CALIFORNIA DEPARTMENT OF FOOD AND AGRICULTURE

OFFICIAL NOTICE
FOR THE COMMUNITIES OF STEVENSON RANCH,
SANTA CLARITA, VALENCIA, AND NEWHALL
PLEASE READ IMMEDIATELY

AMENDMENT TO THE PROCLAMATION OF EMERGENCY PROGRAM FOR THE TAU FRUIT FLY

Between June 6, 2023 and August 21, 2023, the California Department of Food and Agriculture (CDFA) confirmed that a minimum of fifty-five tau fruit flies (TAUs), *Zeugodacus tau* (Walker) group, were trapped in the communities of Stevenson Ranch, Santa Clarita, Valencia, and Newhall in 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 Cuelure Attracted Fruit Flies including the Melon Fly *Bactrocera cucurbitae* (Coquillett)," the CDFA concluded that an infestation of TAU exists in the area. This pest 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 Los Angeles County.

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 TAU from this area. This Proclamation of Emergency Program is valid until December 12, 2023, which is the amount of time necessary to carry out the treatment plan across three life cycles of TAU as required by the treatment protocol for TAU. 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.

The detections of TAU described above require immediate action to address the imminent threat to California's natural environment, agriculture and economy. More specifically, in addition to a wide variety of commercial crops, TAU threatens loss and damage to native wildlife, private and public property, and food supplies. Because the life cycle of the TAU detected between June 6, 2023 and August 21, 2023 has not yet transpired, there is a high potential for sudden future detections in Stevenson Ranch. 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 TAU infestation will be implemented as follows:

- Chemical Control: The male attractant technique (MAT) makes use of small amounts of the attractant cuelure mixed with the pesticide naled (Dibrom® Concentrate), soaked into cotton wicks placed inside Jackson traps. Male flies are lured to the traps, where they are killed by the pesticide when they feed at the wicks. This disrupts the breeding cycle and the population is eliminated. Within a nine-square-mile area around each detection site, traps are placed six to eight feet above the ground. Traps are replaced every four weeks for two life cycles (typically four to six months). Life cycle durations are dependent on temperature.

- Chemical Control: If evidence that a breeding population exists in an area (i.e., immature stages, mated female, or multiple adults are detected in a 3-mile radius), foliar bait treatments may be used within 200 meters of each detection site in order to mitigate the spread of TAU 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/.

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

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 or host fruit removal will be notified in writing at least 48 hours in advance of any treatment, in accordance with the Food and Agricultural Code sections 5771-5779 and 5421-5436. Following the treatment, completion notices are 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/tau_ff_treatment.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 TAU 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 TAU FRUIT FLY

Between June 6, 2023 and August 21, 2023, the California Department of Food and Agriculture (CDFA) confirmed that a minimum of fifty-five tau flies (TAUs), *Zeugodacus tau* (Walker) group, were trapped in the communities of Stevenson Ranch, Santa Clarita, Valencia, and Newhall in Los Angeles County. These detections indicate that a breeding population exists in the area. Unless emergency action is taken, there is high potential for sudden future detections in Los Angeles County. TAU 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 site. 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 Cuelure Attracted Fruit Flies including the Melon Fly *Bactrocera cucurbitae* (Coquillett)," I have determined that an infestation of TAU exists in the area.

The results of the additional survey also indicated that the local infestation is amenable to CDFA's TAU 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.

TAU is an exotic insect originating in southeast Asia. It is not known to be established in the United States. TAU has a broad host range; at least 34 hosts in nine plant families are reported, including melon, okra, peppers, papayas, citrus, cucumber, pumpkin, avocado, tomato, and gourds. It is considered a significant pest of cucurbits. 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 lifecycle 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 TAU. Because the third (F3) life cycle of the TAU detected between June 6, 2023 and August 21, 2023 is not projected to be complete until December 12, 2023, it is likely that there are additional flies in the environment that will lead to sudden future detections.

This pest presents a significant and imminent threat to the natural environment, agriculture and economy of California. Exotic 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 2021 gross production value of host commercial commodities potentially affected by TAU was over $10.09 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.

