USDA UNITED STATES DEPARTMENT OF AGRICULTURE

APHIS

EXOTIC FRUIT FLY

STRATEGIC PLAN

FY 2006-2010

USDA, APHIS
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Executive Summary

Fruit flies of the family Tephritidae are among the most destructive pests of fruits and vegetables around the world and pose a significant risk to agriculture in the United States. During a portion of their life time, Tephritidae fruit flies live and feed inside fruit causing economic losses from spoiling and destruction of the host commodity. They are known to attack more than 400 host plants. In addition to lost production, establishment of these pest species in the United States would also result in costs associated with implementing control measures, increased pesticide usage, and loss of markets due to restrictions on shipment of host commodities. The U.S. market value of exotic fruit fly host commodities was about $7.2 billion in 2002.

The Animal and Plant Health Inspection Service (APHIS) responds to exotic fruit fly risks with an integrated system that incorporates surveillance activities, fruit fly control programs, and regulatory actions. This multi-tactical approach is the product of close collaboration and consultation among APHIS and its exotic fruit fly program cooperators and stakeholders. Several federally funded activities play a role in managing the risk of introduction of fruit flies. This strategic plan focuses on the activities funded through the APHIS Fruit Fly Exclusion and Detection (FFED) budget line item. The primary mission of FFED programs is to protect the health and value of American agricultural resources threatened by the establishment of exotic fruit fly pests.

APHIS bases its management of the risk associated with exotic fruit fly introductions into the United States on three tenets:

1. Detection and preventive release programs (PRPs) using the sterile insect technique (SIT), are critical to stop small introductions from becoming established populations in high-risk areas.
2. To reduce the likelihood of exotic fruit fly introductions into the United States, APHIS should participate in offshore programs to reduce the threat at its source.
3. SIT is an essential operational tool for successful exclusion and eradication programs.

APHIS considers potential economic impact, frequency and location of past introductions, effectiveness of available control methods, potential pathways, and geographical proximity when assigning limited resources.

This process is dynamic as the increased globalization of the transportation industry and the according increased availability of affordable travel opens new pathways for exotic fruit flies. The Mediterranean fruit fly or Medfly (*Ceratitis capitata*) and Mexican fruit fly or Mexfly (*Anastrepha ludens*) remain the primary threats but detections of new and less frequently captured species are becoming more common and presenting new risks to U.S. agriculture.

To address these issues and achieve its mission, APHIS must take a global approach and will focus on achieving the following priorities:

1) Prevent individual exotic fruit fly introductions from becoming established populations.
2) Reduce the imminent threat of introduction or spread of Medfly and Mexfly from existing populations in Mexico.
3) Mitigate the impact of exotic fruit flies presently established in portions of the United States.
4) Encourage development of exotic fruit fly detection and management programs in the Caribbean Basin and Central America to act as an early warning system and further reduce the risk of introduction.
5) Reduce risk of entry of exotic fruit flies, especially Medfly, through technical support for fruit fly risk reduction activities worldwide.

Currently, APHIS with both domestic and international partners is conducting a wide range of activities to accomplish its mission. However, the threat of introduction of exotic fruit flies is increasing and future outbreaks are expected. During the next five years, APHIS intends to bolster its capacity to meet this challenge and prevent establishment of exotic fruit flies by accomplishing the following goals:

Goal 1: Enhance detection and response capabilities and strengthen preventive release programs.

- Implement recommendations of the National Exotic Fruit Fly Surveillance Program review. Ensure national and international standards are followed in all U.S. states and territories.
- Complete implementation of the National Preventive Release Programs review recommendations.
- Conduct periodic reviews (every 4 years) of detection, response, and preventive release programs to ensure cost effective use of best technologies and methodologies.
- Develop alternative control technologies for *Bactrocera* species.
- Provide a stable, secure source(s) of sterile Medflies and Mexflies to serve as backup in case primary sources fail.

Goal 2: Ensure Medfly does not move north of the State of Chiapas, Mexico.

- Stabilize U.S. Moscamed Program funding that minimizes reliance on emergency funding. Explore alternative sources to appropriated funding both in the United States and from international donors.
- Form an international commission with Mexico/Secretariat of Agriculture, Livestock, Rural Development, Fisheries and Feed (SAGARPA) to ensure long-term joint management of the Moscamed Program activities in southern Mexico.
- Continue to work closely through the Moscamed Program with Guatemala/ Ministry of Agriculture, Livestock and Feed (MAGA) to fortify field activities and continue the production of sterile flies in the El Pino facility.
- Conduct periodic reviews of strategies, tactics, technologies, and administration to ensure cost efficient and effective operations. Enhance quality assurance/quality control processes and activities.

- Cooperate with Mexico to enhance the exotic fruit fly detection program throughout Mexico to assure effectiveness of the Moscamed Program to serve as early warning system for all exotic fruit flies.

Goal 3: Eradicate Mexfly from Texas and northern Mexico along the Lower Rio Grande Valley (LRGV) and maintain the area free of reintroduction.

- Augment the current Mexfly Preventive Release Program using the sterile insect technique and implement survey, regulatory, and control activities to eradicate Mexfly from Texas.
- Ensure that the Mexfly PRP and complementary suppression program activities in Reynosa, Tamaulipas, Mexico maintain an adequate, ongoing sterile release program.
- Implement an ongoing Mexfly PRP in the Texas LRGV to prevent reintroduction.
- Develop new and improved regulatory pre-and post-harvest treatments for Mexfly
- Conduct periodic reviews of strategies, tactics, technologies, and administration to ensure cost efficient and effective operations. Enhance quality assurance/quality control processes and activities.
- Develop strategies to collaborate with Mexico on its plan to establish northern Mexican states as free of Mexfly.

APHIS will use two measures to track whether it is achieving the overall mission:

- The number of introductions resulting in a quarantine.
- The size of each quarantine (in square miles).

Additional measures and milestones will help monitor efficiency and progress in accomplishing the three primary goals over the next five years.

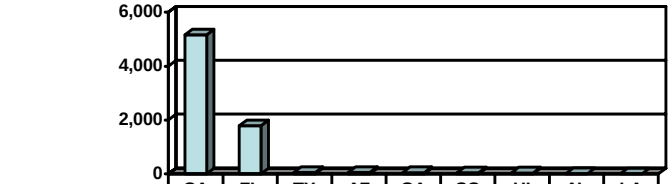
APHIS formed the Fruit Fly Program Board as a policy setting and coordination group that provides Federal leadership for the exotic fruit fly safeguarding system. The Board has appointed a Fruit Fly Program Director to work with regional operations managers and individual fruit fly program coordinators to implement Fruit Fly Exclusion and Detection program activities. The overall goal is to harmonize all fruit fly activities and to become more strategic in the planning and management of exotic fruit fly programs using a global approach.

To accomplish its goals over the next five years, APHIS will need to continue efforts to integrate fruit fly exclusion and detection programs into the overall plant safeguarding system; maintain emphasis on development, exploration, and enhancement of current and new technologies; and foster increased planning and participation by cooperators and stakeholders.

