



United States Department of Agriculture

Plant Protection and Quarantine:

Helping U.S. Agriculture Thrive—
Across the Country and Around the World



2017
Annual Report

Animal and Plant Health Inspection Service
APHIS 81-05-020

Plant Protection and Quarantine:

Helping U.S. Agriculture Thrive—
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2017

At-a-Glance

In 2017, Plant Protection and Quarantine kept potentially damaging pests and diseases out of the country.



Inspected and cleared 194 million pounds of fresh fruits and vegetables and more than **1.2** billion plants from 25 countries before they shipped to the United States



Worked with the U.S. Department of Defense to inspect **24,278** household goods shipments, **13,170** unaccompanied baggage shipments, **16,224** vehicles, and **717,539** pieces of military cargo before they returned stateside



Reduced the number of incoming ships with Asian gypsy moth egg masses from **48** in 2014 to **0** in 2017 thanks to the PPQ-led multinational offshore vessel inspection program



Cleared more than **17,000** shipments containing over **1.6** billion plant units and approximately **1,874** tons of seeds, intercepting **817** quarantine pests



Identified 143,411 pests (of which **71,158** were quarantine significant) found in imported shipments, allowing PPQ and U.S. Customs and Border Protection to act quickly to prevent pest entry



Inspected the bags of **11.4** million passengers in Hawaii and Puerto Rico before they left for the U.S. mainland, intercepting more than **275,000** prohibited agricultural products and **4,242** quarantine pests



Conducted more than **98,000** inspections of agricultural commodities shipped from Hawaii and Puerto Rico before they left for the U.S. mainland; carried out more than **7,000** treatments



Issued 18,633 import permits that detail specific entry requirements for incoming commodities and responded to **11,850** permit holder questions, helping to keep harmful pests from traveling to the United States



Cleared through post-entry quarantine 898 normally prohibited high-risk plant cultivars and germplasm from **14** different plant species, making safe new plant varieties available to U.S. importers and producers



Seized 2,347 prohibited agricultural items valued at over **\$554,000** from retail stores, internet sales, and express shipment courier inspections, preventing them from entering U.S. commerce

We fought back against the spread of invasive pests and diseases that threatened our Nation's crops and forests.



Eradicated 8 of 12 fruit fly outbreaks from 2016 and 2017



Achieved 5 years of zero pink bollworm finds in commercial cotton



Reduced boll weevil populations by **80%** in the Lower Rio Grande Valley, the last place in the United States where this pest exists, through coordinated eradication activities with State officials, the U.S. cotton industry, and Mexico



Released 12 million wasps in citrus-producing States to kill disease-spreading Asian citrus psyllids and reduce their populations by as much as **99%** around some release sites



Funded eight new citrus greening research projects to improve early detection, evaluate psyllid suppression in certain States, investigate thermo-therapy use on infected trees, and screen additional citrus varieties for greening resistance



Conducted 394 surveys with partners in 50 States and 3 Territories targeting **369** high-risk pests; coordinated response to detections of 30 federally significant pests



Protected more than **661** million acres of rangeland and forage crops worth over **\$8.7 billion** from damage caused by grasshoppers and Mormon crickets



Contained Karnal bunt to portions of Arizona, protecting **\$9 billion** worth of wheat production across the country and **\$5.3 billion** of U.S. wheat exports



Protected more than **\$20 billion** in U.S. specialty crop production (fruits, vegetables, tree nuts, horticulture, nursery crops) by preventing the spread of exotic fruit flies, citrus pests and diseases, glassy winged sharpshooter, pale cyst nematode, plum pox virus, sudden oak death, and light brown apple moth



Allocated \$53.2 million from the 2014 Farm Bill Section 10007 to support **483** plant pest and disease management projects in 50 States and 2 Territories



Supported 22 clean plant centers in 15 States that distribute disease-free stock of fruit trees, grapes, hops, berries, citrus, sweet potato, and roses to growers

We helped U.S. agriculture thrive in the global marketplace.



Secured release of **778** U.S. commodity shipments valued at more than **\$47 million** that were held at foreign ports



Issued 738,625 phytosanitary certificates to facilitate the export of U.S. plant products



Opened new markets for U.S. exports totaling **\$171.6 million**



Expanded market access for U.S. exports valued at **\$122.3 million**



Retained market access for U.S. exports totaling **\$22.7 billion**



Conducted 17 bilateral meetings with 15 countries and **14** technical meetings with 10 countries to negotiate phytosanitary requirements for the safe trade of live plants and fresh fruits and vegetables



Worked with **182** International Plant Protection Convention members to adopt 15 new international standards and 10 diagnostic protocols that ensure safe trade, a record number for a single year



Processed nearly **1 million** Lacey Act declarations, more than double the number in 2016, helping to combat the illegal trade of protected plant species

Message From the Deputy Administrator



For Plant Protection and Quarantine (PPQ) and our partners, 2017 was a year of notable achievement. We continued to push the United States' line of defense against invasive pests and diseases further offshore, allowing us to take action against pests hitchhiking on or in imported goods before they reached our borders. Here at home, we fought back against the spread of damaging pests such as exotic

fruit flies, citrus greening, Asian longhorned beetle, boll weevil, and pale cyst nematodes that threatened our Nation's crops and forests. In total, our efforts protected more than \$98 billion worth of U.S. agriculture production and exports valued at over \$138 billion.

On the world stage, PPQ helped U.S. agriculture thrive in the global marketplace. We worked closely with our international trading partners to develop and promote science-based standards, helping to create a safe, fair, and predictable agricultural trade system that minimizes the spread of invasive plant pests and diseases. We reached critical plant health agreements and resolved plant health barriers to trade to open, expand, and retain U.S. export markets valued at nearly \$23 billion. And, we helped U.S. producers meet foreign market access requirements and certified the health of more than 738,000 exports, securing economic opportunities for U.S. products abroad. These successes underscore how PPQ is working every day to keep U.S. agriculture healthy and profitable.

To make sure PPQ maintains our high-quality work and service, we continuously evaluate our efforts and take steps to strengthen our pest exclusion system, optimize our domestic pest management and eradication programs, and increase the safety of agricultural trade. In 2017, for example, we further improved our data quality, collection, and management and increased our use of analytics and risk modeling. This gave us and our partners an enhanced, data-driven view of the pest risks and threats we are facing. The information is now influencing how we regulate pest risk and respond to plant health issues based on evidence of risk, not just perception of risk.

We adopted, adapted, and applied modern technologies to improve program effectiveness and enhance program delivery. From unmanned aircraft systems and molecular diagnostics to tablet computers, technology is putting us on the cutting edge in the fight against invasive pests. We took a critical look at our regulatory authorities and used alternatives to rulemaking when possible. In doing so, we also explored flexibilities in our regulations that have not been used before and continued streamlining them. Our goal in this work is to successfully mitigate risk in the least restrictive and most cost-effective way. With this idea in mind, we also engaged with domestic and international partners to leverage, share, and focus resources for maximum impact and mutual benefit. As you will see in the coming pages, these efforts had many tangible results.

I am grateful to the talented men and women of PPQ and their deep commitment to our mission. I am also thankful for our partners, without whom none of this would be possible. We look forward to working with each of you in the years ahead as we continue to safeguard American agriculture and facilitate the safe trade of agricultural products.

Sincerely,

A handwritten signature in blue ink, appearing to read "Osama El-Lissy". The signature is fluid and cursive.

Osama El-Lissy
Deputy Administrator
Plant Protection and Quarantine
Animal and Plant Health Inspection Service
U.S. Department of Agriculture

We safeguard U.S. agriculture and natural resources against the entry, establishment, and spread of economically and environmentally significant pests and facilitate the safe trade of agricultural products.

