United States Department of Agriculture
Animal & Plant Health Inspection Service

Mediterranean Fruit Fly Preventive Release Program

2014 Review of Sterile Insect Release Facilities

Sarasota, Florida & Los Alamitos, California

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Executive Summary

The review team found that both Sarasota, Florida and Los Alamitos, California sterile insect release facilities were operating efficiently. There is good technical and managerial expertise. The staffs are successfully implementing the goals and objectives of the Fruit Fly Exclusion and Detection (FFED) - Preventive Release Program (PRP) strategy. Many of the recommendations from the United States Fruit Fly Eclosion and Release Facility (ERF) Review in 2008 were achieved. Some of the 2008 recommendations will carry over into this review, along with some additional technical recommendations.

The team was greatly concerned about the aging conditions of the facilities. The replacement of the Los Alamitos Dave Rumsey Sterile Insect Release Facility (SIRF) has been recommended several times over the last decade because the majority of the work is done in wooden trailers, which causes a potential fire hazard. In addition to needing repairs, the Sarasota SIRF lease is expired. The facility is operating on a lease extension until 2016. APHIS Realty has recommended moving the Sarasota SIRF from this location, due to a variety of lease issues. These issues make it critical to begin a plan for new SIRF facility design, development, stakeholder involvement, ultimately leading up to construction of new facilities for these two important FFED functions.

The review team focused on the APHIS fruit fly emergence and release facilities located in California and Florida. The goal was to determine the condition and effectiveness of the Mediterranean Fruit Fly Preventive Release Program (Medfly PRP), identify, and evaluate the administration and overall program delivery.

The review team's goals were to ensure consistent use of standard operating procedures and protocols. The team would provide methods development support. Evaluate the budget utilization and program delivery. Document any innovation observed, and identify program strengths, weaknesses, and areas for improvement. The evaluation is based on all available information and reports, site visits, and discussions with facility staff, program managers, and cooperators in the respective states of Florida and California.

The review shows that the Medfly PRP is effective and efficient. This has been a major factor in the program's success to date. The PRP in California and Florida provides protection of multi-billion dollar industries in those States leading to employment across many sectors of the US economy, export opportunities, and an abundance of safe and nutritious foodstuffs to American consumers at affordable prices. Outbreaks in California have been reduced more than 98% compared to prior years. In Florida, no Medfly outbreaks have occurred in PRP areas. Emergency project costs have been reduced 85%.

The threat and concern of entry and establishment of non-native fruit flies (Diptera: Tephritidae) into the United States continues to remain high. APHIS response is vital to mitigating risk and program success.

Background and Overview

The 2014 Medfly PRP review will assess the overall program delivery in the areas management and budget, science and methods support, quality assurance, technical implementation, reporting and data analysis. This Medfly PRP review is a follow up of the APHIS ERF review of all APHIS fruit fly emergence and release facilities in the United States, Mexico, and Guatemala conducted in July of 2008. The 2008 review was used as background and a guide. The recommendations from the 2008 report were determined to be pivotal in the 2014 review. Significant budget cuts were made in the FFED line allocation during FY2013 resulting in operational changes. This review will assess the impact of the reduction on program delivery. A pressing issue of concern is the expired facility lease in Sarasota, Florida. . In addition, the cost of upkeep is becoming a challenge to sustain at both of the facilities due to aging infrastructure. These were the catalysts in reviewing the PRP. A team was put together of management and technical expertise.

This review covers the Medfly PRP Sterile Insect Release Facilities (SIRF) located in Sarasota, Florida and Los Alamitos, California. The selection of the two Medfly SIRFs in California and Florida provides a comparison of the administration and delivery of services to the field. The review team's intent was to obtain and assess the relationship to the type of activities carried out. Activities such as the effectiveness of program delivery and risk reduction, efficiency of program resources, evidence of program success, efficiency of operations, and compliance with fruit fly program policies were evaluated.

The 2008 report contained comprehensive recommendations. The 2014 review is much broader in nature. The review team did not want to recreate the detail of the last review. A holistic approach was taken to find the answers to two specific questions: 1) "What is working well", and 2) "What can be improved in terms of increased efficiency and/or reducing costs".

Methodology:

The program components of the FFED program were reviewed using the following methods:

- Evaluate program management and oversight through observations (site visits) and interviews with program participants.
- Evaluate management organization
- Evaluate current program rearing and release protocols
- Evaluate current quality assurance methods
- Evaluate budgets and their utilization
- Evaluate program reporting and analysis
- Review current and past program operations and prior program review recommendations

Administration

Ensure consistent use of standard operating procedures and protocols, organizational structure, staff numbers, and program delivery.

Financial

Assess budget utilization from contracts, procurement, and purchasing of bulk supplies; analyze costs per million flies released, and status of facilities.

Data Management

Information management- ensures proper documentation (protocols and guidelines), Sterile Insect Technique (SIT) facility reports, and PRP recapture data.

Science and Technology

The technical scope of the review covered all aspects of the Medfly PRP components including reception of pupae, sterile recapture reports, rearing procedures, environmental temperatures, space and tower utilization, knock down procedures, quality assurance protocols, methods development support, release procedures, release equipment and release strategies, such as the rate of release and number of swaths.

Chapter 1 - SIRF Review - Sarasota, Florida

Entrance view – Credit: USDA

Dates of SIRF Review: April 22-25, 2014
Participants:

APHIS PPQ

Review Team: Vionette James – Coordinator; Sarah Marnell – Assistant Coordinator; John Stewart and Dr. Shaharra Usnick – Review Co-leaders; Technical Team - Patrick Gomes - Leader, Earl Andress, Dr. Hugh Conway, Dr. David Dean, Tim Roland

SIRF Facility Director: John Renshaw

Fruit Fly Program Director - Florida: Abbie Fox

Assistant State Plant Health Director: Dr. Cathy Marzolf

International Atomic Energy Agency – Technical Cooperation Department

Dr. Pedro Rendón – Entomologist and expert on Sterile Insect Technique

Florida Department of Agriculture & Consumer Services/Division of Plant Industry:

Dr. Craig Welch, Head of Identification Section

Observations:

The review team observed that the Florida SIRF is an efficient Eclosion and Release Facility (ERF). The procedures and protocols are well documented and followed. The management and staff are extremely dedicated and coordinated in the program delivery. This component of the Florida Cooperative Fruit fly program is very successful and has never found a wild fly for the last 14 years of the Medfly PRP. Historically, Florida's Medfly detections and outbreaks rivaled that of California. The lower number of finds can be attributed to effective sterile Medfly release rates, swath patterns and overall release strategy of flying several times each week into every

square mile on a third of a mile swath- alternating coverage weekly over areas that have been considered at risk of fruit fly introductions.

The release areas were reassessed after two (2) Medfly outbreaks on the southern east coast area; the Sarasota-Manatee release zone was closed and resources transferred to the higher risk areas of Broward and Palm Beach County areas. This is a good model for assessing risk and allocating resources in the most efficient and risk-based manner possible.