Introduction

Fruit flies in the family Tephritidae are among the most destructive and well-publicized pests of fruits and vegetables around the world. The genera *Anastrepha*, *Bactrocera*, and *Ceratitis* pose the greatest risk to American agriculture and are the focus of this strategic plan. Tephritidae fruit flies spend their larval stages feeding and growing in more than 400 host plants. Introduction of these pest species into the United States causes economic losses from destruction and spoiling of host commodities by larvae, costs associated with implementing control measures, and loss of market share due to restrictions on shipment of host commodities. The extensive damage and wide host range of Tephritidae fruit flies become obstacles to agricultural diversification and trade when pest fruit fly species are present.

Fig 1. 2002 Market Value of Commodities Susceptible to Fruit Fly Infestation: Total Value = $7.2 billion



	CA	FL	TX	AZ	GA	SC	HI	AL	LA
Value in $ millions	5,152	1,788	60	57	50	44	35	8	1

California and Florida are at highest risk from exotic fruit fly establishment. This conclusion is based on the historical record of frequent outbreaks and the costs to eradicate them; the high approach rate of unmitigated fruit fly host material at the major ports of entry coinciding with the climatic conditions favorable to establishment of reproducing populations; public opposition to chemical control measures; and the availability of hosts. The market value of exotic fruit fly host commodities totaled about $7.2 billion in the United States in 2002, with approximately $5.1 billion of that grown in California and $1.8 billion in Florida (Fig. 1).

APHIS responds to exotic fruit fly risks with an integrated system that incorporates surveillance activities, fruit fly control programs, and regulatory actions. This multi-tactical approach is the product of close collaboration and consultation between APHIS and its exotic fruit fly program cooperators and stakeholders.

The APHIS Fruit Fly Exclusion and Detection (FFED) budget line item is the primary source of Federal funding to implement the system. In 2005, Congress allocated $57.9 million to the FFED line item.

This strategic plan focuses on the FFED programs. However, there are several other federally funded activities that play a major and critical role in achieving the safeguarding mission. Congress appropriates funds to the APHIS Agricultural Quarantine Inspection (AQI) line item to support Hawaii and Puerto Rico pre-departure inspection programs. AQI user fees support regulatory and inspection activities at ports of entry. Other APHIS budget line items (AQI, Plant Methods, Pest Detection, and Biocontrol) support the APHIS Center for Plant Health Science and Technology projects. Congress

also provides funds for the Agricultural Research Service to carry out exotic fruit fly research and demonstration projects. In addition, the Secretary of Agriculture may at any time authorize the transfer of emergency funds, subject to approval by the President's Office of Management and Budget, to meet emergency program needs.

Primary Mission

The primary mission of Fruit Fly Exclusion and Detection programs is to protect the health and value of American agricultural resources threatened by the establishment of exotic fruit fly populations.

Risk-based Strategy

Strategic management of the risk associated with exotic fruit fly introductions into the United States is based on three tenets:

1. Detection and preventive release programs (PRPs) using SIT are critical to stop small introductions from becoming established populations in high-risk areas.
2. In order to reduce the likelihood of exotic fruit fly introductions into the United States, APHIS should participate in offshore programs to reduce the threat at its source.
3. SIT is an essential operational tool for successful exclusion and eradication programs.

First, it is critical that individual introductions be detected, evaluated and, if necessary, eradicated as quickly as possible to prevent an introduction from becoming an established population. This is critical in urban, suburban, and environmentally sensitive areas where large-scale application of pesticides is problematic. Detection and preventive release programs are critical to stop small outbreaks from becoming established populations in high-risk areas. Successfully addressing this issue is difficult because:

- There are numerous fruit fly species of economic importance, and they approach the United States via several high-risk pathways.
- A broad range of agricultural commodities are subject to fruit fly damage.
- Previously established populations of pest fruit fly species within the United States pose a constant threat to fly-free areas.
- The origins and nature of Medfly, *Bactrocera*, and *Anastrepha* species introductions to the United States are not fully understood.
- Lures and toxicants for detection and control programs are not available for all species of concern. Existing and future lures and toxicants must comply with current environmental mandates.
- Aerial applications of bait sprays are unpopular with the urban public and restricted by the manufacturer.
- The SIT is a species-specific population management tool that has been developed for a limited number of species.

Second, to reduce the likelihood of exotic fruit fly introductions into the United States, APHIS should actively participate in offshore eradication and surveillance programs that reduce the threats at their source. Conducting offshore programs is complex and challenging because:

- Exotic fruit fly species have worldwide distribution.
- Delineating high risk pathways for introduction of pest fruit fly species requires technology to differentiate species complexes and identify potential source populations. This technology is not generally available.
- Expansion of international travel facilitates the movement of fruit fly host material and effectively increases the approach rate of exotic fruit flies to the United States.
- Fruit fly populations in Mexico and Central America are a significant threat to agriculture in the continental United States due to the large numbers of people migrating north from fruit fly infested areas.
- Foreign governments with endemic populations of fruit flies exotic to the United States do not necessarily concur with our need to mitigate risk to U.S. agriculture.

Third, SIT is an essential operational tool for successful exclusion and control programs. SIT production capacity and new technologies must be available to manage target species. Management of SIT infrastructure is challenging because:

- Sterile fly production and distribution are resource-intensive processes.
- Efficient and effective SIT implementation requires continuous cooperation and consensus within APHIS and with outside entities.
- SIT is a species-specific population management tool that is dependent upon mass production methodologies and facilities for each target fruit fly species. Several years are required to implement SIT for a new species.
- New population suppression technologies, such as mass production and release of biological control agents, must be cost-effective and fully integrated with SIT and pesticides.

The exotic fruit fly safeguarding system is an integrated, multi-tactical approach. All parts are interrelated and dependent upon each other. Redundancy is built into the system and a balance is achieved through all the various interlocking components. Some activities play a greater role, but all parts are essential to address the numerous risk pathways of economically significant fruit flies that are distributed worldwide. For example, the Mediterranean fruit fly (Medfly), *Ceratitis capitata,* preventive release programs using sterile insect technology in California and Florida have proved to be extremely successful at preventing introductions of Medfly from around the world from becoming established in high risk population areas. Since the inception of the programs, the number of outbreaks has been reduced by 70% in California, and none have occurred in Florida. A portion of this success can be attributed to the three-country cooperative Moscamed Program (Mexico, Guatemala, and the United States) conducted along the Guatemalan/Mexico border. Molecular studies have suggested that the majority of captured flies in California have their origin in Central America. If Medfly were allowed to establish itself along the United States/Mexico border, the sterile release programs

would likely be overwhelmed by the increased introduction pressure along the Mexican border.

APHIS balances resource distribution and level of support among activities based on risk. APHIS considers potential economic impact, frequency and location of past introductions, effectiveness of available control methods, potential pathways, and geographical proximity when assigning limited resources.

This process is dynamic as the increased globalization of the transportation industry and the according increased availability of affordable travel opens new pathways for exotic fruit flies. Medfly and Mexfly remain the primary threats but detections of new and less frequently captured species are becoming more common and presenting new risks to American agriculture.