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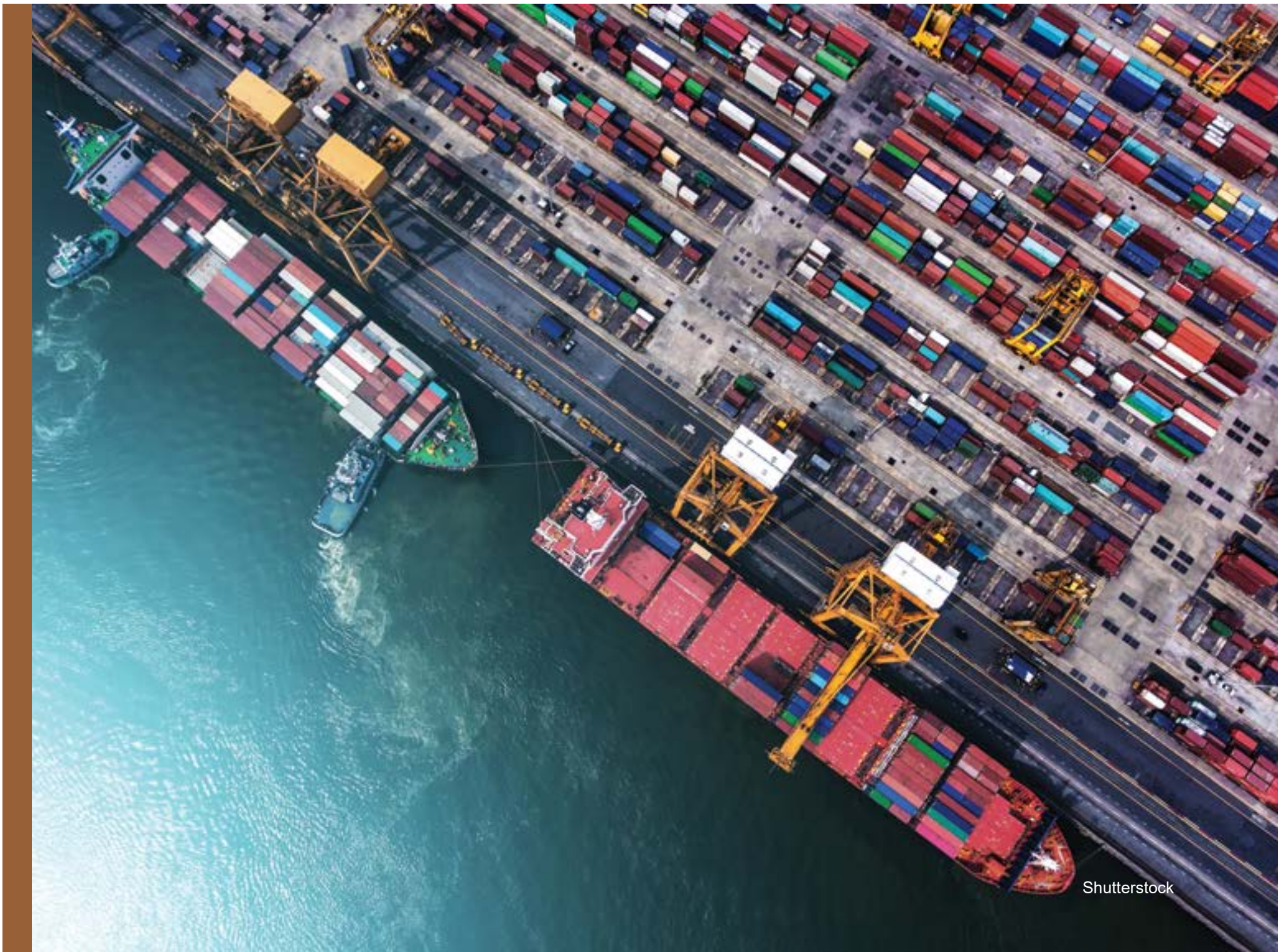


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Strengthening Pest Exclusion

At the core of PPQ's safeguarding system is a continuum of pest exclusion strategies and activities. These work together to minimize the plant health risks that come with agricultural imports, international travel, and the smuggling of prohibited agricultural products. This system of safeguards begins offshore, continues through U.S. ports of entry, and extends across the Nation.

In our 2015 Strategic Plan, PPQ established two objectives for strengthening pest exclusion. The first: To address risks at the first opportunity—when the likelihood of pest exclusion is greatest. The second: To make better use of the information we collect at each point along the pest exclusion continuum to target and reduce threats to U.S. agricultural and natural resources.

Taking the Fight Offshore

One of the most effective ways to make sure commodities and other products move safely into the United States is to address pest threats where they originate. When we take action to prevent or deal with pests in imported goods before they reach our shores, we can protect the health and marketability of our Nation's agricultural and natural resources much more effectively.

Pre-Clearing Commodities, Military Shipments, and Passengers

In 2017, our commodity preclearance program spanned 25 countries across 6 continents and covered 65 different types of commodities. Through this program, we inspected and pre-cleared more than 194 million pounds of fresh fruits and vegetables and 1.2 billion plants, a 9-percent increase over the previous year. This work not only ensures the safety of imported commodities, but also benefits importers whose inspected, pre-cleared, and certified products may pass through U.S. ports of entry without delay.

To help the U.S. military prevent the spread of foreign animal diseases and plant pests, we worked with the U.S. Department of Defense to inspect military equipment, cargo, and household goods returning stateside. This included recertifying 102 military preclearance programs located in Europe and Africa and training more than 2,000 military inspectors. In total, these programs cleared more than 24,000 shipments of household goods, 13,000 unaccompanied baggage shipments, 16,000 vehicles, and 717,000 pieces of military equipment in 2017, helping to speed the safe entry of these items into the United States.

To protect U.S. mainland crops and forests from pests and diseases that are established in Hawaii and Puerto Rico, PPQ inspects the bags of all mainland-bound air travelers and cargo shipments coming from those locations. We carry out many other pest detection and response activities as well to protect valuable agriculture there and keep harmful pests from



In 2017, PPQ inspected and cleared 194 million pounds of fresh fruits and vegetables and more than 1.2 billion plants from 25 countries before they shipped to the United States.

spreading to the U.S. mainland. In 2017, we inspected 11.4 million passengers before they left Hawaii and Puerto Rico for the U.S. mainland, intercepting more than 275,000 prohibited agricultural products and 4,242 quarantine pests. We also conducted more than 98,000 agricultural commodity inspections and more than 7,000 treatments to prevent the movement of damaging plant pests and diseases to the mainland.



PPQ certifies overseas treatment and production facilities that ship high-demand, large-volume commodities to the United States. These certifications verify that the facilities and their operations meet our standards and regulatory requirements, helping to protect U.S. plant health from harmful invasive pests.

Expanding Overseas Certification

PPQ certifies overseas treatment and production facilities that ship high-demand, large-volume commodities to the United States, such as geraniums and niger seed, a common ingredient in bird seed. These certifications verify that the facilities and their operations meet our standards and regulatory requirements, which helps protect U.S. plant health from harmful invasive pests.

In 2017, PPQ launched a 6-month, offshore greenhouse certification pilot program for facilities that export ornamental plant cuttings to the United States. Given the high volume of these shipments—more than 1 billion plant cuttings a year—and their pest risks, PPQ and the U.S. nursery industry wanted to test an idea that could significantly reduce risks: requiring offshore facilities to follow minimum standards and protocols for production, sanitation, and traceability. PPQ will analyze the results to see if certifying offshore greenhouse facilities would further safeguard our country against the entry of plant pests and pathogens on imported plant cuttings.

Teaming Up With Other Countries To Prevent Pest Spread

In 2017, we continued working with countries around the world to stop the spread of damaging plant pests, including Asian gypsy moth (AGM) and exotic fruit flies.

AGM is a devastating forest pest with a wide host range. Experts estimate that if it were to become established in the United States, AGM could cause



Thanks to the PPQ-led multinational Offshore Vessel Inspection Program, more than 90 percent of the vessels entering U.S. ports from Asia are free of Asian gypsy moth.

billions of dollars in losses and pest-control costs. To keep this pest out of our country, PPQ leads a multinational AGM vessel certification program. As a result of our technical coordination with the governments of Canada, Russia, Japan, China, and Korea, more than 90 percent of the vessels entering U.S. ports from Asia are free of AGM. In 2017, PPQ worked with other countries that regulate AGM to harmonize requirements for vessel inspection and certification, making compliance easier for ships that call at ports around the world. We also began monitoring for AGM on U.S. military bases in Japan and South Korea to prevent this pest from moving via U.S.-destined cargo.

Closer to home, PPQ continued working with countries throughout the Caribbean to prevent the introduction and spread of high-risk plant pests, especially exotic fruit flies. This included delivering plant quarantine training, sharing scientific and technical expertise, supporting pest surveys, offering help with emergency response, and cooperating on pest management activities to create a perimeter defense against the movement of pests. PPQ also coordinated the first-ever fruit fly symposium for the Caribbean region and Central America in 2017. The goal is to help countries improve exotic fruit fly surveillance and monitoring and create an early warning network should an outbreak occur close to U.S. shores. Also, we expanded outreach to travelers moving between the United States and the

Caribbean to raise awareness about the importance of declaring agricultural items when they arrive in the United States. Our work helped reduce the threat of fruit flies and other pests in this high-risk pathway. Altogether, these efforts protect the Caribbean and the United States from pest threats and facilitate regional economic growth.

Zeroing In on Higher-Risk Shipments at U.S. Ports of Entry

PPQ continually evaluates, tests, and applies cutting-edge tools and technologies that allow us and our U.S. Customs and Border Protection (CBP) partners to more effectively detect and address plant pests and diseases arriving in foreign shipments and passenger bags. We are also refining our ability to use the pest interception data we collect during port-of-entry inspections to better predict and reduce pest threats approaching our shores. Together, these advances strengthen our ability to exclude pests, focus resources on the highest risks, and safeguard our Nation's agricultural security—all at the speed of commerce.

Smarter Inspections, Stronger Safeguarding

For the last few years, PPQ has been developing a new and more effective way to sample imported commodities for inspection at U.S. ports of entry. The method is called risk-based sampling (RBS). Its objective is to reduce inspections of low-risk items, increase inspections of higher risk items, and give importers incentives to bring in pest-free products.



USDA, R. Anson Eaglin

In 2017, PPQ inspectors cleared more than 17,000 shipments containing over 1.6 billion plant units and approximately 1,874 tons of seeds, intercepting 817 quarantine pests.

