Introduction

The U.S. Department of Agriculture’s Plant Protection and Quarantine (PPQ) program uses the best available science and technologies to develop more effective tools for detecting, identifying, managing, and eradicating invasive pests. These advances keep PPQ and its partners on the cutting edge in the fight against harmful plant pests and diseases.

As global trade continues to expand, the pressure of invasive pest and disease introductions will also increase. To keep ahead of the threat, PPQ continually applies the latest science and technology to develop the most effective survey and diagnostic methods, diagnostic support, treatment technologies, risk evaluations, and strategic program alternatives. We also analyze pest interception data to identify the imports with the highest risk. Then we can address the problem at its source.
**Risk Analysis**

PPQ develops pest risk analyses to support and improve pest exclusion programs and decision making. In FY 2021, PPQ completed approximately 278 risk analyses associated with imports, exports, invasive pest threats, and other programmatic requirements. This total includes 44 analyses to open, expand, or maintain export markets for U.S. producers and 50 risk assessments for import requests from foreign countries.

PPQ’s work also included evaluations of 11 newly detected pests by the New Pest Advisory Group, 7 pathway analyses and spread models, 4 economic analyses supporting operational and policy decisions, and 11 New Pest Response Guidelines for preparedness purposes. These products identify potentially harmful plant pests and diseases and help PPQ decide what mitigating actions to take in order to prevent their entry into or limit their spread or economic impact within the United States.

**Methods Development**

The Plant Protection Methods Development (PPMD) program develops scientifically viable and practical tools for exotic plant pest exclusion, detection, and management. These tools preserve economic opportunities for farmers and industries who engage in interstate commerce and international trade, and safeguard U.S. agricultural and natural resources from invasive plant pests. The program is essential to PPQ’s mission by developing tools for detecting exotic pests in survey programs; developing molecular diagnostic tests and identification tools for pest identification; developing integrated pest management methods, including biological control, to help eliminate or manage invasive pests; and developing phytosanitary treatments to support interstate and international trade.
A major focus of this program is to develop and implement biological control technologies that allow for the use of natural enemies alone, or in combination with other control tactics, to effectively mitigate the impacts of introduced, invasive insect pests, weeds, and plant pathogens, while minimizing impacts to the environment.

In support of methods development for ongoing pest program issues, the PPMD program continues to make advances in new technologies for pest detection and management, including the use of unmanned aerial systems and detector canines. In FY 2021, the program improved unmanned aerial systems for use in multiple applications, such as the application of fruit fly treatments, grasshopper baits, releasing sterile insects for pest eradication programs and fire ant management. In support of pest detection, the program continued the use of canines to detect Mexican fruit fly, coconut rhinoceros beetle, mollusks, and Asian citrus psyllid (ACP), the vector for citrus greening.

In support of methods development for pest emergency programs, the PPMD program developed effective insecticide application methods for the spotted lanternfly (SLF) and deployed improved circle traps in 34 States. The program developed and operationalized treatment of SLF eggs with Golden Pest Spray Oil. The oil, registered with the Environmental Protection Agency and certified for organic use, is a 93 percent food-grade soybean oil used for controlling spotted lanternfly egg masses and preventing pest spread.

The PPMD program also maintains its own quarantine and rearing facilities for biological control agents in Arizona, California, Massachusetts, Michigan, Texas, and Guatemala. PPQ partners with USDA’s Agricultural Research Service (ARS), the U.S. Fish and Wildlife Service, State departments of agriculture, universities in 30 States and Territories, and 2 Native American Tribes to evaluate and
establish biological control agents for invasive plants, pests, and diseases. The biological control program has been responsive in developing biological control agents to address invasive pests and weeds such as Asian longhorned beetle, emerald ash borer (EAB), roseau cane scale, spotted lanternfly, and air potato.

In FY 2021, PPQ permitted four new biological control agents for release against air potato common crupina, Russian wheat aphid and spotted-wing drosophila. The biological control program works with State cooperators for the release and establishment of approved biological control agents. The current FY 2021 biological control portfolio includes 37 cooperative agreements with States and Tribal Nations that have released of 51 biological control agents that collectively attack 23 weed species and 4 arthropod pests.

In support of the EAB management efforts, new research on EAB biological control agents has identified species that climatologically adapt to cooler or warmer U.S. regions and surrounding areas. This discovery allows the program to better target biocontrol releases, while protecting the next generation of ash trees in eastern region forests. Ongoing field evaluation of these EAB biological control agents are determining best management practices for their operational release. As a result, in FY 2021, the EAB biocontrol rearing facility in Brighton, Michigan, shipped more than 476,413 parasitoid wasps to State and Tribal cooperators, for release at 153 sites, in 104 counties in 25 States. To date, the program has cumulatively released a total of more than 8 million parasitic wasps within 30 States and Washington D.C.

The PPMD program also supports research related to invasive honey bee pests, specifically Varroa mites. A Varroa mite feeds on the honey bee’s fat body tissue (an organ similar to the human liver), in
turn weakening and shortening the bee's life. The Varroa mite is considered the greatest single driver of the global honey bee colony losses (ARS). Managed honey bee colonies add at least $15 billion to the value of U.S. agriculture each year through increased yields and superior quality harvests (O’Brien, D. 2019 ARS Microscopy Research Helps Unravel the Workings of a Major Honey Bee Pest).

In FY 2021, the program funded priority projects with other Federal and State agencies, as well as university and non-profit researchers, that support managing, suppressing, and eradicating Varroa mites, small hive beetles, and other pests and diseases contributing to a decline in honey bee health. These projects included investigating new pesticide control options for Varroa mites, and researching other important pests of honey bees. In FY 2022, the program will continue to fund similar priority projects to combat Varroa and other important issues related to honey bee health.