Pennsylvania Department of Agriculture 2019 Entomology Program Report

The Pennsylvania Department of Agriculture (PDA) Entomology Program is responsible for the regulation of insect plant pests, which includes survey, laboratory analysis, and control/mitigation of new invasive insects when warranted. In 2019, the Entomology Program conducted or actively participated in over 10 invasive insect pest surveys across the Commonwealth. The laboratory received and processed 12,800 different samples and identified 108,898 specimens from these samples. All samples were screened for Cerambycidae, Buprestidae, Scolytinae, Siricidae, Vespidae (*Vespula*), *Bombus* and other select species including *Sirex noctilio* and *Adelges tsugae*. Entomology surveys are carried out by permanent and temporary PDA staff, as well as cooperating government and non-government collaborators. Insect samples are also submitted through cooperative extension, private industry, and the public.

SPOTTED LANTERNFLY:

The Pennsylvania Department of Agriculture works on multiple fronts to combat *Lycorma delicatula* (Spotted Lanternfly, or SLF), including focuses on Survey and Treatment, Quarantine Compliance, and Communications. PDA is aided in this battle by its partners, the United States Department of Agriculture (USDA), Penn State University and Extension, County Conservation Districts, and sister Pennsylvania State Agencies.

SPOTTED LANTERNFLY SURVEY AND TREATMENT OVERVIEW:

Since the first detection of Spotted Lanternfly on September 22, 2014 by and agent of the PA Game Commission, PDA has surveyed and treated properties across Pennsylvania in the effort to understand, control, contain and eradicate this invasive pest.

Survey work has occurred in each of Pennsylvania's 67 counties, and occurs in three different ways: the banding of trees for on-going monitoring and early detection of SLF; the scraping of egg masses both within and outside the quarantine; and through a general visual survey to look for SLF anywhere in the state.

In addition to survey work, PDA began treatment of properties for Spotted Lanternfly in 2015. The process of treatment entails a full inventory of a property for all *Ailanthus altissima* (Tree-of-Heaven), a preferred host for SLF. PDA's goal in this treatment is the removal of most of the invasive Tree-of-Heaven, while retaining approximately 10% for the systemic application of insecticide. When feeding on these "trap" Tree-of-Heaven, SLF ingests the insecticide, causing rapid death. This process has proven effective in sites across the Commonwealth with roughly 100,000 trees receiving treatment.

SPOTTED LANTERNFLY QUARANTINE COMPLIANCE

On November 1, 2014, the Pennsylvania Department of Agriculture issued a quarantine with the intent to restrict the movement of SLF. While these restrictions slowed the spread, the pest continued to expand its range with quarantine expansions leading to 14 quarantined counties in southeastern PA by the end of 2019. As the quarantine has grown, so has PDA's response, and in early 2019, a Program Specialist and four Inspection Technicians were hired to aid businesses in complying with the quarantine order. The team has held numerous permit trainings for businesses across the state, as well as began inspections of transportation vehicles in cooperation with the Pennsylvania State Police.

SPOTTED LANTERNFLY COMMUNICATIONS AND OUTREACH

PDA has teamed with the communications offices of both Penn State University and the United States Department of Agriculture to bring a united and consistent message to all Commonwealth citizens. These messages go out through various means, including social media posts, press releases, news interviews, public events, informational handouts, videos, billboards, signs for parks and other public places, and advertising in newspapers and on public transportation.

PDA has also partnered with members of local government and businesses to create SLF-specific Community Taskforces, which meet quarterly to discuss the efforts and needs of the community.

PDA also works with Penn State University on a large-scale Public Reporting Tool for recording sightings of SLF by the public. The ability to report is available either online via a PDA-created web application or through contacting a call center, staffed by Penn State staff. The reports are followed up by PDA staff across the state, where reporters are contacted and visited to confirm sightings to quickly discover pockets of SLF and to control and eradicate them. In 2019, more than 90,000 reports of Spotted Lanternfly were made by Commonwealth citizens.

FEDERAL ASSISTANCE

None of the above programs could occur without the aid and partnership offered by USDA. USDA has supported PDA efforts by supplying funding and contributing staffing and technology to this battle. Both in quarantine and non-quarantine areas, USDA and PDA staff work jointly to effectively survey and control SLF.

SPOTTED LANTERNFLY 2019 SURVEY DETAILS

The Pennsylvania Department of Agriculture (PDA) performed three surveys for Spotted Lanternfly in 2019, including Banding, Egg Mass Scraping and Visual. Surveys were run for the entire year, though each survey occurs within specific time frame. The Visual survey was performed from January through December; Scrape was performed from January through May, and again from October through December; Banding was performed from April through December. The PDA lab received and processed 273 samples, which contained 1,477 specimens, from all three surveys.

Of note, all three surveys turned up spotted lanternfly in counties outside the existing quarantine of 14 counties.

SPOTTED LANTERNFLY BAND SURVEY:

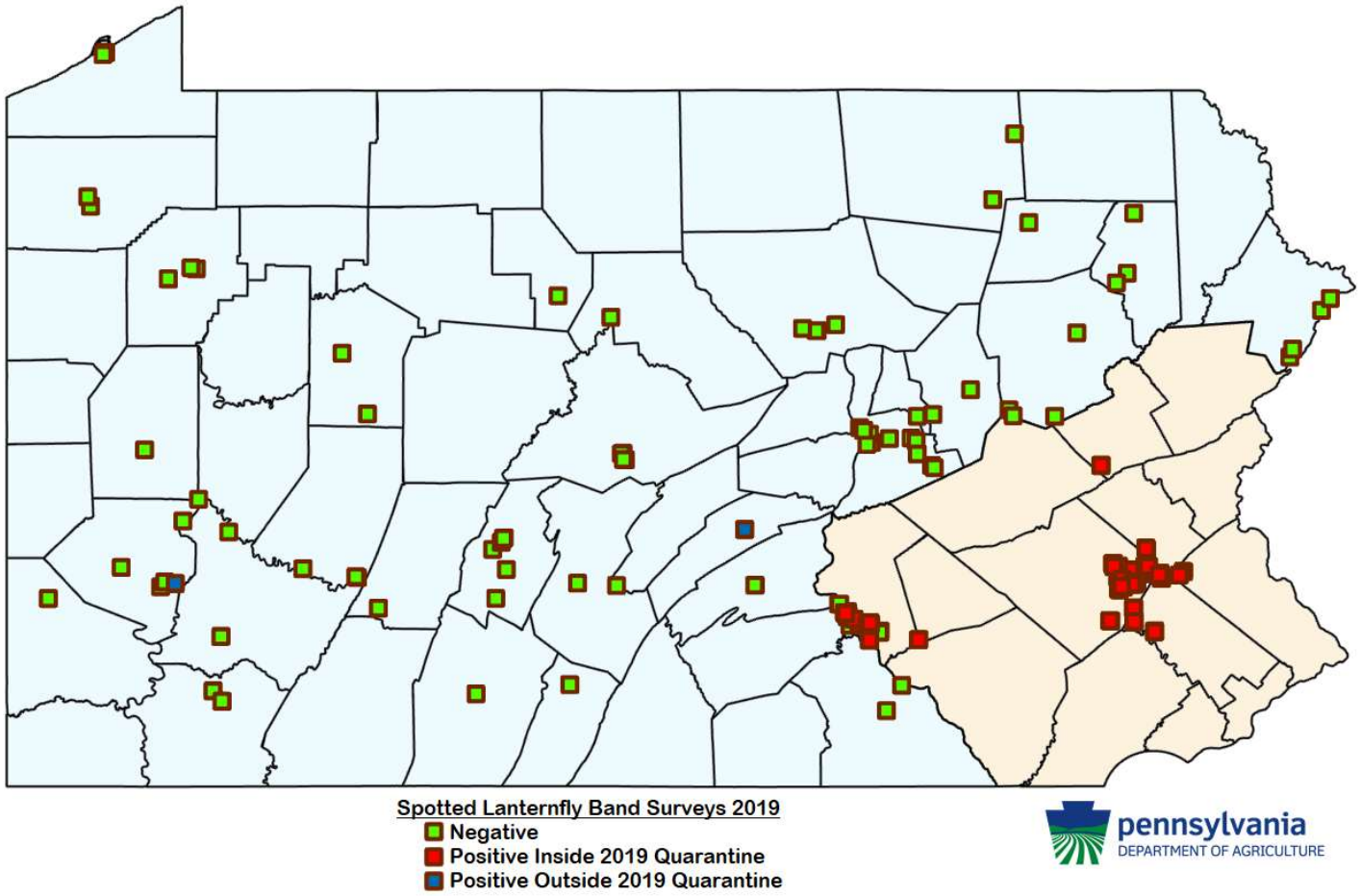
Survey performed 30 April, 2019 through 2 December, 2019

304 banding sites in 35 counties (7 regions)

2,694 services

1,040 Positive Bands

12,922 SLF reported killed

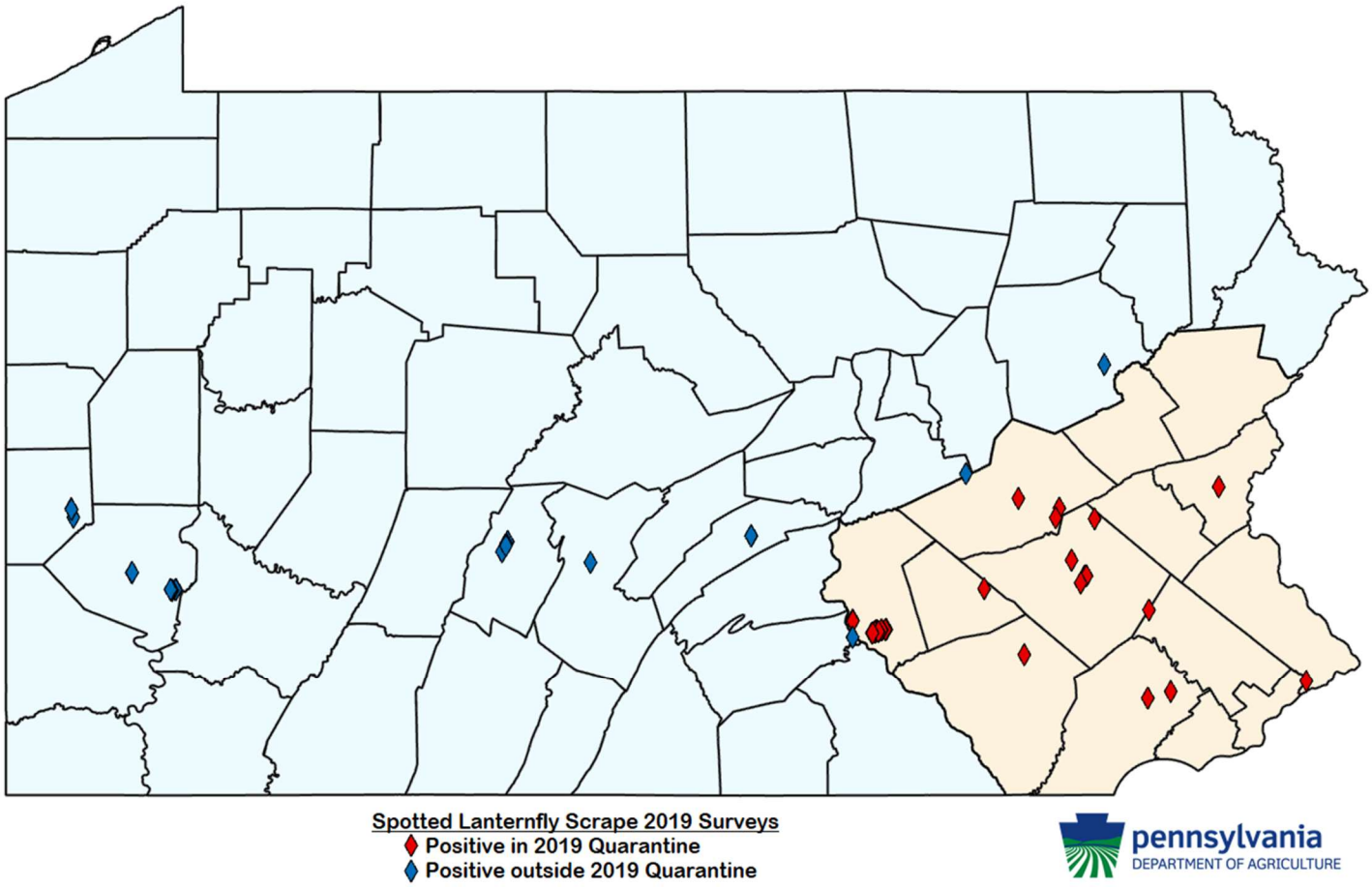


SPOTTED LANTERNFLY SCRAPE SURVEY:

Survey performed 26 January, 2019 through 7 May, 2019, and again from 18 October, 2019 through 27 December, 2019.