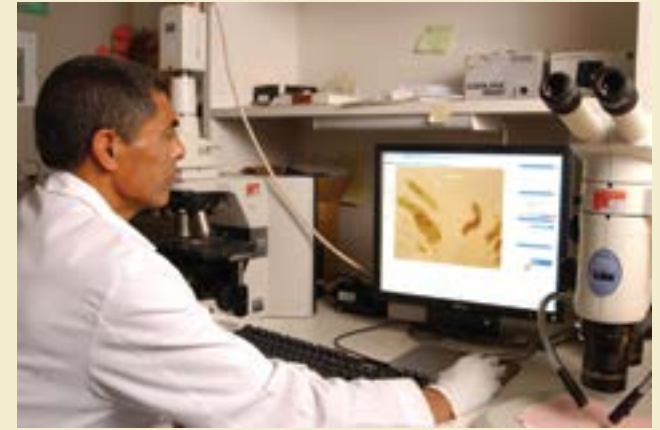
About 2 years ago, PPQ took its first steps toward putting RBS in place. We stopped sampling incoming shipments of plants for planting at a flat rate (usually 2 percent) and started calculating the number of boxes to inspect based on a shipment's size and the number of sample units and plant taxa it contains. This process, called hypergeometric sampling, has allowed our inspectors to detect pests more consistently and efficiently: they know exactly how many boxes they need to look at to confidently determine if there is a pest in an incoming shipment.

In 2017, PPQ began using the data from hypergeometric sampling to estimate pest approach rates for specific types of plant material. Our next step is to develop risk-based sampling strategies that better target inspections on live plant shipments, which are more likely to be infested. We are also working with CBP to expand the use of risk-based inspection strategies for agricultural commodities entering U.S. ports.

Assessing Pest Risk in Real Time

PPQ deployed the Agricultural Risk Management (ARM) system in all of our plant inspection stations in 2016. The system tracks and analyzes shipments that contain live plants, cuttings, and seeds, giving users quick access to pest-risk trends. ARM also incorporates previously separated but closely related processes and workflows, such as pest quarantine decisions, treatment schedule recommendations, and remote pest identification using digital imaging, which helps speed cargo processing and release.

In 2017, PPQ took steps to integrate ARM with CBP's Automated Commercial Environment (ACE, also known as the "Single Window"). This will allow for seamless exchange of data between PPQ and CBP on imported commodities, pest interceptions, and emergency action notifications. Together, ARM and ACE are enabling PPQ to collect more detailed data on incoming plant and commodity shipments that we can feed into our risk analyses. This constant data cycle strengthens our ability to accurately assess risks in real time and take quick action to reduce or eliminate threats from pests or diseases arriving in or on imported goods.



USDA, R. Anson Eaglin

Our scientists identified more than 143,000 pests found in imported shipments in 2017, allowing PPQ and U.S. Customs and Border Protection officials to take quick action and prevent the entry of potentially harmful pests.

Identifying Intercepted Pests With Greater Speed and Accuracy

PPQ continues to test and evaluate the use of molecular diagnostics at U.S. ports of entry to enhance our methods and inform quarantine decisions. This technology is increasing our ability to detect diseases that may not be found through visual inspection. It can also help us more accurately identify intercepted pests and diseases to the species level, which could expedite cargo clearance. Additionally, molecular diagnostics has the potential to alert us to new or undisclosed infestations in other countries. For example, we recently used molecular diagnostics to analyze DNA from intercepted fruit flies and determine the pests' geographic origin. As a result, we were able to narrow the flies' origin to a specific region and, in some cases, a specific country, which helped us find and address a potentially serious pathway.

In related efforts, PPQ continues to design, develop, and deliver digital, media-rich identification tools. These tools speed the accurate identification of pests intercepted at U.S. ports and elsewhere. In FY 2017, we released new web-based identification tools for pollinator and palm pests. We also added more than 19,000 images to imageID, a restricted-access site for port identifiers, bringing the total number of images to 110,000.

Making Safe New Plant Varieties Available to U.S. Importers and Producers

PPQ has the only Federal plant quarantine program that regularly imports a wide range of prohibited plants to improve U.S. agriculture. Through this program, we test quarantined plants for multiple foreign pathogens using a combination of methods before releasing them. In 2017, we began using next-generation sequencing technologies, a powerful new diagnostic tool for identifying pathogens. Within a few months, our scientists were able to use the technology on more than 70 collected grass varieties and assemble a pathogen database of viruses infecting those plants. As a result, we detected Barley virus G infecting a switchgrass plant in our collection—the first-ever report worldwide of this virus infecting this host.

This new identification tool is strengthening our ability to detect and keep high-risk diseases out of the country, while making safe new plant varieties and breeding lines available to U.S. growers, breeders, scientists, and other importers.



USDA, R. Anson Eaglin

In 2017, PPQ cleared through post-entry quarantine 898 normally prohibited high-risk plant cultivars and germplasm from 14 different plant species, making safe new plant varieties available to U.S. importers and producers.



PPQ officers scour markets, retail stores, and the internet looking for prohibited or restricted agricultural products that may have been smuggled into the country or that entered illegally. In 2017, they seized more than 2,300 prohibited agricultural items, preventing them—and the harmful plant pests or animal diseases they might harbor—from entering U.S. commerce.

Safeguarding Beyond the Border

PPQ's pest exclusion system stretches across the country, where we work to detect prohibited products and foreign pests and diseases that may have evaded other safeguarding measures or entered the United States through illegal means.

Finding Pests Before They Cause Harm

PPQ officers scour markets, retail stores, and the internet looking for prohibited or restricted agricultural products that may have been smuggled into the country or that entered illegally. These products may harbor invasive plant pests or foreign animal diseases that could harm our Nation's crops, livestock, or forests. In 2017, PPQ seized more than 2,300 prohibited agricultural items valued at over \$554,000 from retail commercial locations, internet sales, and express courier package inspections. We also conducted 24 national recalls to remove more than 46,000

pounds of high-risk products from commerce and eliminate dangerous and costly invasive pests that pose a threat to U.S. agriculture. PPQ continues to focus on closing illegal pathways for high-risk agricultural goods. This work helps safeguard over 2 million farms and high-value agriculture industries operating in the United States.

On an ongoing basis, PPQ and its partners also scan agricultural production areas and the environment looking for signs of pests that may have slipped into the United States. Our goal: Detect new or re-introduced pests and diseases early and respond quickly to prevent large-scale agricultural, environmental, and economic losses. Together, we conducted 394 surveys in 50 States and 3 Territories that targeted 369 high-risk pests in 2017. As a result, PPQ coordinated response to detections of 30 federally significant pests.

Case Study:

PPQ Tests New Offshore Greenhouse Certification Program for Imports of High-Volume Plant Cuttings

Did you know that the United States imports over 1 billion plant cuttings each year? In fact, over half of the plants you see at retail stores today started from a tiny cutting produced in a greenhouse in Central or South America, Africa, or the Middle East. And all of these cuttings must pass through one of PPQ's 16 plant inspection stations before going to their final destinations. That puts a lot of pressure on the U.S. safeguarding system.

To alleviate some of this pressure, a small group of PPQ experts, nursery company managers, and horticulture industry representatives designed an offshore greenhouse certification program in 2017. The program will focus on generally admissible, unrooted plant cuttings and

will operate under a comprehensive policy framework, which includes standards for greenhouse construction, security, production and sanitation, pest management, training, and recordkeeping. If successful, it will make inspections at PPQ's plant inspection stations more efficient and help speed the entry of high-volume plant-cutting shipments by effectively reducing pest risks in the exporting countries' greenhouse facilities.

Before launching the pilot program, officials from PPQ and APHIS International Services visited eight candidate facilities in six countries: Colombia, Costa Rica, Guatemala, El Salvador, Mexico, and Nicaragua. The team audited each facility to ensure compliance with the pilot

framework before certifying them to participate in the program. PPQ staff also worked closely with staff from the Miami and Atlanta plant inspection stations to develop standard operating procedures and train employees on collecting shipment data from certified facilities.

The pilot will run for 6 months, from October 2017 through March 2018. During that time, PPQ will collect data on shipments from certified overseas facilities that are entering the United States through the Miami and Atlanta plant inspection stations. These inspection stations typically receive the highest volumes of unrooted plant cuttings in the country, and data collected at these points will help us confidently determine whether green-

house certification can effectively mitigate pest and disease risks associated with this pathway.

If the pilot is successful, PPQ will open the program to other offshore facilities and reduce inspection frequency on generally admissible plant-cutting shipments from certified greenhouses. The result will be a win-win situation for everyone involved: high-volume, low-risk shipments of plant cuttings from certified facilities will clear faster; PPQ will focus more of its live plant inspection resources on higher risk imports; and America's agricultural and natural resources will benefit from better overall risk management.





Optimizing Pest Management and Eradication

When foreign pests that can harm our Nation's forests, damage U.S. crops, or disrupt trade become established in the United States, PPQ works closely with Federal, State, Tribal, and industry partners to control and, when possible, eliminate them from our country. In 2017, we made great progress in eradicating a number of plant pests and diseases. We also contained and suppressed other foreign pests and diseases to prevent their further spread and keep export markets open.

In our 2015 Strategic Plan, we established two objectives for optimizing pest management and eradication. The first: To more fully coordinate with and engage our partners in determining where we can and should focus our resources to yield the greatest results. The second: To explore how we might integrate and wisely use the unique capacities of all partners to strengthen and extend PPQ's domestic programs. Underpinning both of these goals is our commitment to use the best available science, data, and technologies to strengthen our effectiveness and deliver results for the industries we serve.

Modernizing the Fight Against Harmful Pests and Diseases

PPQ continuously evaluates, adapts, and adopts the best available science, tools, and technologies to improve its plant protection methods. From the use of mobile data collection tools to unmanned aircraft, these advances are keeping PPQ and its partners on the cutting edge in the fight against harmful plant pests and diseases.

