CALIFORNIA DEPARTMENT OF FOOD AND AGRICULTURE

OFFICIAL NOTICE
FOR THE CITY OF LOS ANGELES
PLEASE READ IMMEDIATELY

AMENDMENT TO THE PROCLAMATION OF AN ERADICATION PROJECT REGARDING THE ORIENTAL FRUIT FLY

Between October 28, 2014 and January 8, 2015, oriental fruit flies (OFFs), *Bactrocera dorsalis* (Hendel) group, were trapped in the city of Los Angeles, Los Angeles County. Based on the survey data, pest biology, information from the California Department of Food and Agriculture (CDFA) *Bactrocera* Science Advisory Panel (BacSAP), recommendations provided by the CDFA Primary State Entomologist, and the CDFA "Action Plan for Methyl Eugenol Attracted Fruit Flies including Oriental Fruit Fly *Bactrocera dorsalis* (Hendel)," an infestation of OFF exists in the area.

Immediate action is needed to protect California from the negative economic and environmental impacts the establishment of this pest would cause. OFF is a serious exotic insect pest that is not native to California. OFF originates in Asia, and has been accidentally introduced into a number of Pacific Islands, including Hawaii. OFF 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. 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. This pest presents a major threat to a wide variety of California produce, such as pome and stone fruits, citrus, dates, avocados, and many vegetables. The combined 2012 gross value of these commodities was over $15.2 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.

The eradication project is based on a work plan developed in consultation with the Pest Prevention Committee of the California Agricultural Commissioners and Sealers Association, the USDA, and scientists on the BacSAP. Pursuant to sections 5401-5405 and 5761-5764 of the Food and Agricultural Code (FAC), the Secretary is mandated: to thoroughly investigate the existence of a pest; to determine the probability of the spread of a pest; to adopt regulations (Title 3 of the California Code of Regulations, Section 3591.2) as are reasonably necessary to carry out the provisions of this code; to abate a pest from the established eradication area; and, to prevent further economic damage.

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 eradicate OFF. 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.

To eradicate OFF from this area, the treatment portion of the work plan is as follows:

- The male attractant treatment (MAT) makes use of small amounts of the attractant methyl eugenol and the pesticide naled (Dibrom® Concentrate) mixed into a clay matrix (Min-U-Gel® 400) to lure the male flies to bait stations. A second MAT product is undergoing logistical testing as a replacement for the current mixture. This product is STATIC™ Spinosad ME, a pre-mixed solution of methyl eugenol, spinosad, and SPLAT®, and may be used in place of the naled product in some instances. The male OFFs are killed before they can mate with the female OFFs. This disrupts the breeding cycle and the population is eliminated. Spot applications of approximately five milliliters will be applied to utility poles, street trees, and other unpainted surfaces using pressurized tree marking guns within a nine-square mile area around each OFF detection site. The bait stations are placed six to eight feet above the ground and out of the reach of the public and pets. 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), 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). 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). Visit the CDFA website to learn more about the treatment process at http://www.cdfa.ca.gov/plant/videos/spinosad/.

- If evidence that a breeding population exists on a property (i.e., immature stages, mated female, or multiple adults), all host fruit from each detection site and all properties within a minimum of 100 meters of each detection site may be removed and disposed of in a landfill in accordance with regulatory protocols. Fruit removal will occur once at the beginning of the project, but may be repeated if additional flies are detected.

Public Notification:
Any resident whose property will be treated via foliar bait sprays or host fruit removal will be notified in writing at least 48 hours in advance of any treatment, in accordance with FAC Sections 5779 and 5401-5404. Following the treatment, completion notices are left with homeowners detailing precautions to take and post-harvest intervals applicable to any fruit on the property. For MAT applications in public areas, notification is given to the general public via mass media outlets such as newspapers or press releases, and information is posted on the CDFA website at http://www.cdfa.ca.gov/plant/PDEP/treatment/oriental_ff.html. Information concerning the OFF project will be conveyed directly to concerned local and State political representatives and authorities via letters, emails, and/or faxes. 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.

Please contact the CDFA toll-free hotline at 800-491-1899 and staff will be able to assist with any questions related to the project. This telephone number is also listed on all treatment notices.

AMENDMENT TO THE PROCLAMATION OF AN ERADICATION PROJECT
REGARDING THE ORIENTAL FRUIT FLY

Between October 28, 2014 and January 8, 2015 oriental fruit flies (OFFs), *Bactrocera dorsalis* (Hendel) group, were trapped in the city of Los Angeles, Los Angeles County. Based on the survey data, pest biology, information from the California Department of Food and Agriculture (CDFA) *Bactrocera* Science Advisory Panel (BacSAP), recommendations provided to me by the CDFA Primary State Entomologist, and the CDFA "Action Plan for Methyl Eugenol Attracted Fruit Flies including Oriental Fruit Fly *Bactrocera dorsalis* (Hendel)," I have determined that an infestation of OFF exists in the area.

