the other treatment options. All host fruit will be removed from all properties within a minimum of a 100-meter radius around the detection sites. If, within a 60-day period, larvae or mated females are detected at five or more sites within a mile of each other, all host fruit shall be removed within a half-mile of each of the detected immature stages and/or mated females and disposed of in a landfill and/or waste facility or buried in a deep pit, trench, or other style of hole dug on site in accordance with regulatory protocols.

## **SENSITIVE AREAS**

The CDFA has consulted with the California Department of Fish and Wildlife's California Natural Diversity Database for threatened or endangered species, the United States Fish and Wildlife Service, the National Marine Fisheries Service and the California Department of Fish and Wildlife when rare and endangered species are located within the treatment area. Mitigation measures for rare and endangered species will be implemented. The CDFA will not apply pesticides to bodies of water or undeveloped areas of native vegetation. All treatment will be applied to residential properties, common areas within residential development, non-agricultural commercial properties, and rights-of-way.

## **PUBLIC NOTIFICATION**

For MAT applications, notification is given to the general public via mass media outlets such as newspapers or press releases. Residents whose property will be treated via foliar bait sprays, host fruit removal, or soil drench will be notified in writing at least 48 hours in advance of any treatment, in accordance with the Food and Agricultural Code (FAC) sections 5771-5779. Following the treatments, completion notices will be left with residents detailing precautions to take and post-harvest intervals applicable to any fruit on the property. For any questions related to this program, please contact the CDFA toll-free telephone number at 800-491-1899 for assistance. This telephone number is also listed on all treatment notices. Treatment information is posted at <http://www.cdfa.ca.gov/plant/pdep/treatment/>.

Press releases, if issued, are prepared by the CDFA information officer and the county agricultural commissioner, in close coordination with the program leader responsible for treatment. Either the county agricultural commissioner or the public information officer serves as the primary contact to the media.

Information concerning the MEREFF program shall be conveyed directly to local and State political representatives and authorities via letters, emails, and/or faxes.



# INTEGRATED PEST MANAGEMENT ANALYSIS OF ALTERNATIVE TREATMENT METHODS TO ERADICATE METHYL EUGENOL RESPONDING EXOTIC FRUIT FLIES

## November 2023

The treatment program used by the California Department of Food and Agriculture (CDFA) for control of methyl eugenol responding exotic fruit flies (MEREFFs) employs an area-wide chemical treatment called male attractant technique, complemented with a targeted foliar bait spray treatment using an organic pesticide and with fruit removal, as needed.

Below is an evaluation of alternatives treatment methods for MEREFFs that have been considered for eradication programs in California. These flies include, but are not limited to, the oriental fruit fly (*Bactrocera dorsalis*) (OFF) and its sibling species (collectively referred to as *Bactrocera dorsalis* group) (OFF group), guava fruit fly (*Bactrocera correcta*) (GFF), and peach fruit fly (*Bactrocera zonata*) (PFF).

### A. PHYSICAL CONTROL

**Mass Trapping:** This method involves placing a high density of traps in an area in an attempt to physically remove the adults before they can reproduce. For MEREFFs, trapping is considerably enhanced when an insecticide is added to the lure to help capture adults. Mass trapping with lure only and without an insecticide, would capture some adult OFF, but would not eradicate an infestation.

**Active Fly Removal:** Adult flies are mobile daytime fliers, and adults could theoretically be netted or collected off of foliage. However, due to their ability to fly when disturbed, and the laborious and time prohibitive task of collecting flying insects from several properties by hand, it would be highly improbable that all of the adults could be captured and removed. Larvae live inside the fruit, so all potentially infested fruit in the entirety of the eradication area would have to be removed and disposed of in order to eliminate the larvae from the environment. For these reasons, active fly removal is not considered to be an effective alternative.