Expanding the Use of Canines, Unmanned Aircraft, and Biological Control

PPQ has been working on a number of initiatives to make our pest management and eradication programs more efficient and effective. In the field, we have been putting dog teams to the test by challenging them to detect a wide range of plant pests and diseases, including coconut rhinoceros beetle, fruit flies, and citrus canker. In controlled trials, the dogs demonstrated their ability to detect citrus greening disease before molecular diagnostic tests could confirm the disease's presence. In field trials, the dogs were able to detect plum pox virus in orchards and in dormant tree material held in cold storage.

Looking to the sky, we continue exploring how we could use unmanned aircraft systems (UAS) to improve our operations. In 2017, we developed a new backpack-portable UAS that can help survey trees for signs of pests, conducted proof-of-concept trials with a camera-equipped UAS for capturing images of gypsy moth egg masses on ship containers, and tested a UAS with sensor array for evaluating grasshopper treatments on open rangeland. We are also testing this technology's ability to release sterile insects, including fruit flies.



Since 2014, PPQ has been working with leaders in the field of unmanned aircraft systems (UAS) to develop and adapt the technology for plant health protection, including releasing sterile insects, conducting remote pest surveys, and assessing plant health over wide areas.

When it comes to developing new, more effective plant protection methods, a major focus for PPQ is to advance the use of pests' natural enemies, either alone or in combination with other control tactics. These natural enemies, also known as biological controls, have a proven track record of mitigating the impacts of invasive pests, weeds, and diseases, while minimizing impacts of pest control activities on the environment. In 2017, PPQ scientists traveled to a number of countries to identify natural enemies for three particularly challenging forest pests—Asian longhorned beetle, spotted lanternfly, and emerald ash borer—and imported several potential biocontrol agents for testing.

Collecting Better Data, Making Better Decisions

PPQ field surveyors collect extensive pest-detection data as part of their daily work. We use that data to plan, conduct, and evaluate domestic programs; demonstrate the pest-free status of U.S. exports; develop new science-based methods and models; and stay accountable to our stakeholders.

To make sure we have access to quality, error-free data, we delivered 300 mobile devices to operations staff and field surveyors in more than 20 States to improve field data collection in 2017. We also tested cloud-based geographic information system tools and incorporated improved data collection solutions in several domestic pest programs, including fruit flies, citrus health, gypsy moth, grasshoppers and Mormon crickets, and Asian longhorned beetle. In 2017, our analysts completed five comprehensive program reviews using collected data. They also developed a prototype system called the Pest Data Management Tool. This tool pulls, translates, and analyzes data from numerous sources and produces near real-time national and local views of pest program operations. The possibilities it has for improving data-driven decision making in domestic operations are exciting.

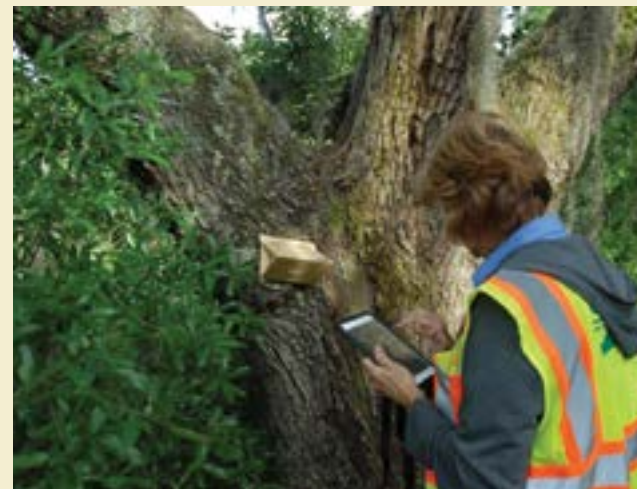
Maximizing PPQ and Partner Actions To Deliver Results

Strategic partnerships are a critical part of our pest management and eradication success. We work with numerous groups—grower and industry associations, State and local officials, academia, other Federal agencies, and foreign governments—to fight back against invasive plant pests.

Our most important domestic partner is the National Plant Board (NPB)—an organization of plant regulatory officials from State departments of agriculture. Not only do we work together to address plant pests and diseases that may threaten U.S. production and disrupt U.S. access to valuable export markets, but we also collaborate with the NPB to determine when, where, and how we take action to yield the greatest results.

Eradicating Cotton Pests

For decades, PPQ has been working with growers, the cotton industry, affected States, and Mexico to eradicate two of the most destructive cotton pests—boll weevil and pink bollworm—from all commercial cotton-producing areas in the United States. As a result, PPQ and cooperators have eliminated boll weevil from 99.5 percent of the United States' 11 million cotton acres. The Lower Rio Grande Valley is the last zone within our country where boll weevil persists. To accelerate progress toward eradicating the pest from this area, we established a cooperative agreement with the North American Plant Protection Organization to help fund boll weevil treatments for the last 2 years in northern Mexico. This approach reduced boll weevil populations in the Lower Rio Grande Valley by more than 80 percent in 2017, bringing us one step closer to full eradication.



PPQ delivered 300 mobile devices to operations staff and surveyors in more than 20 States to improve the collection of quality, error-free field data in 2017.

PPQ and partners have also eliminated pink bollworm from California, Arizona, New Mexico, and Texas. With zero detections since 2012, we expect to announce eradication of this damaging pest in the near future. In 2017, we finalized our post-eradication plan. It includes maintaining the sterile pink bollworm colony in our Arizona containment facility. The plan also provides strategies for ongoing monitoring and rapid response to small-scale outbreaks if they occur in the future.

By controlling and eventually eradicating these devastating cotton pests, PPQ protects U.S. cotton production worth \$27 billion, significantly lowers production costs, and helps maintain strong export markets abroad.



PPQ has reduced boll weevil populations by 80 percent in the Lower Rio Grande Valley, the last place in the United States where this pest exists, through coordinated eradication activities with State officials, the U.S. cotton industry, and Mexico.

Protecting Field Crops and Rangeland

PPQ cooperates with Federal, State, Tribal, and local agencies to protect U.S. field crops and rangelands from harmful pests, including grasshoppers and Mormon crickets, imported fire ants, Karnal bunt, and witchweed. This work helps protect important natural and agricultural resources that rural communities depend on for income.

Grasshoppers and Mormon Crickets: In 2017, PPQ surveyed for grasshoppers and Mormon crickets in 17 States and treated approximately 25,000 acres of rangeland, helping to protect 52,000 acres of

rangeland forage and wildlife habitat. We continued to assess the effect of grasshopper and Mormon cricket treatments on the environment to minimize their impact on wildlife habitat, wetlands, and beneficial insect species. This included conducting trials on private rangelands in New Mexico to test new treatment options for grasshoppers and Mormon crickets. These new treatment options are more environmentally safe with very low toxicity to bees and other beneficial insects, including predatory and parasitic insects that help suppress grasshopper populations. In 2018, we will publish an environmental impact statement that describes the new treatment options.

Imported Fire Ant: Imported fire ant (IFA) is found today in 14 States and Puerto Rico. This invasive pest eats crops, inflicts painful stings, and builds large nests that can damage farm equipment. Working with cooperators, PPQ keeps IFA from spreading to other areas by regulating the interstate movement of baled hay and other products that could harbor the pest, using biological controls to reduce IFA populations in impacted areas, and developing cutting-edge tools to support safe interstate movement of agricultural products. For example, PPQ and cooperators from USDA's Agricultural Research Service worked with a private firm to develop a rapid identification test kit for IFA. Previously, shipments with suspicious ants would be held at agricultural checkpoints until the ants could be identified—12 to 24 or more hours later. Now, the new test kit identifies red and hybrid IFAs in as little as 5 minutes.

To fight back against IFA infestations, PPQ and its partners have unleashed the pest's natural enemy:



Scott Bauer, USDA Agricultural Research Service, Bugwood.org

PPQ and partners are using a parasitic insect called the phorid fly to fight back against imported fire ants. In South America, phorid flies keep fire ant population densities down to about 20 percent of U.S. densities.

a parasitic insect called the phorid fly. For 16 years, PPQ funded a cooperative project to rear and release these flies and eventually give them a firm foothold in IFA-infested States. The project concluded in July 2017, with phorid flies established in all quarantine areas. Over time, we expect the flies will help slow IFA population growth and allow native ants to take back their natural habitat.

Karnal Bunt: Karnal bunt is a fungal disease of wheat that was first detected in the United States in 1996. Working with State departments of agriculture and the U.S. wheat industry, PPQ has contained this disease to portions of one State. This cooperative effort protects U.S. wheat production worth more than \$9 billion and wheat exports valued at over \$5.3 billion. In 2017, PPQ processed more than 1,200 Karnal bunt survey samples from 32 States, confirming the disease does not exist outside current regulated areas. Based on survey results from within the regulated areas, PPQ will further reduce the size of the quarantine by more than 16,000 acres in 2018.

To help expand market opportunities for wheat and straw grown in Karnal bunt-regulated areas, we conducted two pathway analyses last year. The first examined the risk of spreading Karnal bunt through wheat, durum wheat, and triticale harvested for silage; the second evaluated the risk of spreading the disease through straw harvested from Karnal bunt-positive fields. The analyses found that silage crops posed a negligible risk of spreading Karnal bunt and that straw can be moved out of regulated areas and processed into animal feed without spreading the disease. These findings have helped to open markets for impacted growers while preventing the spread of Karnal bunt to new areas.

