United States
Department of
Agriculture

Animal and
Plant Health
Inspection
Service

Cooperating State
Departments of
Agriculture

ACTION PLAN

ORIENTAL FRUIT FLY
Bactrocera dorsalis (Hendel)
(Synonym = *Dacus dorsalis* Hendel)

October 1989

This PPQ Action Plan or New Pest Response Guideline has not been updated since its publication date. The actions or guidelines recommended may not be appropriate now, new survey tools may be available, and chemical pesticides named may no longer be registered. This documents is posted until updated versions can be drafted and as such are only guidelines that represent the state of knowledge at the time they were written. Please consult PPQ and/or your State Plant Regulatory Official prior to implementing any recommendations listed herein.

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AUTHORIZATION

This Action Plan provides guidelines and actions for the eradication of an oriental fruit fly infestation. This Action Plan supplements information contained in the Plant Protection and Quarantine (PPQ) Treatment, Emergency Programs, and Administrative Procedures Manuals.

It is to be used in conjunction with other manuals when conducting emergency program activities. The information and instructions contained in this Action Plan were developed with and approved by representatives of the Animal and Plant Health Inspection Service (APHIS), cooperating States, the Agricultural Research Service, Cooperative State Research Service, and affected industry.

All program technology and methodology employed are determined through discussion, consultation, or agreement with the cooperating State officials.

James W. Glosser

Administrator
Animal and Plant Health Inspection Service

8/22/89
Date

Chairman
National Plant Board

Date

NOTICE

Pesticides recommended in this Action Plan are registered or may be exempted under the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA), as amended. Precautions on the pesticide label and all instructions in this Action Plan must be carefully followed.

Federal and/or State personnel may not make any warranty or representation, expressed or implied, concerning the use of these products and shall not be responsible for any loss, damage, or injury sustained as a result of the use of any product as specified in this Action Plan.

The use of trade names in this Action Plan does not imply an endorsement of those products or of the manufacturers thereof by Federal-State pest control programs. Equivalent formulations under different trade names are acceptable.

I. GENERAL INFORMATION

A. Action Statement

The information contained in this document is intended for use only when an oriental fruit fly (OFF) infestion is known to exist. This Action Plan is to be used for guidance in implementing eradication procedures and in preventing spread to other locations. This Action Plan provides technical and general information needed to implement any phase of an OFF eradication program. Specific emergency program action is to be based on information available at that time.

B. Background Information

The OFF is native to Asia. This tephritid fly has currently been verified from Burma, China (incl. Taiwan), India, Indonesia (Java, Sumatra, Timor), Thailand, and the United States (Hawaiian Islands). Infestations in the United States (California, the Mariana Islands) and Japan (the Ryukyu Islands) that occurred prior to 1988 have been eradicated. The larvae of the OFF have been recorded worldwide in 236 different fruit hosts. Injury to fruit occurs through oviposition punctures and subsequent larval feeding.

Development from egg to adult, in optimum temperatures of 80 ^{o}F (27 ^{o}C) and 70 percent relative humidity, takes approximately 22 days. The adult usually becomes sexually mature 8 to 12 days after emergence. The minimum period of time for one generation is approximately 30 days.

C. Life Cycle Application

Insect development is temperature dependent. Egg, larval, and adult reproductive development are influenced by air temperatures. Pupal development is influenced by soil temperatures. In both environments, there is a minimum temperature threshold below which no measurable development takes place. A model can be designed to use air temperature data for all insect stages and to predict the entire life cycle. Temperature data are available from the National Oceanic and Atmospheric Administration, U.S. Department of Commerce, private, State, university, or industry sources or are generated by strategically placed soil probes and thermometers. If available, electronic temperature recording equipment should be used.

Some of the critical parameters for OFF have yet to be determined. Previous research and OFF program activities have shown a developmental threshold of 54.3 ^{o}F (12.2 ^{o}C) in air and 49.4 ^{o}F (9.4 ^{o}C) in soil. The number of degrees accumulated above the developmental threshold each day is called day degrees (DD). For the air temperature model depicted in the following table, 620 DD must be accumulated before one life cycle has been completed.

Formula:

Minimum Daily		Maximum Daily		Total		Average Daily	Devel. Threshold Temp.	Day Degrees
Temp ^{o}F	+	Temp ^{o}F	=	$\frac{\text{Temp } ^{o}\text{F}}{2}$	=	Temp ^{o}F -	Temp ^{o}F	= Temp ^{o}F

Example: (Air Temperature Model 54 ^{o}F Threshold)

Minimum Daily		Maximum Daily		Total		Average Daily	Threshold	Day Degrees
54 ^{o}F	+	74 ^{o}F	=	$\frac{128\ ^{o}\text{F}}{2}$	=	64 ^{o}F -	54 ^{o}F	= 10 DD

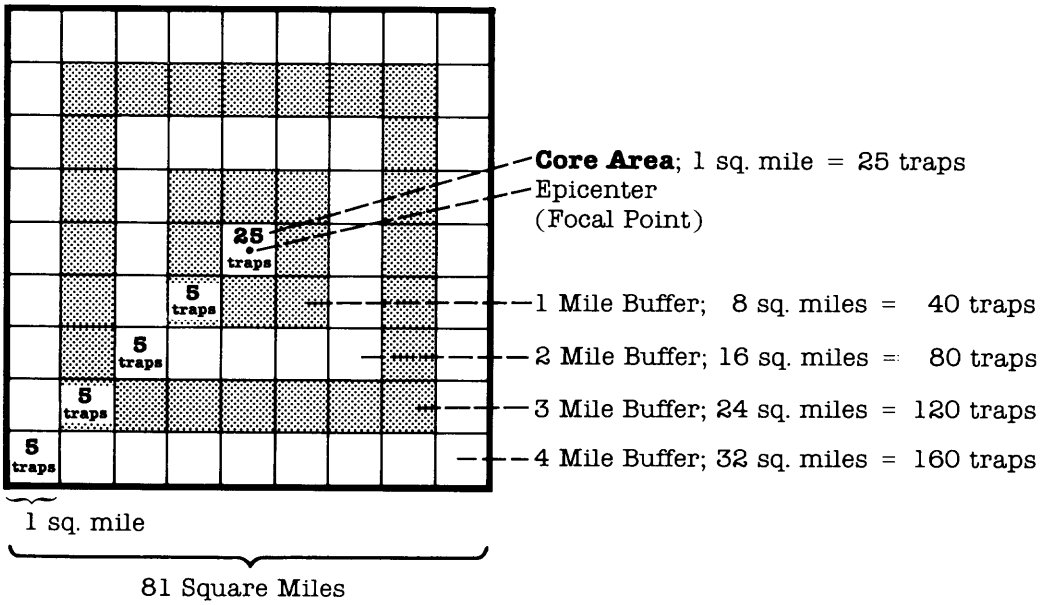
Program actions are guided in part by insect life cycle data. Eradication treatments, length of trapping activities, and regulatory functions are affected primarily by the length of time it takes to complete each phase of the life cycle. Unforeseen delays in completion of the life cycle must be anticipated.

II. SURVEY PROCEDURES
(See Addendum D for Technical Survey Information)

A. Delimiting Survey

When one or more OFF are collected in an area, a delimiting survey will be implemented immediately to determine the population distribution. Using the site of the detection as the epicenter (focal point), Jackson traps will be set out in a 25-5-5-5-5 per square mile (mi^2) trap array sequence. The traps are to be serviced weekly. Traps will be maintained through three OFF generations after the last fly find.

Traps Set Per Square Mile



McPhail traps, utilizing yeast tablets or preferably protein hydrolysate (Miller's NU-LURE®) in water as the attractant, are to be placed in the core area and the first buffer area at the same rate as the Jackson traps.

If a fly is found in a particular mi^2, that area becomes an additional core area.

B. Monitoring/Evaluation Survey

A monitoring/evaluation survey will be conducted in that area where eradication treatments are applied.

Where a sterile fly release project is employed, a dry-type trap (either a Steiner or a Nadel) is substituted for the Jackson trap and used at the rate of five traps per mi^2.

C. Fruit Cutting Survey

Preferred host fruit from the core, first buffer, and surrounding preferred host areas can be surveyed, depending on host availability. Fruit from the core area is to be cut and examined at the site.

D. Host Collection and Holding

Fruit can be collected within approximately 200 yards (yd) of a detection and held for at least one OFF life cycle at an optimum developmental temperature of 80 ^{o}F (27 ^{o}C) and 70 percent relative humidity. Security of the facility where the fruit is held must be equal to those established for a quarantine insect rearing facility as given in APHIS publication, series 81, number 61.

E. Detection Survey

The area beyond the 4-mile (mi) buffer area (up to a 100-mi radius from the core area) is trapped at the minimum rate of one Jackson trap per mi^2. These traps are to be serviced for three generations and relocated after each servicing, depending on preferred host availability.

F. Orientation of Survey Personnel

New personnel will be trained, on the job, by experienced personnel. Three working days will be necessary to teach the many important facets of the OFF survey.

G. Survey Records

Records noting the areas surveyed, sites trapped, dates, locations, and hosts in which detections were made will be maintained.

For sterile release, a Cunningham Report (CR) will be completed. The CR is a square graph that charts trap areas and gives the weekly ratio of sterile (X) to wild (Y) finds per mi^2.

X:Y	X:Y	X:Y
X:Y	X:Y	X:Y
X:Y	X:Y	X:Y
X:Y	X:Y	X:Y

III. REGULATORY PROCEDURES

A. Instructions to Officers

Regulatory actions will be required until the pest is eradicated. Officers must follow instructions for regulatory treatments or other procedures when authorizing the movement of regulated articles. Understanding the instructions and procedures will serve as a basis for explaining such procedures to persons interested in moving articles affected by the quarantine and regulations. Only authorized treatment procedures may be used.

General instructions that are to be followed in regulatory treatments may be found in the PPQ Treatment Manual.