APHIS targets Medfly and Mexfly because of their potentially devastating impact on agricultural production and trade, their frequency of past introductions and their current distribution in neighboring Mexico. *Bactrocera* species have the potential to cause serious economic impact on many fruit and vegetable crops. However, current survey and control technologies for species most frequently detected are very effective, relatively simple, and inexpensive.

APHIS is concerned with two main types of entry risk associated with exotic fruit flies:

- "Long-distance" risk associated with the entry into the United States of infested fruit or vegetables from fruit fly infested countries distant from our borders. This includes transiting infested fruit or vegetables entering via the Canadian border.
- The risk of the northward spread of exotic species into the United States via Mexico. Mexico is an especially high-risk pathway due to the shared border and the large numbers of people migrating from fruit fly infested areas of Central America and Mexico to the United States.

Global Approach

The APHIS approach to accomplishing its mission begins with defending against new establishment and spread of economically important exotic fruit fly species in the United States. Secondly, we support, through direct participation where possible, the elimination or management of existing populations of species of concern in neighboring border countries. Third, we facilitate domestic production and commerce impacted by established populations of economically important fruit fly species. Fourth, we actively encourage and support development of detection and management programs in the Caribbean Basin and Central America to act as early warning systems and to further reduce the risk of introduction. Fifth, we strive to reduce the risk of entry of exotic species, especially Medfly, from all parts of the world by providing technical assistance to encourage fruit fly management at the source.

In line with this approach, APHIS focuses resources on achieving the following priorities:

1. Prevent individual exotic fruit fly introductions from becoming established populations.
2. Reduce the imminent threat of introduction or spread of Medfly and Mexfly from existing populations in Mexico.
3. Mitigate the impact of exotic fruit flies presently established in portions of the United States.
4. Encourage development of exotic fruit fly detection and management programs in the Caribbean Basin and Central America to act as an early warning system and further reduce the risk of introduction.
5. Reduce risk of entry of exotic fruit flies, especially Medfly, through technical support for fruit fly risk reduction activities worldwide.

Current Status

1.) Prevent individual exotic fruit fly introductions from becoming established populations.

The first priority is to detect and/or mitigate economically important exotic fruit fly introductions to prevent production losses and/or trade disruption to U.S. growers and industry that would result from their establishment and spread in the United States.

Detection:
Early detection offers the best chance to successfully eliminate new introductions. When outbreaks are discovered early, program managers have more options for control and management that allow them to conduct emergency response operations that have less impact on the public and the environment. The duration of the emergency response programs are shorter and much less costly.

The current exotic fruit fly detection program is risk based. Focus is placed on urban areas and ports of entry with previous history of introductions and in States with climates conducive to establishment and with industries most impacted by fruit flies. Most species of the genus *Anastrepha, Ceratitis,* and *Bactrocera* will respond to the current detection program. There are a total of almost 160,000 traps arrayed across southern and western States and Puerto Rico. The Federal share of costs in 2004 totaled approximately $16.4 million for detection and emergency response infrastructure, with more than 150 APHIS employees involved. In many instances, this is complemented by similar investments by State and local agencies on infrastructure to exclude and detect exotic fruit flies so as to prevent their establishment and spread.

Emergency Response:
In States with a history of introductions such as California and Florida, response is swift and aggressive. Supplies are warehoused, and lines of command and communication are well established. Personnel are trained and available for immediate response to outbreaks. As a result of ongoing sterile release of Medfly, permanent facilities are placed strategically to support response actions. Since implementation of the National Response

Plan and National Incident Management System, APHIS and States are rapidly transitioning to the Incident Command System to manage fruit fly outbreaks. Pesticides and SIT are the primary control technologies available for responding to outbreaks of exotic fruit flies.

Preventive Release Programs (PRPs):
In California and Florida where introductions of Medfly are frequent, APHIS and State cooperators release sterile Medflies on a continuous basis. Although it does not prevent introductions, the PRPs have been successful preventing Medfly establishment. Prior to implementation of the PRPs, Medfly introductions disrupted trade and industry operations on a frequent basis. Between 1987 and 1995, California experienced nine Medfly outbreaks in the eight year interval. The average cost of eradicating an outbreak was $18.89 million, which amounted to an annual cost of $21.25 million. Since the California PRPs began in 1996, three infestations occurred that were not within the PRP areas at the time of the outbreaks. The average cost of eradicating these outbreaks was $2.52 million or approximately $1 million annually. Therefore the California PRP contributed to a gross savings of at least $20 million per year in lower eradication costs.[1]

APHIS, California's Department of Food and Agriculture (CDFA), and Florida's Department of Plant Industry maintain facilities to support the existing PRPs and a ready supply of sterile Medflies to address an introduction that may occur outside the PRP release areas. Each week California processes 310 million sterile pupae for aerial release over 2,489 square miles, and Florida processes 100 million pupae to cover 600 square miles. Existing PRPs are considered extremely viable and will need to be operated for the foreseeable future.

APHIS and CDFA partner to produce sterile male Medfly pupae for the California PRP. CDFA operates a rearing facility in Hawaii that produces approximately 110 million male pupae per week. These pupae are sterilized in an APHIS irradiation unit. The total annual operating budget is $3.2 million, with costs shared equally between CDFA and APHIS. APHIS supplies additional sterile male Medflies from the APHIS Medfly rearing facility in El Pino, Guatemala, to meet all the California PRP needs. The El Pino rearing facility is also responsible for providing 100 million sterile Medfly pupae for the Florida PRP and any emergencies that may arise.

The APHIS Fruit Fly Production Facility in Waimanlo, HI, was removed from operation due to structural and operational problems in 2002 and will not be reopened. Prior to its closing, this facility provided additional sterile Medflies needed for the California PRP and served as a backup to El Pino for emergency outbreaks and the PRP in Florida.

[1] Benefits attributable to the California PRP are likely higher as this estimate does not include quarantine losses incurred by producers. Moreover, outbreaks were increasing at the time the PRP was implemented so that eradication costs would likely have been higher than those indicated by an average had the PRP not been put in place.

Mexican Fruit Fly (Mexfly) Management in the Lower Rio Grande Valley (LRGV) of Texas:

APHIS, Texas Department of Agriculture, and the Texas citrus industry cooperate to manage Mexfly populations that are present in the LRGV. The managed area includes three counties in Texas and the contiguous area in Mexico. The program currently releases sterile Mexfly at a low rate over citrus growing areas, thereby allowing shipment of citrus without treatment unless detections of fertile Mexfly exceed a regulatory threshold.

APHIS operates a Mexfly rearing facility in the LRGV to support this program. The facility located in Mission, Texas, also provides sterile Mexfly for cooperative programs in Mexico and stands ready to provide sterile Mexfly in response to outbreaks in other areas of the United States. Its production capacity was increased in 2004 from 80 to 150 million sterile pupae (males and females) per week. Actual production in 2004 was about 55 million pupae per week, with 16 million shipped to Tijuana, Mexico, each week and the remainder used in the Texas suppression program. The facility had an operating budget of $1,174,000 in 2004 with twelve staff providing support. The Texas Valley Citrus Committee contributed $179,000 and the Texas Department of Agriculture contributed $100,000 towards the cost of operation.