Supporting Specialty Crops

PPQ works with State, Tribal, university, and industry partners to develop and carry out policies and regulations that protect U.S. fruits and vegetables, tree nuts, and nursery crops from damage and trade disruptions due to invasive pests. In 2017, our efforts protected U.S. specialty crop production valued at more than \$30 billion and exports worth over \$8 billion.

Citrus Diseases: One of our greatest challenges is saving U.S. citrus from citrus greening, one of the world's most devastating citrus diseases. This disease has ravaged Florida and caused the loss of more than 840,000 acres of citrus and over 8,000 jobs in that State. And now the Asian citrus psyllid, the insect that carries citrus greening, is widespread in southern California, putting that State's \$2 billion citrus industry at risk. For the last 4 years, we have invested more than \$25 million through a PPQ-led multiagency group to more quickly develop new technologies that could help the U.S. citrus industry fight back against citrus greening. In 2017, cooperator projects funded by this group delivered more sensitive diagnostic tools that enable faster detection and quicker response. Cooperators also continued studying the use of thermotherapy and screened additional citrus varieties for resistance to citrus greening.

Through our Citrus Health Response Program, we continued to increase the production of Asian citrus psyllid biocontrol agents, rearing more than 3 million parasitoids in 2017. We also developed



USDA, R. Anson Eaglin

In 2017, the PPQ-led *Huanglongbing* multi-agency coordination group funded eight new citrus greening research projects to improve early disease detection, evaluate psyllid suppression in certain States, investigate thermotherapy use on infected trees (shown), and screen additional citrus varieties for greening resistance.

a new diagnostic tool that can screen citrus black spot suspect samples in 1 hour. And we updated our citrus nursery stock protocol, helping nearly 14,000 businesses move regulated citrus fruit and nursery stock to market. In total, this program protects more than 711,000 acres of citrus production nationwide worth \$3.4 billion and over \$1 billion in citrus exports.



Biopix, S.D. Lund, www.biopix.com

Last year, PPQ eradicated 8 of 12 fruit fly outbreaks from 2016 and 2017. We also detected European cherry fruit fly in Niagara County, New York—the first-ever detection of this species in the United States. We had been carefully monitoring for this pest in New York following Canada’s detection in 2015 and are currently working with cooperators to determine a response.

Exotic Fruit Flies: Fruit flies are among the most destructive and feared agricultural pests in the world, and PPQ takes the threat of outbreaks very seriously. Working with State partners, our goal is to detect an outbreak early and respond rapidly. Our swift and effective action protects crops and the industries that depend on them, as well as valuable foreign export markets. To accomplish this, PPQ and cooperators maintain a sensitive detection network

of approximately 150,000 traps across the Southern United States from California to South Carolina and in Puerto Rico. In areas at highest risk for Mediterranean or Mexican fruit flies in California, Texas, and Florida, we release billions of sterile fruit flies annually. The sterile fruit flies mate with wild fruit flies, preventing reproduction. In 2017, PPQ released on average 356 million sterile fruit flies per week in those States, helping to eradicate 7 of 8 outbreaks in Texas and 1 outbreak in California.

In 2018, PPQ will open a new sterile fruit fly facility in Sarasota, FL, and begin construction on another facility on Moore Air Base, in Mission, TX. We are also planning for a new sterile fruit fly facility in Los Alamitos, CA, which will replace our current Southern California facility. Together, these new facilities will bolster our ability to fight back against fruit fly introductions.

Grape Pests: PPQ works with a number of cooperators to protect U.S. grape production from devastating pests and diseases, including glassy-winged sharpshooter and European grapevine moth (EGVM), and keep valuable export markets open. PPQ and partners eradicated EGVM from the United States in 2016 and continue monitoring for the pest in all grape-growing areas of California, with zero detections in 2017. This monitoring will continue through 2019 to make sure we detect any new EGVM introductions quickly. PPQ and cooperators also continued their efforts to control glassy-winged sharpshooter populations and prevent the pest’s spread in California. In total, we conducted surveys in 49 counties, treated more than 37,000 acres, and inspected over 36,000 nursery stock shipments from infested areas, protecting 841,000 acres of grape production worth more than \$5 billion in 2017.



Charles Ray, Auburn University, Bugwood.org

PPQ and partners have protected 841,000 acres of California grape production worth more than \$5 billion by preventing the spread of light brown apple moth and glassy-winged sharpshooter (shown).

Potato Pests: Working with State departments of agriculture and the potato industry, PPQ is fighting back against two significant potato pests—pale cyst nematode in Idaho and golden nematode in New York. Together, we have confined each pest to relatively small areas and continue survey and other regulatory activities to protect 1 million acres of potato production nationwide and export markets worth more than \$203 million. In Idaho, PPQ and partners have reduced viable pale cyst nematode populations by 99 percent since the pest was first detected in 2006. In New York, we have lifted restrictions on 76 percent

of the quarantined area. We also continue developing alternatives to methyl bromide fumigation treatments for infested fields. This includes the use of a trap crop that stimulates nematodes to hatch but doesn't allow them to reproduce. In 2017, we planted the trap crop on 36 acres in Idaho and will evaluate the results next year. In addition, we completed a pathway analysis and produced New Pest Response Guidelines for *Dickeya solani*, a fungal pathogen of potatoes that has not yet been detected in the United States.

Sudden Oak Death: PPQ protects U.S. nursery stock production and trade by limiting the spread of sudden oak death, a disease caused by a fungus-like organism called *Phytophthora ramorum*. This disease can affect several oak tree species and more than 100 types of landscape plants. For more than 10 years, PPQ and State partners have contained the disease to 15 California counties and a small area in 1 Oregon county. Since 2014, we have focused our regulations more and more on the highest risk nurseries, while easing requirements on lower risk nurseries (those that ship interstate, but where the disease was never found or has not been found in the last 3 years). At this time, interstate-shipping nurseries in a quarantine area and any nurseries outside quarantine areas that have tested positive for sudden oak death must take specific steps to eliminate the disease and prevent its reintroduction. This approach is helping PPQ and State officials make better use of limited inspection resources while strengthening our ability to prevent the spread of this disease.

Combating Tree Pests

Fighting back against the Asian longhorned beetle, emerald ash borer, and Asian gypsy moth is a top priority for PPQ. Asian longhorned beetle is one of the worst invasive insects to ever enter the United States. It threatens U.S. forests nationwide. Fortunately, we have eradicated it from two States and significantly reduced its foothold in the remaining three States where it's been detected.

Asian gypsy moth feeds on more than 500 tree species. Experts estimate that if this species becomes established in the United States, it could alter our environment, change our urban and rural landscapes, and cause billions of dollars in losses and control costs. In response to single detections of this pest in Oklahoma (2013 and 2014), South Carolina (2014 and 2015), and Georgia (2015), PPQ and cooperators have conducted annual surveys in these States to make sure the pest did not become established. In 2017, after 3 years of surveys with no more detections, PPQ confirmed that Oklahoma is free of Asian gypsy moth. We also continued surveys in treated areas of Washington and Oregon, where 14 moths were found in 2015. If there are no further detections in 2018, we expect to declare eradication in these States as well.

Progress against the emerald ash borer has been more elusive. It has spread to 31 States and the District of Columbia. This pest has killed more than 100 million ash trees and continues to spread. Our main strategy now for managing beetle populations is releasing the pest's natural enemies—tiny, stingless parasitoid wasps—into infested areas. In 2017, we released them



John Ghent, Bugwood.org

PPQ confirmed that Oklahoma is free of Asian gypsy moth in 2017 after 3 years of surveys with no further detections. Surveys continue in Washington and Oregon where 14 moths were found in 2015. If there are no further detections in 2018, PPQ will declare eradication in those States.

in 25 States and the District of Columbia, and we have detected reproducing wasp populations in 14 of them. This approach is showing promise, especially in protecting younger trees.

Case Study:

PPQ Unleashes the Full Power of a Detector Dog's Nose

For decades, detector dogs have proven their value in sniffing out prohibited agricultural products in passenger baggage, cargo, and parcels. They zero in on the smells of certain fruits and meats. Now PPQ is working with a third party to train canines to detect specific pests and diseases. This new “breed” of detector dogs could accompany pest survey specialists during a foreign pest or disease outbreak, speeding our efforts to determine the infestation’s boundaries and identify pest-free areas. They could also work at ports, sniffing entire shipments of commodities to detect traces of insect larvae or plant disease.

A number of recent PPQ pilot studies revealed the enormous potential of these dogs:

- In Hawaii, the dogs searched for the palm-killing coconut rhinoceros beetle (CRB) in mulch piles, a favorite breeding

site for the invasive insect. During the study, the canines had a nearly 90-percent detection rate for CRB larvae living 2–10 inches deep in mulch. They could also confirm that mulch piles were CRB-free in half the time it takes a four-person survey crew.

- Also in Hawaii, this time in controlled environments, dogs sniffed out Mediterranean fruit fly (medfly), demonstrating 90-percent proficiency detecting medfly larvae, 82-percent proficiency finding a medfly-infested fruit piece among non-infested fruit pieces, and a response time of less than 7 minutes to search 100 pieces of fruit and identify the 3 medfly-infested fruits in the study.
- During training exercises in Florida, dogs found citrus canker disease more than 99 percent of the time; dog

teams are also training to detect citrus greening disease.