The OFF is an exotic 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.

Under my statutory authority, as Secretary of the CDFA, I have decided, based upon the likely environmental and economic damage that would be inflicted by this infestation of OFF, that it is incumbent upon me to address this threat. This pest presents a major threat to a wide variety of California produce, with the combined 2012 gross value of these commodities being over $15.2 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.

My duty to act, and this decision, is based upon authority set forth in Sections 24.5, 401.5, 403, 407, 408, 5401-5405, and 5761-5764 of the Food and Agricultural Code (FAC) authorizing and mandating me: to thoroughly investigate the existence of the pest; to determine the probability that the pest will spread; to adopt regulations (Title 3 of the California Code of Regulations, Section 3591.2) as are reasonably necessary to carry out the provisions of this code; to abate the pest from the established eradication area; and, to prevent further economic damage. The enclosed project work plan describes the actions to be taken by the CDFA which are necessary to mitigate the establishment and spread of this pest.

This decision to proceed with an eradication program is based upon a realistic evaluation that it may be possible to eradicate OFF using currently available technology in a manner that is based on the enclosed work plan developed in consultation with the Pest Prevention Committee of the California Agricultural Commissioners and Sealers Association, the USDA, and scientists on the BacSAP. Due to the size of the infested area and the number of OFF detected, historical data indicates that eradication is possible. The first California OFF detections occurred in Orange and Santa Barbara counties in 1960, and since that time, numerous re-introductions have been delimited and successfully eradicated.

In making this decision, the CDFA has evaluated possible eradication methods. In accordance with integrated pest management principles, the following is a list of the options that I have considered for the eradication of this OFF infestation: 1) physical controls; 2) cultural controls; 3) biological controls; and 4) chemical controls. Based upon input from my professional staff and outside experts familiar with OFF, I have concluded that there are no cultural or biological controls that are effective to eradicate OFF that allow the CDFA to meet its statutory obligations. To eradicate OFF, I am ordering that male attractant treatments, consisting of methyl eugenol, a pesticide (naled), and a thickener 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 and host fruit removal will occur. Descriptions of these options are contained in the enclosed work plan.

The CDFA has prepared and certified a Final Environmental Impact Report (FEIR) entitled "The Exotic Fruit Fly Eradication Program Utilizing Male Annihilation and Allied Methods," which is implemented as per the operations described above. This FEIR identifies and analyzes alternative actions applicable to exotic fruit fly pest eradication projects. The enclosed work plan incorporates the appropriate integrated pest management techniques as described in the FEIR. The CDFA has not detected any local condition which would justify or necessitate preparation of a site specific plan.

Sensitive Areas

The treatment area has been reviewed through consultation with the California Department of Fish and Wildlife's California Natural Diversity Database for threatened or endangered species. The CDFA also consults with the California Department of Fish and Wildlife, the U.S. Fish and Wildlife Service and the National Marine Fisheries Services when rare and endangered species are located within the treatment area. Mitigation measures will be implemented as needed. 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 right-of-ways.

Eradication Plan

The eradication area includes those portions of Los Angeles County which fall within an approximate nine-square mile area around each property on which an OFF has been trapped or on which another life stage of the insect is detected. A map of the detection sites with eradication boundaries and the proposed eradication work plan are attached. In summary form, the work plan contains the following elements:

1. Delimitation. Two types of traps will be placed throughout the project area 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 in the core areas, and Jackson traps will be placed at a density of five per square mile in the remaining delimitation area. 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 eradicate the adult OFF. The MAT makes use of small amounts of the attractant methyl eugenol mixed with the pesticide naled (Dibrom® Concentrate), and incorporated into a clay matrix (Min-U-Gel® 400) to lure the male flies to bait stations. A second MAT product is undergoing logistical testing as a replacement for the current mixture. This product is STATIC™ Spinosad ME, a pre-mixed solution of methyl eugenol, spinosad, and SPLAT®, and may be used in place of the naled product in some instances. The flies are killed when they feed at the stations. In each square mile within the eradication boundary, a targeted density of 600 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 is 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.

- If evidence that a breeding population exists on a property (i.e., immature stages, mated female, or multiple adults are detected), 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).

- 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 may be removed and disposed of in a landfill in accordance with regulatory protocols. Fruit removal will occur once at the beginning of the project, but may be repeated if additional flies are detected.