122 scrape sites in 16 counties (5 regions)

1,676 egg masses scraped



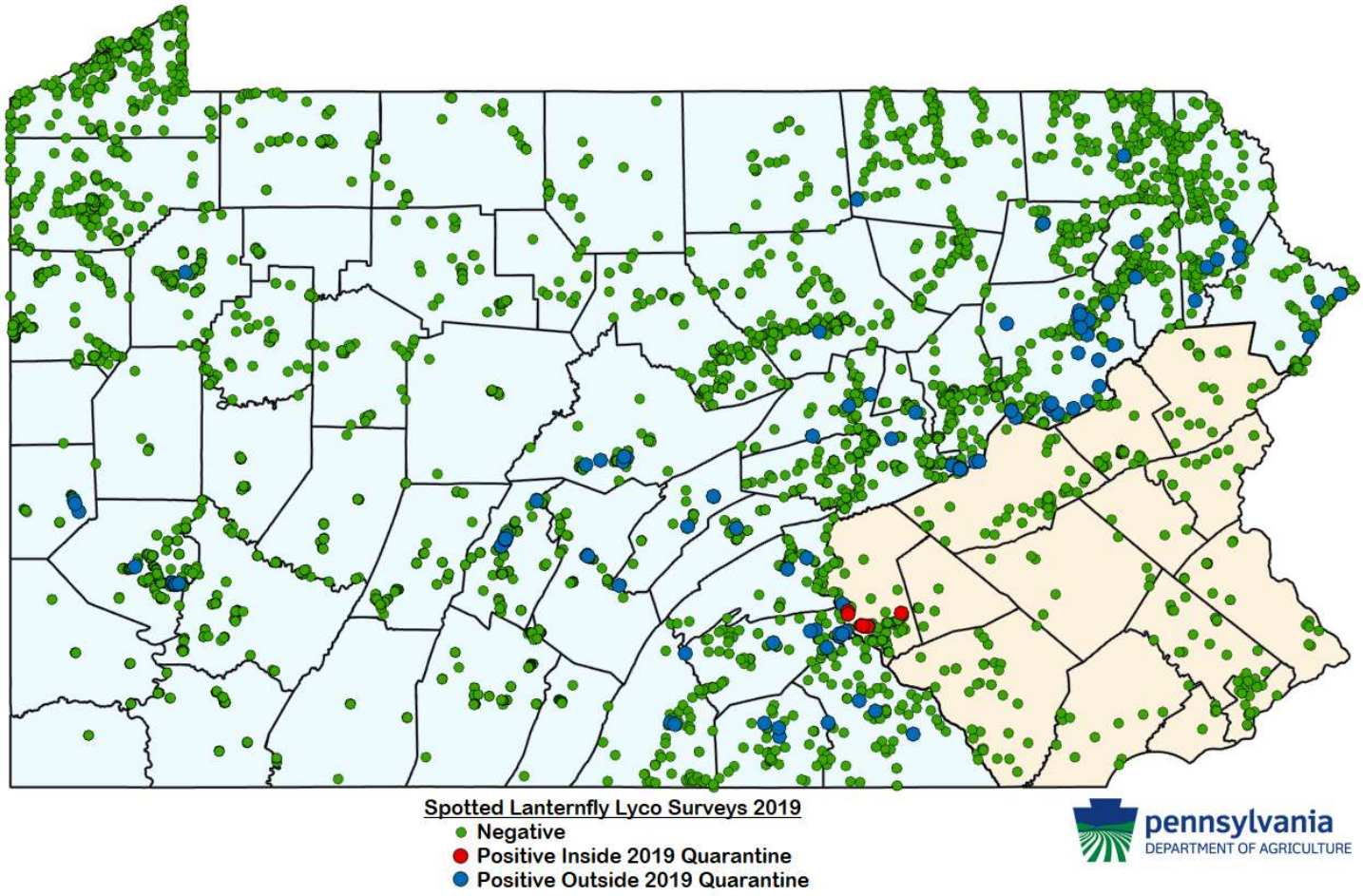
SPOTTED LANTERNFLY VISUAL SURVEY:

Survey performed 5 February, 2019 through 30 December, 2019

712 Lyco surveys in 67 counties (7 regions)

24,501 SLF reported

1,307 specimens identified



GRAPE COMMODITY PEST SURVEY:

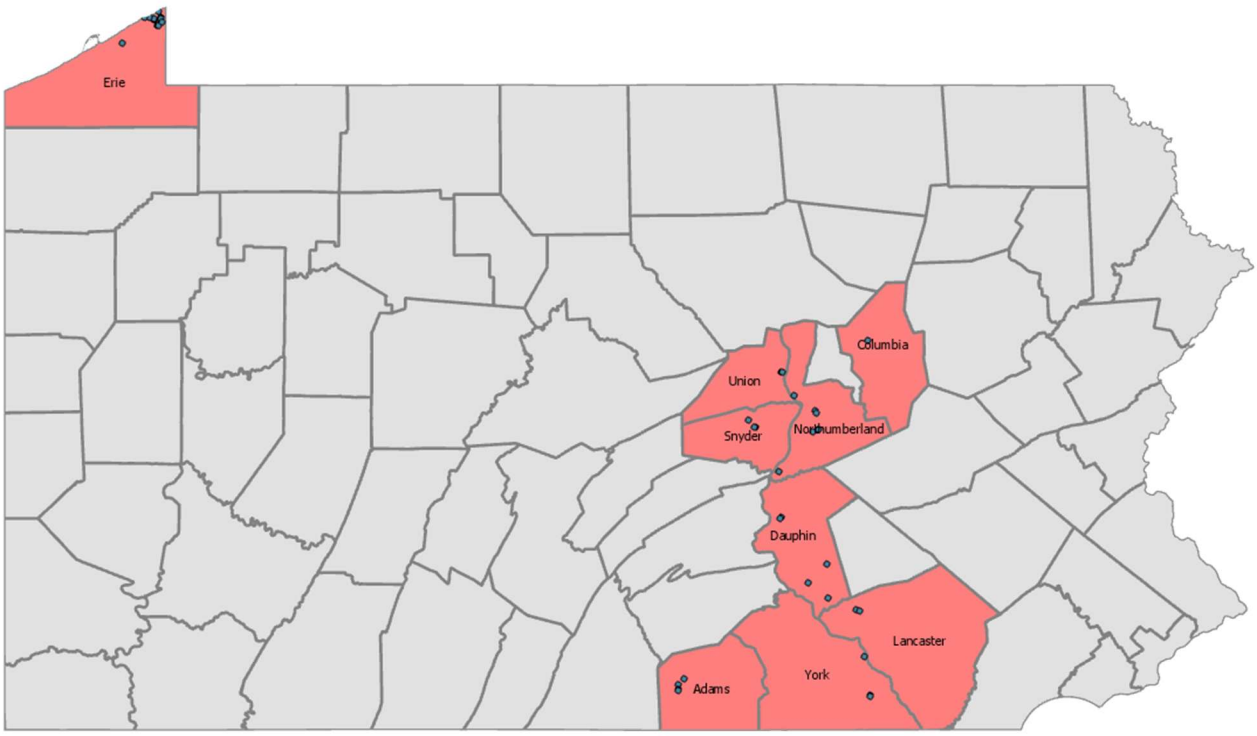
PDA first implemented a grape pest survey in 2010, using Farm Bill funds from the USDA. This survey has been continued through part of 2019. The survey was run from April until the end of June 2019. Target pests for 2019 included *Lobesia botrana* (European grapevine moth), *Autographa gamma* (silver-"Y" moth), *Epiphyas postivittana* (light brown apple moth), *Spodoptera littoralis* (Egyptian cottonworm), and *Lycorma delicatula* (spotted lanternfly). In the spring of 2019, survey crews established 282 trap locations in 9 PA counties at locations supporting wine and juice production. The PDA lab received and processed 550 samples, which contained 926 specimens. No target species were detected in 2019. Surveys did detect 8 specimens in the genus *Autographa,* but none were *Autographa gamma*.

30 trap sites in 9 counties (3 regions)

282 trap locations

550 samples

926 specimens identified



Grape Commodity Pest survey locations (2019)

ASIAN LONGHORNED BEETLE (ALB):

The pest *Anoplophora glabripennis* (Asian longhorned beetle) continues to be a high priority for eradication if detected in Pennsylvania. PDA screens all wood destroying insect samples for ALB, all of which were negative in 2019. In addition, ALB visual surveillance is performed as part of Pennsylvania's Cooperative Agricultural Pest Survey.

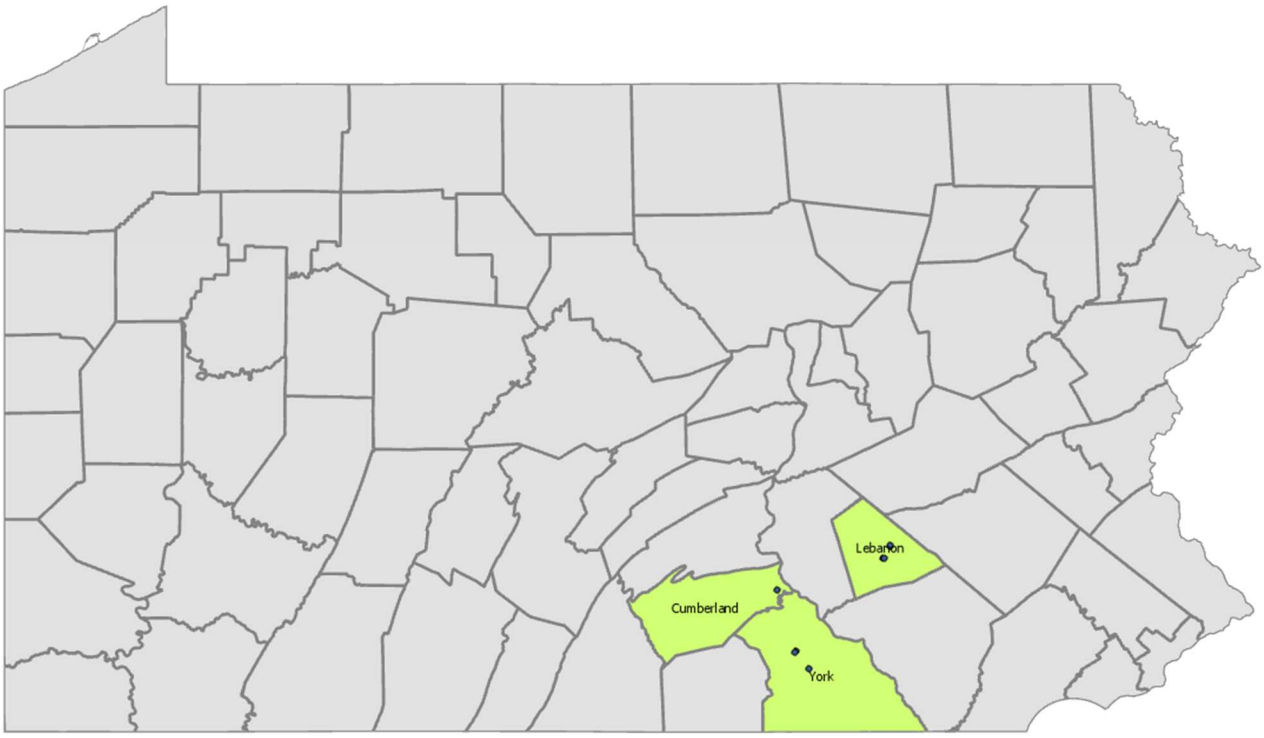
5 trap sites in 3 counties

24 trap locations

154 samples

128 specimens identified

2 visual survey sites in 1 county



Asian Longhorned beetle survey trap locations (2019)

TOMATO COMMODITY PEST SURVEY:

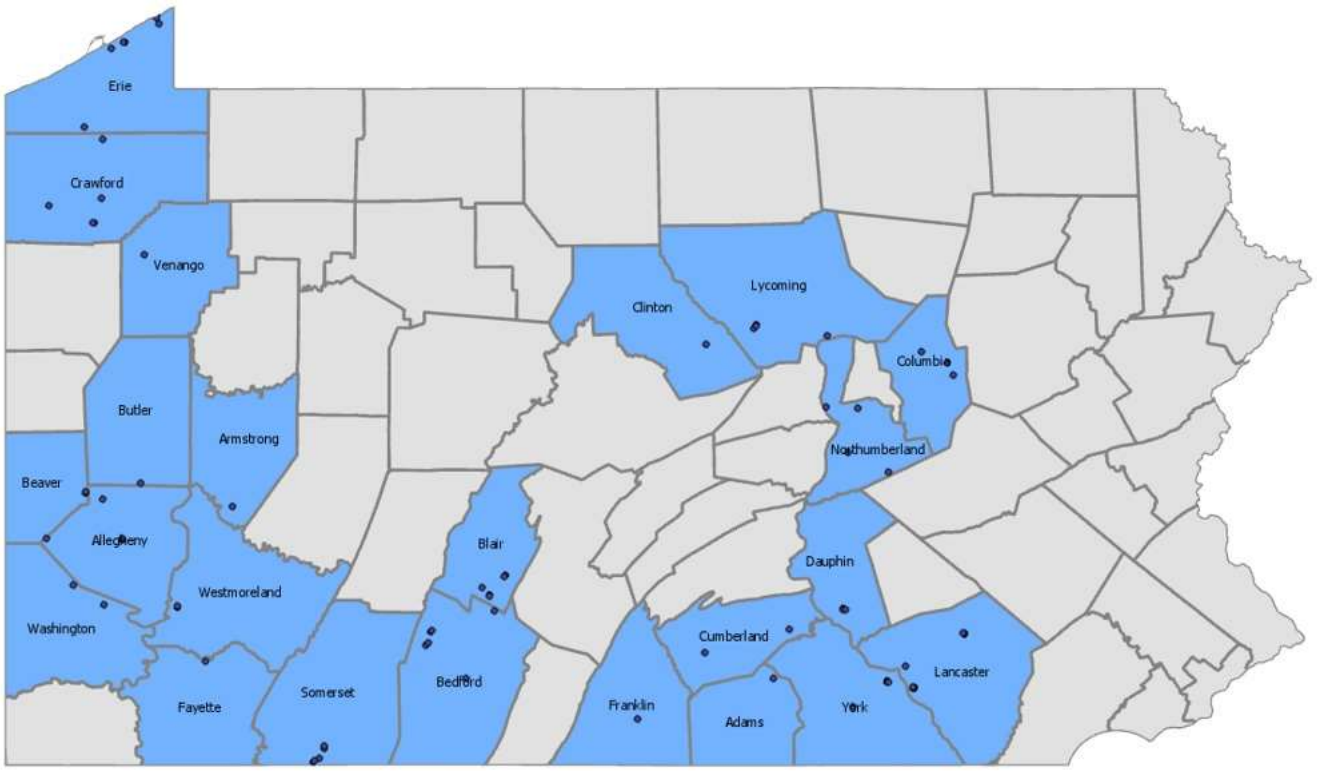
Due to numerous new detections of the tomato pest *Tuta absoluta* (Family Gelechiidae) in Europe, a small survey for this pest was conducted through the PDA IPM program in 2010. In 2011, PDA received Farm Bill funding through the USDA to implement an official tomato commodity pest survey in PA and this was continued in the first half of 2019. The 2019 project target pests were *Tuta absoluta* (tomato leaf miner), *Chrysodeixis chalcites* (golden twin spot moth), *Spodoptera litura* (Cotton Cutworm), *Helicoverpa armigera* (old world bollworm), and *Bactericera cockerelli* (tomato/potato psyllid). Seasonal surveyors deployed 419 trap locations in 23 counties at tomato-processing facilities and tomato production sites. For the 2019 season, surveyors submitted 1385 samples which contained 391 specimens, all of which were negative for the target pests. Traps did collect 41 specimens of *Helicoverpa*, but none were *Helicoverpa armigera*.

50 trap sites in 23 counties (5 regions)

419 trap locations

1385 samples

391 specimens identified



Grape Commodity Pest survey locations (2019)

COOPERATIVE AGRICULTURAL PEST SURVEY (CAPS) Exotic Wood Boring Beetle Survey (EWBB):

The Cooperative Agricultural Pest Survey is a federally funded survey that targets pests of specific national concern to agriculture. Though the EWBB survey targets species of national concern, it also adds species of state concern. Due to the extreme economic impact caused when non-native wood destroying insects are introduced to PA, PDA runs some form of this survey each year. Surveys are carried out in accordance with national survey guidelines. Pests of state concern can be surveyed in a more flexible manner. In 2019, insects affecting oak, maple, walnut, other Northeastern hardwoods, and conifers were selected as target species. This included pests like oak splendor beetle, Asian longhorned beetle, oak ambrosia beetle, spruce engraver, bamboo borer, citrus longhorned beetle, and many other pests not known to occur in PA or with a very limited PA distribution. Information from the interception of pests at ports provided by the U.S. Customs and Border Patrol, European pest alerts, and NAPIS are used to help refine the list of target pests for PA. Protocols for the surveillance of many of these pests require visual surveillance, while others call for pheromone or plant volatile-baited traps. For pests that are trapped, 12 sites were established at sites deemed high-risk for exotic pest introduction with 84 variously baited traps. In addition, 24 traps using general Cerambycidae lures using two lure delivery systems, were set. Traps were run from April through the end of October. Each trap was serviced every two weeks, which generated a total of 1448 samples and 19,359 specimens. A total of 12 CAPS targets were trapped in 2019 surveys. Detections of note include *Trichoferus campestris* in two counties (Dauphin, Lebanon) and records of Emerald Ash Borer in already confirmed counties.