- During a proof-of-concept exercise in a controlled environment in Georgia, dogs searched actual palletized cargo for the telltale sign of wood-boring beetle infestations: frass, a mixture of larvae-produced sawdust and excrement. The dogs searched about 100 pallets, 10 of which contained frass samples placed by their trainers, and detected the frass with 100-percent accuracy. Based on these results, U.S. Customs and Border Protection is evaluating options for deploying frass-detecting canines in the field.

Pest-detecting canines trained by PPQ have already proven themselves operationally: The California Department of Agriculture is using them to detect prohibited agricultural products entering the State

via international and domestic mail and express parcel services. The Florida Department of Agriculture and Consumer Services (FDACS) is using them to sniff out the last giant African snails (GAS) in Miami-Dade County.

While canine training is the foundation of this initiative, laboratory work is equally essential to detection success. PPQ’s scientists must isolate the specific pest and disease scents—or “volatiles”—needed to teach the dogs the distinguishing odor of a pest or disease. Then, the labs must produce a sufficient supply of volatiles for the dogs’ initial training, plus more for field work to remind the dogs of the scent they must seek.

PPQ’s Management Team has concluded that the canines’ potential safeguarding value is well worth the investment. These trained dogs may be a powerful new tool for pest detection and surveillance.



USDA, R. Anson Eaglin



USDA, Robert Nowitz



USDA, R. Anson Eaglin



Making Agricultural Trade Safe and Supporting U.S. Exports

International trade in agricultural products feeds the world and supports nearly 1 million American jobs. While global trade brings tremendous benefit, it also brings risk. Potentially harmful plant and animal pests and diseases can hitchhike on or in the plants, fruit, vegetables, and other products we trade. They can also travel in or on vessels, sea containers, and wood packaging material. To help the world move billions of dollars in commodities without spreading invasive pests and diseases, PPQ works with countries around the globe to promote a safe, fair, and predictable trade system. This system, built on internationally and regionally harmonized, science-based plant health measures, not only reduces pest risks, but also helps to create a level playing field for U.S. products abroad.

In 2015, we set a goal of increasing the safety of agricultural trade and expanding economic opportunities for U.S. products in the global marketplace. Our approach has been three-fold: promote widespread use of science-based standards, resolve plant health barriers to trade, and help U.S. producers meet foreign market access requirements.

Creating a Safe, Smooth-Functioning Trade System

PPQ sits at the negotiating tables of two of the world's renowned plant health standard-setting organizations: the International Plant Protection Convention (IPPC) and the North American Plant Protection Organization (NAPPO). Through these forums, PPQ is building important relationships that help our country advance standards and harmonized approaches needed to safely expand global agricultural trade.

Promoting Safe Trade Through Effective International Collaboration

Strategic international relationships are critical to achieve a safe, fair, and predictable trade system. These relationships create a stronger basis for addressing trade-related pest and disease threats, resolving plant-health trade problems, establishing science-based trade standards, and advancing mutually beneficial trade goals.

For example, PPQ worked with the IPPC's other 182 member countries to adopt a record number of 15 new international standards and 10 treatment and diagnostic protocols in 2017. The new standards give guidance for the safe trade of numerous plant commodities, including seeds, wood, and growing media. The treatment and diagnostic protocols help ensure that pest identification and treatment requirements are applied in a consistent, effective, and technically justified manner. Both are key to aligning and broadening the tools that plant health regulators around the world can use to support and expand the safe trade of agricultural products.



PPQ worked with 182 International Plant Protection Convention members to adopt 15 new international standards and 10 diagnostic protocols that ensure safe trade, a record number for a single year.

At the regional level, PPQ worked with Canada and Mexico to implement NAPPO's revised 5-year strategic plan and approve the 2017 work program. These documents reflect U.S. stakeholder input and will help advance efforts to strengthen the North American perimeter against foreign pests. For example, the work program includes projects that advance a number of key U.S. priorities, including preventing the spread of seed-borne pests and ensuring a standard approach for reducing pest risks as seeds move internationally in commerce, promoting risk-based inspection practices,

and strengthening the North American perimeter against agricultural, forest, and other invasive pest threats. In 2017, PPQ arranged for U.S. Government and industry representatives to work on NAPPO projects or participate in expert groups, ensuring strong U.S. stakeholder involvement in international standard-setting activities.



PPQ worked with Canada and Mexico to implement NAPPO's revised 5-year strategic plan and approve the 2017 work program. These documents reflect U.S. stakeholder input and will help advance regionally important safeguarding initiatives that will strengthen the North American perimeter against foreign pests.

PPQ also continues building influential relationships with key foreign counterparts to advance shared goals. This includes forming an international coalition with the chief plant protection officers of Australia, Canada, and New Zealand. This group, known as the "Quads," has advanced the development and adoption of strategically important international standards for diagnostics, treatments, and the movement of high-value commodities like grain. They have also been instrumental in urging global action on emerging plant health issues, such as reducing pest risks associated with sea containers and e-commerce, electronic phytosanitary certificate exchange, and the safe movement of wood packaging material. In addition, PPQ continues to strengthen its relationship with the European Plant Protection Organization (EPPO). In 2017, PPQ and EPPO agreed to work together on planning for the International Year of Plant Health in 2020, furthering the development of a global electronic phytosanitary exchange system and helping other countries put in place key trade standards.

Advancing Global Use of Modern Plant Protection Practices

PPQ is working with countries around the world to advance global use of effective, modern plant protection practices. In 2017, PPQ and NAPPO welcomed 122 participants from 27 countries to the first-ever International Symposium for Risk-Based Sampling. We put together this symposium to help drive a global conversation about the use of data- and statistics-driven inspection practices not only here in North America, but around the world. These practices can help countries more readily identify riskier imports and adjust resources and policies to maximize the effectiveness of inspection.

We also continued to pursue the long-term, strategic goal of building a global electronic phytosanitary



During the first-ever International Symposium for Risk-Based Sampling, PPQ experts and their international counterparts exchange best practices for implementing data- and statistics-driven sampling strategies in port inspections.

certificate exchange system. This initiative, called ePhyto, will transform agricultural trade by making certificate exchange fast, efficient, and fraud-resistant. It will also simplify development and reduce start-up costs of national electronic certificate exchange systems, allowing developing countries to participate with minimal investment. In 2017, we began testing the system with 12 other countries. We also established regular communication through the ePhyto system with the Netherlands and New Zealand and expect to begin exchanging electronic certificates with Argentina, Australia, Chile, Mexico, and South Korea in 2018.

Helping the World Address Critical High-Risk Pest Pathways

PPQ continues to help the global community tackle high-risk pest pathways such as sea containers, international seed trade, and internet-based trade. In 2017, PPQ worked with the Canadian Food Inspection Agency, U.S. and Canadian border protection agencies, North American shippers, and global shipping companies to develop practical guidance for cleaning and inspecting sea containers. In the future, we plan to engage Mexican government and industry officials



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PPQ has been working with Canadian partners and the maritime industry to develop and promote the use of voluntary guidelines for effectively cleaning and disinfecting sea containers to reduce pest risk.

and possibly expand this guidance to other regions. We also participated at the global level in the newly established IPPC Sea Container Task Force, which is developing added short- and long-term strategies to reduce the risk of pests hitchhiking in or on containers.

In other efforts, we continued developing a holistic systems approach to reduce risks associated with seed trade. This new approach is called the Regulatory Framework for Seed Health (or ReFreSH). ReFreSH is based on the internationally recognized system for reducing the risk of food safety hazards. It will use testing and integrated pest risk management measures at critical control points in the seed production process to verify seed safety. In 2017, PPQ officials visited seed production facilities to gather information about production practices, pest risks, and control points. We also started work on seed health pest risk assessments to determine the scope of risks in the seed pathway. Internationally, we continue working with our counterparts in Canada, Mexico, and other countries to promote the adoption of standard, harmonized requirements for international seed movement.

For nearly a decade, PPQ has been monitoring online trade of plants, plant and animal products, and live plant pests, and we have started developing strategies to address risks linked with these imports. In 2017, we worked with the IPPC on an action plan related to internet trade; we will present the plan to the Commission for Phytosanitary Measures in 2018. Our goal is to promote information sharing among countries that are also tackling this issue so we can identify best practices and develop effective tactics for finding and closing internet-based, high-risk pathways.



To reduce pest risk associated with the complex flow of seed in international trade, PPQ is developing the Regulatory Framework for Seed Health (ReFreSH) in collaboration with the seed industry, State and Federal officials, academia, and others. It will leverage industry best practices for managing pest risk, making international seed movement safer.



USDA, R. Anson Eaglin

In 2017, PPQ secured the release of 778 U.S. commodity shipments valued at more than \$47 million that were held at foreign ports.

Securing Economic Opportunities Abroad for U.S. Products

U.S. agricultural exports bring significant value to our economy. Consider this: International sales of U.S. farm and food products totaled \$138 billion in fiscal year 2017, the third highest level on record. These exports created a trade surplus of more than \$21 billion last year, helping to energize our rural economies. And, considering that 95 percent of consumers worldwide live outside the United States, the global marketplace has plenty of room to grow.