Emerging Threats:

Although Medfly and Mexfly are currently the primary focus of APHIS domestic and offshore activities, *Bactrocera dorsalis* (oriental fruit fly, OFF) and other species in this genus are serious potential threats to U.S. industry. In the past decade, the increase in detections of OFF in California and Florida demonstrates the potential for establishment of this pest. *Bactrocera carambolae* (carambola fruit fly) has invaded Surinam from Asia and threatens the Caribbean Basin. Three species that are established in Hawaii *Bactrocera cucurbitae* (melon fly), *Bactrocera latifrons* (solanum fruit fly), and OFF are a constant threat to the U.S. mainland.

Although a frequent invader, OFF outbreaks are eliminated quickly, effectively, and relatively inexpensively. Male fruit flies of most *Bactrocera* species are strongly to moderately attracted to scents commonly used as food additives known as parapheromones. These synthetic lures are used to attract males and, when mixed with pesticides, form the basis of the male annihilation technique (MAT) that is the primary control strategy. There is concern that the OFF lure, methyl eugenol, may be carcinogenic and will no longer be available for use in eradication programs. As long as MAT is available for area-wide suppression programs, permanent establishment of the pest is unlikely.

2.) Reduce the imminent threat of introduction or spread of Medfly and Mexfly from existing populations in Mexico.

To mitigate the risk of northward spread of fruit flies via Mexico, APHIS participates in cooperative programs:

- Medfly control program in southern Mexico and Guatemala (Moscamed Program).
- Mexican fruit fly detection and PRPs in Tijuana, Baja California Norte, and Reynosa, Tamaulipas areas of northern Mexico.

Medfly – Moscamed program:

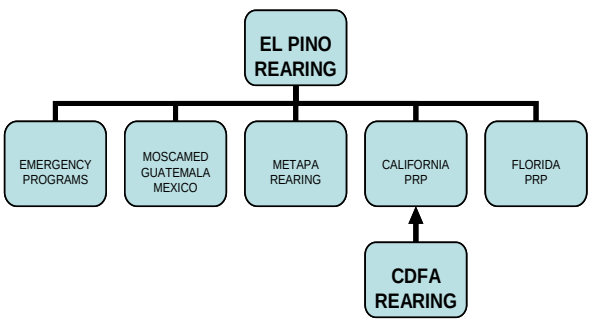
The establishment of Medfly in northern Mexico along the U.S. border would have a dramatic impact on our ability to protect the U.S. industry. We would expect an increase in introductions due to both natural and human-assisted movement. It is likely that even with increased detection and expanded sterile releases, repeated Medfly introductions would strain resources and disrupt markets much like the present situation in the Texas LRGV with Mexfly.

APHIS, in cooperation with Guatemala and Mexico, currently operates a Medfly management program, Moscamed, in the southern Mexican state of Chiapas and a portion of Guatemala. For the past 28 years, the program has successfully prevented the northern spread of Medfly closer to the United States.

The Moscamed program has a five-year plan with the goal of reducing the risk of Medfly infestations in Mexico by eradicating Medfly from Mexico and Guatemala. To accomplish this goal, the cooperative program is implementing an area-wide pest management strategy involving a range of field operations including the release of billions of sterile male Medfly each week. USDA contributed more than $30 million to fund the program in 2004. Lesser amounts have been contributed by Mexico and Guatemala. The cooperative program employs more than 1,000 workers in Mexico and Guatemala to conduct project activities.

The ultimate goal of the program is eradication of the Medfly from Central America. Although thought to be technically feasible, uncertainty and timing of funding, adverse weather, the abundance of coffee berries (a host) when coffee prices are low, social concerns with pesticide applications, and inconsistent commitment from cooperators have limited progress in eradicating the pest. However, the program is fully successful in maintaining a barrier to northern spread.

APHIS operates the El Pino sterile Medfly production facility in Guatemala. This is currently the largest sterile fruit fly production facility in the world, with a capacity of 3.5 billion sterile male pupae per week. APHIS has invested more than $21 million in the physical plant, which was built in 1995 and renovated in 2004. Approximately 500 Guatemalan employees work at the facility, which supplies the sterile Medfly needs for several control programs and other production



facilities (above). Sterile pupae for domestic PRPs and emergency control programs in the United States receive first priority.

Mexfly Offshore Activities:
APHIS partners with Mexico to conduct a Mexfly PRP in northern Mexico, adjacent to high risk areas along the U.S. border. The goal of this program is to reduce the risk of Mexfly introduction into California and Texas. The program involves the weekly release of approximately 16 million sterile Mexfly produced by a Mexican production facility (Moscafruit) located in Tapachula, Chiapas, and released over the Municipality of Tijuana, Mexico, and 12.5 million sterile Mexfly from the APHIS production facility for release in Reynosa, Tamaulipas. Mexico provides both land and a facility in Reynosa for an emergence center and staging area. Traps are monitored by APHIS in both locations to ensure quality and to act as an early detection system for approaching exotic fruit flies. In 2004, APHIS spent more than $1 million on this effort, and the APHIS Mexfly sterile production facility in Mission, Texas contributed sterile flies valued at $200,000.

In 2005, this SIT program was expanded to the LRGV of northern Mexico to suppress the Mexfly population in a 25-mile band along the entire shared border of Texas and the Mexican state of Tamaulipas. APHIS will spend approximately $600,000 per year on the release effort, and Mexico SENASICA will contribute 16 million sterile pupae per week.

Enhanced Detection in Mexico:
Consistent with the principle that early detection is the best protection, APHIS cooperates with Mexico to conduct a detection program for exotic fruit flies near the U.S. border. This activity is complementary to the fruit fly detection program operated by Mexico. The program proved its value with the discovery of a Medfly outbreak in Tijuana in late 2004. The detection allowed for a rapid emergency response and successful eradication with very limited impact on U.S. and Mexican agriculture. Molecular analysis determined that the origin was likely Central America. Its occurrence reinforces the need for added vigilance in Mexico for all exotic fruit flies and supports the goal of eradication of Medfly from Central America.

3.) Mitigate the impact of exotic fruit flies established in portions of continental U.S., Hawaii, and U.S. territories.

Several exotic Fruit Fly species have established in the United States. These include: Medfly, OFF, melon and solanum fruit fly in Hawaii; Caribbean fruit fly (*Anastrepha suspensa*) in Florida; olive fly (*Bactrocera oleae*) in California; and West Indian Fruit Fly (*Anastrepha obliqua*) in Puerto Rico. APHIS activities focus on mitigating the impact of these species and in trade facilitation. In Hawaii, APHIS provides technical assistance through methods development and detection surveys in support of a USDA Agricultural Research Service (ARS)-sponsored suppression program. In Florida, APHIS monitors a Caribbean fruit fly management program to satisfy phytosanitary requirements of export market countries. APHIS works with CDFA and ARS to identify potential biological control agents for the olive fly.

4.) Encourage development of exotic fruit fly detection and management programs in the Caribbean Basin and Central America to act as an early warning system and further reduce the risk of introduction.