12 trap sites in 12 counties in 7 regions

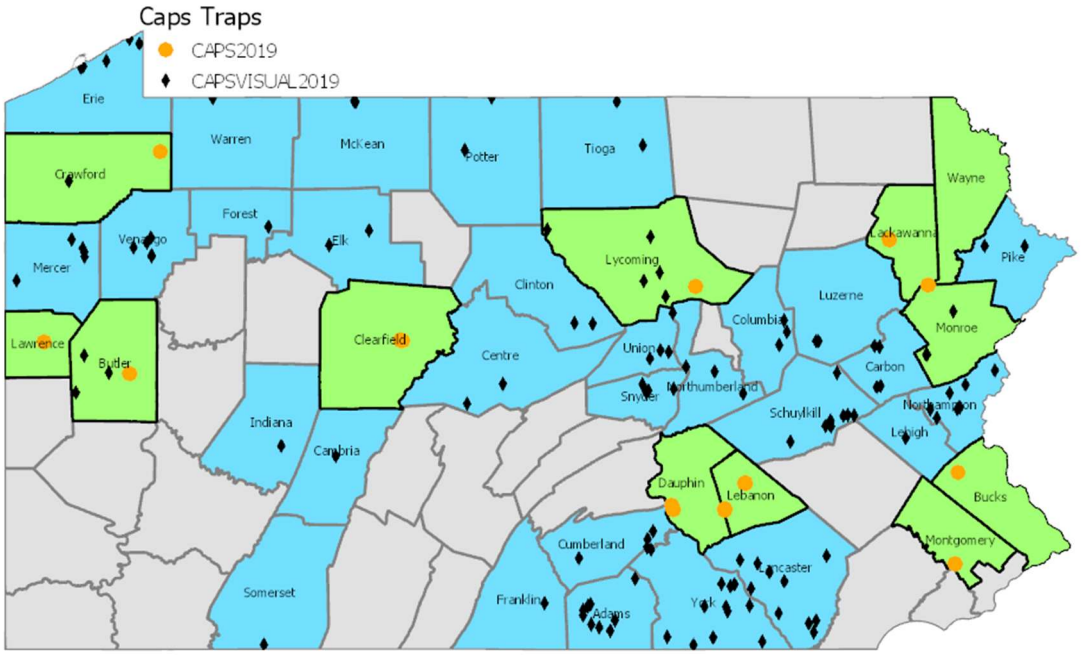
108 trap locations

1448 samples

19,359 specimens identified

123 visual survey sites in 33 counties in 7 regions

Visual survey points were taken at all sites and several additional locations, totaling 123 visual survey sites in 33 counties for pests that are visual survey only. All visual surveys were negative for target pests. This survey will be conducted again in 2020, targeting high priority potential pests and new high-risk locations.



CAPS survey visual and trap locations (2019)

EUROPEAN CHERRY FRUIT FLY SURVEY:

The objective of this project was to survey for the invasive insect, the European Cherry Fruit Fly (ECFF) *Rhagoletis cerasi*. The survey was conducted by PDA in the following 19 counties: Adams, Allegheny, Armstrong, Beaver, Bedford, Blair, Centre, Columbia, Dauphin, Erie, Indiana, Lancaster, Lawrence, Lycoming, Mifflin, Northumberland, Snyder, Westmoreland, and York. PDA staff placed traps in sets of 6 around cherry orchards or on Asiatic bush honeysuckle/cherry trees situated along wood edges or fence rows/hedge rows near fruit stand and produce markets. Traps were serviced every two weeks and then sent to the PDA laboratory to be screened for the target pest. A total of 43 sites with 265 traps were established by July and a total of 2,026 samples were processed.

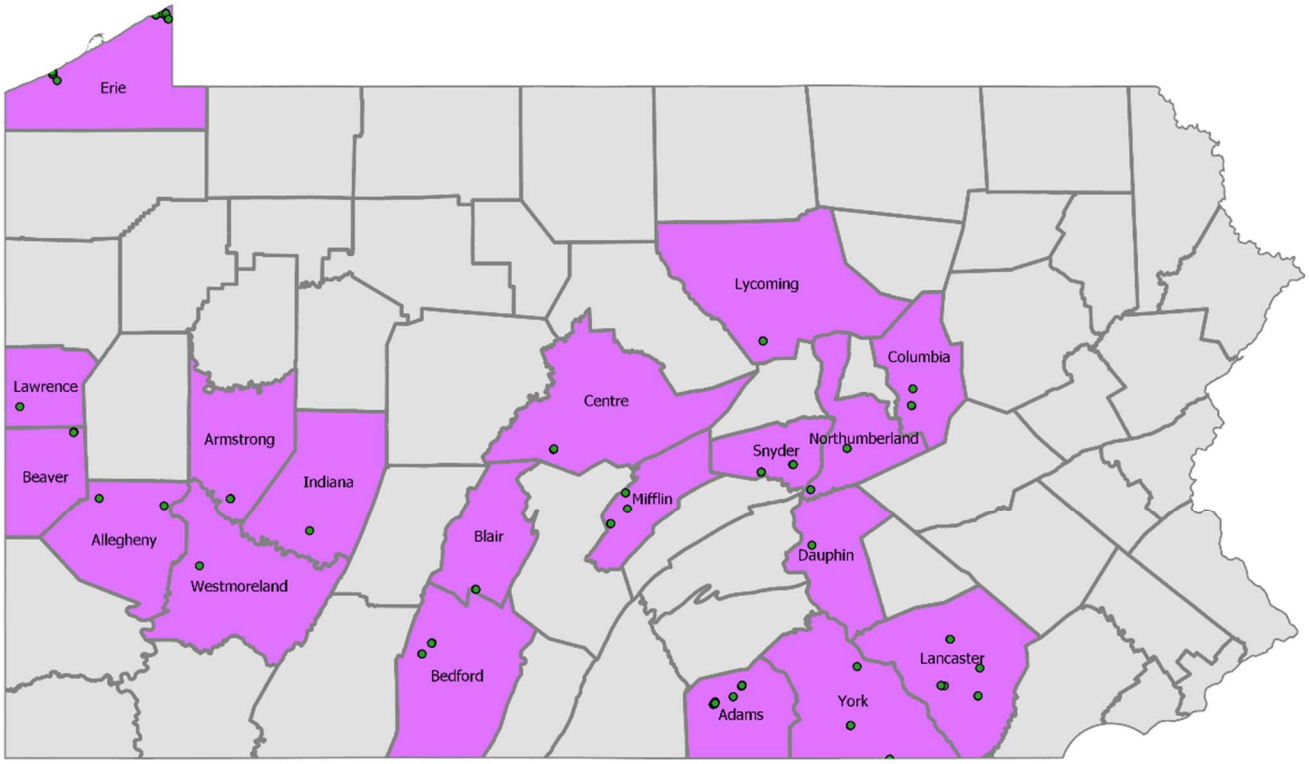
A total of 35 *Rhagoletis* and *Zonosemata* were identified to species level on the basis of being morphologically similar to ECFF, but all were found to be negative.