Sustaining and Expanding Key Export Markets

Each year, PPQ conducts technical negotiations with countries around the world to open, expand, or maintain export markets for U.S. commodities. We use science, data, and international guidelines to remove plant health-related barriers to American products. In addition, we provide technical expertise to the Office of the U.S. Trade Representative and USDA's Foreign Agricultural Service as they pursue other diplomatic channels, such as the World Trade Organization, to help resolve trade barriers for U.S. exporters.

In 2017, we completed 17 meetings with 15 countries: Australia, Canada, China, Colombia, Costa Rica, European Union, India, Israel, Japan, Korea, Mexico,

Netherlands, New Zealand, South Africa, and Taiwan. Through our negotiations, we helped the United States realize significant trade opportunities, including establishing the first-ever protocol for exporting U.S. rice to China; easing regulations on U.S. citrus going to the European Union; reinstating shipments of U.S. distillers dried grains to Vietnam and China; expanding market access for U.S. chipping potatoes in Japan; and keeping China's market open to U.S. soybeans, the United States' single most valuable export commodity.

Certifying the Health of U.S. Exports

U.S. exporters rely on PPQ and its State and county partners to inspect and certify plants and plant products being shipped to markets overseas. These export certificates attest that the United States is presenting products which meet the importing countries' requirements. Thanks to PPQ's electronic certification system, the once time-intensive, manual process of issuing phytosanitary certificates is now fast, efficient, and fraud-resistant. PPQ also maintains a database of foreign countries' plant and plant product import requirements. With these tools, our nationwide team of Export Certification Specialists, Plant Health Safeguarding Specialists, and our State and county cooperators issued more than 738,000 certificates in 2017.

Case Study:

PPQ and Partners Act Quickly To Protect U.S. Corn Markets

When PPQ confirmed the first-ever detection of *Xanthomonas vasicola pv vasculorum* (Xvv) on a corn plant in late summer 2016, it threatened to disrupt U.S. corn trade and put valuable markets at risk. But with help from key partners, PPQ acted quickly to build a strong scientific case that demonstrated the safety of U.S. corn and protected export markets worth more than \$6 billion annually.

Racing against the harvest clock, PPQ teamed up with State plant regulatory officials, Extension plant pathologists, and U.S. corn industry representatives to gather

information about the disease's impact and distribution in the central United States while corn was still in the field. This was one of the largest, fastest, and most complex response efforts in PPQ's history. It took a great deal of communication and coordination between PPQ and our partners to gather the data we needed and fully understand what we were dealing with. PPQ also enlisted the National Plant Diagnostic Network (NPDN) to help process the hundreds of tissue samples coming in from the survey. This included working with U.S. *Xanthomonas* experts to develop a molecular test that could accurately identify the pathogen.

With reports of disease symptoms coming in from States throughout the U.S. Corn Belt, it was clear that quarantining U.S. corn would prove costly and create undue burdens on corn producers. Instead, PPQ and its partners devised a different strategy: develop best management practices to effectively control the disease and build a strong scientific case to demonstrate the safety of U.S. corn and protect export markets.

For the rest of the harvest season, PPQ and its partners advised U.S. corn growers on the best methods to limit the disease's impact on corn yields and suppress future

outbreaks. PPQ scientists also conducted thorough risk analyses to determine the disease's ability to spread through the movement of corn grain and seed. Armed with this information, PPQ presented a solid technical case to those countries that import U.S. corn, making clear that the disease presented no human or animal health risk, could be effectively managed, did not impact corn yield or quality, and was not transmitted by corn. As a result, the United States maintained uninterrupted access to the world's grain markets for the 2016–2017 shipping season.



Phase One Consulting Group

A. Robertson, Iowa State University



Enhancing Our Organization

Our Most Valuable Resource: PPQ Employees

Every accomplishment in this report reflects the hard work of PPQ's diverse and dedicated workforce of more than 2,900 men and women. Every day, they apply their unique talents and skills to achieve PPQ's mission and provide global plant protection leadership. The PPQ Management Team has been working to equip and empower our employees for continued success. This includes increasing employee engagement across all levels of the organization, investing in our supervisors and managers to help them better support their employees, fostering employee development, and nurturing a more inclusive environment. While we are proud of our improvements in all of these areas, we recognize that improving any organization is a never-ending process and there is still more to do.

Preparing PPQ for the Future

We took steps in 2017 to make sure our employees are ready for any challenges the future brings us. This included partnering with the U.S. Office of Personnel Management (OPM) to assess employee training needs. We are analyzing the results now and will roll out a comprehensive training plan in 2018. We also offered developmental opportunities to employees who were looking to expand their career experiences and gain new skills by working on an assignment outside the scope of their normal work. The program was a win-win situation for all involved. Managers got much-needed projects completed, and employees developed important skills that will help them advance in their own careers.

In 2017, we also created a 5-year Human Capital Plan (HCP) to help us attract and retain high-performing employees, continuously develop employee skills to better achieve our mission, and better align people and skills across the organization so we can respond to future mission demands more efficiently. The plan includes goals around employee development, knowledge management, recruitment, and retention.

Two years ago, we delivered a series of supervisory workshops focused on equipping our leaders to better serve and support their employees. In 2017, they applied these skills to build trust; coach and develop their employees; and ensure that civil rights, Equal Employment Opportunity, and human resource policies are carefully followed. To take this effort to the next level, PPQ is helping to develop an APHIS-wide workshop for all supervisors. It will focus on mentoring employees, improving employee performance and productivity, conducting employee performance appraisals, and identifying and assisting employees who are underperforming.

In 2017, we also invested in our next generation of leaders by delivering our "Leadership Journey Suites: Non-Supervisory Employees Stepping Up to Leadership" training. The course explores all facets of leadership and how non-supervisors can move into leadership roles in PPQ. It helps employees develop basic-level leadership and supervisory core competencies, such as accountability, conflict management, developing others, as well as the other vital competencies of integrity, honesty, and interpersonal skills.

Supporting Employees

PPQ fully implemented our new Ombudsman Program in 2017. The primary job of our Ombudsmen is to help employees at every level—management, non-management, union, non-union—resolve situations that occur in the workplace. They work in concert with management as they advise PPQ employees and offer resources to help them face and manage conflict in a way that encourages, promotes, and sustains healthy working relationships. The Ombudsmen also conduct onsite assessments to improve employee relations. Workplace assessments give employees and managers in a work unit an opportunity to share their concerns confidentially in a safe environment. These assessments result in an action plan that employees and managers carry out together.

PPQ also continued to adopt best practices for keeping employees safe on the job. This included a comprehensive safety review of more than 270 facilities, safety and health training for supervisors, and monthly communications on various safety topics to help prevent injuries and illness in the workplace. In addition, PPQ gave detailed guidance on hurricane preparedness to ensure the safety and well-being of employees in States impacted by devastating storms in 2017.

Strengthening PPQ With Diversity

PPQ's workplace diversity is a key element of our mission success. This diversity enriches our workforce and makes us a more innovative and productive team. It also helps us to reflect the many stakeholders we serve—from consumers and farmers, to importers and academics, just to name a few—strengthening our effectiveness and credibility. To promote diversity and inclusion at PPQ, we have Civil Rights and Diversity Advisory Committees at the national and local levels. They deliver robust diversity and inclusion programs that celebrate the accomplishments of Americans in underrepresented groups, including women; African Americans; American Indian and Alaska Natives; Caribbean Americans; Hispanics; Lesbian, Gay, Bisexual, and Transgender Americans; and veterans.

To help our country's youth envision a career safeguarding American agriculture and the environment, PPQ engaged middle and high school students attending APHIS' AgDiscovery programs during the summer. In 2017, 345 students attended AgDiscovery programs held at 22 campuses, including new offerings at Purdue University, Coppin State University, and California State University at Fresno. AgDiscovery plays a critical role in PPQ's long-term recruitment efforts because it develops an awareness in young students about PPQ's important mission

and the diverse career paths available to them in agriculture. Some explored animal health, entomology, environmental science, and food safety, while others took a deep dive into biotechnology, wildlife management, aquaponics, agribusiness, and forestry. Many AgDiscovery alumni have gone on to major in agriculture-related disciplines, and some have become USDA employees.

In addition, PPQ field experts reached out to Tribal and other youth this summer through the agency's Safeguarding Natural Heritage (SNH) program. SNH marked its 10th year of offering summer outreach and career exploration to high school students at Tribal colleges and universities and historically American Indian institutions. In 2017, over 100 students, ages 14 to 17, experienced college life—lectures, field trips, and dormitory living—while also discovering the wide array of career opportunities in plant and animal science, wildlife management, and agribusiness. Tribal elders, practitioners and professionals, university professors, and U.S. Government scientists use hands-on, character- and team-building activities to keep the curriculum fresh and interactive. They also engage in activities that stress preservation of Native American natural heritage.



Every year since 2007, PPQ has collaborated with Tribal colleges and universities and other entities to deliver the Safeguarding Natural Heritage Program.



USDA, R. Anson Eaglin

Recognizing PPQ's Employees

Every day, PPQ employees give their all to deliver extraordinary results for our organization and our stakeholders. This section highlights some of this exemplary work that was recognized in 2017.