B. Regulated Articles

1. Those fresh fruits, nuts, vegetables and berries given in Addendum C which exist in the regulated area, will be listed as regulated articles.

2. Cannery waste.

3. Soil within the drip area of plants which produce the fruits, nuts, bolls, vegetables, or berries listed in Addendum C.

4. Any other product, article, or means of conveyance of any character whatsoever when it is determined by an inspector that it presents a hazard of spread of OFF and the person in possession thereof has been so notified.

C. Quarantine Actions

Regulatory action will be required if:

1. More than 5 adult flies or an unmated female and a male are found in an area less than 1 mi^2 within one estimated OFF life cycle,

or

2. One mated female, or larva, or pupa are detected,

or

3. A single adult fly is found which is determined to be associated with a current eradication project.

When detections are made, implement the following steps:

a. Issue Emergency Action Notifications (PPQ Form 523) to all growers and establishments that grow, handle, or process regulated articles within 4.5 mi of the epicenter.

Emergency Action Notifications and/or comparable State Notifications are issued by field personnel to the property owners or managers of all establishments handling, moving, or processing articles capable of spreading the OFF. Notifications will be issued pending authoritative confirmation and/or further instruction from the Deputy Administrator.

b. If necessary, the Deputy Administrator will issue a letter directing PPQ field offices to initiate specific emergency action under the Federal Plant Pest Act (7 U.S.C. 150dd) until Federal regulations can be published in the Federal Register. For other legal authorities see Section II, A and B, of the Federal Emergency Programs Manual.

c. The Deputy Administrator will notify State cooperators of the OFF detection, actions taken, and actions contemplated.

d. A narrative description of the regulated area with supporting documents will be developed by the U.S. Department of Agriculture (USDA) and the State cooperator and provided to the Domestic and Emergency Operations Staff (DEO), Operational Support (OS), PPQ. The regulated area will also be defined by the Universal Transverse Mercator (UTM) grid map marking system for use by the Project Manager. The regulated area will normally be 81 mi^2.

e. APHIS will publish an interim rule explaining the OFF regulations in the Federal Register. The interim rule will announce a date for submitting written comments, which shall be approximately 60 days after publication.

f. After receipt of written comments, a final determination specifying the action decided upon will be published in the Federal Register.

D. Regulated Establishments Inspection

Efforts to detect the pest within the regulated area will be made at establishments where regulated articles are sold, handled, processed, or moved. Establishments that might be involved are: airports, landfill sites, fruit stands, farmers' markets, produce markets, flea markets, and any other establishments that handle regulated articles. A minimum of two Jackson traps or two dry-type traps may be deployed and serviced by survey personnel at those establishments deemed to be at risk by program management when a large OFF infestation exists.

E. Use of Authorized Chemicals

The PPQ Treatment Manual and this Action Plan contain the authorized chemicals, methods and rates of application, and any special application instructions. Concurrence by the DEO staff, OS, PPQ, is necessary for the use of any other chemical or procedure for regulatory purposes. If treatments selected or proposed, including those listed in this Action Plan, are not in conformance with current pesticide labels, an emergency exemption will need to be obtained under Section 18, or 24C, special local need (SLN), of FIFRA, as amended. For further instructions, see Emergency Programs Manual, Section V.B.

F. Approved Regulatory Treatments

1. Soil Treatment. An approved insecticide applied to the soil within the dripline of host plants.

Diazinon--(Diazinon AG-500) 3.68 ounces (oz) (1.92 avoirdupois (avdp) ounces active ingredients (oz ai)) of 48 percent diazinon in enough water to soak 2 in of soil over 1,000 square feet (ft^2) to kill larvae, pupae, and emerging adults. Adjust water hydrogen-ion concentration (pH) to 6.5 or less prior to adding insecticide. The treatment interval will be described in the exemption issued by the Environmental Protection Agency (EPA). Normally, treatments are applied at a 14-16 day interval.

Diazinon--Work Diazinon 14 G (granular) 1 to 2 in into soil at the rate of 35 lb per acre (a) or 1.45 oz (0.2 avdp oz ai) per 12 foot (ft) diameter drip circle (113 ft^2), then thoroughly water the treated area.

2. Fumigation. The application of an approved fumigant as a treatment (methyl bromide, Phostoxin®) alone or in conjunction with cold treatment procedures.

3. Cold Treatment. The use of cold temperatures as a treatment on selected products alone or in conjunction with fumigation.

4. Vapor Heat Treatment. The use of heated air saturated with water vapor to raise the temperature of the commodity to a required point and held there for a specified period as a treatment.

5. Bait Spray. The application of approved ground or aerial proteinaceous bait spray to commercial host properties within the regulated area, as a condition for certification and movement. Applications will be at the same prescribed intervals and dosages as given in IV.C.2. and 3.b, Eradication Procedures.

G. Principal Activities

The following identifies principal activities necessary for conducting a regulatory program to prevent the spread of OFF. The extent of regulatory activity required is dependent on the degree of infestation. For example, safeguarding fruit stands throughout the entire regulated area which are only engaged in local retail activity may not be necessary when the regulations that are imposed are based on a limited and light infestation. On the other hand, mandatory checks of passenger baggage at airports and the judicious use of road patrols and roadblocks may be necessary where general or heavy infestations occur.

1. Advising regulated industry of required treatment procedures.

2. Supervising, monitoring, and certifying treatments of regulated articles.

3. Contact visits with:

   a. Security and airline personnel
   b. Fruit stands
   c. Local growers and packers
   d. Farmers', produce, and flea markets
   e. Commercial haulers of regulated articles
   f. Public transportation and
   g. Post office contacts.

4. Visiting canneries and other processing establishments.

5. Monitoring the movement of waste material to and from landfills to ensure adequate disposal of regulated articles.

6. Monitoring the movement of regulated articles through airports and other transportation centers.

7. Observing major highway and quarantine boundaries for movement of host materials.

H. Removing Areas From Quarantine

Areas placed under regulation may be removed from quarantine requirements after the OFF has been declared eradicated. Project management will identify areas to be removed at such time that three OFF life cycles have been completed since the last specimen recovery. One life cycle must have elapsed since the cessation of control activities. APHIS will publish a Notice of Quarantine Revocation in the Federal Register when areas are removed from quarantine requirements.

I.	Orientation of Regulatory Personnel	Only trained or experienced personnel will be used initially. Replacement personnel will be trained by the individual being replaced. A training period of up to 3 working days is necessary for the orderly transfer of these functions.
J.	Regulatory Records	Records will be maintained as necessary to carry out an effective, efficient, and responsible regulatory program. See Addendum G of this Action Plan for detailed instructions.

IV. ERADICATION PROCEDURES

The DEO staff, in consultation with methods and research agencies, will outline treatments to be used and must be notified of all treatment plans. If treatments selected or proposed are not in conformance with current pesticide labels, an emergency exemption will need to be obtained under Section 18, or 24C, special local need (SLN), of FIFRA, as amended. For further instructions, see Emergency Programs Manual, Section V.B.

Eradication of an OFF infestation in the continental United States is essential. The following provides approved procedures available for use in most situations. These procedures include mechanical, chemical, and biological control (e.g., sterile flies). Local conditions will determine the most acceptable procedure or combination of procedures to achieve eradication.

A. Eradication/ Control Method Selection

The following criteria will provide guidance for the selection of appropriate treatments to achieve eradication. Additional treatment actions can be applied if mutually agreed upon by cooperating agencies. Eradication measures will continue for at least two OFF generations. Trapping to verify that eradication has been accomplished will continue for at least one OFF life cycle after eradication measures have stopped.

1. If two adult flies other than mated females are detected within a 3 1/2 mile radius and within one estimated life cycle, the minimum response would be the initiation of ground applied male annihilation treatments.

2. If the infestation criteria requiring regulatory action is met within an approximately 10-day period in an urban area, male annihilation applications, soil treatment, and host stripping will be the minimum recommended response. Similar fly detections in a commercial area are treated as above, with the addition of ground or aerial application of bait spray. Sterile release is an optional treatment.

B. Recommended Pesticides

1. Naled (Dibrom®);
2. Malathion; and
3. Diazinon.

Some pesticides and/or bait and lure formulations can damage painted surfaces, plastic, and some uncoated metal surfaces. Care must be exercised when formulating and applying these compounds. Potential damage caused by accidental contamination can be eliminated or minimized by promptly cleaning the affected surface.

C. Approved Eradication Treatments

1. Male Annihilation Option

Spot Treatment: Apply the lure/insecticide with a pressurized applicator or a hydraulic oil squirt can to utility poles, trees, fences, etc. Apply at least 600 evenly distributed bait spots per mi^2 or 60 to 80 to a city block. Apply treatment every 2 weeks. The area of coverage will extend 9 mi^2 around each fly find.

Male Annihilation Formulation (formulated by weight)

Naled 1.75 oz (by weight)----10 percent Dibrom® 14
*Min-U-Gel® 4 oz (by weight)--------23 percent Min-U-Gel 400® oz
Male Lure 11 fluid oz (by weight)-----67 percent methyl eugenol

The proper viscosity of the formulation must be maintained (i.e., the surface of a spot application is thick enough to hold indentations) to avoid splashback, runoff, and possible ineffective treatments on nonporous surfaces.

The male annihilate is squirted on tree trunks, fences, utility poles, etc., out of the reach of children, at the rate of 0.1 to 0.2 oz (3 to 5 mL) per station.

*Normally 4 oz (by weight) of Min-U-Gel® is sufficient to maintain appropriate viscosity, however additional amounts may be required to achieve desired results.

2. Aerial Proteinaceous Bait Spray Option

Treatment or retreatment should not be considered if weather reports indicate a 50 percent or greater chance of precipitation within 48 hours.

Applications of full-coverage protein bait spray will be scheduled and applied 7 to 10 days apart. The area of full-coverage bait spray will extend a minimum of 1.5 mi beyond any known infestation. It may be expanded to 2.5 mi from any find if the infestation is heavy. Weather conditions may dictate changes in spray schedule. After an estimated two OFF generations of negative trapping, spray operations may be discontinued.

