United States Department of Agriculture

FRUIT FLY EXCLUSION AND DETECTION

STRATEGIC PLAN

FY 2019-2023

Animal and Plant Health Inspection Service

Fruit Fly Exclusion and Detection Program

Riverdale, MD 20737

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Cover images of Mexican fruit fly and Mediterranean fruit fly courtesy of USDA ARS Photo Unit

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Mission

The mission of APHIS' Fruit Fly Exclusion and Detection (FFED) Program is **to protect the health and value of American agricultural resources threatened by the establishment of non-native fruit fly populations.**

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. Tephritid fruit flies spend their larval stages feeding and growing in more than 400 host plants. Introduction of these pest taxa 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 tephritids become obstacles to agricultural diversification and trade when pest fruit fly species are present.

Program Focus

APHIS is concerned with two main types of entry risk associated with non-native fruit flies:

- Risk associated with the entry into the United States of infested fruit or vegetables from fruit fly infested countries distant from our borders, including infested fruit or vegetables of non-Canadian origin entering via the Canadian border.
- The risk of the northward spread of non-native species into the United States via Mexico and the Caribbean and the eastward spread from Hawaii of fruit fly pests established on the islands but not in the continental United States. Mexico is an especially high-risk pathway due to the shared border and immigration from fruit fly-infested areas of Central America and Mexico to the United States. The Caribbean has recently become infested with Medfly, increasing the risk of spread into Puerto Rico and Florida.

Changes in the diversity of species of fruit flies detected domestically have broadened the focus of the FFED Program:

- Although Mediterranean fruit fly (Medfly) and Mexican fruit fly (Mexfly) are currently the primary focus of APHIS domestic and offshore activities, *Bactrocera dorsalis (*Oriental fruit fly or OFF) and other species in this genus are serious potential threats to U.S. industry. In the past decade, OFF detections in California and Florida have increased by 35 percent over the previous decade, demonstrating the potential for establishment and spread of this pest.

- Along with Medfly, three other non-native species have become established in Hawaii, *Bactrocera cucurbitae* (melon fly), *B. latifrons* (solanum fruit fly), and OFF, and are a constant threat to the U.S. mainland. The solanum fruit fly recently invaded California, leading to the first U.S. quarantine of this fruit fly species.
- The olive fruit fly, *B. oleae* recently became established in commercial olive production and ornamental plants in California and threatens virtually all commercial and fruit-bearing ornamental olive plantings. *B. invadens,* more recently determined to be synonymous with the *OFF*, has spread rapidly through the Near East and Africa and threatens to colonize areas of the western hemisphere as other non-native pests from these areas have done over the years. In addition, *B. carambolae* (carambola fruit fly), which invaded and became established in South America in the 1990's from Indonesia, was detected in Puerto Rico in 2015. This was the first northern hemisphere record for this species and indicates the potential for invasion from its current range in northern South America. Another unexpected invasive *Bactrocera* species in the *Bactrocera* tau-group was recently detected in 2016.
- In September 2017, the European cherry fruit fly (ECFF; *Rhagoletis cerasi*) was detected for the first time in the United States in Niagara County, New York. This followed Canada reporting detection and establishment of this pest in 2016 in Ontario. ECFF attacks cherry but also native plants such as honeysuckle (*Lonicera*) and snowberry (*Symphoricarpos*) species in the family Caprifoliaceae, making it difficult to eradicate in unmanaged and natural areas.
- Increasing trade with China and other countries necessitates the development of work plans and systems approaches to mitigate the risk of non-native fruit flies making entry. Discussions on work plans require involvement of FFED subject matter experts to address how to properly mitigate the pathways.

Approach

APHIS responds to non-native fruit fly risks with an integrated system that incorporates domestic and offshore surveillance activities; fruit fly control programs; interpretation of exclusion risk data to implement port of entry mitigation; and regulatory actions. This multi-tactical approach is the product of close collaboration and consultation between APHIS and its fruit fly program cooperators and stakeholders.