PPQ-Led Trade Data Team Receives 2017 Administrator's Award

Each year, APHIS' Administrator honors exceptional people in the agency whose efforts have transformed our work and fortified our safeguarding mission. This year, Associate Administrator Michael Gregoire recognized the PPQ-led Automated Commercial Environment (ACE)/International Trade Data System (ITDS) Team for helping the U.S. Government realize its goal of having a "single window for trade." ACE is the United States' primary system for processing

Government-required import and export data. And thanks to the hard work of APHIS' ACE Team, importers, brokers, and filers can electronically submit APHIS-required data through ACE.

For the last 3 years, the ACE/ITDS Team has led APHIS' transition from a paper-based system to an electronic one. The team's strategic and proactive communications with U.S. Customs and Border Protection, other participating Government agencies, contractors, brokers, and importers helped to elevate awareness and understanding about this Government-wide initiative. Team members remained mindful of their mission and position representing the agency and its leadership. They consistently displayed exemplary personal and professional excellence, creativity, and innovation as they pursued widespread adoption of ACE by APHIS stakeholders.



Cindy Walters accepts the APHIS Administrator's Award on behalf of the five-person ACE/ITDS Team, which also includes Technical Team Lead Brett Miller, Agriculturists Jeff Beaman and Marco Flores, and Management and Program Analyst Anne LeBrun.

PPQ Scientists and Partners Win 2017 Collaborative Research Team Award

In July, the Florida Entomological Society presented PPQ scientists—along with their university and industry partners—with its 2017 Collaborative Research Team Award. The Society recognized the group's outstanding contributions to the management of the Redland Oriental fruit fly (OFF) outbreak. The team quickly formed in response to an OFF infestation that left many avocado groves in the quarantine area unable to move their crops to market. Team members included scientists from PPQ's Center for Plant Health Science and Technology (CPHST) based in Miami, the University of Florida's Tropical Research and Education Center, and Florida avocado industry collaborators.

They investigated whether post-harvest treatments could allow the safe movement of marketable avocados out of the quarantine area. In the process, they made an important discovery with serious economic implications: Certain treatments degrade avocado quality, making the commodity unsellable. And some varieties did not show quality damage until after they were stored and then transported to retail stores. The treatments tested included methyl bromide fumigation alone and combined with cold storage, which are known to be effective against OFF.

This valuable information prevented avocado growers from wasting money on treatments that ultimately would make the fruit unmarketable. Now that this finding is public knowledge, it will spare avocado growers from further losses in the future if their groves fall within an OFF quarantine.



Florida Entomological Society President Rue-di Wei (*far left*) presents the 2017 Collaborative Research Team Award to avocado research team members: (*left to right*) PPQ's Woodward Bailey, University of Florida's Daniel Carrillo, and PPQ's Amy Roda. Jawwad Qureshi (*far right*), who chairs the Society's awards committee, joins them. Not pictured from PPQ: Xikui Wei and William Guyton.

PPQ Receives Award for Khapra Beetle Research

CPHST took the “Judges Choice” award at the 54th annual North American Chemical Residue Workshop held in Naples, FL, for its scientific research on new technology to screen for Khapra beetle in imported rice. The innovative technology—a miniature high-speed gas chromatograph analyzer called the zNOSE—is an electronic sniffing tool that can “smell” the pest’s presence.

The Khapra beetle is one of the world’s most destructive pests of grain products and seeds. Unfortunately, Khapra beetle larvae can be hard to find because they have no known pheromones that a sensor or trap could use to detect them. But when the larvae feed on the rice, they create chemicals unique to a Khapra beetle infestation. The zNOSE technology can analyze rice samples, smell those chemicals if present, and alert an inspector to the infestation.

PPQ scientists have successfully demonstrated the zNOSE technology in the laboratory, and now they are developing an implementation plan. There is still a lot of work ahead before we’ll know if this technology can be integrated into PPQ operations. However, if zNOSE passes muster, PPQ and U.S. Customs and Border Protection inspectors will have a cutting-edge tool to safeguard U.S. agriculture.

Invasive Species Group Presents Award to PPQ

In July, PPQ received the Outstanding Federal Government Agency Achievement Award from the Reduce Risks from Invasive Species Coalition (RRISC) for successfully eradicating the European grapevine moth (EGVM) from California and protecting its \$4.1 billion grape industry. Each year, RRISC recognizes legislators, State and local government agencies, nonprofits, and businesses for their achievements in addressing invasive species issues nationwide.

EGVM was first detected in a Napa Valley vineyard in 2009. Subsequent surveys detected the moth in numerous California counties. The moth threatened California’s grape crop and jeopardized valuable export markets for U.S. grapes and stone fruit, another EGVM host. Over the program’s 7 years, PPQ invested \$54.5 million in the eradication effort, in addition to the funding from the State, counties, and producers. The cooperative eradication plan called for growers to carry out pest treatments, while State and county partners set traps and lures for detection purposes and reported findings. PPQ and APHIS’ Legislative and Public Affairs launched an EGVM public outreach campaign to enlist support from California residents for the eradication and help prevent further EGVM spread. Counties also actively conducted outreach.

In August 2016, APHIS declared EGVM eradicated from the State of California, lifting all quarantines and removing restrictions on the movement of EGVM host material. The EGVM Program will continue post-eradication surveillance and response until 2019.



On behalf of the Federal-State-industry European Grapevine Moth Eradication Cooperative Program, PPQ National Policy Manager Rich Johnson (*left*) accepts the Outstanding Federal Government Agency Achievement Award from Richard D. Otis, Jr., president of the Reduce Risks from Invasive Species Coalition.

California Agency Credits PPQ for Reducing State's Pesticide Use

The California Department of Pesticide Regulation (CDPR) has given out more than 100 Integrated Pest Management Innovator Awards since 1994. They honor California organizations for their efforts to manage pests while using fewer pesticides. In 2017, the California Department of Food and Agriculture (CDFA) received an award for its work with the State's Cooperative Pink Bollworm Program. When accepting the award, CDFA credited PPQ's Pink Bollworm Rearing Facility for its significant role in reducing the program's pesticide use.

Instead of spraying conventional insecticides, the program used an integrated, non-chemical approach to eradicate the moths. The approach included transgenic cotton, insect pheromone technology, and the release of sterile insects reared at PPQ's Phoenix, AZ, facility. Sterile male moths were an important part of the overall strategy because they suppressed reproduction when they mated with wild female moths. At the height of the program, PPQ was distributing more than 5 million moths per day in California alone, and more

than 30 million across all impacted States. Initially, the goal was simply to prevent the spread of this pest. But over time, PPQ and partners saw how effective this technique was and realized they could eradicate pink bollworm.

Pink bollworm is one of the most destructive cotton pests in the world. It was first detected in the United States in 1917 and quickly spread throughout U.S. cotton-growing States. Today, thanks to the hard work and collaboration of impacted States, the cotton industry, and the U.S. and Mexican Governments, PPQ is on the verge of declaring U.S. commercial cotton-growing areas free of this damaging pest.

2016 Safeguarding Award Winner

In April 2017, Deputy Administrator Osama El-Lissy chose PPQ's Furniture Recall Team to receive the 2016 Safeguarding Award. This team coordinated a nationwide consumer-level recall of imported pine furniture after customer complaints that insects, later identified as brown fir longhorned beetles, were found emerging from the furniture.

Working closely with the Minnesota Department of Agriculture and the national retailer who imported the furniture, the Recall Team traced 313 pieces of furniture that were sold to about 200 customers in 44 States. In less than 4 weeks, the team recovered and destroyed 83 percent of the purchased furniture pieces and 100 percent (more than 10 tons) of the furniture that remained in the warehouse. The team also gave critical information to U.S. Customs and Border Protection, helping them to stop further shipments of potentially infested furniture and close this pathway.

One of the keys to success was the retailer's support. The company understood the seriousness of the issue and cooperated fully. Not only did the retailer work locally to secure and safeguard the infested products, it also offered incentives to help encourage customers to return the furniture. Other factors that contributed to the response's success included creating a consumer hotline to answer the public's questions, and the team's common-sense approach that allowed each State to select the best-suited method of destruction from a list of approved options.

APHIS Honored for Groundbreaking Preclearance Program

APHIS' Dutch Preclearance Program was recently recognized by the Royal Dutch Wholesalers Association for Flower Bulbs and Nursery Stock (ANTHOS) at its annual conference on December 19, 2017, in Haarlem, Netherlands. Jennifer Smythe, Director of PPQ's Preclearance and Offshore Programs, traveled to the event to accept the Emanuel Sweerts Award honoring APHIS' contributions to the Dutch flower bulb and plant trade.

APHIS created the Dutch flower bulb and perennial preclearance program 66 years ago to help the post-World War II recovery effort in the Netherlands. It was the first program of its kind, and it continues to serve as a model for dozens of other agriculture preclearance programs around the world. Upheld as an example of Government-to-Government and private-public cooperation, the preclearance program has achieved widespread benefits.

"The United States addresses pest risk offshore," Smythe explained. "Dutch exporters avoid costly delays or rejections at U.S. ports. And we both benefit because plant health issues are dealt with promptly and transparently." Today, the United States is one of the top markets for Dutch flower bulbs and perennials with sales reaching approximately \$120 million this past year.



Rene Faas

Jennifer Smythe, Director of PPQ's Preclearance and Offshore Programs, accepts the Emanuel Sweerts Award from Henk Westerhof, Chairman of the Royal Dutch Wholesalers Association for Flower Bulbs and Nursery Stock, during the association's annual conference in Haarlem, Netherlands, in December.

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