The review team spent the first morning viewing presentations by the facility Director, Fruit Fly Identification Laboratory Coordinator, and the Center for Plant Health Science and Technology (CPHST) methods support person. There were excellent discussions on current operations, the 2008 ERF Review report and recommendations, and overall Medfly SIT strategy. The IAEA -TC methods support scientist, Pedro Rendón, assigned to the Guatemala Moscamed program, was extremely valuable in discussing successful SIT control strategies against the wild populations of Medflies in Central America and Mexico that have vastly improved the Moscamed program. Those lessons learned have been transferred to the US programs with excellent results. Florida has always been accepting of and strives to be the trailblazers in any new Medfly SIT technologies in the US. Dr. Rendón presented several interesting and useful graphs of over flooding ratios, testing protocols and videos of processes being developed and used at the large Medfly ERF in Guatemala.

Florida's Medfly PRP has a good data collection system. The staff is able to assess monthly the recapture data received from the ID section. A GIS color-coded map is generated showing sterile flies trapped per day within each release block. In the future, efforts will be made to link this report to the overall detection program database using the Oracle database. This linkage would enhance the use of the vast program data available to improve fruit fly detection and response, and the use of SIT in control and eradication of the Medfly.

The aging facility was also an important discussion topic. The current lease was recently extended. The site needs a lot of maintenance and upgrades. The owner is not willing to make any investment in the property. Due to this and other owner situations, program management is actively seeking to relocate the SIRF.

Contracts and Procurement - There is a large purchase of agar used in the adult fly diet each year. The agar contract totaled approximately $30,000 per year. The contracts are managed through separate purchase orders. In 2008, it was recommended that bulk purchases of agar be consolidated. Since several APHIS facilities are all doing separate purchase orders for a standardized product, consolidation may save funds. In addition, the current aerial release contract is expiring at the end of August and the process for announcing and awarding the next contract needs to begin immediately.

During the program, the team agreed on working closely with the Florida team on a SIT methods development strategy and work plan. In addition, a general exchange of information can be

fostered between the Florida Statewide Fruit Fly Committee and the National level Fruit Fly Core Functional Working Group (FFCFWG). It was agreed that the FFCFWG would be invited to the Florida team meetings and Florida would be invited to participate in other fruit fly program calls or national level calls. CPHST Fruit Fly Unit call discussions would also be shared with the field program staff.

Florida is concerned about the hiring process for NTEs. The hiring has become challenging, as approval is needed for every position. As a result, the SIRF is rarely fully staffed and significant hours are invested by management and administration in the continual hiring process, which takes time away for the mission. Succession planning came up as well and a discussion on how to prepare for the future cadre of SIT and fruit fly program experts. Having face-to-face meetings of SIT experts and Temporary Duty (TDY) exchanges is always a good idea. The fruit fly staff needs to be exposed to what is going on in other locations, especially SIRF activities in California, Texas, Hawaii, and Guatemala, where much can be gained by sharing experience among facility staff.

The heating, venting, and air conditioning (HVAC) system at the Sarasota SIRF is in very good condition. The chillers, air handlers, and air conditioning units were replaced with newer units since the last review. In addition, the emergency generator has been upgraded from 15,000 KW to 75,000 KW. The program also has a 40-foot trailer with a refrigeration unit available, in the event, that the need arises to emerge additional flies during a Medfly outbreak. The refrigeration trailer also serves as a backup when the cold room is being serviced.

The ERF is located close to the local airport in Sarasota, Florida. Since 2000, the facility receives sterile pupae produced and shipped from El Pino Medfly mass rearing facility in Guatemala. The ERF in Sarasota receives 10-13 boxes of pupae/day, which contain 12-plastic bags filled with fluorescent-marked sterile pupae (Fig 1).

Fig. 1 - Cardboard box containing sterile Med Fly pupae, held inside plastic bags. Pupae are marked with a fluorescent powder that allows differentiating between sterile and wild insects. Notice a BLACK DOT mark (a dosimeter indicator) that verifies that the pupae had been exposed to the required irradiation dose for sterilization.

As soon as pupae reach the facility, the quality control section measures the temperature condition under which the shipment has arrived usually between 65 – 71 degrees F. The bags are then opened to stop the period of hypoxia. Pupae are transferred to a funnel and loaded tray by tray into the emergence towers (Fig. 2).

After pupae are loaded into a trough situated along the margins of each tray, food in the form of a single rectangular agar block (Fig. 3) is added to each of the self-stackable aluminum trays (Fig. 4). Additional blocks of agar are placed on the bottom four and on the top two screens. Stacks of trays (a.k.a. Towers) are then transferred to an open room (Fig.5). At the top of each tower, a small fan is placed and plugged into a power outlet (located at the top part of the tower) to generate airflow within the tower. Adults are allowed to emerge and mature for four/five days.

Fig. 2

Fig. 3

Fig. 4

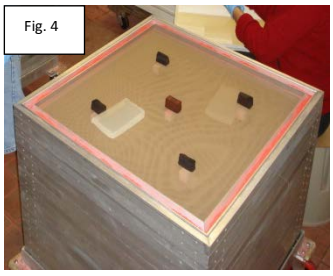


Fig. 2 - Loading pupae into the troughs of each emergence tray. Fig. 3 - Agar block prepared during a separate diet procedure. Fig. 4 - Tray shows how pupae and agar blocks placed within each emergence tray.

Fig. 5 - Large room at the Sarasota ERF shows placement of “towers” where sterile adult Med fly emerge and feed prior to release.

Additionally, 24 hours prior to chilling and release, flies are exposed to ginger root oil, which enhances mating propensity. After 6-7 days (adult age is 4-5 days old), towers move to a cold room to chill at 38°F or below. After chilling (referred to as “knockdown”), dormant flies are placed inside aluminum boxes (a.k.a. “release boxes”) to be loaded inside the airplane for their aerial release over designated areas at predefined release densities (flies/sq. mile or acre).

In 2003, Florida switched from PARC boxes to Worley towers to emerge sterile adults. When new, the screens interlock with each other so that flies cannot escape. This also allows movement of the tower from place to place without the screens coming apart. Many screens are over 10 years old and worn so that they slide from side-to-side when moving the tower posing a safety concern. Florida has between 110-120 towers. Florida staff would like to replace 10-12 towers each year. AEO estimates the cost of replacement at $2,200 – 2,500 per tower.

Fig. 6

Fig. 6 - Release box loaded with sterile files is placed on top of a "release machine". This procedure was followed to verify the desired calibration rate of release in flies/sq. mile.

Fig. 7

Fig. 7 - Release machine placed inside the airplane used for the aerial release of sterile flies.

Fig. 8

Fig. 8 - Box loaded with chilled, sterile adult Med flies is placed on top of a "release machine" prior to take off.

Fig. 9

Fig. 9 - Contract aircraft used for sterile Med Fly aerial releases.