Coordination

The implementation of this plan is dependent upon a fully integrated USDA partnership among APHIS International Services (IS), APHIS Plant Protection and Quarantine (PPQ), and the Agricultural Research Service (ARS). This network extends beyond USDA to include foreign plant protection organizations. APHIS cooperates with and provides technical assistance to a number of foreign governments to conduct fruit fly programs. These include the governments of Mexico, Guatemala and Belize for the MOSCAMED Program; the government of Mexico for the Mexfly programs along the Mexican border; and the Greater Caribbean Plant Health Directors, including Organismo Internacional Regional de Sanidad Agropecuaria (OIRSA), whose area of coverage includes the Caribbean region, as well as Central and northern South America. 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. APHIS participates with international organizations, such as the International Atomic Energy Agency (IAEA), International Plant Protection Convention (IPPC), and North American Plant Protection Organization (NAPPO), to further technology development and to develop standards for fruit fly programs. Domestically, APHIS cooperates with other federal agencies such as the Department of Homeland Security's Customs and Border Protection; state departments of agriculture; universities; tribal nations; U.S. fruit and vegetable industries; and the general public.

All APHIS fruit fly activities are cooperative in nature. APHIS has cooperative agreements and memorandums of understanding (MOUs) with states to:

- Maintain adequate detection programs;
- Implement Medfly and Mexfly preventative releases;
- Share resources; and
- Respond jointly to fruit fly infestations.

USDA APHIS Leadership

APHIS formed the Fruit Fly Executive Board (FFEB) as a policy setting and coordination group that provides leadership for the APHIS FFED Program and its current annual expenditures of nearly $80 million originating from domestic and Agriculture Quarantine Inspection (AQI) fund sources. The FFEB consists of the APHIS Administrator and Deputy Administrators from IS and PPQ. Continued success is dependent upon distribution of resources within the safeguarding program network according to the appropriate level of protection. Based on an

assessment of the current program components and anticipated fruit fly threats, the FFEB sets priorities and provides direction. The FFEB meets annually, with additional meetings if needed, with APHIS Directors involved in fruit fly activities to receive updates, and approve modifications in strategy and budgets, including sharing of the Specialty Crop Pests appropriation.

Additional Federally Funded Activities Supporting FFED Goals

This strategic plan focuses on the FFED Program. 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 AQI line item to support Hawaii and Puerto Rico pre-departure inspection programs. AQI user fees support regulatory inspection and identification activities at ports of entry accomplished by either DHS, CBP or APHIS PPQ. Other APHIS budget line items (AQI, Plant Methods, Pest Detection, Biocontrol and Farm Bill) support APHIS PPQ Center for Plant Health Science and Technology (CPHST) projects. Congress appropriates funds for USDA ARS to carry out research on non-native pests of concern, funding 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.

Authorities and Linkages to Other Plans and Initiatives

APHIS' FFED Program carries out mission activities under the authority of the Plant Protection Act of 2000 (7 United States Code (U.S.C.) 7701 et seq.). Additionally, APHIS programs support activities that are also directly or indirectly enhancing the mission of APHIS FFED Program, such as PPQ's Greater Caribbean Safeguarding Initiative, IS' Trade Support Team and International Technical and Regulatory Capacity Building, as well as established cross-cutting working groups, such as PPQ's Fruit Fly Pathway Taskforce.

This plan was developed with priorities that align with the USDA FY 2018-2022 Strategic Goals and Objectives and the APHIS FY 2019-2023 Strategic Goals and Objectives. See Appendix 1 for the specific goals and objectives.

Strategic Goals and Objectives

The strategic goals of the APHIS FFED Program consider the entirety of the safeguarding continuum from prevention at points of origin, exclusion at ports of entry, early detection through effective surveillance, and eradication or management, as appropriate. Additionally, APHIS must continue the innovative and forward-looking approach to enhance the facilities and tools available to the FFED Program.

The objectives and initiatives to be pursued under each goal are constrained by fiscal, scientific, and operational realities. The FFED Program budget has essentially remained flat, or slightly reduced, for the last six years. This static budget and increasing costs due to inflation and increased costs of supplies, materials, and contracts have reduced the overall ability of the program to keep up with expanding program needs. Additional resource requirements include those needed for the increased number of fruit fly outbreaks, incursions of novel non-native fruit flies, and expanding urban areas that need to be surveyed and assessed on a regular basis. The program continually focuses efforts on identifying ways to improve efficiency to enable the continued success of the FFED Program and to optimize resources.