This decision to proceed with treatment is based upon a realistic evaluation that it will be possible to eliminate TAU 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. Due to the size of the infested area and the number of flies detected, historical data indicates that eradication is possible. The first detections of TAU in California occurred in San Bernardino County in 2016, and, since that time, three 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 TAU: 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 TAU 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 TAU, and County Agricultural Commissioner representatives who are knowledgeable on TAU, I find there are no cultural or biological control methods that are both effective against TAU 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 cuelure mixed with a pesticide (naled), be applied inside traps 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.

Sensitive Areas

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 proposed treatment area encompasses those portions of Los Angeles County which fall within a 1.5-mile radius around each property on which a TAU has been detected and any subsequent detection sites within the program boundaries. The Proclamation of Emergency Program is valid until December 12, 2023, which is the amount of time necessary to carry out the treatment plan across three life cycles of TAU as required by the treatment protocol for TAU. A map of the project boundaries is attached. The work plan consists of 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 TAU populations. The cardboard Jackson sticky trap is baited with the attractant cuelure 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. Fifty Jackson and 25 McPhail traps are placed in the square mile core around each detection. In the remaining four one-mile deep buffers, Jackson traps are placed at densities of 25, 15, 10, and 5 traps per square mile respectively, proceeding outward from the detection. 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 generations beyond the date of the last TAU 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 TAU 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 TAU. The MAT makes use of small amounts of the attractant cuelure mixed with the pesticide naled (Dibrom® Concentrate), soaked into cotton wicks placed inside Jackson traps. Male flies are lured to the traps, where they are killed by the pesticide when they feed at the wicks. In each square mile within the eradication boundary, a targeted density of 1000 evenly spaced traps are deployed onto trees, shrubs, or other inanimate objects. 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. Traps are replaced every four weeks for two life cycles (typically four to six months). Life cycle durations are dependent on temperature.

- If evidence that a breeding population exists in an area (i.e., immature stages, mated female, or multiple adults are detected in a 3-mile radius), foliar bait treatments will be used within 200 meters of each detection site in order to mitigate the spread of TAU 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 or a mated female are detected), all host fruit from each detection site and all properties within a minimum of 100 meter radius will 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 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 or host fruit removal 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 and 5421-5436. Following the treatment, completion notices are left with the residents detailing precautions to take and post-harvest intervals applicable to any fruit on the property.

Treatment information is posted at https://www.cdfa.ca.gov/plant/PDEP/treatment/tau_ff_treatment.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 TAU 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 TAU, 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 TAUs, there is high potential for sudden future detections in Los Angeles County.

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.

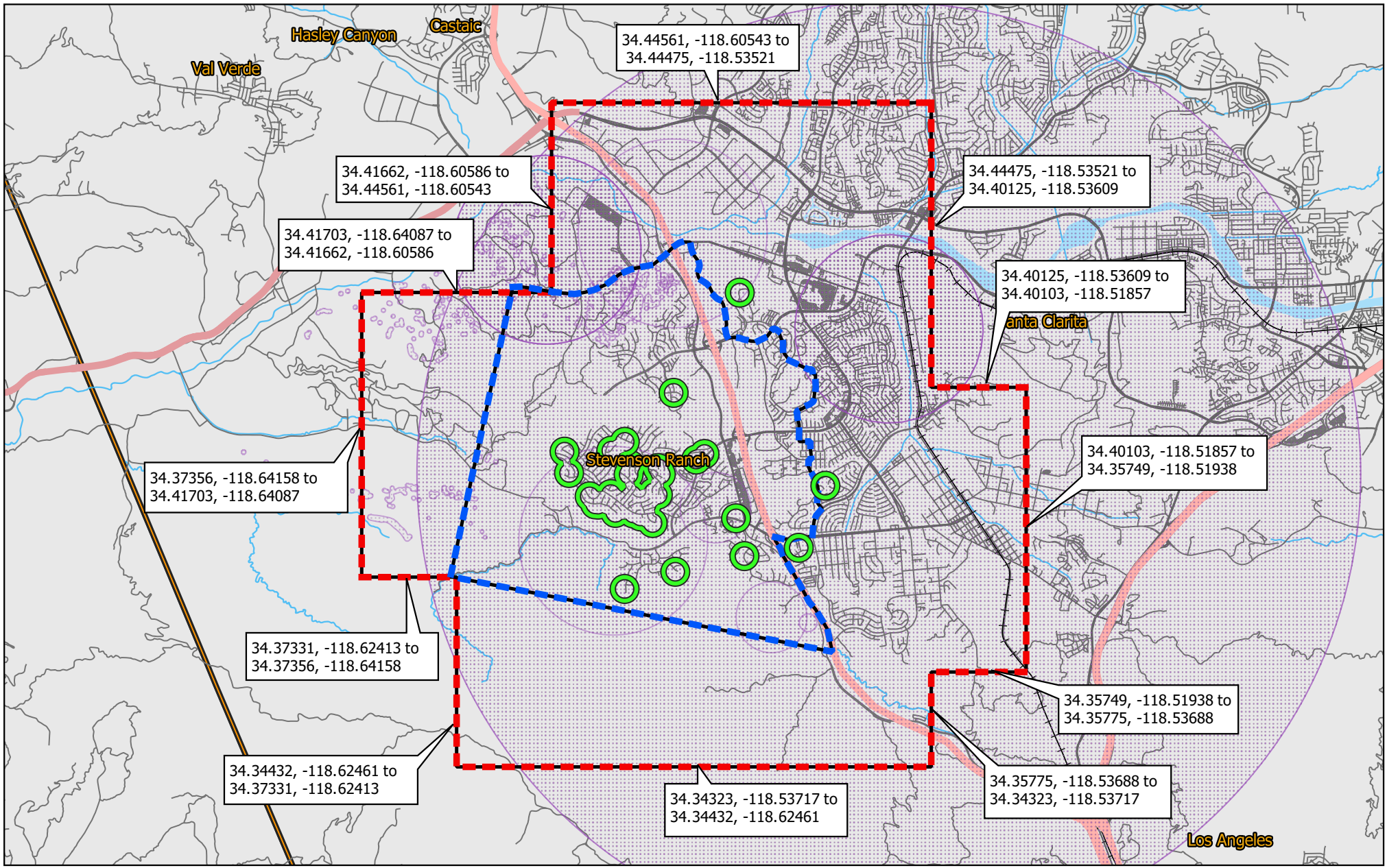
Therefore, I am invoking Public Resources Code Section 21080(b)(4) to carry out immediate emergency action to prevent this loss and damage.

