PPQ 2022 Annual Report

Risk Analysis and Methods Development

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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 and epidemiological approaches to support and improve pest exclusion programs and decision making. In FY 2022, PPQ completed approximately 278 risk analyses associated with imports, exports, invasive pest threats, and other programmatic requirements. This total includes 33 analyses to open, expand, or maintain export markets for U.S. producers and 48 risk assessments for import requests from foreign countries.

PPQ's work also included evaluations of 10 newly detected pests by the New Pest Advisory Group, 9 pathway analyses and spread models, 2 economic analyses supporting operational and policy decisions, and 8 New Pest Response Guidelines to proactively prepare for emergency responses. These products identify potentially harmful plant pests and diseases and help APHIS decide what mitigating actions to take to prevent their entry into or limit their spread or economic impact within the United States.

PPQ's Plant Pathogen Confirmatory Diagnostics Laboratory (PPCDL) develops, adapts, validates, and utilizes diagnostic methods for the detection of regulated plant pathogens. In FY 2022, PPCDL supported the development and implementation of innovative molecular diagnostic tools at ports of entry for a *Ralstonia*, a pathogen that cannot be detected visually.

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 FY 2022, the program continued developing and improving technologies, tools, and treatments for APHIS' plant pest and disease programs, including Mexican fruit fly, grasshopper, and spotted lanternfly (SLF), among others. For SLF, the program continued operationalizing the use of golden pest spray oil (a product that is 93 percent food-grade soybean oil registered with the Environmental Protection Agency and certified for organic use) as a control method on the pest's egg masses to prevent pest spread. In FY 2022, four States—Delaware, New Jersey, Pennsylvania, and Virginia—began using it on a trial basis. If the treatment is successful, APHIS will expand it to additional States in FY 2023.

The program continues to make advances in new technologies for pest detection and management, including the use of unmanned aerial systems (UAS). In FY 2022, the program worked toward the use UAS for aerial sprays of fruit fly treatments. For example, the program evaluated the effects of three flight path algorithms on spray efficiency to determine software requirements. The program also used UAS to obtain images of wild grasshoppers to improve use of artificial intelligence for UAS-based surveys.

The program provides ongoing methods support to a variety of plant pest and disease programs, providing short-term improvements and helping to solve immediate program needs. In FY 2022, the PPMD program tested new diet ingredients for Mexican fruit fly sterile insect production when citric acid supplies were impacted by supply chain issues and found a substitute for the ingredient, ensuring production of sterile flies could continue. The program also developed standard operating procedures for APHIS' domestic sterile fruit fly production facilities. The procedures provide a step-by-step guide to a series of tests conducted daily throughout the facilities to ensure that the sterile insects are high-quality and effective in the field. The guide makes the processes consistent across facilities and provides an easy-to-use reference document for employees.

The PPMD program maintains its own quarantine and rearing facilities for biological control agents in Arizona, California, Massachusetts, Michigan, Texas, and Guatemala. APHIS 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, air potato and spotted lanternfly. The current FY 2022 biological control portfolio includes 38 cooperative agreements with States and Tribal Nations that collectively attack 25 weeds and 3 arthropod pests.

In FY 2022, the biological control program continued to work with State and Tribal cooperators to rear and release approved biological control agents. 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 will determine best management practices for their operational release.

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 2022, the program continued to fund 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 2023, the program will continue to fund similar priority projects to combat Varroa mites and other important issues related to honey bee health.