Collaboration and communication is also an overarching component of the FFED Program. For example, efficient and effective SIT implementation requires continuous cooperation and consensus within APHIS and with our domestic and foreign cooperators. Additionally, domestic management and eradication programs draw on expertise and personnel from APHIS and our state partners to ensure that they are conducted in a manner that incorporates the nuances of the impacted industry and geographical area.

Goal 1: Strengthen domestic surveillance and response capabilities to ensure early detection and timely mitigation of non-native fruit fly infestations.

Goal 2: Support and improve exclusion activities at the ports of entry and manage targeted and effective preventative release programs.

Goal 3: Strengthen the offshore regional approach to maintain effective barriers against the establishment and spread of Medfly in Mexico, Belize, and the Caribbean, and to suppress Mexfly populations along the U.S.-Mexico border.

Goal 4: Advance the FFED Program by enhancing APHIS infrastructure, partnerships, scientific collaborations, and communication.

Goal 1

Strengthen domestic surveillance and response capabilities to ensure early detection and timely mitigation of non-native fruit fly infestations.

It is critical that individual introductions be detected, evaluated, and, if deemed 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. Early detection is critical to reducing the scale of the infestations and therefore to increase the chances of successful and quick eradication and reduce the size and duration of regulatory quarantines.

Although the successful eradication of introduced fruit flies occurs each year, 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.
- Established populations of pest fruit fly species with limited distributions within the United States pose a constant threat to fly-free or low pest prevalence areas.
- The origins and nature of *Ceratitis*, *Bactrocera*, and *Anastrepha* species introductions to the United States are not fully understood.
- Lures and toxicants for detection and control (e.g. attract and kill and male annihilation) programs are not available for all species of concern (e.g., *B. minax*). Existing and future lures and toxicants must comply with current environmental mandates.
- Aerial applications of bait sprays are unpopular with the urban public and sometimes restricted by the manufacturers.
- The Sterile Insect Technique (SIT) is a species-specific population eradication tool that has been developed for only a limited number of species.

Objective 1.1: Maintain an effective detection program based on periodic risk-based evaluations and emerging non-native fruit fly threats.

Tactics to achieve the objective:

- Maintain the detection system at appropriate trap type and densities, lure types, and service frequency based on risk-based annual evaluations.
- Improve APHIS trap and lure supply management to ensure timely ordering and quality control testing, proper inventory control, and appropriate and timely distribution to FFED Program work units.

Objective 1.2: Eradicate economically and environmentally significant fruit fly infestations within five lifecycles.

Tactics to achieve the objective:

- Ensure all legal approvals are in place and manufacturer labels are adequate for chemicals needed during eradication and quarantine programs in collaboration with

federal and state agencies, as well as chemical manufacturers and fruit and vegetable producers.

- Implement new bait stations, and similar attract and kill applications, for the control of fruit fly populations.
- Ensure adequate production levels of quality sterile Medfly and Mexfly are maintained to provide for eradication programs.
- Enhance emergency response capabilities through development of training exercises to improve consistency, speed, and effectiveness of responses led by Incident Management Teams.
- Update and consolidate existing species-specific action plans into a National Fruit Fly Action Plan.

Objective 1.3: Support efforts to improve the effectiveness and efficiency of detection, mitigation, and eradication to reduce regulatory burdens and impacts on growers.

Tactics to achieve the objective:

- Validate the effectiveness of fruit fly commodity treatments and systems approaches for fruit fly hosts.
- Evaluate and approve additional pesticide regimes for quarantine eradication and crop certification. This includes the use of Extension-recommended pesticides as part of a systems approach.
- Continue to include the New Pest Advisory Group (NPAG) process for novel fruit fly species incursions to evaluate economic and environmental significance and implications for trade and impacts on industry.
- Continue to identify and develop fruit fly pest mitigation measures and negotiate work plans for non-native tephritids that are difficult to eradicate or become established in the United States in order to protect U.S. growers by reducing trade impacts.

Operational Targets for Goal 1

- Percent of fruit fly trap and lure deliveries fulfilled within 30 days. Target is 100%.
- All expired lures currently in the warehouse removed by end of FY 2019.
- Develop a computer-based inventory system developed to provide accurate and up-to-date information by end of FY 2020.
- Number of comprehensive reviews of fruit fly detection programs in states with risk of fruit fly incursions and establishment. Target is 1 per year.
- Number of table top or full scale fruit fly eradication program exercise completed in a fruit fly state with infrequent incursions. Target is 1 per year.