My decision to adopt findings and take action is based on Sections 24.5, 401.5, 403, 407, 408, 5401-5405, and 5761-5764 of the FAC.

Signature on File — 8/30/23

Karen Ross, Secretary — Date

Tau Fruit Fly Eradication Project
Stevenson Ranch, Los Angeles County
2023



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MAT Treatment Boundary

Possible Foliar Treatment Area

Previous MAT Treatment Area

Sensitive Environmental Area Treatment Mitigations In Place

N W E S

ERADICATION PROJECT WORK PLAN FOR
CUELURE RESPONDING EXOTIC FRUIT FLIES
(Includes *Bactrocera albistrigata* and *Bactrocera cucurbitae*)

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 cuelure 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, 50 Jackson and 25 McPhail traps are placed in the square mile core around each find. In the remaining four one-mile deep buffers, Jackson traps are placed at densities of 25, 15, 10, and 5 traps per square mile respectively, proceeding outward from the detection. 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) makes use of small amounts of the attractant cuelure mixed with the pesticide naled (Dibrom® Concentrate), which are absorbed by cotton wicks placed in Jackson traps. Male flies are, lured to the traps, where they are killed by the pesticide when they feed at the wicks. MAT is applied as traps placed in trees, shrubs, or other inanimate objects, placed six to eight feet above the ground and out of the reach of the public. The project boundaries will be nine-square miles around each site where flies were detected. Application is made to a targeted density of 1000 evenly distributed sites in each square mile. Traps are replaced every four weeks for two life cycles (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. 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. The fruit is taken to a landfill for burial using regulatory compliance protocols. Fruit removal will occur once at the beginning of the project, but may be repeated if additional flies are detected.

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.

PUBLIC NOTIFICATION

Residents of properties affected by foliar bait sprays or host fruit removal shall be notified in writing at least 48 hours in advance of any treatment, in accordance with the California Food and Agricultural Code (FAC) Sections 5771-5779 and 5421-5436. For MAT applications, notification is given to the general public via mass media outlets such as newspapers or press releases. 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/.

Following foliar bait treatment, completion notices are left with residents detailing precautions to take and post-harvest intervals applicable to any host fruit on the property.

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 program will be conveyed directly to local and State political representatives and authorities via letters, emails, and/or faxes.