43 trap sites in 19 counties (5 regions)

265 trap locations

2026 samples

35 specimens identified



WALNUT TWIG BEETLE (TCD):

In 2011, Penn State Cooperative Extension received a sample of dying black walnut from Bucks County. The cause was determined to be Thousand Cankers Disease, a disease complex caused by the interactions of a bark beetle *Pityophthorus juglandis* (walnut twig beetle) and the fungus it vectors. Trees at the initial detection site were voluntarily removed and destroyed by the property owner in February of 2012, and PA initiated a statewide trapping survey for the beetle. PA received Farm Bill support to run 11 sites for the beetle starting in April through June. In 2019, PDA focused on uninfested counties adjacent to the quarantine of known positive counties. The state of Maryland requested assistance with the processing of samples from MD to which PDA agreed to identify. In all, PDA received and processed 579 samples. A total of 14 specimens of *Pityophthorus juglandis* were collected in 2019 from Maryland, while none were found in PA. The quarantine was not expanded but remains in effect for Bucks, Chester, Philadelphia, Delaware, Montgomery, and Lancaster Counties.

11 trap sites in 5 counties (2 regions) (PA)

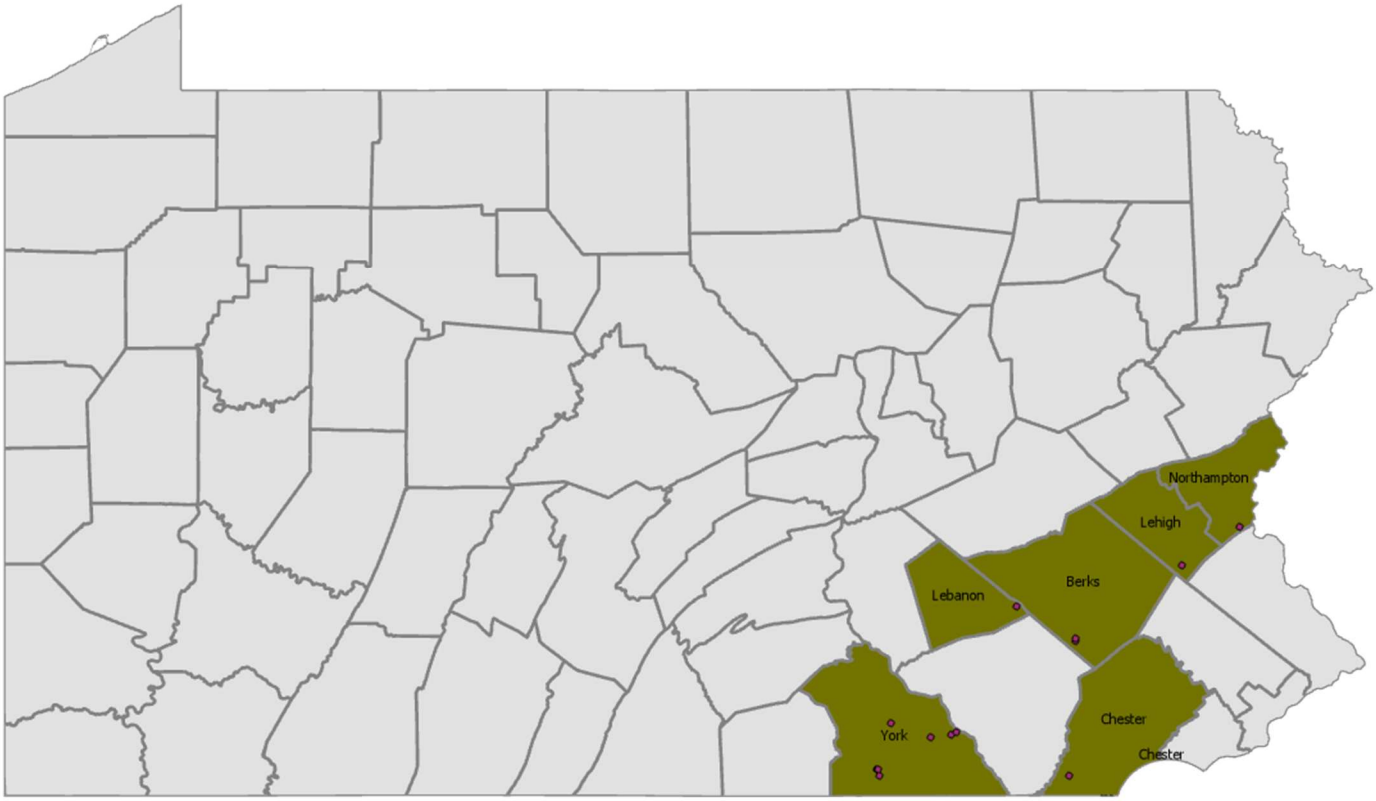
66 samples (PA)

487 specimens identified (PA)

1 visual survey site (PA)

513 samples (MD)

4025 specimens identified (MD)



Walnut twig beetle trap locations (2019)

APIARY PERMITS ISSUED:

The Pennsylvania Department of Agriculture (PDA) issued 27 Certificates of Inspection to process export permits for beekeepers requesting permission to allow honey bees and/or used equipment to leave PA. Queen producer/nuc-selling permits were issued to 89 beekeepers enabling them to sell queens and nucleus colonies in Pennsylvania in 2019.

APIARY INSPECTION PROGRAM:

The value of the apiary industry in Pennsylvania in 2019 was estimated at more than $76 million. Much of this value is attributed to increased yield in crops partially or completely dependent on honey bees for pollination. In 2007, it was estimated that each honey bee colony provided $1,659.21 to Pennsylvania's economy.

Since the onset of Colony Collapse Disorder (CCD) in 2006, more people worldwide have become interested in becoming beekeepers and helping native pollinators. Currently in PA more than 5,700 registered beekeepers manage over 54,500 colonies in approximately 7,800 bee yards. The majority of these beekeepers care for 0-10 hives.

Managed honey bee colonies can be found almost everywhere in the Commonwealth from roof tops in urban areas to towns, suburbs, farms, and undeveloped land. From the end of April until the end of October, there were seven full-time seasonal Apiary Inspectors working across Pennsylvania, as well as the State Apiarist, located in Harrisburg. The Apiary Inspectors conducted approximately 1,200 inspections in 2019.