Key Performance Measures for Goal 1

- Percentage of economically and environmentally significant fruit fly infestations eradicated within five lifecycles. Target is 100%.
- Square miles under quarantine within the United States as part of an eradication program. This includes all areas under quarantine at any time during the fiscal year, regardless of when the quarantine was initiated. Target is 500.
- Number of detection traps set in all states trapping for non-native fruit flies as part of routine surveillance. Target is 153,000.

Goal 2

Support and improve exclusion activities at the ports of entry and manage targeted and effective preventative release programs (PRPs).

There are multiple fruit fly introduction pathways into the United States through ports of entry and by people bringing in infested illegal or smuggled fruit fly host material. International direct and courier mail can move infested fruit directly into vulnerable areas. Increased trade and passengers into the United States have greatly strained the ability to exclude infested host material as proven by the numerous fruit fly outbreaks and quarantines each year. The Oriental fruit fly and other Asian fruit fly species are more frequently being detected and resulting quarantines have risen significantly in the United States due to increased trade with Asia. Genetic analysis is allowing analysts currently to help narrow down points of origin of these introductions and should lead to enhanced ability to work on specific Asia pathways and to develop possible partnerships off shore in Asia to reduce the risk in trade. Significant weather patterns and particularly the El Niño weather pattern that appears in the Western Hemisphere, have an influence on fruit fly populations and likely many other insect pests. It is documented that during an El Niño year, Medfly populations in South and Central America increase considerably, placing additional pest pressure on the United States. Fruit fly pathway analysis and enhanced exclusion of fruit fly host material from infested countries must be a high priority

in order to reduce the fruit fly pressure and quarantines that threaten agriculture production and valuable commodity exports.

There are many different state and federal units working on strengthening the exclusion network and evaluating pathways. The FFED will work cohesively with these units primarily through the Fruit Fly Pathway Task Force. This task force will be central in pulling the different entities and data sources together for evaluation and recommendations for risk committees and others.

Objective 2.1: Identify high risk pathways of pest introduction to improve coordination of safeguarding components.

Tactics to achieve the objective:

- Initiate the Fruit Fly Pathway Analysis Task Force to accomplish stated goals and objectives and begin evaluating domestic fruit fly detections for analyses, reports, and recommendations.
- Support efforts to develop a genetic library of global populations of fruit flies, intercepted flies at ports of entry, and flies captured as part of domestic surveillance to elucidate likely origins of fruit fly incursions to inform trace back activities.
- Evaluate interception records in pest identification databases to identify high risk pathways for particular species and geographic sources.
- Provide port risk committees with risk assessments or historical patterns on demonstrated fruit fly pathway risks to better target inspections at ports of entry, inform special operations, and support educational activities.

Objective 2.2: Evaluate and refine routine PRPs (Mexfly in Texas and Medfly in California and Florida) to ensure effectiveness and efficiency.

Tactics to achieve the objective*:*

- Evaluate geographic areas currently considered high risk for introduction of Medfly and ensure flight coverage and appropriate dispersal rates.
- Utilize Geographic Information Systems (GIS) and other trend analysis techniques to evaluate sterile fly recapture data to ensure correct release densities and distribution patterns are being met.
- Ensure adequate supplies of sterile fruit flies are available for program use and for emergency contingencies.
- Conduct a complete SIT Program Review during the period of the strategic plan.

Operational Targets for Goal 2

- Weekly reports provided for kilograms of fruit fly host material seized after inspection in buses, airports, road stations, and markets. Target is 52.
- Increase the number of records in genetic library that support characterization of specific global populations of fruit flies.
- Initiate a Fruit Fly Pathway Task Force to evaluate possible pathways for significant fruit fly introductions into the United States and neighboring regions. Target is 1.
- Number of weeks that pupae shipping requirements are met. Target is 52.

Key Performance Measures for Goal 2

- Number of eradication programs in the United States in areas under a PRP. Target is 0.
- Mexfly quarantines in commercial citrus-producing counties of the Lower Rio Grande Valley in Texas. Target is 0.

Goal 3

Strengthen the offshore regional approach to maintain effective barriers against the establishment and spread of Medfly in Mexico, Belize, and the Caribbean, and to suppress Mexfly populations along the U.S.-Mexico border.