Ultralow volume (ULV) Malathion (Cythion®)--2.4 oz (2.2 avdp oz ai) of 91 percent technical grade malathion plus 9.6 oz of Miller's NU-LURE® (protein bait) per a.

3. Supplemental Eradication Methods

a. Soil Treatment: Properties with confirmed larval infestations and the environs within 200 yds will have approved soil treatments applied within a minimum of 1 yd outside the dripline of all host plants and a minimum of a 1 yd radius around any spot where host fruit may have dropped or rolled. Take particular care to soak cracks or crevices in or next to barriers to horizontal movement of larvae (i.e., sidewalks, stones, etc.). Apply prescribed treatments at 14- to 16-day intervals as per EPA specific exemption.

Diazinon--(Diazinon AG-500) 3.68 oz (1.77 avdp oz ai) of 48 percent diazinon in enough water to soak 1 to 2 in of soil over 1,000 ft^2 (5 lb ai/a) to kill larvae or pupae and emerging adults. Adjust water pH to 6.5 or less prior to adding insecticide.

Diazinon--Work Diazinon 14 G 1 to 2 in into soil at the rate of 35 lb per a (5 lb ai/a) or 1.45 oz per 12-ft diameter drip circle (113 ft^2). The area should be treated with water that has been buffered (6.0-6.5) to enhance percolation of the material into the soil.

b. Ground Applied Proteinaceous Bait Spray: All hosts (available shelter, oviposition, or food sites in any stage of development) on the infested property, adjacent property, and within approximately 200 yd of the known find will be sprayed at the prescribed intervals. Ground spraying may be discontinued after an estimated two OFF generations of negative trapping or after the initiation of male annihilation or of aerial treatment.

The bait may be applied as a limited coverage application to hosts and plants providing shelter or resting areas by means of a backpack sprayer or equivalent unit. Applications are sprayed out of reach of children or pets. If full coverage application is desired, a mistblower or similar unit can be utilized. Treatments are to be applied 7 to 10 days apart.

Subsequent applications, if in orchards or groves, may be decreased by treating every other tree.

Malathion 50 WP--One lb ai per a.
Protein (Miller's NU-LURE®)--0.4 gal.
Water--The amount of water needed will depend on the application equipment selected.

Each host or station, approximately 6,500 per mi^2, shall be given a drench of 0.3 to 0.5 oz sufficient to cover a minimum 5.4-ft^2 area until the surface is wet.

Ground application of protein bait spray formulations historically have not significantly reduced infestations in urban areas. This failure has been attributed to the inability of crews to gain access to all sites requiring treatment, equipment constraints and timeliness of applications. Hence, this treatment should not be considered as a primary option for eradication in urban areas.

c. Fruit Stripping: All ripe preferred host fruit up to 200 yd of a confirmed larval site should be promptly stripped and placed in a plastic bag and properly disposed of in an approved landfill.

d. Sterile Insect Release (SIR): In situations where SIR is the most appropriate response to eliminate residual OFF populations, this technique may be employed.

It may be used in conjunction with fruit stripping, ground application of protein bait spray, and soil drench.

Due to the presence of extremely similiar species to the OFF, it will be necessary to verify that the infestation consists of a population identical in every respect to the sterile flies being released. Such identification must be verified through the use of all known taxonomic characters, including morphological, DNA, electrophorsis, and any other features or processes needed to make a positive determination.

A trap array of five traps per mi^2 using Steiner or Nadel traps will be utilized in a monitoring survey throughout the operational area where sterile flies are released. The traps will be baited with methyl eugenol lure and dibrom and serviced on a 1-week schedule.

Sterile release can be achieved using two methods. These methods will be utilized to ensure that no less than 1 million adult flies are dispensed in the infested mi^2 core area per week and no less than 50,000 adult flies per mi^2 are to be dispensed in a 3-mi buffer zone completely surrounding the core area. Additional flies are to be released to any mi^2 where monitoring surveys indicate that the overflooding ratio is less than 100 sterile flies to 1 wild fly. The following methods will be utilized to achieve sterile fly distribution:

(1) Roving Sterile Release: This release system involves the release of adult flies from a moving vehicle. Use of this system permits rapid dispersal of large volumes of adult flies under favorable conditions.

Roving sterile release is generally used in the core area. The roving sterile release method also may be used to distribute 50,000 sterile flies per mi^2 per week within the minimum 3-mi buffer zone surrounding the core area.

Quality control data secured from the rearing supervisor will be used to determine how many flies to release.

(2) Aerial Sterile Release: This method of releasing sterile OFF provides better general distribution over an area than roving sterile release.

Fly distribution must be accomplished over the entire aerial sterile release zone for any day aerial operations are conducted. It will be necessary to conduct additional aerial sterile release flights over the core area to maintain the 20:1 ratio of population (i.e., core area versus buffer zone) when aerial release is the only method of release being utilized.

Either system (i.e., roving sterile release, aerial sterile release, or a combination of roving sterile/aerial sterile release) is a satisfactory method of achieving desired sterile OFF distribution. Infestation size and location will influence the release method selected. This selection is to be made by control personnel.

D. Orientation of Eradication/Control Personnel

Only trained and experienced personnel will be used initially. Replacement personnel will be trained by the individual being replaced. A training period of up to 3 working days is necessary for the orderly transfer of these functions.

E. Eradication/Control Records

Records noting the location, dates, number, and type of treatments and materials and formulations used will be maintained for all areas treated. See Addendum G of this Action Plan for detailed instructions.

F. Monitoring

An effective monitoring program will be implemented to aid in the evaluation of program efforts and environmental impact. The application and use of pesticides will be assessed through the use of appropriate monitoring program criteria. The evaluation must effectively address Agency, cooperator, and public concerns.

The monitoring program will include at least the following elements:

1. Determine efficacy of pesticides against the target pest.

2. Evaluate dye cards to monitor aerial bait applications, including:

    a. Droplet size information

    b. Droplet distribution information

    c. Bait deposition information

    d. Identification of wind drift components

    e. Verification of spray block boundaries and

    f. Identification of skips.

3. Sample to evaluate effect on environmental components.

    a. Water sampling to detect insecticide levels resulting from direct application, leaching, and runoff

    b. Soil sampling to determine insecticide levels and residues

    c. Foliage sampling to identify residues

    d. Biological organism sampling before, during and after applications and posttreatments to determine impact of insecticides

    e. Air sampling to determine presence of pesticides

The monitoring program is to be a combined effort between the State in which the emergency program is being conducted and PPQ. Specific plans will need to be developed for monitoring activities and the DEO staff will request assistance and guidelines from the Program Planning and Development Staff.

V. REARING AND STERILIZING PROCEDURES

The logistics of supplying, equipping, irradiating, packaging, and monitoring sterile fly releases is a program within itself. For detailed information involving supplies, equipment, packaging, monitoring, and quality control, contact the DEO staff, OS, PPQ.

VI. CONTACTS

When an OFF eradication program has been implemented, its success will depend on the voluntary cooperation, assistance, and understanding from other involved groups. The following is a list of groups which either are involved in or must be kept informed of all operational phases of an emergency program:

1. Other Federal, State, county, and municipal agricultural officials
2. Grower groups
3. Commercial interests
4. Universities
5. State and local law enforcement officials
6. Public health agencies
7. Foreign agricultural interests
8. National, State, and local news media
9. The general public and
10. Post office contacts.

VII. ADDENDA

Addendum A--Definitions

Aerial Proteinaceous Bait Treatment:	Applying an insecticide and a protein hydrolysate bait by aircraft over a treatment area.
Aerial Sterile Release:	Releasing sterile OFF over a designated area by aircraft.
Aerial Release Area:	The core area and all peripheral areas 3 mi beyond the nearest known infestation or to a suitable natural barrier within the 3-mi peripheral area.
Array:	The trapping pattern in a 1-mi^2 area.
Array Sequence:	The trapping pattern (array) beginning with the core area and continuing outward through each buffer area ending with the outer buffer area.
Bactrocera dorsalis (Hendel):	(= *Dacus dorsalis* Hendel). The scientific name of the OFF.
Bait:	An attractant and food source (protein hydrolysate) mixed with an insecticide for treating OFF infestations.
Buffer Area:	The area extending beyond the boundary of the core--1-, 2-, 3-, and 4-mi buffer.
Cold Treatment:	The use of cold temperatures as a treatment on selected products alone or in conjunction with fumigation.
Commercial Production Area:	An area where host material for commerce is grown.
Confirmed Detection:	A positive identification by a recognized expert of a submitted life form (specimen) as OFF.
Core Area:	An area of 1 mi^2 surrounding a confirmed OFF detection.
Day Degrees:	An accumulation of heat units above a developmental threshold.

Delimiting Survey:	Determining whether an infestation exists and if so, the extent of the infestation in an area where the OFF has been detected.
Detection:	The collection of any life stage of OFF.
Detection Survey:	An activity conducted in a susceptible area not known to be infested with OFF.
Developmental Threshold:	The minimum (or maximum) temperature below (or above) which physiological development stops (peaks).
Epicenter/Focal Point:	The initial site of an infestation.
Eradication:	The confirmed removal of all OFF life forms in a specified geographical area as determined by the completion of three life cycles without pest specimens being recovered.
Fruit Collection Survey:	The collection of fruit to determine the extent and nature of an infestation.
Fruit Cutting Survey:	Cutting fruit and examining for larvae.
Fumigation:	The application of an approved fumigant as a treatment (methyl bromide, Phostoxin®) alone or in conjunction with cold treatment procedures.
Generation (Life Cycle):	The period of time for the pest to complete all stages of development.
Ground Bait Spray:	Using ground equipment to spray host vegetation in an OFF infested area with an insecticide and a protein hydrolysate bait.
Host:	A plant species that provides for reproduction of the OFF.
Host Collection/Holding:	The collection and holding of host material to determine the extent and nature of an infestation.