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

INTEGRATED PEST MANAGEMENT ANALYSIS OF ALTERNATIVE TREATMENT METHODS TO ERADICATE CUELURE RESPONDING EXOTIC FRUIT FLIES
June 2014

The treatment program used by the California Department of Food and Agriculture (CDFA) for control of cuelure responding exotic fruit flies (CREFFs) 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 CREFFs which have been considered for eradication programs in California. These flies include, but are not limited to, the melon fly (*Bactrocera cucurbitae*) and white-striped fruit fly (*Bactrocera albistrigata*) (WSFF).

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 CREFFs, 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 CREFFs, 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 homegrown 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 CREFF program performs host fruit removal within a minimum of a 100-meter radius of detection sites that are indicative of an active breeding area (those areas 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 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 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 CREFF 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 CREFFs.

Nematodes. No nematodes have been shown to be effective at controlling CREFFs.

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 has been used in conjunction with chemical controls since the 1970s to eradicate melon fly populations from some southern Japanese islands, and continues to be used in preventive releases. However, the existing sterile insect rearing facility is too small and too far away to support an active eradication effort in California. There are no production-level colonies of this species outside of Japan.

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 application method for CREFFs was first used in the 1980's and has been successfully employed over the years to eradicate introduced populations of CREFFs. MAT makes use of small amounts of the attractant cuelure mixed with the pesticide naled (Dibrom® Concentrate), which are absorbed

by cotton wicks placed in Jackson traps. Sexually maturing males are strongly attracted to cuelure, which may be involved in enhancing mating success. The male flies responding to the cuelure die from the pesticide when they feed at the traps. In each square mile within the eradication boundary, a targeted density of 1000 evenly spaced traps are hung in trees. 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. Traps are replaced every four weeks for two life cycles (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 exotic fruit flies in the past. By drenching the soil surrounding host plants, the goal is to directly kill larvae entering the soil to pupate, pupae in the soil, and adults emerging from pupae. 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 for the area to be treated, 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

PEST PROFILE

Common Name: Tau Fly

Scientific Name: *Zeugodacus tau* group

Order and Family: Diptera: Tephritidae

Description: The adult tau fly is approximately 7 mm in length (similar to that of a housefly). The body is yellow with black markings. The clear wings have two dark stripes, one along the front margin that ends in a dark spot and one about half as long running diagonal from the wing base. The female has a pointed slender ovipositor to deposit eggs under the skin of host fruit. The egg is almost one millimeter in length, white, cylindrical, and about four times as long as wide. The larva is creamy-white, legless, and may attain a length of nine millimeters. The pupa is encased in a dark brown cylindrical puparium.

History and Economic Importance: Tau fly is an exotic insect originating in Asia. It has a broad host range (see below). Important California crops at risk include cucurbits, avocado, citrus, tomatoes, and peppers. The first California detections occurred in San Bernardino County in 2016, and since that time, three re-introductions have been delimited and successfully eradicated.

Distribution: Tau fly is an exotic insect originating in southeast Asia. It is not known to be established in the United States.

Life Cycle: Females lay eggs under the skin of host fruits and a single female can lay more than 400 eggs in her lifetime. The amount of time it takes for egg development depends on the ambient temperature, but eggs typically hatch in one to two days. Larval development is also likely dependent on temperature, but can take as little as one week. The larvae tunnel through the fruit feeding on the pulp, shed their skins twice, and finally emerge through exit holes. The larvae drop from the fruit and burrow into the soil to pupate. In approximately one week, adults emerge from these puparia. The newly emerged adult females need approximately 12 days to mature sexually prior to egg-laying. Breeding is continuous, with several generations per year.

Hosts and Damage: Tau fly has a broad host range; at least 34 hosts in nine plant families are reported, including melon, okra, peppers, papayas, citrus, cucumber, pumpkin, avocado, tomato, and gourds. It is considered a significant pest of cucurbits (see Partial Host List below). The adult female lays eggs in host fruit and the larvae tunnel through and feed in this fruit. Fruit that has been attacked may be unfit for consumption due to this damage and as a result of decay-producing organisms that enter, leaving the interior of the fruit a rotten mass.