To reduce the likelihood of non-native fruit fly introductions into the United States, APHIS continues to actively engage through communication and collaborative efforts in offshore management, eradication, and surveillance programs that reduce the threats at their source.

Conducting offshore programs is complex and challenging because:

- Invasive fruit fly species occur all over the world.
- Foreign governments with endemic populations of fruit flies not native to the United States do not necessarily concur with our need to mitigate risk to U.S. agriculture.
- The illicit traffic of drugs in Mexico and Central America can impede program operations.
- Outreach efforts of program operations in Mexico and Central America must use innovative means to reach a multi-cultural population.
- Delineating high risk pathways for introduction of pest fruit fly species requires the technology to accurately identify the introduced species and its origin.
- Expansion of international travel facilitates the movement of fruit fly host material and increases the approach rate of non-native 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 immigrants from fruit fly-infested areas.
- ♦ Medfly is now established in the Caribbean (Aruba and Curacao), posing an additional threat to nearby Puerto Rico and Florida.
- ♦ The demand for exotic fruits and vegetables continues to grow in the United States due to increasing popularity.

Objective 3.1: Support efforts to prevent the re-establishment of Medfly in Belize and Mexico.

Tactics to achieve the objective:

- Maintain strong collaborative relationships with Mexico, Guatemala, and Belize through continued participation in the leadership of MOSCAMED.
- Provide technical support and guidance to detection, eradication, and barrier programs.

Objective 3.2: Support development of a regional Caribbean surveillance network and emergency response plan for fruit flies of concern.

Tactics to achieve the objective:

- Provide subject matter expertise to initiatives related to non-native fruit fly detection and response plan development led by the Greater Caribbean Safeguarding Initiative Program and the Caribbean Plant Health Directors.
- Participate on strike teams as necessary as part of a coordinated, swift response to non-native fruit fly infestations.

Objective 3.3: Reduce pressure on the United States through effective detection and control measures, including PRP.

Tactics to achieve the objective:

- Continue to partner with Mexico to implement an effective Mexfly PRP and survey activities in northern Mexico, adjacent to high risk areas along the U.S. border.
- Maintain production of sterile Medflies for maintenance of a biological barrier in Guatemala and distribution to the United States in support of PRPs and eradication programs.

Operational Targets for Goal 3

- Evaluate the APHIS Medfly rearing strategy. Target is FY 2020.
- Finalize and realize the APHIS Mexfly rearing strategy to include the new Moore Air Base facility. Target is FY 2021.

Key Performance Measures for Goal 3

- Number of Medfly pupae produced at El Pino weekly. Target is 1 billion.
- Number of square kilometers identified as Medfly free area in Guatemala. Target is 40,000 km^2.
- Number of Medfly outbreaks in the Petén and Belize. Target is 0.
- Number of Medfly detections north of the State of Chiapas. Target is 0.
- Number of Mexican municipalities with on-going Mexican Area 1 APHIS fruit fly program activities. Target is 7.
- Number of Caribbean countries participating in fruit fly survey and reporting data. Target is 19.

Goal 4

Advance the FFED Program by enhancing APHIS infrastructure, partnerships, scientific collaborations, and communication.

Continual improvement is a hallmark of the FFED Program. APHIS must continue to leverage scientific advancements and field innovation to advance the program. To have effective tools to face the challenges in the future, we must remain forward-thinking. 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. New lures and traps need to be developed to enhance surveillance while also maintaining the highest regard for the safety and health of our personnel.

The APHIS FFED Program is in the process of renovating or replacing the current domestic fruit fly rearing and release facilities. These facilities are critical to maintain this key tactic for fruit fly prevention and eradication. Similarly, APHIS investments in facilities in Guatemala and Mexico should be protected by ensuring routine maintenance is conducted.

Partnerships and collaborations have been beneficial to address the Medfly and Mexfly fruit fly pathway from the Caribbean and Central American countries to the United States. Similar efforts should be made to enhance regional partnerships and explore opportunities for cooperative efforts related to fruit flies of concern within the Asia-Pacific region to address exotic fruit fly pathways into Guam, Hawaii, and ultimately the west coast of the United States.