Infestation:	The collection of one mated female, more than 5 unmated females, a larva, a pupa, more than five males, or an unmated female and a male from within an area of 1 mi^2 and within one OFF life cycle or the detection of a single adult determined to be associated with a current eradication project.
Infested Area:	An area 1-1/2 mi around all detection sites unless biological factors indicate the need for more or less area.
Lure Bait: (Methyl eugenol)	A male lure bait with a thickening agent and an insecticide.
Male Annihilation Procedure:	An eradication procedure that is designed to kill the adult OFF male. Bait spots which consist of a male lure, thickening agent, and an insecticide are ground applied.
Monitoring/Evaluation Survey:	Using interdependent visual and trapping surveys in an area where an insecticide or sterile release treatment has been applied, to evaluate the effectiveness of the application.
PPQ-APHIS-USDA:	Plant Protection and Quarantine, Animal and Plant Health Inspection Service, U.S. Department of Agriculture.
Regulated Area:	An area that extends at least 4 1/2 linear mi in any direction from the epicenter of an infestation.
Regulated Articles:	All known or suspected hosts of OFF, also cannery waste, soil and any other suspected product or article.
Regulatory Survey:	Trapping conducted around establishments where regulated articles are sold, handled, processed, or moved.
Roving Sterile Release:	The release of sterile OFF in an area from a motor vehicle.
Soil Treatment:	The application of an approved insecticide to the soil of nursery stock and within the dripline of host plants.

Sterile Release:	Releasing sterile OFF in an area as a method of eradication or as one of several methods in an integrated eradication program.
Ultralow-Volume (ULV) Bait Spray:	A mixture of an insecticide with protein hydrolysate. This mixture is applied as droplets by aircraft.
Urban/Residential Area:	An area containing multiple- or single-family dwellings.
Vapor Heat Treatment:	The use of heated air saturated with water vapor to raise the temperature of the commodity to a required point.

Addendum B--Safety

1. GENERAL INFORMATION

Personnel and public safety must be prime considerations at all times. Safety practices should be stressed in preprogram planning and through the duration of actual program operations. Supervisors must enforce on-the-job safety procedures. For complete instructions, see V.D., in the Emergency Programs Manual.

Addendum C--Hosts

The OFF host list is separated into preferred and other hosts. The hosts are listed by common and scientific names. The common names are arranged in a manner that is indicative of their usage. The common names of a particular group or family of hosts are listed first. In all instances, an attempt has been made to select the most widely recognized common name. Where a common name includes more than one word, the host may be listed more than once; first under the first common name, and second under the popular common name in the title, if one is given. This follows the practice given in USDA, Agricultural Research Service, Agriculture Handbook Number 505, "A Checklist of Names for 3,000 Vascular Plants of Economic Importance". Thus, a host with the word "apple" in its common name will be listed under "Apple" as well as under its first common name. Some species, which have no accepted or approved common name, but are identifiable as a particular kind of plant, are designated by: (ncn) = no common name. Other species without an accepted or approved common name are given at the end of the appropriate list. There are a total of 239 hosts in this list. All hosts are from the "Host List Oriental Fruit Fly" prepared by APHIS's Biological Assessment Support Staff (BASS) in 1983. Additional hosts may have been added since that date. This list arranges the hosts by scientific name and includes many other common names for a given species.

PREFERRED

Common Name	Scientific Name
Akia	*Wikstroemia phillyraeifolia*
Alexander laurel	*Calophyllum inophyllum*
Almond, tropical	*Terminalia catappa*
tropical	*Terminalia chebula*
American plum	*Prunus americana*
Apple, custard	*Annona reticulata*
custard	*Annona squamosa*
domestic	*Malus domestica*
rose	*Eugenia jambos*
star	*Chrysophyllum cainito*
velvet	*Diospyros discolor*
Apricot	*Prunus armeniaca*
Arabian coffee	*Coffea arabica*
Avocado	*Persea americana*
Banana, common	*Musa paradisiaca* var. *sapientum* = (*Musa* x *paradisiaca*)
dwarf	*Musa acuminata*
Banana passion fruit	*Passiflora mollissima*
Black mulberry	*Morus nigra*
Brazil cherry	*Eugenia dombeyi*
Breadfruit	*Artocarpus altilis*
Cactus, prickly pear	*Opuntia ficus-indica*
(ncn)	*Cereus coerulescens*

Caimitillo	*Chrysophyllum oliviforme*
Calamondin orange	*Citrofortunella japonica*
California black walnut	*Juglans hindsii*
Cashew	*Anacardium occidentale*
Cherimoya	*Annona cherimola*
Cherry, Brazil	*Eugenia dombeyi*
catalina	*Prunus lyonii*
hollyleaf	*Prunus ilicifolia* (ornamental)
Surinam	*Eugenia uniflora*
West Indian	*Malpighia punicifolia*
Chili	*Capsicum frutescens* var. *longum*
Chinese orange	*Fortunella japonica*
Coffee	*Coffea arabica*
Cotton	*Gossypium* spp.
Country gooseberry	*Averrhoa carambola*
Cucumber	*Cucumis sativus*
Custard apple	*Annona squamosa*
Custard apple, annona	*Annona reticulata*
Date palm	*Phoenix dactylifera*
Downy rose myrtle	*Rhodomyrtus tomentosa*
Dragon tree	*Dracaena draco*
Dwarf banana	*Musa acuminata*
Egg-fruit tree	*Pouteria campechiana*
Elengi tree	*Mimusops elengi*
English walnut	*Juglans regia*
European prune, common	*Prunus domestica*
Fig, common	*Ficus carica*
Garden plum	*Prunus domestica*
Gooseberry, country	*Averrhoa carambola*
Gourka	*Garcinia celebica*
Granadilla, sweet	*Passiflora ligularis*
yellow	*Passiflora lauriflora*
Grape	*Vitis* spp.
Grapefruit	*Citrus paradisi*
Guava, common	*Psidium guajava*
pineapple	*Feijoa sellowiana*
red strawberry	*Psidium cattleianum littorale*
strawberry	*Psidium cattleianum*
yellow strawberry	*Psidium cattleianum lucidum*
Imbu	*Spondias tuberosa*
Jackfruit	*Artocarpus heterophyllus*
Japanese persimmon	*Diospyros kaki*
Jerusalem cherry	*Solanum pseudocapsicum*
Ketembilla	*Dovyalis hebecarpa*
King orange	*Citrus* x *nobilis*

Kumquat	Fortunella japonica
Lemon	Citrus limon
Lilikoi, yellow	Passiflora mollissima
Lime, sour	Citrus aurantiifolia
Longan	Euphoria longana
Loquat	Eriobotrya japonica
Lychee	Litchi chinensis
Malay apple	Syzygium malaccense
Mammee-apple	Mammea americana
Mandarin	Citrus reticulata
Mango	Mangifera indica
Mangosteen	Garcinia mangostana
Mock orange	Murraya paniculata
Mulberry, black	Moris nigra
Mullein nightshade	Solanum verbascifolium
Myrtle, downy rose	Rhodomyrtus tomentosa
Natal plum	Carissa macrocarpa
Nectarine	Prunus persica var. nectarina
Nightshade, mullein	Solanum verbascifolium
(ncn)	Solanum auriculatum
Oleander, yellow	Thevetia peruviana
Orange, calamondin	Citrofortunella japonica
Chinese	Fortunella japonica
king	Citrus x nobilis
mock	Murraya paniculata
sour	Citrus aurantium
sweet	Citrus sinensis
unshu	Citrus nobilis unshu
Oriental bush red pepper	Capsicum frutescens var. abbreviatum
Otaheite apple	Spondias cytherea
Palm, date	Phoenix dactylifera
date	Phoenix spp.
syrup	Jubaea spectabilis
Papaya, common	Carica papaya
Passion-flower, softleaf	Passiflora mollissima
Passion-fruit, banana	Passiflora mollissima
(ncn)	Passiflora edulis flavicarpa
Peach	Prunus persica
Pear, common	Pyrus communis
Pepino	Solanum muricatum
Pepper, sweet	Capsicum frutescens var. grossum
Oriental bush red	Capsicum frutescens var. abbreviatum
Persimmon, Japanese	Diospyros kaki
(ncn)	Diospyros spp.
Pineapple guava	Feijoa sellowiana

Plum, American	*Prunus americana*
Garden	*Prunus domestica*
Natal	*Carissa macrocarpa*
Pomegranate	*Punica granatum*
Pricklypear cactus	*Opuntia ficus-india*
Prune, common European	*Prunus domestica*
Pummelo	*Citrus maxima*
Quince	*Cydonia oblonga*
Red strawberry guava	*Psidium cattleianum littorale*
Rose-apple	*Eugenia jambos*
Sandalwood, red	*Santalum paniculatum*
white	*Santalum album*
Santol	*Sandericum koetjape*
Sapodilla	*Manilkara zapota*
Sapote, white	*Casimiroa edulis*
Seagrape	*Coccoloba uvifera*
Softleaf passion-flower	*Passiflora mollissima*
Sour lime	*Citrus aurantiifolia*
Sour orange	*Citrus aurantium*
Soursop	*Annona muricata*
Star-apple	*Chrysophyllum cainito*
Strawberry	*Fragaria spp.*
Strawberry guava	*Psidium cattleianum*
Surinam cherry	*Eugenia uniflora*
Sweet granadilla	*Passiflora ligularis*
Tangerine	*Citrus reticulata*
Tomato	*Lycopersicon esculentum*
Tropical almond	*Terminalia catappa*
	Terminalia chebula
Unshu orange	*Citrus nobilis unshu*
Velvet apple	*Diospyros discolor*
Walnut, California black	*Juglans hindsii*
English	*Juglans regia*
Wampi	*Citrus lansium*
West Indian cherry	*Malpighia punicifolia*
White sandalwood	*Santalum album*
White sapote	*Casimiroa edulis*
Yellow granadilla	*Passiflora lauriflora*
Yellow oleander	*Thevetia peruviana*
Yellow strawberry guava	*Psidium cattleianum lucidum*
Ylang-ylang	*Cananga odorata*

OTHER

The literature indicates that these hosts could permit OFF development but does not disclose all the conditions under which the host/pest relationship occurs. The available data does not support their inclusion as regulated articles, unless it is determined by an officer or by the project that they, or any one of these, present a hazard for spread of the OFF.