The presence of West Indian fruit fly in the Caribbean and the Carambola fruit fly (*Bactrocera carambolae*) in Surinam establishes the Caribbean Basin as an area of concern. APHIS encourages and provides technical support in the development of exotic fruit fly detection systems by Caribbean nations. APHIS is also exploring the development of biological control programs to suppress *Anastrepha* species populations of concern.

5.) Reduce risk of entry of exotic fruit flies, especially Medfly, through technical support for fruit fly risk reduction activities worldwide.

APHIS cooperates with international organizations and countries worldwide to reduce the threat of introduction of pest fruit flies into the United States. We provide technical experts in survey, regulatory, and control to support development of fruit fly management programs and technology transfer. In addition, we provide sterile Medfly to support SIT programs in Israel. We also ascribe to free-area and low-prevalence concepts to encourage fruit fly management in foreign countries and subsequent reduced risk to the United States.

Fruit Fly Exclusion and Detection Program Goals for FY 2006 through FY 2010

The domestic and offshore activities that make up the integrated fruit fly exclusion and detection (FFED) programs are accomplishing the APHIS mission. The U.S. mainland is free of Medfly. Mexican fruit fly establishment is limited to the Lower Rio Grande Valley of Texas. We have detected OFF frequently but have successfully prevented OFF and other occasional *Bactrocera* introductions from establishment.

However, the FFED program is being challenged every day. For example, from September 2004 through November, 2005, APHIS and various cooperators experienced the following detections:

- In California, two Medfly outbreaks have occurred;
- In Tijuana, APHIS partnered with Mexico to combat a Medfly outbreak that extended to within 3 miles of the U.S. border with California;
- In the Texas LRGV, a single detection of Sapote fruit fly (*Anastrepha serpentina*) occurred;
- In California, a number of exotic fruit fly species were detected including a single detection of West Indian fruit fly, two detections of Mexfly, nine detections of guava fruit fly (*Bactrocera correcta*), and eight detections of OFF in 16 distinct areas of the state.

APHIS recognizes that it is not a matter of whether we will have another fruit fly outbreak, but when. During the next five years, APHIS intends to bolster its capacity to meet this challenge and prevent establishment of exotic fruit flies by accomplishing the following initiatives:

1.) Enhance detection and response capabilities and strengthen preventive release programs (PRPs).

APHIS has recently conducted reviews of its national detection and PRPs. Recommendations must be implemented to ensure that national and international standards are followed in all U.S. states and territories. The recommendations include:

1) For detection:

- Harmonize technical criteria of international, national, and State surveillance protocols,
- Harmonize fruit fly trapping terminology across the United States,
- Upgrade surveillance programs to meet national and international standards,
- Conduct pest risk analyses to identify pathways and high risk areas for species of the genus *Bactrocera* and fine tune trapping system accordingly,
- Implement the use of the Multi-lure trap as the standard trap for synthetic food lures and protein baits,

- Improve communications and exchange of information,
- Develop a capacity for DNA analysis of target species,
- Develop diagnostic technologies to discern wild from sterile fruit flies.

2) For PRPs:

- Develop standard operating procedures for detection and identification under PRPs,
- Integrate trapping data from the Mexican side of the border into the system,
- Develop and standardize specifications and requirements for diet material contracts,
- Implement strain development/maintenance protocols,
- Implement the use of eclosion towers in fly emergence facilities. Eclosion towers are a new, more efficient means of facilitating the transformation of an immature stage (pupae) to an adult, winged, fly.
- Introduce fly preconditioning agents such as ginger oil into eclosion process,
- Review current sterile fly release rates and determine optimum numbers for specific situations,
- Conduct efficiency reviews on aerial operations and cost of producing sterile flies.

The recent increase of *Bactrocera spp*. introductions, coupled with potential loss of methyl eugenol for survey and control, dictates increased attention to this species. Diagnostic capacity, alternative and improved survey and control technologies, and methodology to mass produce sterile pupae are needed. APHIS believes that Hawaii provides an excellent natural laboratory for research and development to address national and local fruit fly needs. To enhance our ongoing research efforts in Hawaii, we are currently contracting to build a $3 million facility to house the APHIS Fruit Fly Genetics and Management Laboratory. In addition, APHIS is expanding fruit fly detection activities in Hawaii to serve as an early warning for the introduction of new exotics and support local management of established species.

With the closing of the APHIS Fruit Fly Production Facility in Waimanalo, Hawaii, the El Pino rearing facility in Guatemala is the sole APHIS source of sterile Medfly. APHIS needs a stable, secure source of sterile Medfly to backup production at El Pino, and to ensure the integrity of Medfly sterile release and/or eradication programs. Mexfly sterile release and emergency programs are just as vulnerable because the Mexfly rearing facility in Mission, TX, is the sole APHIS source. The construction of a backup facility for production of exotic fruit flies will require several years to plan, acquire significant additional resources, erect, and commence operations. The first step is to determine the best location whether in the United States or abroad. An analysis is in progress to determine the suitability of potential sites based on several criteria including pest risk, ease of transportation and distribution, and resource needs for construction and maintenance.

2.) Ensure Medfly does not move north of the State of Chiapas, Mexico.

The Moscamed technical advisory committee concluded that recent reintroduction and northern spread of Medfly in Chiapas, Mexico, during 2005 is related to a number of factors, chief among them is the amount and timeliness of funding. Inability to apply chemical treatments and conduct quality surveys in 2005 resulted in an increase of Medfly outbreaks in previously free areas. Reliance on uncertain emergency funds has severely impacted the ability of Moscamed managers to plan and implement an effective program. Funding and management issues must be stabilized to, at a minimum, successfully maintain a barrier in southern Mexico, and, ultimately, eradicate the pest from Central America.

3.) Eradicate Mexfly from Texas and northern Mexico along the Lower Rio Grande Valley (LRGV) and maintain the area free of reintroduction.

Increased urbanization along the LRGV in Texas has introduced more hosts in backyards that are in close proximity to commercial citrus groves. This has resulted in increased Mexfly populations that jeopardize management programs that facilitate the movement of commercial citrus. These Mexfly populations pose an increased risk for spread of this important economic pest to other States. Shipping protocols are challenged earlier in the shipping season, and neighboring citrus producing states are detecting larvae in Texas shipments more frequently.

Eradication of the Mexfly in the LRGV is complicated by the threat of repeated reintroduction from Mexico into the United States. Recently, Mexico has taken an interest in cooperating with the United States to eliminate Mexfly populations in northern Mexico and create new opportunities for agriculture on both sides of the border.

Implementation strategies:

APHIS has developed a number of strategies to achieve its goals.

Goal 1: Enhance detection and response capabilities and strengthen preventive release programs.

- Implement recommendations of the National Exotic Fruit Fly Surveillance Program review. Ensure national and international standards are followed in all U.S. states and territories.
- Complete implementation of the National Preventive Release Programs review recommendations.
- Conduct periodic reviews (every 4 years) of detection, response, and preventive release programs to ensure cost effective use of best technologies and methodologies.
- Develop alternative control technologies such as SIT for *Bactrocera* species.
- Provide stable and secure sources of sterile Medfly and Mexfly in order to ensure emergency preparedness.