Public Notification

Any resident whose property will be treated via foliar bait sprays or host fruit removal will be notified in writing at least 48 hours in advance of any treatment, in accordance with
FAC Sections 5779 and 5401-5404. Following the treatment, completion notices are left with homeowners detailing precautions to take and post-harvest intervals applicable to any fruit on

the property. For MAT applications in public areas, notification is given to the general public via mass media outlets such as newspapers or press releases, and information is posted on the CDFA website at http://www.cdfa.ca.gov/plant/pdep/treatment/oriental_ff.html. Information concerning the OFF project will be conveyed directly to concerned local and State political representatives and authorities via letters, emails, and/or faxes. 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.

Please contact the CDFA toll-free telephone number at 800-491-1899 and staff will be able to assist with any questions related to this project. This telephone number is also listed on all treatment notices.

Karen Ross, Secretary

Date

Attachments

INTEGRATED PEST MANAGEMENT ANALYSIS OF ALTERNATIVE TREATMENT METHODS TO ERADICATE METHYL EUGENOL RESPONDING EXOTIC FRUIT FLIES
January 2015

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 which 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 double-bagged before being buried in a landfill. California's MEREFF program performs host fruit removal within a 100-meter radius of detection sites which 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 which are not targeted under the preferred area-wide treatment of male attractant technique, such as sexually immature males and females. Fruit removal is not considered an economically inefficient option for area-wide treatment because it is so labor intensive. It is also intrusive to residents, who may oppose losing their home grown

produce. 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 removal area. For these reasons, fruit removal is most useful as a complimentary treatment to one or more other treatments.

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 inefficient 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. And finally, because only the fruit becomes infested, there is no need to remove the entire plant during a temporary eradication project as long as the fruit can be removed.

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 could 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) (formerly male annihilation technique) in California can be traced back to the 1960's. The current formulation was developed in the 1970's and has been successfully employed over the years in California and Florida to eradicate introduced populations of MEREFFs. MAT makes use of small amounts of the attractant methyl eugenol mixed with the pesticide naled (Dibrom® Concentrate), and incorporated into a clay matrix (Min-U-Gel® 400) to lure the male flies to bait stations. A second MAT product is undergoing logistical testing as a replacement for the current mixture. This product is STATIC™ Spinosad ME, a pre-mixed solution of methyl eugenol, spinosad, and SPLAT®, and may be used in place of the naled product in some instances. 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 600 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 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. However, this treatment has not been used since 2001 in California because of its environmental toxicity,

difficulty in removing all ground clutter and debris, and a potential lack of effectiveness in the varied soil types found in urban environments.

E. RESOURCES

California Department of Food and Agriculture. 1993. The Exotic Fruit Fly Eradication Program Utilizing Male Annihilation and Allied Methods. Final Programmatic Environmental Impact Report. State of California, Department of Food and Agriculture, Sacramento, California. State Clearinghouse Number 90021212, April 1993. 572 pp. http://www.countyofsb.org/agcomm/fruitfly/ExoticFFEIR.pdf

United States Department of Agriculture. 2001. Fruit Fly Cooperative Control Program. Final Environmental Impact Statement 2001. 385 pp. http://www.aphis.usda.gov/plant_health/ea/downloads/fffeis.pdf

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January 2015

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Below is an evaluation of alternatives treatment methods for MEREFFs which 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 double-bagged before being buried in a landfill. California's MEREFF program performs host fruit removal within a 100-meter radius of detection sites which 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 which are not targeted under the preferred area-wide treatment of male attractant technique, such as sexually immature males and females. Fruit removal is not considered an economically inefficient option for area-wide treatment because it is so labor intensive. It is also intrusive to residents, who may oppose losing their home grown

produce. 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 removal area. For these reasons, fruit removal is most useful as a complimentary treatment to one or more other treatments.

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 inefficient 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. And finally, because only the fruit becomes infested, there is no need to remove the entire plant during a temporary eradication project as long as the fruit can be removed.

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 could 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) (formerly male annihilation technique) in California can be traced back to the 1960's. The current formulation was developed in the 1970's and has been successfully employed over the years in California and Florida to eradicate introduced populations of MEREFFs. MAT makes use of small amounts of the attractant methyl eugenol mixed with the pesticide naled (Dibrom® Concentrate), and incorporated into a clay matrix (Min-U-Gel® 400) to lure the male flies to bait stations. A second MAT product is undergoing logistical testing as a replacement for the current mixture. This product is STATIC™ Spinosad ME, a pre-mixed solution of methyl eugenol, spinosad, and SPLAT®, and may be used in place of the naled product in some instances. 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 600 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 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. However, this treatment has not been used since 2001 in California because of its environmental toxicity,