The Florida Medfly aerial release machines were calibrated in Sarasota on April 25, 2014. These release machines use a double auger base that feeds flies from beneath the aerial release containment box inward towards centrally located release chutes. Calibration resulted in almost a straight line along a graph (see Appendices). Pilots will be able to use the potentiometer table to set values that will release the correct number of flies per acre to help improve the accuracy in reaching the desired number of sterile males per acre.

In the event that contract aircraft cannot take off due to adverse weather or unscheduled maintenance, the program has a truck mounted release machine that can disperse sterile flies by ground (Figs. 10-13). The program has found that the flies readily disperse.

Fig. 10

Fig. 10 - Shows truck used to disperse sterile flies by ground.

Fig. 11

Fig. 11 - Chilled adult release machine with tube extending to the right side of the vehicle. DC converter and portable generator also are visible in photo.

Fig. 12

Fig. 12 - Earl Andress inspects side chute where chilled adults will be blown from moving vehicle away from traffic toward the shelter of trees and shrubs.

Fig. 13

Fig. 13 - Controller for chilled adult release machine is mounted in truck cabin. The controller is used to set potentiometer (pot) settings affecting the rate of release.

The quality control section from the ERF collects samples of sterile pupae to monitor the quality of the insect upon arrival to the SIRF and on adult flies after chilling but prior to release. The procedures used follow the Food and Agriculture Organization of the United Nations/ International Atomic Energy Agency/USDA (FAO/IAEA/USDA) Manual on Product Quality Control and Shipping Procedures for Sterile Mass-Reared Tephritid Fruit Flies.

Fig. 14

Fig. 15

Fig. 14 - Quality control set up to assess emergence and flight ability of the sterile flies received in the ERF-Sarasota. Fig. 15 - Emergence grids to verify sex ratio of sterile flies.

Chapter 2 - SIRF Review – Los Alamitos, California

Aerial view – Credit CDFA

Dates of SIRF Review: June 3-5, 2014

Participants:

APHIS PPQ

Review Team: Vionette James – Coordinator; Sarah Marnell – Assistant Coordinator; John Stewart and Dr. Shaharra Usnick – Review Co-leaders; Technical Team - Patrick Gomes - Leader, Earl Andress, Dr. Hugh Conway, Dr. David Dean, Tim Roland

International Atomic Energy Agency – Technical Cooperation Department

Dr. Pedro Rendón – Entomologist and expert on Sterile Insect Technique

SIRF Facility Co-Director: Mike Arbogast

PRP Administration & Budgeting: Andrew Dang

State Operations Support Officer: Norman Mullaly

Observer: Todd Shelley

California Department of Food and Agriculture (CDFA)/ Plant Health & Pest Prevention Services

Pest Detection & Emergency Programs Staff: Debbie Tanouye, Branch Chief; Dr. Kevin Hoffman, Director – Statewide Emergency Programs; Jason Leathers, State Entomologist

SIRF Facility Co-Director: Ed Baltazar – Also serves as Director for Quality Control, Administration, Pest Identification, Maintenance, and PRP Emergency Response

SIRF Managers: Edwardo Gomez, PRP Rearing Manager; Ian Walters, Aerial Operations Manager; and Mamoudou War, Quality Control Manager

Observations:

The current David Rumsey SIRF located at the Los Alamitos National Guard Air Force Base operates out of mobile trailer units many of which are over 45 years old. The facility is in desperate need of replacement with permanent structures. The current site was originally intended to be temporary. It has evolved into a long-term on-going operational program. Despite a host of dilapidated trailers, the management and staff have done an excellent job of maintaining the old mobile units and most of the facility looked clean and professional.

Previous reviews in both 2003 and 2008 called for a plan to replace the temporary mobile units with a permanent structure suitable for eclosion and release of sterile insects. An attempt to design and build a replacement facility in 2006 resulted in an engineered Program of Requirements (POR) along with a plan for construction and implementation. CDFA has a Memorandum of Understanding (MOU) with the Air National Guard that secures additional space for a permanent building next to the current site. However, budget reductions in 2007 derailed any attempts at following through with this effort.

The Los Alamitos National Guard Air Force Base provides an ideal secure site for the SIRF and has limited public access. It is located near the center of the Los Angeles Basin where PRP activities are carried out. Releases can and have been made in other parts of the State (Sacramento, San Diego, Santa Clara, etc.) operating from this location. Base officials have expressed their concerns to PRP management about the need to remove and replace all mobile trailers with a permanent structure. They have cited building code and fire safety requirements. Asbestos was detected in several trailers adding to the complication of trailer removal. The unused trailers stored nearby pose a fire hazard. The Los Alamitos SIRF is located opposite the base fueling station. This issue needs to be addressed soon.

The Medfly PRP Review team found the SIRF to be a well-managed and highly efficient sterile insect release program. The staff is highly trained, efficient, and motivated to continually provide and deliver the best Medfly SIT delivery that can be achieved in their current facility. The PRP management staff has over 150 years of sterile insect release experience. Many of the insect production workers have 10 years or more of experience. The staff promptly and effectively addresses issues when they arise. They have the most efficient operation using the Worley Emergence Towers. They have reduced staffing in half from 120 to 60 employees. There is a contingency plan for increasing capacity for emergency response and the facility is able to handle up to 500 million sterile pupae per week. Within current staffing, the program can respond rapidly to expand release functions on a limited basis without the need for additional personnel. This allows this work unit to be constantly ready to respond to fruit fly emergencies. The responders are trained in all aspects of emergency response functions. These responders play a key support role for eradication efforts against a multitude of pests in Southern California.

The facility also houses the Pest Identification Unit information for Southern California, and there are trained identifiers that support the fruit fly identification as well as other pest detection ID activities. The Los Alamitos Medfly PRP is truly a multi-functional unit ready to address any new pest incursion, which differs from the Sarasota SIRF in Florida that focuses only on fruit fly SIT. These additional functions coupled with less than desirable infrastructure relying on mobile units requires additional resources that are reflected in a higher cost per million flies delivered to the field compared to Florida (see Comparison Chart of SIRFs below).

The SIRF is jointly funded by the CDFA and APHIS PPQ. While the majority of the program delivery is managed by CDFA, PPQ provides management oversight and administrative support in contracting, purchasing, managing personnel, and is a key partner in the program. Many of the program personnel rotate back and forth between CDFA and PPQ. There may be as many as 25 (51%) staff on the PPQ payroll at one time.

The Los Alamitos SIRF is currently at peak efficiency using a 4-day release cycle, which fits in with their current facility and staff capacity. While this provides administrative convenience, biologically the adult flies are released prematurely affecting their ability to compete with wild Medflies. The review team believes that holding the mature male sterile fly for at least 5 days would allow for a more effective fly in the field. If a new facility is designed, then a longer adult fly maturation window should be considered.