Goal 2: Ensure Medfly does not move north of the State of Chiapas, Mexico.

- Stabilize U.S. Moscamed Program funding by minimizing reliance on emergency funding. Explore alternative sources to appropriated funding both in the United States and from international donors.
- Form an international commission with Mexico/Secretariat of Agriculture, Livestock, Rural Development, Fisheries, and Food (SAGARPA) to ensure long-term joint management of the Moscamed Program activities in southern Mexico.
- Continue to work closely through the Moscamed Program with the Guatemala Ministry of Agriculture to fortify field activities and continue the production of sterile flies in the El Pino facility.
- Conduct periodic reviews of strategies, tactics, technologies, and administration to ensure cost efficient and effective operations. Enhance quality assurance and quality control processes and activities.
- Cooperate with Mexico to enhance the exotic fruit fly detection program throughout Mexico to assure effectiveness of Moscamed program and serve as early warning system for all exotic fruit flies.

Goal 3: Eradicate Mexfly from Texas and northern Mexico along the Lower Rio Grande Valley (LRGV) and maintain the area free of reintroduction.

- Augment the current Mexfly PRP using SIT and implement survey, regulatory, and control activities to eradicate Mexfly from Texas.
- Ensure that the Mexfly PRP and complementary suppression program activities in Reynosa, Tamaulipas, Mexico, maintain an adequate, ongoing sterile release program.
- Implement an ongoing Mexfly PRP in the LRGV to prevent reintroduction.
- Develop new and improved regulatory pre- and post-harvest treatments for Mexfly
- Conduct periodic reviews of strategies, tactics, technologies, and administration to ensure cost efficient and effective operations. Enhance quality assurance and quality control processes and activities.
- Develop strategies to collaborate with Mexico on its plan to establish northern Mexican states as free of Mexfly.

Budget and Allocation of Resources

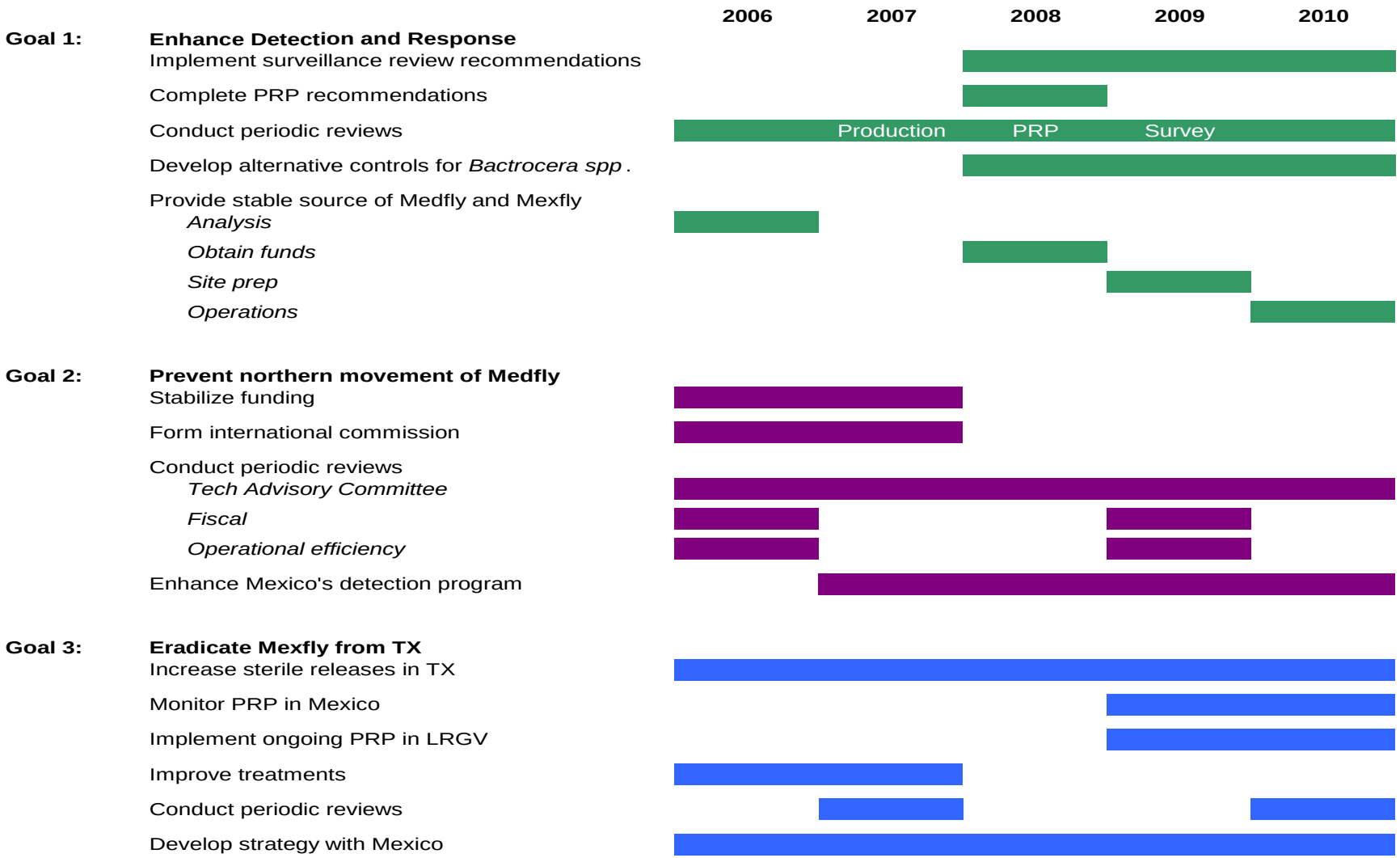
Congress recognizes the importance of fruit fly activities and, in 2005, appropriated more than $57 million per year to implement risk management programs. APHIS allocates these resources to an integrated system of detection and emergency response, preparedness and prevention, and mitigation and recovery activities. The current system has been successful in preventing establishment of exotic fruit flies and protecting susceptible fruit and vegetable crops. However, the system is being challenged by the increasing movement of people and host commodities.

APHIS allocated these resources among five main programs under the Fruit Fly Exclusion and Detection line item:

- Detection programs in 10 states & Puerto Rico
- Medfly PRPs in California and Florida
- Mexfly suppression in Texas
- Mexfly detection and SIT in northern Mexico
- Medfly control in Mexico and Guatemala

Table 1. FFED Programs: Resource Distribution, Fiscal Year 2006		**Goal**
Program	**APHIS Funding ($ millions)**	
Detection Programs in 10 States and Puerto Rico	21.386	1
Medfly (*Ceratitis capitata*) PRPs in California and Florida	8.227	1
Mexfly *(Anastrepha ludens)* Suppression Program in Texas	3.666	3
Mexfly Detection and SIT in Northern Mexico	2.13	3
Medfly Control in Mexico & Guatemala (Moscamed)	24.567	2
TOTAL	**59.976**	

APHIS Exotic Fruit Fly Goals: Activity Timeline



Performance Measures

APHIS will use two measures to track whether it is achieving the overall mission:

- The number of introductions resulting in a quarantine
- The size of the quarantines (in square miles)

To maximize program performance, program managers use a variety of other efficiency and impact measures, such as time to initiate an emergency response, time to declare an area free of threat, total cost to eradicate an outbreak, and economic impact of quarantines on trade.