**Fruit Bagging:** Fruit bagging involves individually enclosing each developing fruit in a bag which prevents fruit flies from laying eggs. In order to be effective, frequent monitoring of the bagged fruit is needed to identify and repair damage to the bags before female flies can enter and lay eggs. Fruit bagging is considered an economically inefficient option for area-wide treatment because it is so labor intensive. It is also intrusive to residents, who may oppose having their home grown produce confined inside bags. Additionally, this method may possibly promote the dispersal of female flies in search of egg laying sites, thus spreading the infestation if other treatments are not used outside the fruit bagging area. For these reasons, fruit bagging is not considered to be an effective alternative.

**Host Fruit Removal:** Removal of host fruits involves the physical removal of all suitable fruit from both the host plant and from the surrounding ground, in order to eliminate developing eggs and larvae. The fruit is collected and disposed of in a landfill and/or waste facility or a deep pit, trench, or other style of hole dug on site in accordance with regulatory protocols. California's MEREFF program performs host fruit removal within a 100-meter radius of detection sites that are indicative of an active breeding area, such as those with immature stages, a mated female, or multiple adults, as an added measure to reduce populations within that area and to prevent spread of adult life stages that are not targeted under the preferred area-wide treatment of male attractant technique, such as sexually immature males and females. If, within a 60-day period, any immature stages or mated females are detected at five or more sites within a mile of each other, host fruit



will be removed within a 0.5 mile (half-mile) of each of the detected immature stages and/or mated females. Fruit removal across the entire treatment area is not considered an economically efficient option because it is so labor intensive. It is also intrusive to residents, who may oppose losing their home grown produce. Fruit removal can be feasible and effective when used in targeted areas in combination with one or more of the other treatments discussed.

**Host Plant Removal:** Removal of host plants involves the large-scale destruction of plants by either physical removal or phytotoxic herbicides. Host plant removal is not considered an economically efficient option for area-wide treatment because it is so labor intensive. It is intrusive to residents, who may oppose losing their plants. Additionally, this method may possibly promote the dispersal of female flies in search of egg laying sites, thus spreading the infestation if other treatments are not used outside the host plant removal area. Finally, because only the fruit is subject to infestation, removing entire plants during a temporary eradication project is excessive, unduly intrusive, and wastefully inefficient.

## B. CULTURAL CONTROL

**Cultural Control:** Cultural controls involve the manipulation of cultivation practices to reduce the prevalence of pest populations. These include crop rotation, early harvest (i.e., harvesting green fruit before it is suitable for oviposition), using pest-resistant varieties, and intercropping with pest-repellent plants. None of these options are applicable for MEREFF eradications in an urban environment with multiple hosts, and may only serve to drive the flies outside the treatment area, thus spreading the infestation.

## C. BIOLOGICAL CONTROL

**Microorganisms:** No single-celled microorganisms, such as bacteria, have been shown to be effective at controlling MEREFFs.

**Nematodes:** No nematodes have been shown to be effective at controlling MEREFFs.

**Parasites and Predators:** Parasites and predators are not considered an effective stand-alone eradication method because their success is density dependent; they are more effective against dense prey populations than against light populations, so their effectiveness decreases as the prey populations decline. Although several organisms, such as parasitic wasps, have been investigated as potential biological control agents against exotic fruit fly species, they have only been used in suppression programs and not in eradication programs. Since there is insufficient research documenting their efficacy in an eradication program, using these organisms would likely lead to the ineffectiveness of the program.

**Sterile Insect Technique (SIT):** SIT is currently used to suppress OFF and GFF populations in mango orchards in Thailand, and research is ongoing for use against OFF in Hawaii and against a member of the OFF complex, *Bactrocera philippinensis*, in the Philippines. However, there are no production-level colonies of these species outside of Thailand, and these facilities and research colonies are too small and too far away to support an active eradication effort in California. In addition, for introduced populations of the OFF complex, there is uncertainty as to which species has actually invaded, and therefore SIT using the wrong species could lead to ineffectiveness of the program.