Outreach and communication, both internally and externally, is important to advancing the FFED Program. We need to continually educate our stakeholders and the general public about the FFED Program, the threat from incursions of non-native fruit flies, and the value of exclusion and detection efforts to American agriculture so that we can enhance understanding and support for the program.

Objective 4.1: Replace, improve, and maintain SIT facilities to produce high quality sterile insects while incorporating operational efficiencies.

Tactics to achieve the objective:

- Complete all planned upgrades to the SIT facilities located in the United States over the next 5 years.
- Continue to evaluate and implement improvements to increase operational efficiency at all APHIS SIT facilities.
- Provide technical support for fruit fly production and emergence operations.
- Collect and review data collected from each facility as part of quality assurance.

Objective 4.2: Improve the detection systems for economically and environmentally significant fruit fly species.

Tactics to achieve the objective:

- Reinvigorate and maintain an active and efficient National Fruit Fly Trapping Committee to evaluate new detection systems.
- Develop additional trap and lure strategies that allow for improved efficiencies in the detection system, e.g., combination solid lures that may reduce overall trap sites.
- Approve for use in detection programs the combination solid lures currently being evaluated.
- Ensure effective traps and lures exist for emerging fruit fly threats.
- Continue to support advancements in morphological and molecular diagnostics of economically and environmentally important fruit fly species.
- Transfer the technology for the use of detector dogs to identify the presence of larvae and pupae as an additional surveillance tool in U.S. fruit fly programs.
- Develop an offshore regional approach in the Pacific to improve information sharing and collaborative initiatives on fruit flies of concern.

Objective 4.3: Develop and implement targeted outreach campaigns and engage stakeholders in discussions on the importance of the FFED Program.

Tactics to achieve the objective:

- Work with APHIS Legislative and Public Affairs and the PPQ communications team to develop targeted outreach and education efforts that utilize fruit fly pathway information to improve exclusion efforts.
- Develop a focused FFED outreach plan for selected U.S. industry groups.

Objective 4.4: Develop and implement advancements in fruit fly technology.

Tactics to achieve the objective:

- Maintain a Steering Committee of subject matter experts from APHIS, ARS, State cooperators and U.S. and international scientists to share knowledge, evaluate new technologies, and ensure technical components of the program remain state-of-the-art.
- Maintain a strong technology transfer program that identifies key partners and key projects with potential to improve the effectiveness and/or efficiency of the FFED Program.
- Develop Mexfly genetic sexing strains and other new SIT technologies.
- Develop alternative control technologies, such as SIT for *Bactrocera* species and mating disruption.
- Improve molecular and morphological methods for identification and determination of origin for non-native fruit flies.
- Develop new and improved regulatory pre- and post- harvest treatments.
- Develop new, more effective attractants for economically and environmentally important fruit fly species.
- Develop and register retrievable bait station technologies for use in urban, environmentally sensitive, and quarantine areas.
- Continue to develop, improve and implement male annihilation technique (MAT), e.g., optimize densities of STATIC™ Spinosad ME bait stations and validate melon fly MAT with specialized pheromone and lure application technology (SPLAT) in combination with methyl-eugenol (ME) and spinosad (=SPLAT-MAT-ME with spinosad). Support methods development activities to reduce costs and improve efficiencies of sterile fruit fly mass-rearing and release efforts such as improvements to sanitation protocols, diet formulations, egg and pupal recovery systems or adult marking, etc.

- Support the development and validation of non-native fruit fly host lists for use in eradication and quarantine programs.

Operational Targets for Goal 4

- New SIT facility completed and fully operational. Target is 1 in FY 2019 (Sarasota, FL) and 1 in FY 2021 (Moore Air Base, TX). Dependent on funding availability, 1 in FY 2023 (Los Alamitos, CA).
- New trap and combination lure strategy for fruit fly detection implemented by FY 2020.
- Mexfly genetic sexing strain developed by the end of FY 2023.

Key Performance Measures for Goal 4

- Number of outreach campaigns developed and executed per year containing messaging to the general public about risks posed by non-native fruit flies. Target is 1 per year.
- Number of outreach efforts to specific communities and stakeholders in areas containing active eradication programs. Target is 1 per eradication program.