Common Name	Scientific Name
Acorn squash	Cucurbita pepo
Akee	Blighia sapida
Allspice	Pimenta dioica
Almond	Prunus dulcis
Apple, balsam	Momordica balsamina
a balsam	Momordica cochinchinensis
water	Eugenia aquea
Azarolus hawthorn	Crataegus azarolus
Bachang mango	Mangifera foetida
Balata sapodilla	Manilkara hexandra
Balsam-apple	Momordica balsamina
Balsam-apple, (ncn)	Momordica cochinchinensis
Balsam-pear	Momordica charantia
Banyan fig	Ficus banghalensis
Bay rum tree	Pimenta racemosa
Beach naupaka	Scaevola frutescens sericea
Bean, string	Phaseolus vulgaris
Berry, ohelo	Vaccinium reticulatum
California coffee	Rhamnus california
Blue latan palm	Latania loddigesii
Bourbon orange	Ochrosia elliptica
Brazilian nightshade	Solanum seaforthiarum
Broccoli	Brassica oleracea
Bumelia, false buckthorn	Bumelia lanuginosa
(ncn)	Bumelia buxifolia
Cactus, Cochinea	Nopalea cochenillifera
California Bay laurel	Umbellularia californica
California coffee berry	Rhamnus california
Candlenut	Aleurites moluccana
Cantaloupe	Cucumis melo
Chaulmoogra	Taraktogenos laurzii kurzi
Cherry, Portugese laurel	Prunus lusitanica
sweet	Prunus avium
Chestnut, Tahitian	Inocarpus fagiferus
Chilean strawberry	Fragaria chiloensis
Chili pepper	Capsicum annuum var. annuum
China-berry	Melia azedarach

Chinese date	Zizyphus jujuba
Chinese hawthorn	Crataegus pinnatifida
Chinese jujube	Zizyphus jujuba
Cirvelo	Bunchosia armeniaca
Climbing ylang-ylang	Artabotrys uncinatus
Cochinea cactus	Nopalea cochenillifera
Cocoplum	Chrysophyllum icaco
Coconut	Cocos nucifera
Coffee, Calif. (c.) berry	Rhamnus california
Liberian	Coffea liberica
Cotton, Sea Island	Gossypium barbadense
Crataegus hybrid	Crataegus lavallei
Croton, garden	Codiaeum variegatum
Cucumber tree	Averrhoa bilimbi
Cutleaf tomato	Physalis angulata
Date, Chinese	Zizyphus jujuba
Day jessamine	Cestrum diurnum
Dogwood, evergreen	Cornus capitata
Dracaena	Cordyline terminalis
Ebony persimmon	Diospyros ferrea
Eggplant	Solanum melongena
Elderberry	Sambucus glanca
Evergreen dogwood	Cornus capitata
False buckthorn bumelia	Bumelia lanuginosa
False ohelo	Wikstroemia uva-ursi
Fern tree	Filicium decipiens
Fig, banyan	Ficus banghalensis
glossy leaf	Ficus retusa
Moreton Bay	Ficus macrophylla
Port Jackson	Ficus rubiginosa
Garcinia	Garcinia xanthochymus
Garden croton	Codiaeum variegatum
Garden pea	Pisum sativum
Garden radish	Raphanus sativus
Gardenia	Gardenia spp.
Geiger tree	Cordia sebestena
Ginger	Zingiber officiale
Ginseng	Panax spp.
Glossy leaf fig	Ficus retusa
Governor's plum	Flacourtia indica
Granadilla, (ncn)	Passiflora subpeltata
Green sapote	Calocarpum viride
Guama	Inga laurina
Guamachil	Pithecellobium dulce
Hawthorn, azarolus	Crataegus azarolus
Chinese	Crataegus pinnatifida
Husk tomato	Physalis peruviana
India greenstar	Polyalthia longifolia
India jujube	Zizyphus jujuba

India mulberry	Morinda citrifolia
Indian rhododendron	Melastoma malabathricum
Japanese plum	Prunus salicina
Java apple	Syzygium samaramgense
Java plum	Syzygium cumini
Jessamine, day	Cestrum diurum
Jujube, Chinese	Zizyphus jujuba
India	Zizyphus mauritiana
Kuine	Mangifera odorata
Langsat	Lansium domesticum
Laurel, California Bay	Umbellularia californica
Liberian coffee	Coffee liberica
Limeberry	Triphasia trifolia
Madagascar olive	Noronhia emaginata
Mamee sapote	Calocarpum sapota
Mandrone	Arbutus andrachne
Mango, bachang	Mangifera foetida
Methley plum	Prunus salicina x Prunus cerasifera
Mombin, red	Spondias purpurea
yellow	Spondias mombin
Moreton Bay fig	Ficus macrophylla
Mulberry, India	Morinda citrifolia
Myrobalan	Terminalia bellerica
Nightshade, cockroach berry	Solanum aculeatissimum
Brazilian	Solanum seaforthianum
Nut, candle	Aleurites moluccana
Queensland	Macadamia ternifolia
Ohelo berry	Vaccinium reticulatum
Ohelo, false	Wikstroemia uva-ursi
Olive, common	Olea europaea
Madagascar	Noronhia emaginata
Orange, bourbon	Ochrosia elliptica
(ncn)	Citrus tankan
Orchid, vanda	Vanda spp.
Palm, blue latan	Latania loddigesii
(ncn)	Veitchia spp.
Paradise tree	Simarouba glauca
Passion-flower, Tagua	Passiflora foetida and var. gossypiella
Pea, garden	Pisum sativum
Pear, balsam	Momordica charantia
Pepper, chili	Capsicum annuum var. annuum
Persimmon, ebony	Diospyros ferrea
(ncn)	Diospyros packmanni
Pineapple	Ananas comosus
Plum, cherry	Prunus cerasifera
coco	Chrysophyllum icaco
governer's	Flacourtia indica
Japanese	Prunus salicina

Java	Syzygium cumini
methley	Prunus salicina x Prunus cerasifera
Port Jackson fig	Ficus rubiginosa
Portuguese laurel cherry	Prunus lusitanica
Queenpalm	Arecastrum romanzoffianum
Queensland nut	Macadamia ternifolia
Radish, garden	Raphanus sativus
Rambai	Baccaurea motleyana
Rambutan	Nephelium lappaceum
Red mombin	Spondias purpurea
Rheedia, wild lemon	Rheedia edulis
Rhododendron, Indian	Melastoma malabathricum
Rose, wild	Rosa california
Rukam	Flacourtia jangomas
Sapodilla, balata (ncn)	Manilkara hexandra
	Manilkara emarginata
Sapote, green	Calocarpum viride
mamee	Calocarpum sapota
Sea Island cotton	Gossypium barbadense
Sesban	Sesbania grandiflora
Spanish dagger	Yucca aloifolia
Squash, acorn	Cucurbita pepo
Strawberry, Chilean	Fragaria chiloensis
Strawberry tree	Arbutus unedo
String bean	Phaseolus vulgaris
Sweet cherry	Prunus avium
Tagua passion-flower	Passiflora foetida and var. gossypiella
Tahitian chestnut	Inocarpus fagiferus
Tallow-wood	Ximenia americana
Tomato, husk	Physalis peruviana
cutleaf	Physalis angulata
Vanda orchid	Vanda spp.
Wampi	Clausena lansium
Water apple	Eugenia aquea
Watermelon	Citrullus lanatus
Wild lemon rheedia	Rheedia edulis
Wild rose	Rosa californica
Yellow mombin	Spondias mombin
Ylang-ylang, climbing	Artabotrys uncinatus
Yucca	Yucca spp.

No Common Name Available

Actionophloeus macarthurii
Artocarpus polyphema
Baccauras angulata
Brassaia actinophylla
Chickrassia velutina
Citrus tankan
Cucurbita spp.
(Various pumpkins, squashes, gourds, if skin is broken)
Cucurbita spp.
Elaeocarpus grandis
Eugenia palumbis
Euphoria didyma
Muntingia calabara
Orchrosia mariannensis
Pandanus fragrans
Pandanus odoratissimus
Passiflora sp.
Rubus spp.
(Blackberries, possibly raspberries, loganberries, etc.)
Solanum sarmentosum
Solanum toryum
Terminalia melanocarpa

Addendum D--Technical Survey Information

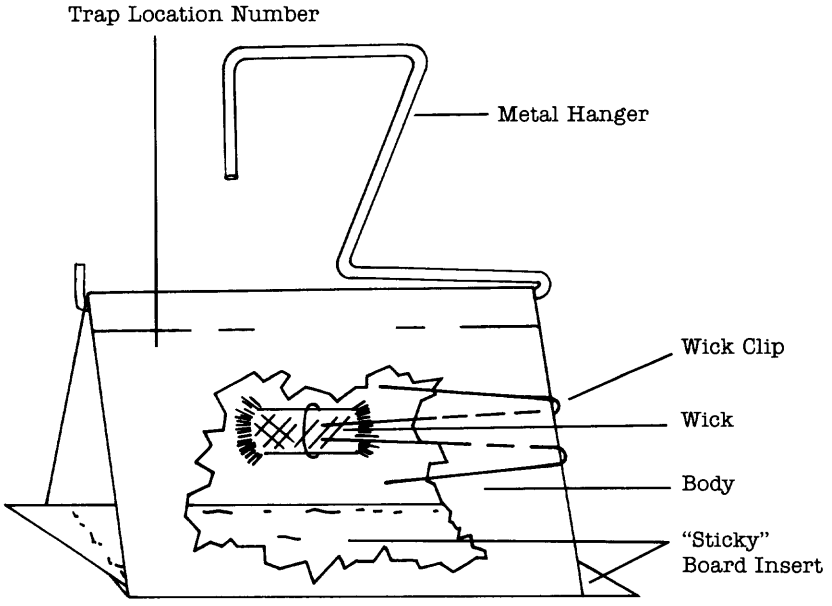
1. The Jackson Trap

A Richmond dental wick 3/4 inch in diameter and 1 inch or 1 1/2-in long will be installed in the trap. The wick will be baited with a mixture of methyl eugenol and naled. The naled in the mixture will be 1 percent ai (Dibrom® 14 @ 1 percent or Dibrom® 8 @ 2 percent by volume). The initial servicing will require 6 milliliters (mL) (0.2 oz) of lure. Subsequent servicings will require adding sufficient lure to saturate the wick without dripping. A period of 8 weeks between rebaitings is optimum but will depend on lure evaporation under existing weather conditions. The following chart may be employed as a guide:

Period	Average Daily Maximum Temperature	Rebaiting Intervals
Winter	50-60 °F	12 weeks
	60-70 °F	9 or 10 weeks
Spring/Cool	70-80 °F	8 or 9 weeks
Summer	80-90 °F	6 weeks
Hot Summer/	90 °F and over	3 or 4 weeks
Hot Fall	80-90 °F	6 weeks
Cool Fall	70- low 80 °F	8 or 9 weeks

If a blowing rain should occur, all traps should be replaced as soon as possible due to contamination.