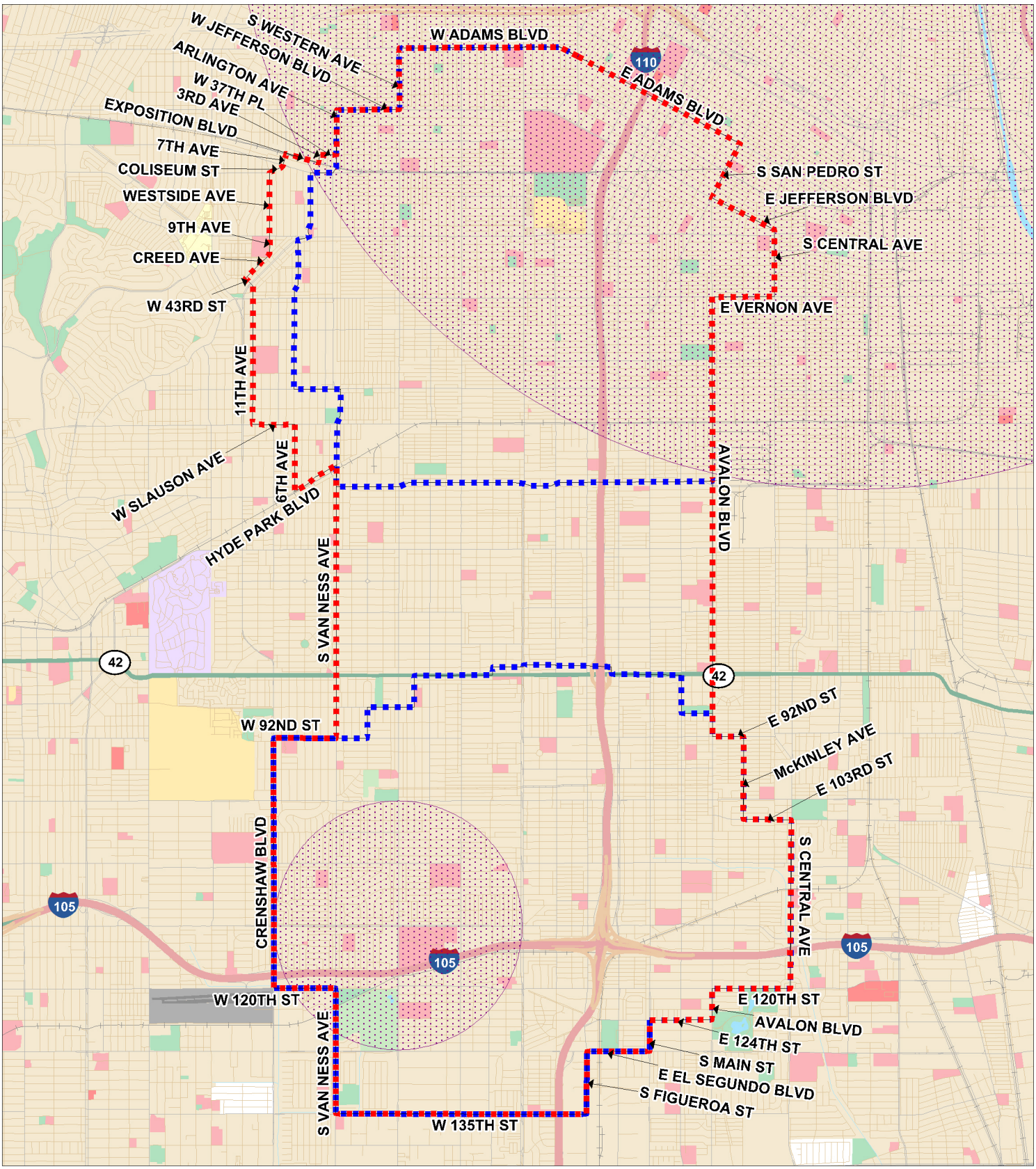
difficulty in removing all ground clutter and debris, and a potential lack of effectiveness in the varied soil types found in urban environments.

E. RESOURCES

California Department of Food and Agriculture. 1993. The Exotic Fruit Fly Eradication Program Utilizing Male Annihilation and Allied Methods. Final Programmatic Environmental Impact Report. State of California, Department of Food and Agriculture, Sacramento, California. State Clearinghouse Number 90021212, April 1993. 572 pp. http://www.countyofsb.org/agcomm/fruitfly/ExoticFFEIR.pdf

United States Department of Agriculture. 2001. Fruit Fly Cooperative Control Program. Final Environmental Impact Statement 2001. 385 pp. http://www.aphis.usda.gov/plant_health/ea/downloads/fffeis.pdf

ORIENTAL FRUIT FLY
LOS ANGELES, LOS ANGELES COUNTY
2015



cdfa

MAXIMUM PROGRAM BOUNDARY

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