The review team found, similar to the Florida SIRF, that there has been a dearth of technical, scientific, and managerial interchange with other entities of like function within the APHIS FFED. The budget constraints for both federal and state agencies have reduced travel and meeting attendance. The technical delivery of sterile insect technique is not being well served due to these restrictions. The SIT program evolved from many different visits and meetings between program units and between the United States and foreign cooperators. These technical visits and interchanges are critical in the continued development and improvement of fruit fly sterile release. The current SIT system and technology is now a decade old. New ideas and exchanges need to take place in order to refresh these managers on program delivery. There have been many recommendations regarding a technical exchange between SIT units and this must again be addressed and realized. An annual or biannual SIT meeting should be held at least between the US SIT units. Technical exchanges should also again be developed between the US SIT staff and the counterparts in Mexico, Guatemala, and Hawaii. There is a cost to these interactions, but there is a tremendous negative cost to having the staff and the technology only be exposed to one way of conducting activities.

The staff at Los Alamitos has a very good history of public outreach and education and recently there was an interview conducted with one of the main aerial release coordinators with one of the local television networks (PRP Los Alamitos Video). The interview was an excellent portrayal of the program and was a good positive image of the program. CDFA also maintains an excellent website that describes all phases of the PRP (USDA-CDFA Medfly Exclusion Program). More

interaction with the media and key stakeholders should be encouraged. In the past stakeholders were invited to visit the facilities and review the activities. This would be a good initiative to start once again on a yearly or biannual basis.

The CA and PPQ FFED leaders, along with the Los Alamitos SIRF staff have revised release blocks and release protocols due to budget reductions and an analysis of data on sterile recapture and on historic detections of Medfly. The size of the release blocks have been reduced by approximately 20%.The amount of flight time has been reduced by approximately 30%. These changes have reduced the cost of the program by at least 15%. The program is currently operating at an efficient base level to address the majority of the risk areas in the Los Angeles Basin, while also having the capacity to respond to fruit fly outbreaks and emergencies.

Fig. 16

Fig. 17

Fig. 16 - Emergence and maturation of sterile Medflies inside mobile trailers. Fig.17) Mobile trailers are closely grouped together connected by an elevated walkway with railings for safety of personnel and to prevent towers from falling.

Fig. 18

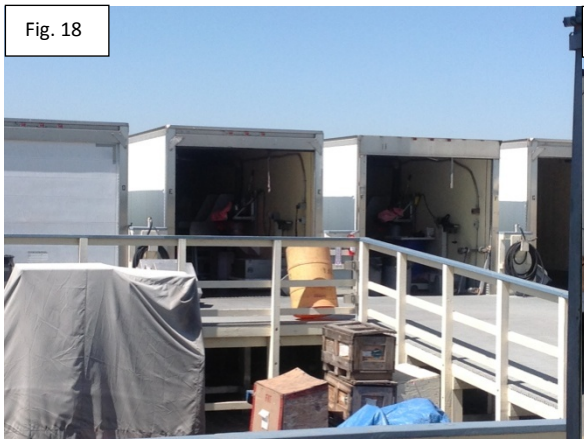


Fig. 19

Fig. 18 & 19 - Front and back views of the refrigerated trailers used at Los Alamitos to chill sterile insects prior to their release. Thermo-King units operate on diesel. For reasons of fire safety, all trailers are grouped together.

Fig. 20

Fig. 21

Fig. 20 - Aerial release box containing chilled sterile flies prior to their aerial release. Fig. 21 Beechcraft King Air contract aircraft used to disperse sterile insects over the Los Angeles Basin.

Prior to knockdown of the adult flies, the temperature in the holding rooms is reduced to 68° F. This procedure has proven beneficial in lessening the impact of placing hot towers in the reefers that frequently increased the time required to chill down the flies and delayed delivery to aircraft.

Towers with flies produced at Hawaii and Guatemala are chilled in the same refrigeration trailer and are mixed together during the knockdown process.

Flies are released during all kinds of weather. Weather influences the altitude that the pilots are able to fly in order to maintain visibility. Flies are not released when the air temperature is below 0° C.

The California Medfly aerial release machines were calibrated in Los Alamitos on June 5, 2014. The California Medfly release machine has an auger base that feeds flies from beneath the aerial release containment box inward towards centrally located release chutes. Calibration resulted in almost a straight line along a graph. The calculated values were used to produce a table of potentiometer settings at different aircraft speeds and Medfly per acre release rates for pilots' use.

Chapter 3 - Comparison of PRP Facility Activities

SIRFs in both CA and FL are currently doing a good job of receiving pupae, eclosing, emerge adult flies and delivering them to the field. Facility managers are efficiently using staff and facilities.

Observations - The physical appearance and structures of both SIRFs are in poor condition. Los Alamitos facility, in particular, has a number of unused trailers that are in a very bad state and should be demolished in place or removed for disposal (Figs. 22-23). The National Guard Base Commander and staff have expressed concerns about the use of trailers including the refrigeration units used for the collection of reared flies. They now require that those units be grouped together because they operate on diesel fuel and pose a threat to all of the trailers should a fire occur. Access to the base was first approved over 20 years ago and was expected to be temporary. The Base Commander has replaced all other temporary structures on base and is applying pressure on PPQ and CDFA to construct a permanent building to house all sterile insect operations. A good start in this direction would be removal of the unused trailers followed shortly by construction of a permanent building to house sterile insect eclosion, holding, knock down and release.

The program needs to begin planning now for replacement of the facilities in the near future. Both CA and FL Eclosion and Release facilities see their role as operational only. Development and innovation needs to occur without interfering with or imposing on the operational component. It is very important to obtain input from CPHST in CA, TX, and FL regarding a generic rearing facility layout and plan. The specific needs for each location can then be reviewed and adopted once a design is agreed on.

New facilities need to include methods development sections from the very beginning in the planning phase and not as an afterthought.

Fig. 22

Fig. 23

Figs. 22 & 23 - Used FEMA trailers were adapted to emerge sterile Med Flies and served that purpose very well for over 20 years. They are now awaiting demolition or removal for disposal. The Base Commander has voiced concerns about the potential fire and safety hazard apart from their unsightly and dilapidated condition.

In California, the quality control (QC) section is well managed. The Florida QC section needs to follow the CA example, in having a separate climate-stabilized area free from other jobs and traffic, which is dedicated to holding the test flies during the various QC procedures.

More research into the post-release behavior and survival is needed. We need to conduct more recapture tests on flies released from airplanes in order to understand how well flies are performing in the field after release. Test should be conducted by Science and Technology during cooler times of the year in order to aspirate the flies from the tarmac.

More evaluations of the effectiveness of release equipment are needed. It has been a long time since release equipment has been evaluated and closely examined for optimal performance or potential problems. Video recording capability inside fly handling equipment is desperately needed. Interaction between Aircraft and Equipment Operations, CPHST, and program staff can determine the details.