For the Moscamed program, performance is measured by the ability of the program to maintain the Peten in Guatemala and the previously eradicated areas of Chiapas, Mexico, free of Medfly. Specific measures of performance would include the number of detections of target species made in survey operations, the number of these detections that do not result in a quarantine action, and the number, size, and scope of the quarantine actions that do occur.

APHIS will monitor progress in achieving the suppression of the Mexfly population in the Lower Rio Grande Valley. If funding is available, the plan projects eradication of Mexfly in Texas after three years of program actions. Specific measures of suppression or eradication progress will include the number of detections and the number of quarantine actions triggered by the detections. APHIS will also measure how well the program facilitates trade by tracking the amount of fruit certified to move from the regulated area. APHIS will track the program efficiencies by quantifying the cost to eradicate Mexfly outbreaks and the economic impact of quarantine actions. For the Mexfly SIT projects in Tijuana and Reynosa, program performance will be measured by the quality and timeliness of the planned sterile Mexfly releases. It will also be important to track efficiency measures, such as unit costs for releases ($ per million steriles released).

APHIS fruit fly production facilities will produce a high quality, low cost supply of sterile flies for SIT programs, in compliance with the international manual for the quality control of mass-produced fruit flies. Quality and cost results should be made available to interested parties routinely.

APHIS will monitor progress toward achieving a 7 percent reduction in the costs of producing and releasing sterile fruit flies in its associated fruit fly programs. APHIS will develop a new cost-efficiency equation based on gross expenditures and the release of sterile flies (including diet material, utilities, personnel, transportation, etc). These variable costs of production are a useful measure of the relative efficiency of a sterile fruit fly facility.

APHIS effectiveness in managing and operating fruit fly production facilities will be measured by the consistency in meeting weekly production targets and the ability to meet extraordinary seasonal targets to offset changes in field status.

Linkage to APHIS Strategic Mission Objectives

APHIS Mission Objective 2: Strengthen emergency and homeland security preparedness and response.

> Priority 1: Prevent individual exotic fruit fly introductions from becoming established populations.

APHIS Mission Objective 4: Reducing domestic threats through increased offshore threat assessment and risk-reduction activities.

> Priority 2: Reduce the imminent threat of introduction or spread of Medfly and Mexfly from existing populations in Mexico.
>
> Priority 4: Encourage development of exotic fruit fly detection and management programs in the Caribbean Basin and Central America to act as an early warning system and further reduce the risk of introduction.
>
> Priority 5: Reduce the risk of entry of exotic fruit flies, especially Medfly, through technical support for fruit fly risk reduction activities worldwide.

APHIS Mission Objective 5: Managing issues related to the health of U.S. animal and plant resources and conflicts with wildlife.

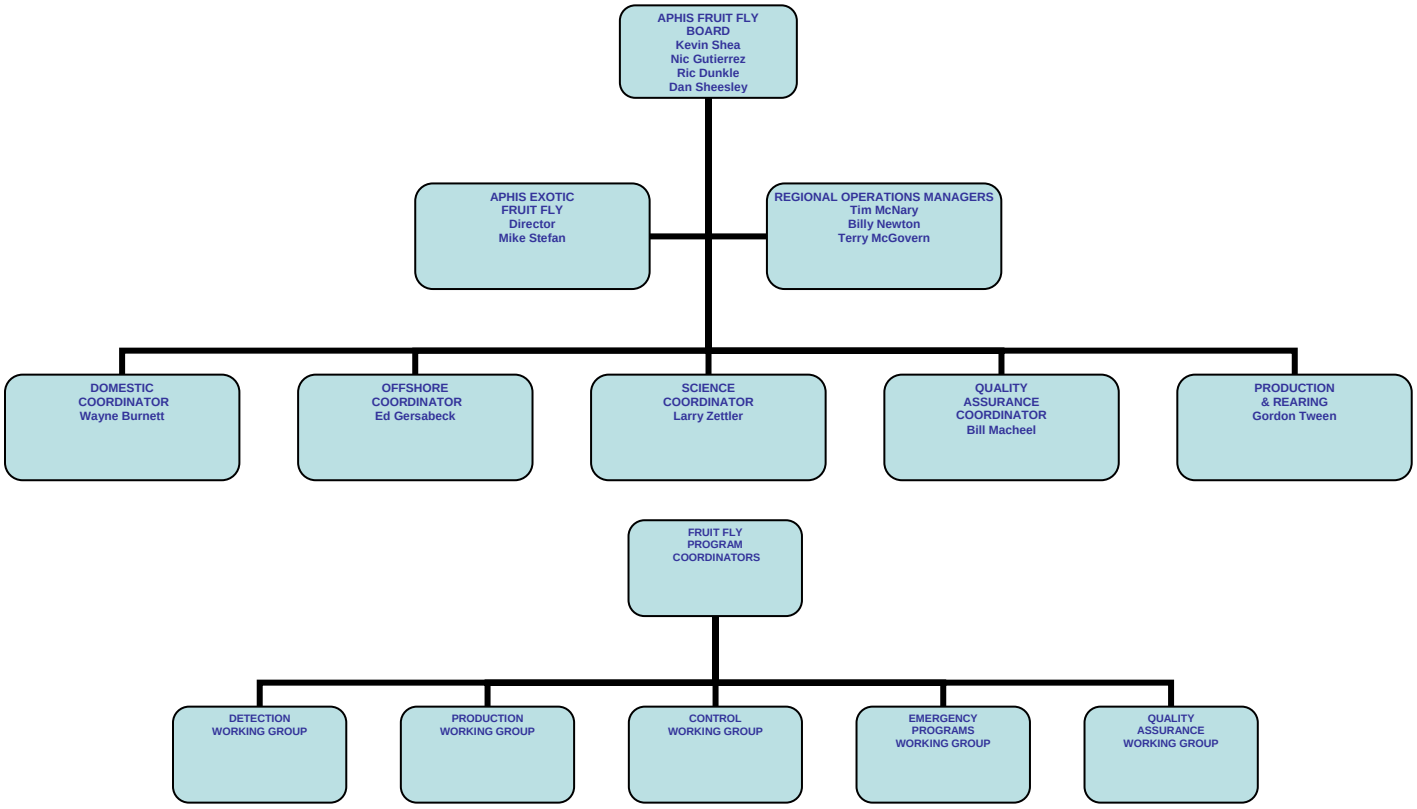
> Priority 3: Mitigate the impact of exotic fruit flies established in portions of the continental U.S., Hawaii, and U.S. territories.

Organization and Staffing

Management Goal:
Effective workforce planning to manage resources within the safeguarding program network that is proportional to the associated degree of risk.