#### D. CHEMICAL CONTROL

**Male Attractant Technique:** The use of male attractant technique (MAT) in California can be traced back to the 1960's. MAT applies small bait stations using STATIC™ Spinosad ME, which is a pre-mixed solution containing the attractant methyl eugenol and an organically registered pesticide spinosad, mixed into a waxy time-release matrix (SPLAT®). The methyl eugenol lures male flies to the bait stations, where the flies ingest the insecticide as they feed. The flies are killed when they feed at the stations. In each square mile within the eradication boundary, a targeted density of 300 evenly spaced five- to ten-milliliter bait stations are applied to utility poles, street trees, and other unpainted surfaces using pressurized tree marking guns mounted on specially modified trucks. The bait stations are placed six to eight feet above the ground. The size of the eradication area is defined as that area within 1.5 miles of each detection site, squared off to create a nine-square mile block, and adjusted to use existing features as boundaries, such as roads. Applications are repeated every two weeks for one life cycle if no quarantine is triggered (typically two to three months), and for two life cycles if a quarantine is triggered (typically four to six months). Life cycle durations are dependent on temperature. Sexually maturing males are strongly attracted to methyl eugenol because it is needed for proper production of their sex pheromone. The male flies responding to the methyl eugenol die from the pesticide when they feed at the stations. In each square mile within the eradication boundary, a targeted density of 300 evenly spaced five milliliter bait stations are applied to utility poles, street trees, and other unpainted surfaces using pressurized tree marking guns mounted on specially modified trucks. The bait stations are placed six to eight feet above the ground. The size of the eradication area is defined as that area within 1.5 miles of each detection site, and squared off to create a nine square mile block, and adjusted to use existing features as boundaries, such as roads. Applications are repeated every two weeks for one life cycle if no quarantine is triggered (typically two to three months), and for two life cycles if a quarantine is triggered (typically four to six months). Life cycle durations are dependent on temperature.

**Foliar Bait Treatment:** Foliar bait treatments use an insecticide mixed with a food attractant in order to kill adults, particularly females. The bait makes the treatment selective for particular flies, and therefore biological control agents for other pests are not affected. The CDFA uses this treatment if evidence that a breeding population exists on a property (i.e., immature stages, mated female, or multiple adults are detected). The goal is to decrease the population density and to target adult life stages which are not susceptible to MAT (e.g., mated females, sexually immature males) in order to contain the population while MAT drives the population to extinction. The foliage of host trees and shrubs within 200 meters of each detection site is treated with an organic formulation of spinosad bait spray (GF-120 NF Naturalyte® Fruit Fly Bait) using hand spray or hydraulic spray equipment. This treatment is repeated at seven to 14 day intervals for one life cycle beyond the last fly detected. While effective in the area treated, this type of treatment is considered economically inefficient to apply in a biologically relevant timeframe over the entirety of the eradication area, so it is used as a complimentary treatment to MAT rather than a standalone treatment.

**Foliar Cover Spray Treatment:** Foliar cover spray treatments use a contact insecticide in order to kill adults. This treatment is non-selective and will affect any insects which come into contact with it, including biological control agents for other pests. In order to sufficiently cover an area, much more pesticide must be applied per area than with foliar bait sprays. For these reasons, cover sprays are not used for this program.

**Soil Treatment:** Contact insecticides drenched into the soil have been used against MEREFFs in the past. The goal is to directly kill larvae entering the soil to pupate, pupae in the soil, and adults emerging from pupae by drenching the soil surrounding host plants. The insecticide previously used for this purpose contains the organophosphate insecticide diazinon. In the case of properties where immature stages have been detected, fruit has been removed, and property owner consent is obtained, a soil drench labeled for use in California will be applied. The product(s) used will contain an active ingredient known to be effective against fruit flies.