Regular tests on the mating competitiveness of sterile flies should be done. Low quality should be identified and addressed. Recent testing indicates a low mating competitiveness by sterile insects eclosed at the CDFA Medfly Rearing Facility compared with wild Medflies collected locally in Hawaii.

New strains should be evaluated for replacement to current strains. Mating competitiveness tests should be done on site in Hawaii and California before committing to a full colony replacement.

Identify improvements in diet and feeding systems for adult flies. We should continue to work toward the development of methods for improved feeding of flies and delivery of higher quality flies to the field.

New Medfly/Mexfly emergence tower was presented. Testing of this system should be conducted at both SIRFs. The new emergence tower uses room ventilation as opposed to the current small fan system on top of emergence towers. It also introduces the use of a liquid diet that can be replenished. The system is more flexible and gives the staff the ability to maintain flies for extended periods. Agar diets are also eliminated which reduces cost of purchase, preparation, distribution, electricity and disposal of the agar blocks while yielding better quality flies shown to have higher flight ability and longevity compared side-by-side with Medflies emerged in Worley towers. However, disadvantages of this system are that the liquid towers take up twice the amount of floor space and require increased personnel to operate. Florida holds their flies up to 7 days. They may be holding their flies longer than necessary which could be causing stress on the flies released near day 7 in the towers from crowding and forced competition for a

diminishing food source, as the agar blocks which usually dry out after 4 or 5 days. On the other hand, California appears to be releasing the flies too early before they are sexually mature. These two extremes in holding times each need to be evaluated to improve the quality of the flies released.

There should be some minimal monitoring of sterile fly recovery in the field in order to monitor areas where there are may be zero catch back. Both programs need to confirm the distribution of the sterile flies and look at the sterile to wild fly over flooding ratio.

Pre-cooling towers prior to knockdown reduces chilling time. Flies are held in the towers at 68 F in the holding room prior to knockdown at Los Alamitos. This temperature reduces latent heat and the time required to chill the flies. This allows a shorter time-line from tower to release boxes and facilitates a quicker delivery to the aircraft.

Emerging flies held individually versus one common space. In Los Alamitos, the flies are eclosed and held in separate rooms. Sarasota holds all of the emergence towers in one common space for the eclosion and holding periods. Individual eclosion and holding rooms also has an advantage that if the HVAC goes out in one room, it will not affect all towers at once.

Calibration findings

There is a difference in the length and bottom angle of the aerial release chutes between the facilities. Florida is using the original tested chutes with a 5-degree angle (see Fig. 24). In California, the ends of the aerial release chutes have a 30-degree angle on some aircraft and a zero degree angle on others. Science and Technology needs to conduct tests in California to determine which release angle at the end of the chute provides the best release for Medflies.

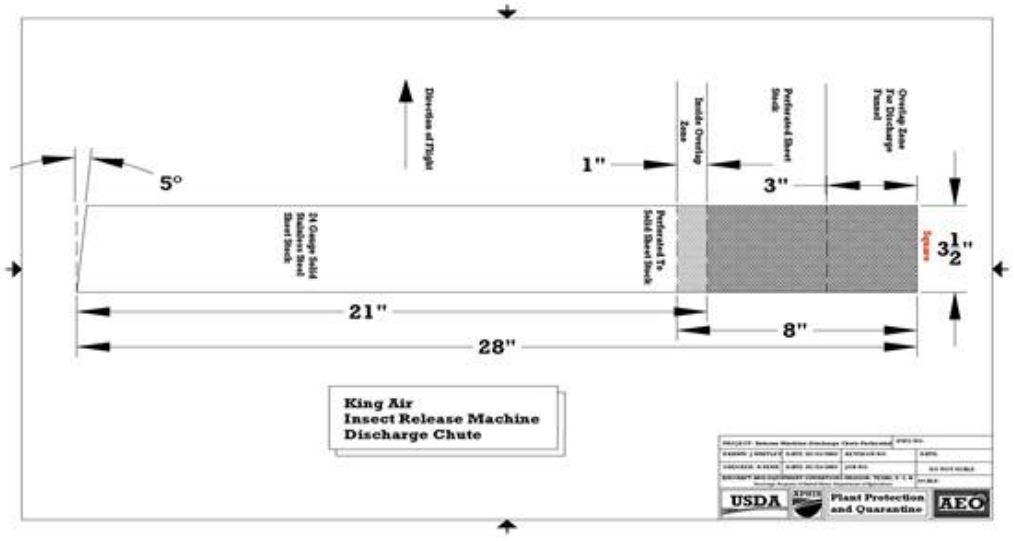


Fig. 24 - Diagram of the release chute

Fig. 25 - Aircraft in California with a 30-degree angle release chute

Fig. 26 - Aircraft in California with a shortened chute with a zero degree angle

Observations - CDFA Medfly Rearing Facility in Waimanalo

Current infrastructure failures, such as HVAC air handlers, in the Hawaii CDFA lab are jeopardizing the main supply of sterile Medfly pupae to Los Alamitos. The chillers and air handlers at the CDFA Medfly Rearing Facility in Waimanalo, Hawaii, are more than 10 years old. Due to close proximity to the sea, they are exposed to harsh environmental conditions and as a result are quite corroded and in need of replacement (see Figs. 24-26). Since the facility produces a temperature sensitive lethal strain of Medfly, it is critical to maintain close control over the temperature in all rearing spaces. All life stages of the female can be affected if temperatures exceed the maximum threshold of 32 degrees centigrade for more than 12 hours. Even short periods of heat exposure can adversely affect the strain.

Fig. 27

Fig. 28

Figs. 27 & 28 – Air handlers at CDFA Med Fly Rearing Facility in Waimanalo, Hawaii. Considerable corrosion to outside vents and inside cooling coils due to constant exposure to ocean air and humid tropical conditions. Both units need to be replaced.

Fig. 29

Fig. 29 - Two chillers at the CDFA Med Fly Rearing Facility in Waimanalo, HI. Corrosion similar to that experienced by the air handlers is due to constant exposure to ocean air and humid tropical conditions. Two newer chillers have been installed so their replacement though necessary is less critical at this time.