Jackson Trap



The Jackson trap consists of five parts:

- trap body
- insert
- wick holder
- wick
- trap hanger

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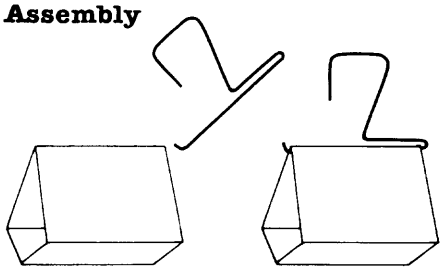
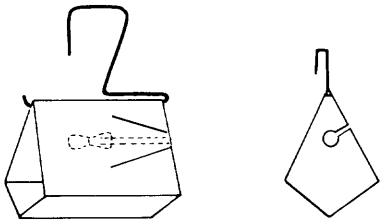
Jackson Trap

Assembly



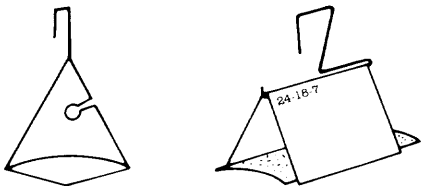
Insert trap hanger at top of trap. Do not bend hanger. It is brittle and will break easily.

Put a 90° bend in wick holder one inch from end. Insert the wick.



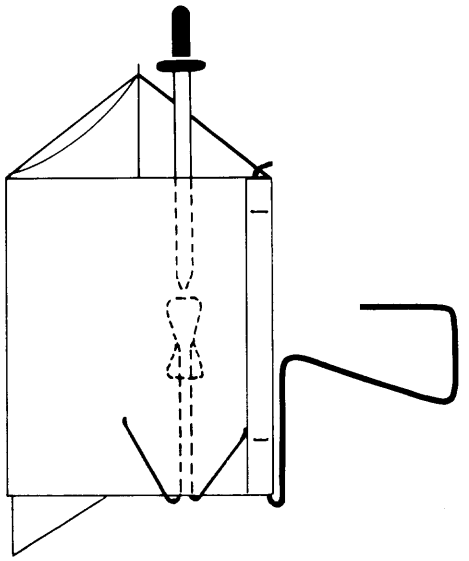
Insert wick holder on side of trap, ensuring that the wick does not touch the side wall, and the wick is midway inside trap.

Put trap number on non-sticky side of insert. Make sure that the stickum is good.



Bow sticky side upward and insert in trap. Number trap body before hanging.

Baiting



NEVER bait a trap over trapping supplies. *ALWAYS* bait over an absorbent material.

Each trapper can service 20 to 50 traps per day, depending on density.

a. When baiting traps, turn trap on end and add 3 ml of ME + Naled to the end of the wick. Then turn the other end of the trap up and add 3 ml to the other end of the wick. This will total 6 ml. Take extreme care not to drip any of the lure on the insert of trap body, or the efficiency of the trap will decrease. If lure is on the outside, the flies will mill around and may not enter the trap at all.

Take care not to saturate wicks to the point that they will drip sometime after the trap is placed in the host.

Care must be taken when baiting the trap. An accidental spill, even a few drops, will cause a decrease in the effectiveness of the trap or may make it totally ineffective.

b. Once a trapper selects a trap site, the location will be plotted on a map which has been sectioned or gridded into 1 square mile blocks. In addition, a trap location record (normally a file card), with a rough drawing or sketch of the specific trap location, will be prepared to document trapping activities such as dates of placement and servicing. Periodically, the trap should be moved to other hosts of equal or greater preference.

2. The McPhail Trap

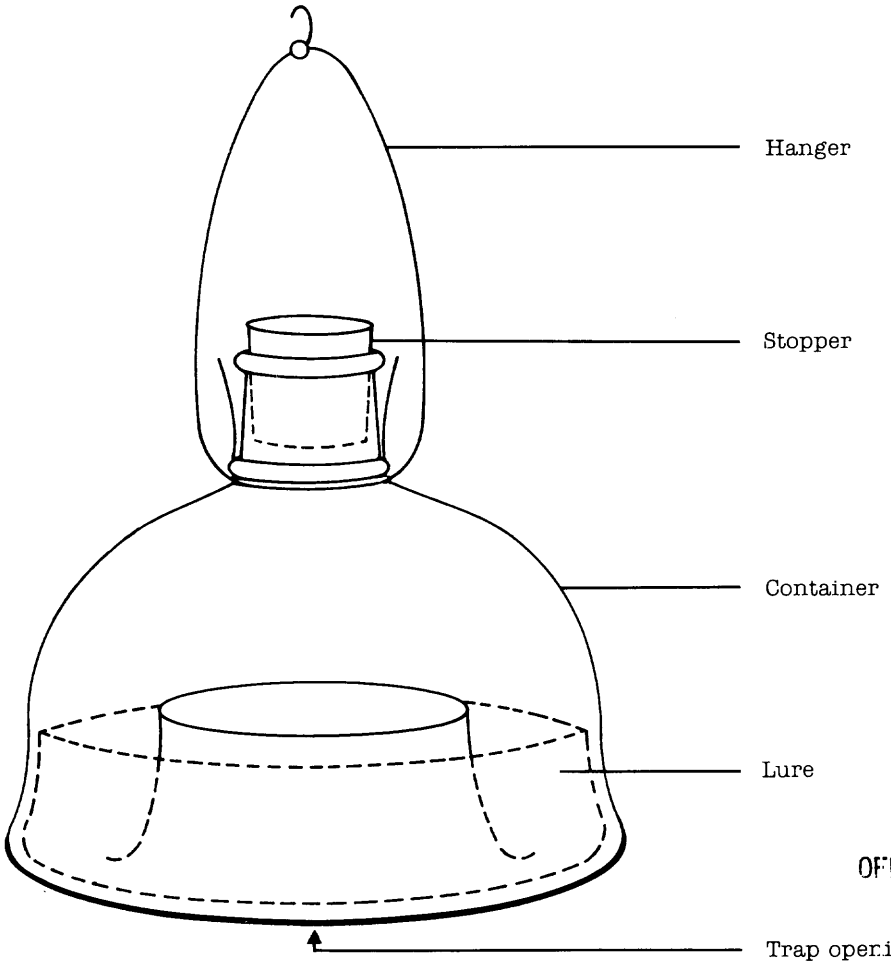
a. Preferred. Fill McPhail traps with approximately 600 ml of Miller's NU-LURE® bait solution which is composed of:

--11 fluid oz of Miller's NU-LURE®
--1/2 pound (lb) of borax
--1 gallon (gal) of water

The solution is best prepared with warm water and stirred. Stir again before adding solution to trap. Trap should be filled to just below lip.

b. Or: Use Five Torula yeast tablets and 500-600 ml of water per trap. Crush tablets, add water, and stir solution until yeast mixture is dissolved for best results.

McPhail Glass Trap



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3. Quality Control

Field supervisors oversee each trapper's work. In addition to arranging schedules, helping with problems, and overall direction, the following quality control items are carried out:

a. Evaluation. The field supervisor periodically checks a number of traps run by each trapper. On an evaluation sheet the supervisor lists the trap number, location, description, and date and notes the condition of the wick, trap placement, and trapping schedule. Trappers are advised of results and problem areas worked out.

b. Trapping Directory--Map Requirement

(1) Trap Location Directory. A list of all trappers, traps, servicing dates, field supervisors, and a copy of each trap card giving the exact location of each trap are maintained in a directory.

(2) Map. A large-scale master map, gridded to the coordinates used in the survey, will be maintained and updated each day. The map will show the location of all traps and finds throughout the regulated area.

c. Initial Trap Training and Public Relations

(1) Trap Placement

New trappers will be given individual instruction on proper trap placement.