APHIS formed the Fruit Fly Program Executive Board as a policy setting and coordination group that provides Federal leadership for the exotic fruit fly safeguarding system. Continued success of this system is dependent upon distribution of resources within the safeguarding program network, according to the associated degree of risk. Based on an assessment of the current program components and anticipated fruit fly threats, the APHIS Fruit Fly Program Executive Board has identified a number of initiatives to strengthen current system components and provide additional safeguarding measures. To set proper priorities the board envisions an ongoing dialogue among all stakeholders, with a continuous cycle of risk analysis, program reviews, and joint planning. The Board has appointed a Fruit Fly Program Director to work with regional operations managers and individual fruit fly program coordinators to implement Fruit Fly Exclusion and Detection program activities. Cooperators and stakeholders will provide input through various workgroups.

APHIS FRUIT FLY PROGRAMS MANAGEMENT STRUCTURE



Scientific Support

Central to the APHIS fruit fly safeguarding system is an integrated research and technical consortium for the advancement of mass production principles and enhancement of detection and control strategies for exotic fruit flies. The APHIS Center for Plant Health Science and Technology (CPHST) has primary responsibility for technology development. APHIS will prioritize resources to first focus technological developments on three primary initiatives:

- Implementation of the mass-rearing of transgenic sterile strains of fruit flies
- Release of bio-control agents to augment the SIT programs
- Implementation of bait stations and similar attract and kill applications for the control fruit fly population

Fundamental to implementation of efficacious technological support of domestic and international detection, emergency response, and preventive release programs directed at exotic fruit flies are the following critical issues:

Detection technology: APHIS seeks to reduce the number and severity of exotic fruit fly outbreaks within the United States through the detection of incipient populations prior to spread beyond the original point of introduction. In order to achieve this goal, sensitive detection systems must be available and their deployment optimized. APHIS plans to concentrate on the optimization of sensitivity of detection trapping systems for Medfly and calibrate the trap density and arrays for monitoring under Medfly PRP and eradication programs. Other technological advances required for the future development of detection tools include formulations of species- and sex-specific attractants, effective toxicants, and efficient traps. Identification of captured adults and intercepted immature larvae is essential to the deployment of appropriate response activities.

Population suppression technology: APHIS seeks to deploy the most efficacious technology available to achieve population reduction in exotic fruit fly suppression and eradication programs. APHIS plans to concentrate technology development on the following for fruit fly population suppression:

- Evaluation of transgenic strains for mass-rearing of tephritid fruit flies including novel technologies for population suppression based on species-specific genetic manipulation.
- Operational support for the fruit fly production and eclosion facilities.
- Evaluation of augmentative releases of Broconid parasitoids.
- Development of Medfly bait stations/attract and kill applications.
- Refinement of day degree models for fruit flies.
- Development of a new SIT aerial release machine.

Other technological advances in population suppression technology include optimization of irradiation dose, species-specific application of sterile insect technology, residual pesticides and toxic baits, male annihilation, and biological control as components of an integrated program.

Risk mitigation: APHIS seeks to define the identity of intercepted exotic fruit flies and high risk pathways for their introduction and will concentrate efforts to develop molecular diagnostic techniques and tools that identify foreign sources of fruit fly pest introductions, especially Oriental fruit fly. Molecular diagnostic methodologies are central to accurate identification of adult and immature specimens from closely related species. Determining the point of origin and relatedness of intercepted specimens relies on an extensive database of species-specific molecular information from all potential source populations.

Risk assessment and quality assurance: APHIS will conduct a pest risk assessment to identify susceptible areas of the United States capable of supporting the establishment of populations of fruit flies of the genus Bactrocera, APHIS also seeks to establish a quality assurance system for all fruit fly program activities to ensure that standard operating procedures are consistently applied. Quality control is fundamental to the operation of effective and efficient operational programs.

Data and Communication systems: APHIS plans to develop a GIS application and electronic field capture system to support the Mexfly eradication program in the Lower Rio Grande Valley. APHIS also seeks to incorporate the most effective and efficient technology into the safeguarding system strategy directed at exotic fruit flies by quickly and smoothly transferring newly developed technologies to field applications . Communication linkages and processes for identifying research needs and coordinating technology development activities are fundamental to meeting this goal.

Associated Safeguard Measures

The fruit fly exclusion and detection program is just one component of a safeguarding continuum of activities that directly or indirectly supports the primary mission to protect U.S. agriculture from the establishment of exotic fruit flies.

Preclearance activities and offshore fruit fly management systems address the issue of long distance introduction at origin. The Offshore Pest Information System (OPIS) provides advance information on distribution and trends concerning fruit fly populations in other countries that allow APHIS to adjust port clearance activities and detection programs in response. APHIS participates fully in and provides leadership to international plant health organizations (International Plant Protection Convention, North American Plant Protection Organization, and the International Atomic Energy Agency) that develop phytosanitary standards that countries follow to maintain plant health. APHIS regulates commodity imports and products carried by travelers entering the United States. APHIS works together with the Department of Homeland Security to set policy regarding the implementation of phytosanitary measures for imported fruit fly host commodities and cargo. APHIS conducts market inspections and gathers market information that helps to identify high risk pathways. APHIS also investigates cases of illegal entry of fruit fly host material and fines offenders to deter illegal movement. APHIS conducts pathway risk assessments to identify potential pathways for fruit fly entry. Public outreach and awareness programs educate the public on the potential damage and impacts of moving host commodities. Efforts to implement National Incident Management System and integrate the Incident Command System provide enhanced response capabilities and preparedness for when fruit fly outbreaks occur.

Role of Cooperators and Stakeholders

Operating the safeguarding system and maintaining its program components in proper balance requires the coordinated assistance of many government agencies and stakeholder groups. This plan reflects a fully integrated USDA partnership among APHIS International Services (IS), APHIS Plant Protection and Quarantine (PPQ), and the Agricultural Research Service (ARS). The network extends beyond USDA to include foreign plant protection organizations, other Federal agencies, State Departments of Agriculture, the U.S. fruit and vegetable industry, and the general public.

All APHIS fruit fly activities are cooperative in nature. APHIS has cooperative agreements and Memorandums of Understanding with States to conduct detection programs, implement Medfly and Mexfly preventive releases and control programs, share

resources, and jointly respond to fruit fly outbreaks. APHIS also partners with foreign governments to implement offshore activities. Mexico and Guatemala have cooperative agreements with APHIS to implement the Moscamed Regional Eradication Project. APHIS has international trust fund arrangements in several countries to fund pre-clearance certification programs that facilitate safe export of fruit fly host commodities to the United States. Roles and responsibilities are determined for each activity as dictated by legal authorities, expertise, administrative and technical strengths, and available staff, resources, and equipment.

Other Federal agencies are also involved. The ARS conducts cutting edge research on fruit fly issues and provides advice regarding implementation of action programs. In addition, ARS operates a fruit fly suppression pilot project in Hawaii. This has enabled some Hawaii producers to increase production of fruit fly host commodities for local consumption. The Environmental Protection Agency and APHIS work together to provide chemical tools that are both effective and safe to the public environment.

Industry stakeholders are involved in the implementation of action programs providing information and input into APHIS regulations and fruit fly action programs. Industry also funds research on projects that have a direct application and impact on the success of action programs.

Researchers from academic and other institutions and organizations are dedicated to resolving fruit fly issues and provide deliverables that enhance the current program operations.