Comparison Chart of SIRFs		
	Sarasota, FL	**Los Alamitos, CA**
COSTS		
Total Costs	$3.85 million	$14.8 million
Cost/Sq. Mi.	$6,179	$8,457
Cost/Million Pupae	$740	$1,713
STAFFING		
Director- Federal or State	Federal	Federal and State
Number of Personnel	24	63 (includes 24 positions for Pest Response & Identification)
Number of Rearing Personnel	16 staff (2 vacancies)	13 staff
Number of Aerial Ops Personnel	2	16
Number of QC Personnel	2	3
AIR OPERATIONS		
Square Miles Under PRP	623.1	1,750
Area covered per load	83-120 sq. mi^2	60-65 sq. mi^2
Type of Aircraft	Beechcraft King Air Twin engine turboprop	Beechcraft King Air Twin engine turboprop
Number of Aircraft	2	5
Number of flights/day	2 flights with 2 aircraft - Five days/wk	4-6 flights with 2 aircraft - seven days/wk
Number of flights/week	8-9 flights/wk	28 flights/wk
Swath Numbers	3 per linear mi flown ($1/6^{th}$ of a mile separation)	4 per linear mi flown ($1/4^{th}$ of a mile separation)
Air speed during release	162-165 mph (141-143 knots)	160 mph (140 knots)
Altitude during release (mean sea level, msl; above ground level, agl)	1,400 -1,700 feet	1,000-5,500 feet msl Target 2,000 feet agl
Average flight duration (hours) (including ferry & taxi)	3 – 3.3	2.5 - 3
Type release machine	Double box	Single box
Release Box Types	2- 30 inch boxes; 2- 14 inch stackable boxes	Single box (8 single release machines)24 inch box = ~6.4 million flies
Release Box Numbers	7, various sizes	12, various sizes
Pounds of sterile flies/box	90-100	45-130
Millions of sterile flies/box	**7**	3.5 – 10.5~~9~~

Comparison Chart - continued

	Sarasota, FL	Los Alamitos, CA
FACILITY DETAILS		
Rearing design	Open space building	Mobile trailers
Facility Functions	Single	Multiple
Total Capacity	150 million male Medflies/wk without any additional equipment (= 450 mi^2/wk)	500 million Medflies/wk 200 million Mexflies/wk
PUPAE SOURCE & STRAIN		
Pupae Source	Guatemala – 100 million/wk	Hawaii – 150-160 million/wk Guatemala – 100 million/wk
Strain Type	Medfly – Vienna 8/$^{D53Inv-}$ Toliman *tsl*	Medfly – Vienna 8/$^{D53Inv-}$ Toliman *tsl*
EMERGENCE & KNOCKDOWN		
Total Towers Available	110-120	370
Tower Numbers/wk	84-88 towers/wk	192 - 300 towers/wk
Number of screens/tower	50	43 -58
Number of agar blocks/screen	2 pieces (top four & bottom two) 1 piece each screen	2 pieces of diet per tray
Age of flies at time of release	4-5 days old (6-7 days in tower)	2-4 days (4.5 days in tower)
Aromatherapy – Ginger root oil	1 ml/wick placed under each tower afternoon before release	1 ml/wick placed under each tower morning before release
Pre-cooling of adults	No pre-cooling of adults	Reduced from 78 - 68° F 10 minutes prior to knockdown
Knockdown temperatures	38° F or less	38° F
Duration of knockdown (avg)	Usually 30 minutes	45 minutes
Number of knockdowns/day	3	4
Minimum release densities of sterile male Med Flies/ mi^2/wk (fpsm/wk)	125-145,000 fpsm/wk 250,000 fpsm/wk – eradication areas	62,500 fpsm/wk - low risk areas 125,000 fpsm/wk - high risk areas 250,000 fpsm/wk – eradication areas
MONITORING & IDENTIFICATION		
# traps Statewide	55,000	
Trapping array under PRP	5 ML with 1 TML (1 ME & 1 CL) per $mile^2$	5 Jackson traps with TML 5 McPhail traps with torula
Recapture rate	0.02%	0.07%
Total # sterile flies screened/yr	1-2 million	
Number of Identifiers	8 identifier stations in Palmetto	14 identifiers on-site

Chapter 4 - Recommendations

Facility improvements

Both SIRFs (Management)

1. Invest in the upkeep and maintenance of key rearing facilities.
2. Develop an inventory of existing release machine equipment, boxes, release chutes, and Worley Towers. An assessment of upgrades and replacements of the key pieces of equipment, as well as release capacity for each location, should be included.
3. Facility replacement, as recommended during previous reviews in 2003 and 2008, must be addressed and included in the Fruit Fly Strategic Plan. Consult California, Texas, and Florida to create a POR (Points of Reference) document for a generic rearing facility. Engineers will address the specific needs of each location.
4. Develop replacement plans for each facility, consulting with PPQ and state cooperators.
5. Start replacing 10-12 emergence towers per year at each facility.

CDFA Waimanalo Medfly Rearing Facility (Management)

1. Replace both air handlers as soon as possible to avoid adversely affecting production of *tsl* (*temperature sensitive lethal)* Medflies at the CDFA rearing facility.

Outreach and Communication

Both SIRFs (Management)

1. Develop an Outreach and Communication Schedule to educate and promote the program to stakeholders.
2. Develop a yearly calendar of events where the fruit fly program activities and PRPs are highlighted.
3. Budget for and hold an annual SIT program meeting at each facility.
4. Facilitate operational interactions between fruit fly ERFs with conference calls, Temporary Duty (TDYs), face-to-face meetings, annual meetings, or webinars as recommended during previous reviews in 2003 and 2008.
5. Conduct a yearly or biannual SIT Directors Meeting, which would include key personnel from the United States and foreign SIT facility locations.
6. Develop a plan of technical exchanges and visits between ERF staff and SIT facilities in other US states, Mexico, and Guatemala. Staff should be allowed to visit other fruit fly rearing and SIRFs to observe techniques and interact with colleagues. The facility directors should have a comprehensive understanding of how the sterile flies that they are releasing are being produced. Visits to other ERFs would be beneficial for technical information, exchanges of new ideas and succession planning.

Both SIRFs (Facility Directors)

1. Improve outreach to targeted stakeholders (For example, CHRP and FF team up and have a joint booth at Citrus Expo in August, Florida Citrus Mutual meeting in June, and Florida Agriculture meeting in Miami).
2. Hold an open house each year at the Medfly PRP facilities so the stakeholders and regulatory officials can observe current conditions. This will foster understanding of the operation and enlist support for construction of a new facility.

Sarasota SIRF (Facility Director)

1. Look into getting access to a Florida database of identified fruit flies covering the last 10 years.

Los Alamitos SIRF (Facility Director)

1. Determine percentages for program reductions (reducing from six to four swaths per sq. mile weekly, reducing release areas from 2500 sq. miles to 1750 sq. miles).

Los Alamitos SIRF (CPHST)

1. Science and Technology (S&T) will provide the current BPS adult rearing manual from Mission, Texas.
2. Share results of mating competitiveness testing of sterile vs. wild males conducted in Hawaii and El Pino, Guatemala.

Staffing

Sarasota SIRF (Facility Director)

1. Improve hire process by obtaining blanket approvals for hiring and filling Not to Exceed (NTE) positions.

Los Alamitos SIRF (Facility Director)

1. Fill vacant position for identifier in Los Alamitos, CA.

Technical

Arrival of pupae shipments:

Both SIRFs (CPHST)

1. Conduct tests to determine if hypoxia affects competitiveness of Medfly or Mexfly adults.
2. Determine the most appropriate tray loading density (CA currently uses 350 ml and Florida uses 400 ml.). Determine if there is a difference in terms of fly quality (longevity) and fly recovery (percent fliers post knockdown).
3. Conduct preliminary tests on the use of recyclable bags to replace the current practice.
4. Share the information of temperature and humidity on arrival to the SIRFs with the rearing facilities to allow for improvements in the shipping process.