## PEST PROFILE

<u>Common Name:</u>	Oriental Fruit Fly
<u>Scientific Name:</u>	<i>Bactrocera dorsalis</i> (Hendel)
<u>Order and Family:</u>	Diptera, Tephritidae

Description: The adult oriental fruit fly (OFF) is somewhat larger than a housefly, about eight millimeters in length. The top of the thorax is mostly black with yellow patches, the abdomen is yellow-orange with a dark T-shaped mark, and the face has two black spots. The wings are clear with a dark line along the front edge. The female has a pointed slender ovipositor to deposit eggs under the skin of host fruit. The egg is minute, white, cylindrical, rounded at the ends and about six times as long as wide. The larva is creamy-white, legless, and may attain a length of ten millimeters. The pupa is encased in a dark brown cylindrical puparium.

History and Economic Importance: The OFF is an invasive insect originating in Asia, and has been accidentally introduced into a number of Pacific Islands, including Hawaii. It is a member of a closely related group of species, known as the OFF complex, which are difficult to distinguish based on individual specimens. Several of the complex species are major fruit and vegetable pests, and collectively members of the OFF complex are known to attack over 230 types of fruits and vegetables. Important California crops at risk include pome and stone fruits, citrus, dates, avocados, and many row crops, particularly tomatoes and peppers. Damage occurs when the female lays eggs in the fruit. These eggs hatch into larvae, which tunnel through the flesh of the fruit, making it unfit for consumption. The first California detections occurred in Orange and Santa Barbara counties in 1960, and since that time, numerous re-introductions have been delimited and successfully eradicated.

Distribution: OFF is widespread through much of the mainland of southern Asia and neighboring islands, including Sri Lanka and Taiwan. Distribution in the United States is restricted to the Hawaiian Islands.

Life Cycle: Females lay eggs in groups of three to 30 under the skin of host fruits, and a single female can lay more than 1,000 eggs in her lifetime. The amount of time it takes for egg development depends on the ambient temperature. Larvae tunnel through the fruit feeding on the pulp, shed their skins twice, and emerge through exit holes in approximately ten days. The larvae drop from the fruit and burrow two to three centimeters into the soil to pupate. In ten to twelve days, adults emerge from these puparia. The newly emerged adult females need eight to twelve days to mature sexually prior to egg-laying. Breeding is continuous, with several annual generations. Adults live an average of 90 days, feeding on honeydew, decaying fruit, plant nectar, bird dung, and other sources of protein. The adult is a strong flyer, recorded to travel 30 miles in search of food and egg laying sites. This ability to fly long distances allows the fly to infest new areas very quickly.

Hosts and Damage: In excess of 230 fruits and vegetables have been reported as hosts of members of the OFF complex (see Partial Host List below). Fruit that has been attacked may be unfit for consumption due to the larvae tunneling through the flesh as they feed. Decay-producing organisms then enter, leaving the interior of the fruit a rotten mass.

## Partial Host List

### **Common Name**

Akia  
Alexander laurel  
Apple  
Apricot  
Avocado  
Banana  
Banana, dwarf  
Barbados cherry  
Bell pepper  
Brazil cherry  
Breadfruit  
Caimitillo  
Cashew  
Cactus  
Cherimoya  
Cherry, Catalina  
Cherry, Portuguese  
Cherry, sweet  
Chili  
Coffee, Arabian  
Country gooseberry  
Cucumber  
Custard apple  
Date palm  
Dragon tree  
Eggfruit tree  
Elengi tree  
Fig  
Gourka  
Granadilla, sweet  
Granadilla, yellow  
Grape  
Grapefruit  
Guava  
  
Imbu  
Jackfruit  
Jerusalem cherry  
Kitembilla  
Kumquat  
Tamanu  
Lemon  
Lime  
Longan  
Loquat  
Lychee nut  
Malay apple  
Mammee apple  
Mandarin orange (tangerine)