Partial Host List

Common Name	Scientific Name
Angled loofah	*Luffa acutangula*
Annual gourd	*Trichosanthes cucumerina*
Annual gourd, snake gourd	*Trichosanthes* spp.
Argus pheasant tree	*Dracontomelon dao*
Ash gourd	*Benincasa hispida*
Avocado	*Persea americana*
Bachang mango	*Mangifera foetida*
Bakhal	*Bambusa pallida*
Balsam apple, balsam pear	*Momordica* spp.
Balsam pear	*Momordica cochinchinensis*
Banana	*Musa paradisiaca*
Bean	*Phaseolus vulgaris*
Bird pepper	*Capsicum frutescens*
Bitter apple	*Citrullus colocynthis*
Bitter bottle gourd	*Cucurbita pepo*
Bitter melon	*Momordica charantia*
Bottle gourd	*Lagenaria siceraria*
Bur cucumber	*Cucumis anguria*
Butternut squash	*Cucurbita moschata*
Cabbage	*Brassica oleracea*
Calabur tree	*Muntingia calabura*
Chaulmoogra	*Hydnocarpus* spp.
Chaulmoogra tree	*Hydnocarpus anthelminthicus*
Chayote	*Sechium edule*
Chempedak	*Artocarpus integer*
Chili pepper	*Capsicum annuum*
Chinese lardfruit	*Hodgsonia macrocarpa*
Chinese sour cherry	*Prunus pseudocerasus*
Citrus	*Citrus* spp.
Cluster fig	*Ficus racemosa*
Cowpea	*Vigna unguiculata*
Cucumber	*Cucumis sativus*
Custard apple	*Annona squamosa*
Dragon fruit, red pitaya	*Hylocereus undatus*
Dye fig	*Ficus tinctoria*
Eggplant	*Solanum melongena*
Eugenia	*Eugenia* spp.
Feng gua	*Gymnopetalum scabrum*
Fijian longan	*Pometia pinnata*
Gourd, calabash	*Lagenaria* spp.
Gourd, melon	*Benincasa* spp.
Grapefruit	*Citrus paradisi*
Guava	*Psidium guajava*
Hondala	*Adenia hondala*
Hui li	*Fagraea ceilanica*
Ignatius bean	*Strychnos ignatii*
Indian chestnut vine	*Tetrastigma leucostaphylum*
Indian rhododendron	*Melastoma malabathricum*
Ivy gourd	*Coccinia grandis*
Jackfruit	*Artocarpus heterophyllus*

Japanese plum	*Prunus salicina*
Java-apple	*Syzygium samarangense*
Kuo ye jiao he mu	*Myxopyrum smilacifolium*
Lollipop climber	*Diplocyclos palmatus*
Longan	*Dimocarpus longan*
Loofah	*Luffa aegyptiaca*
Loofah	*Luffa* spp.
Lucuma	*Pouteria lucuma*
Malay apple	*Syzygium malaccense*
Mandarin orange	*Citrus reticulata*
Mango	*Mangifera indica*
Melon	*Cucumis melo*
Melon pear	*Solanum muricatum*
Melon, cucumber	*Cucumis* spp.
Monkfruit	*Siraitia grosvenorii*
Mulberry	*Morus* spp.
Noni, Indian mulberry	*Morinda citrifolia*
Nux-vomica	*Strychnos nux-vomica*
Okra	*Abelmoschus esculentus*
Palmyra palm, doub palm	*Borassus flabellifer*
Papaya	*Carica papaya*
Passionfruit	*Passiflora edulis*
Peach, nectarine, cherry, almond	*Prunus* spp.
Pear	*Pyrus communis*
Pear	*Pyrus* spp.
Pepper	*Capsicum* spp.
Pointed gourd	*Trichosanthes dioica*
Pummelo	*Citrus maxima*
Pumpkin	*Cucurbita maxima*
Pumpkin, squash, gourd	*Cucurbita* spp.
Red angle tampoi	*Baccaurea angulata*
Rose apple	*Syzygium jambos*
Sand pear, Chinese pear	*Pyrus pyrifolia*
Sapodilla	*Manilkara zapota*
Satsuma mandarin	*Citrus unshiu*
Sendangusa	*Bidens biternata*
Snake gourd	*Trichosanthes pilosa*
Soursop	*Annona muricata*
Spine gourd	*Momordica dioica*
Star fruit, carambola	*Averrhoa carambola*
Sweet orange	*Citrus sinensis*
Tangelo	*Citrus tangelo*
Tomato	*Solanum lycopersicum*
Watermelon	*Citrullus lanatus*
Watery rose apple	*Syzygium aqueum*