Diet preparation:

Both SIRFs (S&T)

1. Conduct measurements of pH of the agar diets/blocks, at least once a month. Observe at the end of the rearing process, if there is presence of molds/fungi in the remaining agar blocks. (Guatemala will send info out to FL and CA.)
2. Review the size of the agar blocks being provided to sterile insects
3. Determine the actual consumption rate of "adult food" (agar blocks) by the sterile insects within the tray. Isolate and weigh agar blocks with and without flash.
4. Compare agar blocks with liquid diet in adult flies. Determine the recovery and longevity of both systems in Florida, Texas, and California. Also, monitor moisture, firmness, and available moisture of agar feeding blocks at 6 and 7 days in towers, as well as investigating the advantages of protein supplement in the adult diet.
5. Inventory purchases of agar and sugar to determine use rates and costs. Determine if a large contract amongst all of the APHIS facilities would garner cost savings as recommended in 2008
6. Replicate Guatemala's liquid diet tower tests in FL, TX, and CA, coordinating and standardizing the tests and time-line.

Quality control testing:

Both SIRFs (S&T)

1. Conduct post-knockdown quality control test of percent flies at 2hr, 3hr, and 24hr to determine if there is a statistical difference between the times. If there is not a difference, then adopt a 24-hour test. Based on the results, make a recommendation for new FAO/IAEA/USDA QC manual (Product Quality Control for Sterile Fruit Flies) with a revised methodology.
2. Conduct post knock down testing according to the new FAO/IAEA/USDA product quality manual (Product Quality Control for Sterile Fruit Flies).

3. Determine if facilities are releasing sterile flies at the optimal sexual maturity/mating age and identify corrective measures.
4. Conduct longevity tests on site in small screen-cages using potted plants.
5. A climate stable QC area with appropriate shelving for consistent lighting levels, temperature, and humidity for holding QC cages should be available.
6. Conduct all quality control a test on the flies' flight ability and longevity in a single enclosed area and is not open to traffic or other activities.
7. The longevity test does not need to be kept in a separate room from the other QC tests, but can be maintained in the same climate stable area along with the other QC cages but darkened to eliminate light during the 48-hour longevity tests.
8. The ginger root oil used for aromatherapy should not be stored or applied in or near the QC lab area, but kept separately from the lab, so as not to interfere in any way with the other tests that are conducted on a daily basis.
9. Evaluate mating capability at fly age of 4, 5, and 8 days.

CDFA Waimanalo Medfly Rearing Facility (S&T and CDFA)

1. Replace the current strain of sterile Med flies being produced in the CDFA Waimanalo facility with the more current validated strain being produced in El Pino Guatemala-temperature sensitive lethal (*tsl*) with the inversion for stability.
2. The Science and Technology (S&T) will continue to conduct mating propensity and compatibility tests with the CDFA sterile strain against wild flies in Hawaii.
3. S&T will use irradiated and sterile flies from the CDFA lab that have been exposed to aromatherapy for any of their studies.
4. Conduct annual assessment of mating competitiveness in Guatemala and Hawaii using wild Medflies.
5. Evaluate the QC differences between Medflies from HI CDFA and Guatemala facilities.
6. Design a strategy for strain evaluation and replacement for both CDFA and PPQ.

Holding rooms:

Both SIRFs (CPHST)

1. Check the air quality in facilities 3-4 times a year using 5 second bursts to ensure there are no molds or fungi in the facilities.
2. Review the practicality of application of Ginger root oil to the whole room as opposed to single towers.

Knock Down Rooms:

Both SIRFs

1. Use a less rigid surface area within the funnel where trays are hit to collect flies in order to minimize tray damage (Figs. 29 and 30).

Aerial releases:

Both SIRFs (CPHST and Local Management)

1. Conduct release and recapture tests in the field looking at swaths, swath widths, dispersal, and fly survival. These tests should account for release and recapture rates every day for a specified period of time (percent flight ability and the number of flies/trap/day (F/T/D)).
2. Determine the F/T/D sterile catch within the existing trapping network and use the information to attempt to establish an assumed over-flooding or release ratio (sterile: wild), particularly for areas prone to fly introduction. Start with small areas and expand from there.
3. Continue to evaluate Medfly risk to each of the release blocks, in the event of a need to reduce or move resources to outbreak locations.
4. Determine if we are releasing flies at the optimal age, and schedule program releases accordingly.
5. Improve release densities for Medfly in the California program.
6. For Mexfly, response with SIT the mostly male Black Pupal Strain (BPS) should be utilized in California, Florida, and Texas. It will be provided by the San Miguel Petapa Mexfly Rearing facility located in Guatemala. The rate of SIT releases should be 325,000 mostly males per square mile, until more information is obtained concerning effective over-flooding ratios and inducing sterility in wild Mex Fly populations.
7. Need to implement some level of sterile fly recovery monitoring for the PRPs and develop management tools for assessing field recovery and the SIT program, particularly noting areas with zero catch back.
8. Incorporate more GIS technology and units to visualize the evenness of aerial release.

9. Develop a system to track release density and recapture data (related to the number of F/T/D).
10. Develop a system to track traps with zero fly catches and the number of wild and sterile trapped and adjust release rates in response.
11. Evaluate release chutes and make recommendations.
12. Knockdown vacuum heads need to be refurbished.
13. Look at the evenness of coverage from Medfly aerial dispersal, dispersal rates, and coverage.

Sarasota SIRF (Facility Director)

1. Begin the solicitation process and bids for a new aerial release contract immediately.

Los Alamitos SIRF (Facility Director)

1. Collect service history from the county (where the trap is placed, how often serviced, what host placed in, etc.).

Other FFED Issues:

Solid lure formulations of methyl eugenol and cue-lure

Field operations

1. A manual needs to be developed with pictures demonstrating how to put DDVP strips, and solid plugs into traps for testing.

Science & Technology/CPHST

1. Experiment with DDVP strips in Florida in the fall. Trap and recapture studies should be done.
2. Conduct lure weathering in FL and AZ this summer. These tests will account for both humid and dry heat.