(a) Selection of trapping sites. In selecting possible trap sites, first consideration should be given to the availability of preferred hosts, with fruit, in which to place the trap. If there is a choice between two or more possible trap locations with hosts of equal status, preference should be given to the site that has multiple hosts, either of the same variety or of different varieties. In many cases, single trees will be the only host available and should be utilized. Never pick a location solely because it will look good on a map. For OFF, traps placed throughout or near the center of orchards have a higher likelihood of catching specimens than traps placed at the edges. Placing a trap in a poor or second rate host, or even in a prime host without fruit when hosts with mature fruit are available, has the effect of making the lure compete with natural attractants. In some cases, a very desirable host may be lacking in mature fruit or have

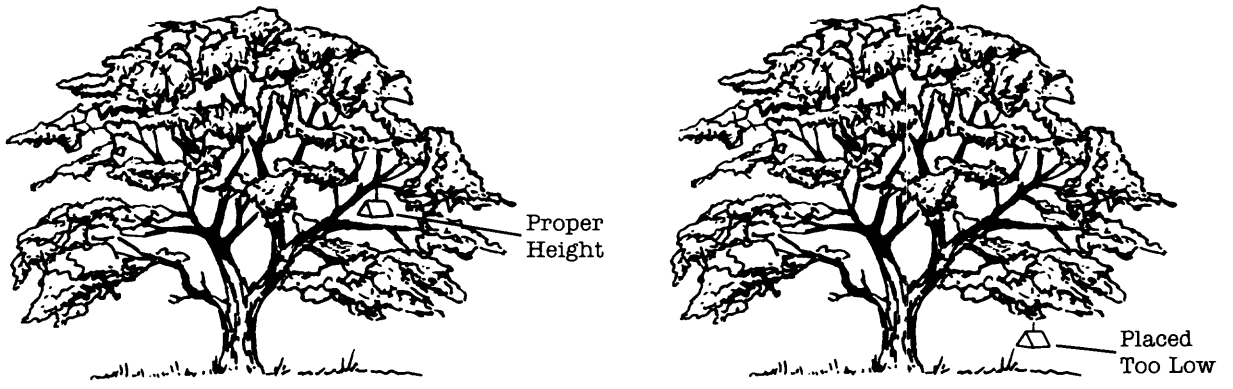
insufficient shade for trap placement. In such cases, a nearby honeydew source might be a desirable trap location. Generally, it is not advisable to place a trap in a host without fruit unless it shows evidence of abundant honeydew. Honeydew is a sweetish, clear excretion produced by certain insects such as aphids, scale insects, mealybugs and whiteflies. It is a good food source for adult fruit flies. A fungus called sooty mold lives on the honeydew. This mold makes the leaves appear blackish. The presence of sooty mold is an indication that the host is infested with insects that produce honeydew.

Those preferred hosts, which are likely to bear mature fruit or be attractive feeding hosts most of the year, should form the bulk of the trapped hosts. The common guava and the mango are choice honeydew sources.

Trees having sparse foliage should be avoided when other preferred hosts are available. This is true especially during the summer months, since these trees do not produce enough shade. When a preferred host does not have sufficient shade, you might consider placing the trap in a lesser host or a nonhost nearby.

Desirable trap sites should be noted on a Trap Location Record to facilitate future trap locations. This may be done at the time of initial trap placement or as the sites are noted during trap servicing.

(b) Placement of trap in host. Generally, it is not advisable to place a trap in a host without fruit except when the tree is being used as a trap site adjacent to a preferred host which has insufficient shade.



Correct **Incorrect**

The trap should be placed in a host at a point high enough to be out of reach of children, livestock, or pets. It should be secured in a manner to prevent it from being blown down. During the summer or warmer portions of the year, the trap must be placed in open shade; whereas, in the winter or cooler time of the year, it should be placed in a southern exposure, but not in direct sunlight. It is preferable to place it 1/2 to 2/3 the distance from the trunk to the outer edge of the foliage. The trap should not hang below or outside the foliage of the tree. The trap should not be placed in dense foliage that may protrude into the trap or give the fly a resting place that would prevent it from entering the trap.

It is desirable to have foliage below the level of the trap but not necessarily directly beneath the trap. A pole with a metal hook attached to one end can be used to place the trap sufficiently high in the host to be out of easy reach of children and curious adults.

(2) Public Relations

Good public relations are an important part of the survey specialist's duties. They are constantly in view and frequently in contact with the public. They should be courteous at all times. Prolonged conversations should be avoided, but short, cordial conversations concerning work are desirable. Do not be drawn into arguments concerning program activities.

Survey officers represent the Department of Agriculture and form an image of that Agency in the eyes of the public. Dress, personal appearance, and actions should be appropriate to make a good impression with the general public.

Shorts and tee-shirts may not be worn. Long pants or slacks and shirts or blouses with sleeves are prescribed for comfort and protection.

Shoes must be worn. Leather shoes with heavy soles help prevent nail and glass cuts.

Identification badges must be worn every workday at chest level for easy identification.

When entering a property for the first time, always attempt to contact the property owner or caretaker, explain the work briefly, and ask permission to place the trap. In conversations with the public, traps should be referred to as "insect survey traps." If no one is home a "Memorandum to Property Owner or Tenant" should be left.

(3) Preliminary Training

A vial of five dead, marked OFF (wing-clipped and color-marked) is sent to each field supervisor by registered mail.

These are randomly placed on a Jackson trap stickyboard and shown to all trappers. As part of the demonstration, the flies will be submitted for identification as described in normal operational procedures.

d. Quality Control Advisors

In a large program, quality control advisors may be employed. These personnel will monitor the trapping program and may ride with every trapper in a trapping district. The advisor works with trappers, assisting with proper trap location, baiting, host selection, trap deployment, and recordkeeping. Deficiencies and recommended improvements in the trapping district are reported to the field supervisor. Such reports are also given to the program manager. Periodic staff meetings of advisors are held to exchange viewpoints and discuss improvements.

e. OFF Quality Control Trapping Test Program

During the course of a large eradication program, it may be advisable to bait a selected number of traps with marked, dead OFF. This would maintain a high level of trapping awareness as well as ensure trapper recognition of and standardize reporting and trapping procedures. Previously killed, marked OFF will be obtained elsewhere and handled at project headquarters. The following procedure is suggested to minimize risk but actual procedures may vary, depending on agreement with State cooperators. Project managers will contact DEO for procedures to implement this test program.

(1) Trap Selection

Each field supervisor will randomly select 5 to 15 traps per trapper to be tested and provide all data to the program office at least 1 full week in advance of test date.

(2) Preparation

The field supervisor will be notified of the approximate delivery time of the specimens. Specimens will be selected and checked for color markings. As a precaution, the color will be changed each month, and the right or left wing will be clipped. Only the program office will be aware of the color and clipping schedule.

(3) Mailing

Each marked specimen will be placed in its own vial with a quality control identification number. The number will be recorded in a quality control log. The marked flies will then be sent by registered mail to the field supervisor. The field supervisor will send the program office a list of the traps to be baited for logging by specimen number. Specimens will be placed in traps no earlier than 1 day before normal servicing.

(4) Return

When a marked specimen is detected, standard trapping procedures are followed. However, the specimen is returned in the original vial, the pest detection report slip is given the quality control number under remarks, and the specimen is returned to the program office via registered mail.

(5) Oral Tests

To maintain trapper awareness, an occasional test may be given. General discussion may follow each test so that all concerned will benefit.

Addendum E--Life History

1. SYSTEMATIC POSITION

Oriental fruit fly, Bactrocera dorsalis (Hendel) (Diptera, Tephritidae)

Class: Insecta
Order: Diptera
Family: Tephritidae

Drew, 1989, revised the Dacinae, raising Bactrocera to full generic rank. Bactrocera and Dacus are in the Dacini. Most of the species, including Dacus dorsalis Hendel, are now in Bactrocera.

This is one of over 300 species of the genus Bactrocera. The genus is found from Africa to Australia and on the islands of the Pacific.

There are many species of lesser or unknown economic damage potential.

2. IDENTIFICATION CHARACTERS

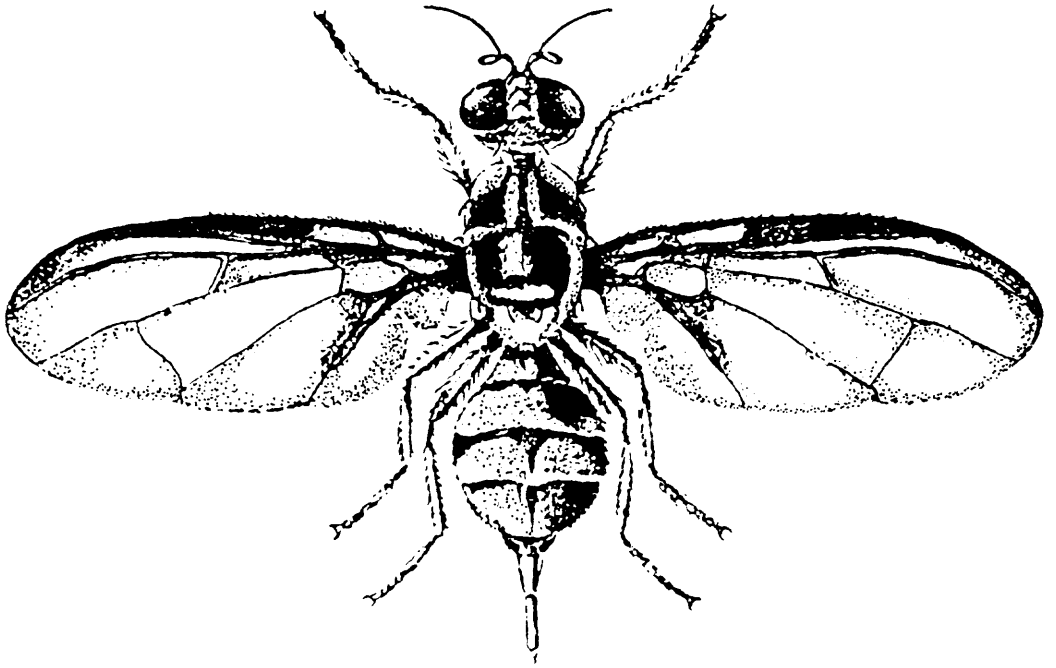
Eggs: Slender, white, elliptical, without sculpturing, slightly over 1.1 millimeters (mm) (0.04 in) long; deposited under skin of host fruit in groups of 3 to 30.

Larvae: A typical headless maggot, creamy white; attains length of 10 mm (0.3 in); body segmented. Mouth hooked with small ventral tooth in first and second instars; absent in third instar, but then dorsal margin straight anteriorly. There are three instars. Third instar larvae can flip.