### **Scientific Name**

*Wikstroemia phyllyraefolia*  
*Calophyllum inophyllum*  
*Malus sylvestris*  
*Prunus armeniaca*  
*Persea americana*  
*Musa x paradisiaca*  
*Musa nana*  
*Malpighia glabra*  
*Capsicum frutescens grossum*  
*Eugenia dombeyi*  
*Artocarpus altilis*  
*Chrysophyllum oliviforme*  
*Anacardium occidentale*  
*Cereus coerulescens*  
*Annona cherimola*  
*Prunus ilicifolia*  
*Prunus lusitanica*  
*Prunus avium*  
*Capsicum frutescens* var. *longum*  
*Coffea arabica*  
*Averrhoa carambola*  
*Cucumis sativas*  
*Annona reticulata*  
*Phoenix dactylifera*  
*Dracaena draco*  
*Outeria campechiana*  
*Mimusops elengi*  
*Ficus carica*  
*Garcinia celebica*  
*Passiflora ligularis*  
*Passiflora lauriflora*  
*Vitis* spp.  
*Citrus paradisi*  
*Psidium guajava*  
*Psidium. littorale*  
*Psidium. cattleianum*  
*Spondias tuberosa*  
*Artocarpus heterophyllus*  
*Solanum pseudocapsicum*  
*Dovyalis hebecarpa*  
*Fortunella japonica*  
*Calophyllum inophyllum*  
*Citrus limon*  
*Citrus aurantiifolia*  
*Euphoria longan*  
*Eriobotrya japonica*  
*Lychee chinensis*  
*Eugenia malaccensis*  
*Mammea americana*  
*Citrus reticulata*

**Common Name**

Mango  
Mangosteen  
Mock orange  
Black Mulberry  
Myrtle, downy rose  
Natal plum  
Nectarine  
Oleander, yellow  
Orange, calamondin  
Orange, Chinese  
Orange, king  
Orange, sweet  
Orange, Unshu  
Oriental bush red pepper  
Otaheite apple  
Palm, syrup  
Papaya  
Passionflower  
Passionflower, softleaf  
Passionfruit (yellow lilikoi)  
Peach  
Pear  
Pepino  
Pepper, sweet  
Persimmon, Japanese  
Pineapple guava  
Plum  
Pomegranate  
Prickly pear  
Prune  
Pummelo  
Quince  
Rose apple  
Sandalwood  
Sandalwood, white  
Santol  
Sapodilla  
Sapodilla, chiku  
Sapota, white  
Seagrape  
Sour orange  
Soursop  
Star apple  
Surinam cherry  
Tomato  
Tropical almond  
  
Velvet apple  
Walnut, Hinds  
Walnut, English  
Wampi  
West Indian cherry  
Ylang-ylang

**Scientific Name**

*Mangifera indica*  
*Garcinia mangostana*  
*Murraya exotica*  
*Morus nigra*  
*Rhodomyrtus tomentosa*  
*Carissa grandiflora*  
*Prunus persica* var. *nectarina*  
*Thevetia peruviana*  
*Citrus mitis* and *C. japonica*  
*Citrus japonica hazara*  
*Citrus nobilis*  
*Citrus sinensis*  
*Citrus unshu*  
*Capsicum frutescens abbreviatum*  
*Spondias dulcis*  
*Jubaea spectabilis*  
*Carica papaya*  
*Passiflora edulis*  
*Passiflora mollissima*  
*Passiflora edulis flavicarpa*  
*Prunus persica*  
*Pyrus communis*  
*Solanum muricatum*  
*Capsicum frutescens* var. *grossum*  
*Diospyros kaki*  
*Feijoa sellowiana*  
*Prunus americana*  
*Punica granatum*  
*Opuntia megacantha*  
*Prunus domestica*  
*Citrus maxima*  
*Cydonia oblonga*  
*Eugenia jambos*  
*Santalum paniculatum*  
*Santalum album*  
*Sandericum koetjape*  
*Manilkara zapota*  
*Achras zapota*  
*Casimiroa edulis*  
*Coccoloba uvifera*  
*Citrus aurantium*  
*Annona muricata*  
*Chrysophyllum cainito*  
*Eugenia uniflora*  
*Solanum lycopersicum*  
*Terminalia catappa*  
*Terminalia chebula*  
*Diospyros discolor*  
*Juglans hindsii*  
*Juglans regia*  
*Citrus lansium*  
*Malpighia puniceifolia*  
*Canaga odorata*