Appendix

Organizational Charts

Review Team - Roles and Responsibilities

Fruit Fly Medfly PRP Review Plan

Program Reviews

- Florida and California 2008 Preventive Release Program Review
- 2008 Recommendation Table with comments
- 2003 PRP Recommendations for CA TX and FL

Preventive Release Program Review Agendas

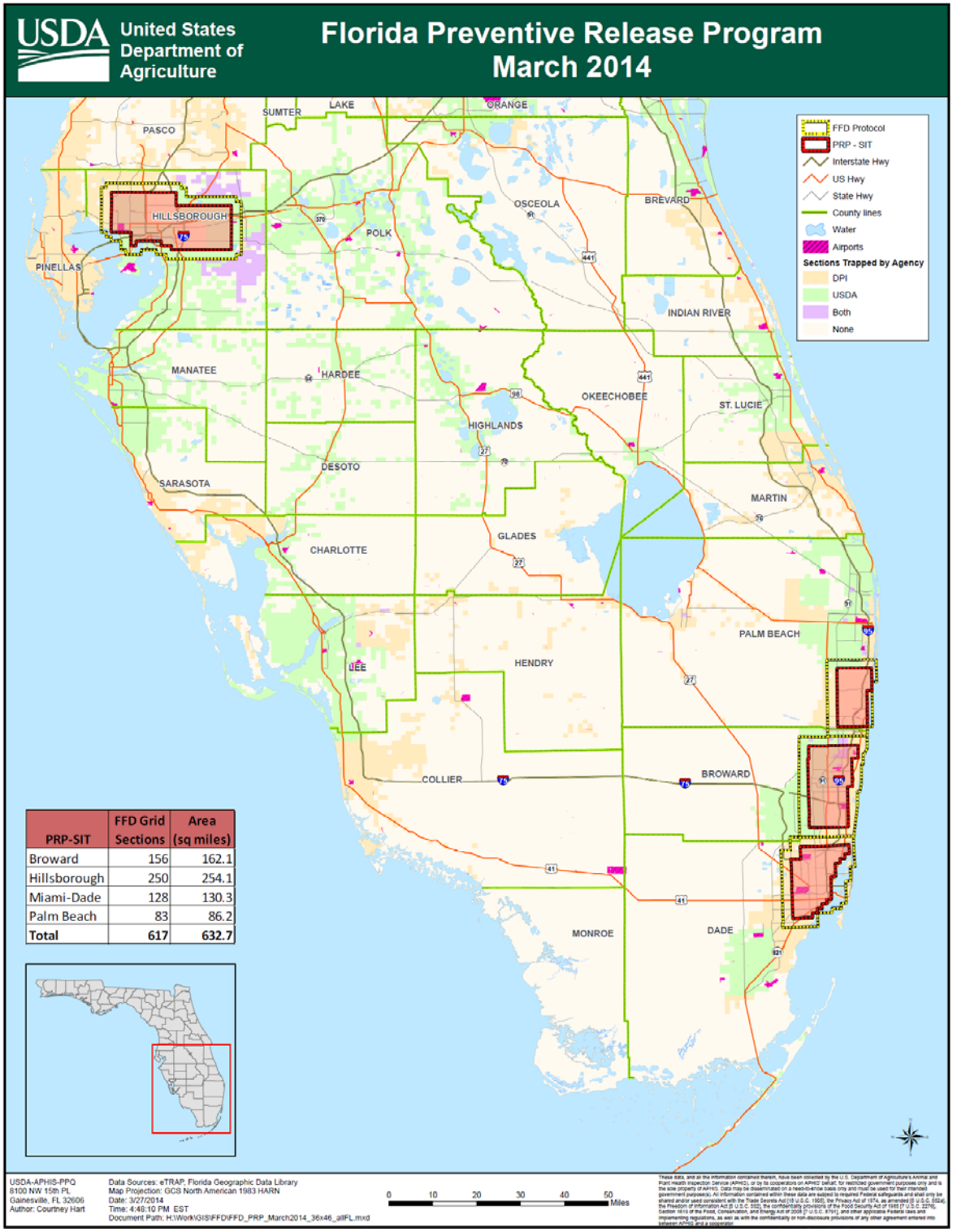
- Medfly PRP Review Agenda FL
- Medfly PRP Review Los Alamitos Agenda

Reports and Data

- SIRF Organizational Chart with Roles and Responsibilities
  - CA - Los Alamitos Organizational Structure 2014
  - FL - SIRF Organizational Structure 2014
- SIRF Protocols and Guidelines
  - IPW Manual
  - FL- List Manuals and Guidance Used
  - Feed Preparation Instructions
  - Pouring Instructions
  - Aspiration Procedure
  - Aroma Therapy - Ginger Oil
  - Sex Ratio SOP
  - QC - Los Alamitos-Corn-Bagasse Procedure
  - QC Checklist
  - SIRF Skill Levels
  - FL - PHSS-Duties
  - CPHST review June 2014
  - BioSci Tech workload
  - Daily Fly Emergence Test
  - Determining Release Rate
  - FL - Emergency Plan for the PRP-SIRF
  - FL - Hurricane Recovery-Employee
- SIRF Facility Reports
  - Data Management
    - Daily Report Entries and Daily Aircraft Record
    - SIRF Annual Vehicle Report
    - FL - Fly Count After Knockdown

- Quality Control Reports
  - QC Analysis over the last 3 years
    - 2014 Mediterranean FF SIT QC Comparison
      - Tower Evaluations
      - FL-PRP-SIRF Equipment Inventory
      - Calibration of California Medfly release machine 5 June 2014
      - Calibration of Florida Medfly release machine 25 April 2014
      - FL - End of the Month QC
      - Percent Fliers Assessment Post-Knockdown
- Program Financials including Budget costs
  - SIRF Budget 2014 Work Plan
  - CDFA and CA PPQ Combined Program Budget FY14
- Long Term Contracts
    - Aerial Release Contract FL-PRP
    - Aerial Release Contract CA-PRP
- Equipment, Supplies and Material
    - Discharge Chute
    - Tim King Air Release Chutes
- SIRF Presentations and other supporting materials
- Medfly Mating Competitiveness Test Results
  - Guatemala - 2014 Sexual Competitive Test
  - Guatemala - 2013 Sexual Competiveness Evaluation of Ceratitis capitata
  - Hawaii Mating Competitiveness Test

Maps


USDA United States Department of Agriculture
Florida Preventive Release Program
March 2014
FFD Protocol
PRP - SIT
Interstate Hwy
US Hwy
State Hwy
County lines
Water
Airports
Sections Trapped by Agency
DPI
USDA
Both
None
SUMTER
LAKE
ORANGE
PASCO
HILLSBOROUGH
PINELLAS
POLK
OSCEOLA
BREVARD
INDIAN RIVER
MANATEE
HARDEE
OKEECHOBEE
ST. LUCIE
HIGHLANDS
DESOTO
SARASOTA
MARTIN
GLADES
CHARLOTTE
PALM BEACH
LEE
HENDRY
COLLIER
BROWARD
MONROE
DADE
PRP-SIT | FFD Grid Sections | Area (sq miles)
Broward | 156 | 162.1
Hillsborough | 250 | 254.1
Miami-Dade | 128 | 130.3
Palm Beach | 83 | 86.2
Total | 617 | 632.7
USDA-APHIS-PPQ
8100 NW 15th PL
Gainesville, FL 32606
Author: Courtney Hart
Data Sources: eTRAP, Florida Geographic Data Library
Map Projection: GCS North American 1983 HARN
Date: 3/27/2014
Time: 4:48:10 PM EST
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