Summary

Even with existing exclusion strategies, the APHIS FFED Program prepares for domestic outbreaks to ensure timely and effective responses. During the next five years, APHIS intends to bolster its capacity to meet this challenge and prevent the establishment of economically and environmentally important fruit fly species by accomplishing the objectives and tactics listed in this strategic plan.

The APHIS FFED Program has a rich history and the retirement of key experts provides a challenge to those assuming the mantle to learn from the past and maintain forward momentum. Knowledge transfer and succession planning are critical to learn and understand past decisions and the path we followed to get to where we are today.

The keys to continue moving the program forward are valuing, supporting, and investing in the personnel who play a role domestically or internationally; in policy management; field operations; and science and technology. We can't execute the tactics to achieve the objectives and meet the goals without having engaged and knowledgeable personnel. The commitment to developing, maintaining, and sharing expertise underpins this strategic plan.

Appendix 1

USDA Goals & Objectives that align with FFED Strategic Plan	
USDA Goals	**USDA Objectives**
USDA Goal 1: Ensure USDA programs are delivered efficiently, effectively, with integrity and a focus on customer service.	1.1: Modernize information technology infrastructure, facilities, and support services to improve the customer experience 1.2: Maintain a high performing workforce through employee engagement and empowerment. 1.3: Remove obstacles for participant in USDA programs by reducing regulatory burdens and streamlining processes. 1.4: Improve financial stewardship of resources and utilize data drive analyses to maximize the return on investment
USDA Goal 2: Maximize the ability of American agricultural producers to prosper by feeding and clothing the world.	2.3: Protect agricultural health by preventing and mitigating the spread of agricultural pests and diseases
USDA Goal 3: Promote American agricultural products and exports	3.2: Prevent or resolve barriers to trade that hinder U.S. food and agricultural exports.
USDA Goal 4: Facilitate rural prosperity and economic development.	
USDA Goal 7: Provide all Americans access to a safe, nutritious, and secure food supply.	

APHIS Goals & Objectives that align with FFED Strategic Plan	
APHIS Goals	**APHIS Objectives & Tactics**
APHIS Goal 1: Deliver efficient, effective, and responsive programs.	1.2: Maintain a high performing workforce through employee engagement and empowerment, and provide a safe workplace. • Tactic: Encourage innovation from employees to enhance workplace environment and mission delivery. • Tactic: Continue knowledge management initiatives to assist with succession planning.
APHIS Goal 2: Safeguard American agriculture.	2.1: Prevent damaging plant and animal pests and diseases from entering and spreading in the United States to promote plant and animal health. • Tactic: Maintain a sterile Medfly barrier in Guatemala preventing the northward movement into Chiapas, Mexico and the Yucatan, including Belize. • Tactic: Produce and provide sterile Medfly pupae to support preventative release operations in high-risk areas in Florida and California. • Tactic: Collaborate and work with states, foreign governments, and international partners to reduce risk pathways; support disease and pest-free zones and conduct animal and plant pest and disease pathway analyses and risk assessments; identify sources of introductions and determine mitigations to prevent new introductions; obtain timely information on pests, diseases, trends and changing risk patterns; monitor and prevent the spread and introduction of pests and diseases; and develop regional cooperation and awareness. • Tactic: Provide technical expertise and leadership to global and regional animal and plant health organizations in their efforts to support local, regional, and global pest and disease control and eradication efforts. • Tactic: Engage in capacity building activities to promote efficient use of exporting countries' Sanitary and Phytosanitary (SPS) infrastructure, technical capacities, and inspection processes to safeguard agricultural exports destined to the United States.
	2.3: Ensure effective emergency preparedness and response systems. • Tactic: Partner with stakeholders and customers to evaluate response options and update response plans, adjusting for changing agricultural production systems and societal expectations.

	• Tactic: Develop emergency preparedness response for pest and disease outbreaks that include ensuring response resources are available and personnel are trained.
	2.6: Provide and coordinate timely diagnostic laboratory support and services. • Tactic: Provide leadership and coordinate with other partners on diagnostic techniques, assays, and new technologies including scientific computing to support greater use of genomics and bioinformatics.
APHIS Goal 3: Facilitate safe U.S. agricultural exports	3.2: Ensure resolution of sanitary and phytosanitary issues and trade barriers. • Tactic: Conduct technical meetings with trading partners to establish fair, practical, science-based plant health requirements for commodity imports and exports.