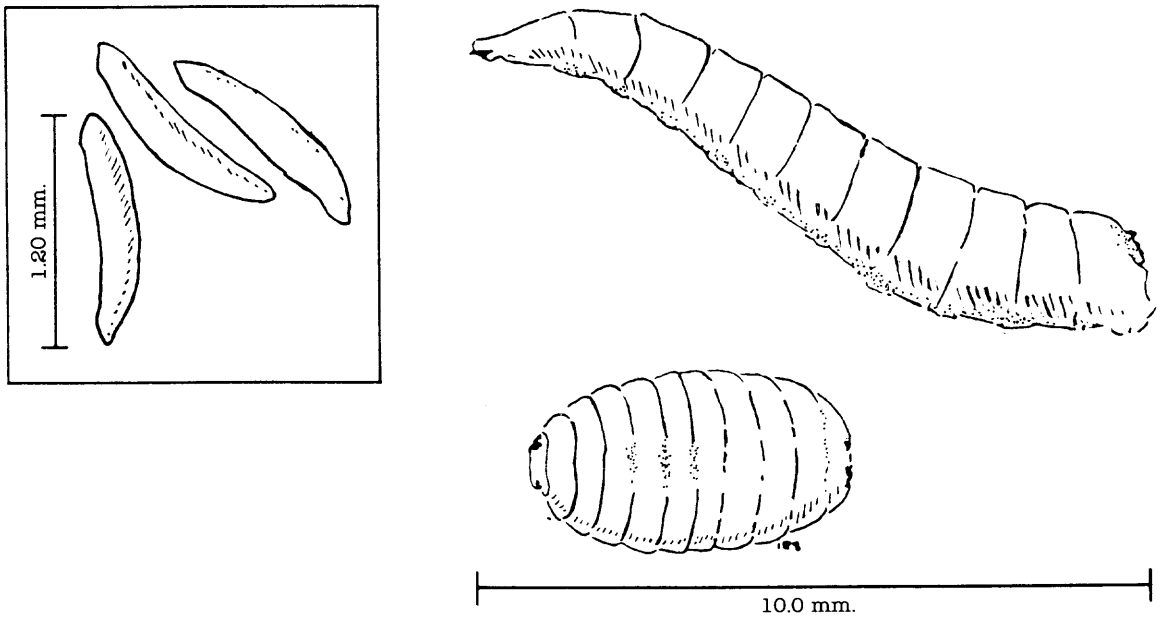
Pupae: Tan to dark brownish yellow, about 5 mm (0.2 in) long; pupation usually occurs 2 to 3 centimeters (cm) (0.7 to 1.1 in) under soil surface, but soil is not always necessary for pupation to occur.

Adult: Somewhat larger than a housefly, about 8.0 mm (0.3 in) long; color bright, variable, mostly yellow but with two black markings on thorax and abdomen. Female with slender, sharp-pointed ovipositor; produces more than 1,000 eggs during lifetime. Wings clear; narrow dark band along forward margin and short diagonal band near base.

Oriental Fruit Fly



Bactrocera dorsalis (Hendel)



Eggs, larva and pupa of *Bactrocera dorsalis*

Source: Florida Department of Agriculture.

3. BIOLOGY

A mated female may oviposit as many as 136 eggs per day, usually about 10 per oviposition site, but this can go up to 100 or more. The eggs may take only 24 hours to hatch but in cooler temperatures can require up to 20 days. The developing larvae go through three instars. The larval stage may last from 6 to 35 days depending on the temperature. Under optimum temperatures of 80 °F (27 °C) and humidity (70 percent), the larval stage can be as short as 6 to 7 days. The third instar can exit the fruit by a flipping motion before or after the fruit drops to the ground. The larvae pupate 2 in (2 -5cm) or rarely to 5 in (13 cm) in the soil. Surface conditions may impel the larvae to move horizontally as much as a yard (yd) (90 cm) radius in a search for suitable soil for burrowing and pupation. The pupal stage usually takes 10 to 12 days for completion, but this can be extended to 120 days (diapause) by extremely cool temperatures. It is in this stage that OFF usually overwinters. The newly emerged females normally need about 8 to 12 days to mature before they can begin to oviposit. If daylight hours are as long or longer than night hours, adults can mate at 5 or 6 days after emergence under optimum temperatures between 77-84 °F (25-29 °C). Adults usually live for about 1 to 3 months but have survived a year in cool mountain localities. If temperatures average below 55 °F (12.78 °C) over a two week period, the species is reproductively inactive although it may be present. Biweekly average temperatures above 98 °F (36.67 °C) are inhibitory to adult activity and result in a high mortality rate. The species has been able to survive frosts and slight snowfall. When hosts are available, the flies tend to remain in an area (non-dispersive movement) and generally do not move more than 656 yd (590 meters (m)) away (mean of 362 yd = 325 m). However, dispersive movement, when prompted by a lack of fruit on hosts for ovipositioning, warm weather following cool or cold temperatures, or by young adults between emergence and maturity, is greater than 3 mi, and when forced, such as flying over water, is as much as 40 mi. There are normally two daily peaks of activity, one in early morning for feeding and one at dusk for mating, which is at a maximum about 15 minutes prior to sunset.

Addendum F--Identification of Specimen(s)

As many specimens as possible of the pest are to be collected for screening/ identification by the local designated identifier.

Suspect adult specimens collected from Jackson traps should be handled carefully. To insure that specimens caught in sticky material can be accurately identified, the following procedures are recommended.

- Cut out a portion of the insert surrounding the specimen. This will leave you with the specimen imbedded in sticky material on a small piece of cardboard. Put an insect pin (number 2 size) through the cardboard and pin the cardboard (with specimen attached) in a mailmaster type pinning box. You are thus treating the specimen as a pinned specimen and do not need to use alcohol or other liquids. To ship the pinning box for identification place it inside a second shipping box and put padding between the two boxes.

- You may find it easier to lift the specimen out of the sticky material with a small spatula. Try not to touch the specimen, i.e. lift from underneath and bring a glob of the sticky material with it. Place the specimen on a small square of paper such as a piece of 3 x 5 index card. The sticky material should hold it on. Then put an insect pin through the piece of index card and place it in a mailmaster pinning box. Ship as described above.

Suspect larvae should be killed by placing in water, bringing to the boiling point, cooling, and then preserved in 70-75% ethyl alcohol. Suspect adult specimens collected from McPhail and Jackson traps and other insect stages should all be forwarded in vials of alcohol for confirmation to 1/ in the following chart. These specimens must be accompanied by PPQ Form 391, Specimens For Determination, marked "Urgent" (see PPQ Manual M390.500). Telephone the identifier prior to shipping specimens to alert them of the shipment.

INFORMATION FLOW FOR THE IDENTIFICATION OF SPECIMENS

SPECIMENS COLLECTED

↓

SCREENING/IDENTIFICATION BY STATE OR PPQ

↓

SPECIMENS SUBMITTED TO USDA [1/]
for Confirmation

↓

CONFIRMATION NOTIFICATION [2/]
to Other USDA Agencies

↓

RESULTS SENT TO APHIS AND IF EXOTIC
Information Relayed to [3/] [4/]

1/	Arizona, Louisiana, New Mexico, Texas	Mr. D. Riley PPQ, APHIS, USDA P.O. Box 306 Brownsville, Texas 78520
	Other States West of the Mississippi River	Ms. K. Corwin California Department of Food and Agriculture 1220 N Street Sacramento, California 95814
	States East of the Mississippi River	Dr. H. Weems Florida Department of Agriculture and Consumer Services P.O. Box 1269 Gainesville, Florida 32602

2/ APHIS — Plant Protection and Quarantine

3/ All States — State and Territory Agricultural Regulatory Officials

4/ NAPPO — North American Plant Protection Organization

Addendum G--Forms

Number	Title
CONTROL	
PPQ 213	Airplane Inspection Record
PPQ 431-R	Treatment Test Record
PPQ 468	Caution - Pesticide Treatment in Progress
PPQ 552-R	Pesticide Samples for Chemical Analysis
PPQ 602	Environmental Monitoring
PPQ 603	Residue Sample for Food or Feed Product
PPQ 802	Daily Aircraft Record
REGULATORY	
PPQ 214	Warning Quarantine Label
PPQ 244	USDA - APHIS Warning Quarantine (Tag)
PPQ 254	Disposition of Plants and Plant or Animal Products
PPQ 287	Mail Interception Notice
PPQ 468	Caution - Pesticide Treatment in Progress
PPQ 518	Report of Violation
PPQ 519	Compliance Agreement
PPQ 522	Certified Under All Applicable Federal or State Cooperative Domestic Plant Quarantine (Tag)
PPQ 523	Emergency Action Notification
PPQ 524	Issuance Record for Permits or Certificates
PPQ 527	Certified Under All Applicable Federal or State Cooperative Domestic Plant Quarantine (Package Certificate)
PPQ 530	Limited Permit
PPQ 535	Certificate of Treatment (Fruit-Foreign Site)
PPQ 537	Limited Permit Label
PPQ 540	Certificate of Federal/State Domestic Plant Quarantine
PPQ 551	Regulated Establishment Record
PPQ 554	Certified Under All Applicable Federal or State Cooperative Domestic Plant Quarantines (Label)
PPQ 577	Phytosanitary Certificate
SURVEY	
PPQ 343	Trapping Record
PPQ 345	Caution - Do Not Handle or Move
PPQ 391	Specimens for Determination
PPQ 539	Trapping Survey Record

Addendum H--Contributors

Industry

Contributors to the first action plan on OFF in 1982 are hereby acknowledged. The implementation of this plan in subsequent years led to many changes. This current version of the action plan was reviewed by the following:

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The aforementioned individuals were major contributors to the development, preparation, and review of this Action Plan. Other contributors and/or reviewers were research scientists of the Agricultural Research Service and regional and staff personnel of PPQ.

Addendum I--References

The literature on OFF is very extensive, and only a selection is given here.

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