HONEY BEE DISEASES AND PESTS:

American Foulbrood (AFB), a highly contagious disease affecting honey bees, was detected in ten bee yards in three PA counties in 2019. There were 36 positive samples taken from the bee yards of six beekeepers. The PA Department of Agriculture continues to focus on detection and treatment of AFB. All suspect cases of AFB were submitted to Harrisburg and then laboratory tested at the PA Department of Agriculture or sent on to the USDA, Beltsville, Maryland to confirm the diagnosis and to screen for Oxytetracycline hydrochloride, (trade name Terramycin) resistance. Resistant strains of AFB may be treated with the veterinary antibiotic tylosin (trade name Tylan) or irradiated. Many beekeepers chose to burn the infected hive(s) since the antibiotics do not kill the bacterium causing AFB. Beekeepers wishing to treat honey bees with an antibiotic (Oxytetracyline and/or tylosin) must now work with a veterinarian to obtain a prescription or veterinary feed directive (VFD). The Varroa mite, *Varroa destructor*, continues to be found throughout Pennsylvania and most areas of the world. These insect pests of the honey bee are a serious concern to beekeepers because they vector viruses causing diseases and can weaken a colony enough to cause the bees to abscond or die. Small hive beetles are found in most areas of Pennsylvania. They are more prevalent in the southern and central areas of the state.

NATIONAL HONEY BEE SURVEY:

This was the ninth year that Pennsylvania was able to participate in the USDA/APHIS National Honey Bee Disease Survey (NHBS). The objectives of this survey include determining the diseases, pests, and parasites present, or absent, in various types of honey bee operations throughout the United States, continuing an epidemiological survey that meets the goal of developing a long-term overall baseline picture of colony health, and identifying risk and protective factors that predict colony health and operational success by connecting honey bee health measures over time and annual colony losses.

The 2019 National Honey Bee Survey (NHBS) sampling was divided into two sections, longitudinal sampling of 5 beekeepers, and 14 general survey surveillance samples split into 3 or more sampling trips throughout the year. The longitudinal sampling was conducted twice for each of 5 beekeepers, and the goal was for each state to have a total of 24 samples at the end of sampling season. Hives sampled for the longitudinal study also have wax samples taken to be analyzed for pesticides exposure effect on colony health, and potential synergisms between pesticides and diseases.

In Pennsylvania, samples were collected from 20 apiaries from throughout the Commonwealth from May through October 2019. The apiaries represented a cross-section of operation types and sizes. Each of the 20 apiaries had a minimum of 8 colonies in the apiary.

The apiaries were located in 13 counties spread out across Pennsylvania and covered a good cross-section of rural, suburban and urban environments. The counties included: Allegheny, Berks, Chester, Clearfield, Columbia, Crawford, Dauphin, Elk, Erie, Mifflin, Philadelphia, Union, and York.

Targeted pests, parasites and pathogens noted in this survey through visual inspection are: American Foulbrood, European Foulbrood, Sac Brood, Chalkbrood, Parasitic Mite Syndrome (PMS)/Snotty Brood, Deformed Wing Virus, Black Shiny Bees, Small Hive Beetle larvae and adults, and Wax Moth larvae and adults. The status of the queen was also noted on the data sheet.

Honey bee and "frame tapping" samples from each apiary are taken and preserved in alcohol. They were sent to University of Maryland where they were examined for *Varroa* mites load, *Nosema* spore count, and the presence of *Tropilaelaps* mites and *Apis cerana*.

Live honey bee samples were taken from each apiary for submission to the USDA-ARS BRL for molecular and visual analyses. The molecular and visual analyses include the following: Lake Sinai Virus-2 (LSV-2), Acute Bee Paralysis Virus (ABPV), Chronic Bee Paralysis Virus (CBPV), Deformed Wing Virus (DWV), Kashmir Bee Virus (KBV), Israeli Acute Paralysis Virus (IAPV), and Varroa Destructor Virus/Deformed Wing Virus-B (VDV/DWV-B).

The five longitudinal sampled apiaries also had two wax samples taken. There was approximately 3 grams of wax cut from the brood frames. These samples were frozen until shipped to University of Maryland. They sent the wax on to USDA Agricultural Marketing Service (AMS) in Gastonia, NC for analysis. The wax will be tested for over 170 known pesticides. collected and submitted for pesticide residue testing.

Sample collection and apiary inspection was begun on May 1, 2019 and completed for the calendar year on October 21, 2019 with 20 apiaries sampled. The four remaining samples (3 regular and 1 longitudinal) will be completed and shipped by June 30, 2020.

NATIVE AND NONNATIVE BEE AND WASP SURVEY:

Asian Giant Hornet, *Vespa mandarinia,* (AGH) gained national notoriety when it was discovered in Canada and Washington state late in 2019. This discovery emphasizes the importance of being prepared for the arrival of invasive insects.

The objectives of this project are to develop an inexpensive, user-friendly surveillance survey for early detection of exotic wasps and bees, by creating a trapping system that can be deployed in various locations and to gather information on wild native bees.

Twenty states participated in this survey by following a standardized exotic wasp and bee survey system which involved a trapping trial which tested the efficacy of the commercially available and commonly used blue vane traps and white plastic 1-gallon jug traps. Each volunteer selected three locations of their choice. There were two blue vane traps and one jug trap at each location. (Each received a total of 9 trap - 3 jug traps and 6 blue vane). The traps were baited using the appropriate amounts of a dark brown sugar and water solution (1 cup packed dark brown sugar added to 1 gallon of water). One of the blue vane traps also had 1 teaspoon of yeast added to the brown sugar solution to see if the increased fermentation affected the catch.

If, as we suspect, these traps are successful for surveying for bees and wasps, the combined trap can be deployed as part of an inexpensive surveillance trapping system in subsequent years

There were approximately 1,797 trap visits from April 25, 2019 to January 21, 2020. There were 206 sites (traps) set up. A total of 15,965 insects were identified so far. There have been 15,868 Hymenoptera identified. There are many insects which are not identified yet, so these numbers will change.

In Pennsylvania, we established 49 traps sites at high risk sites including international airports, ports, shipping, rail, and truck transportation hubs in 6 counties. The counties included: Allegheny, Crawford, Dauphin, Erie, Lebanon, and Westmoreland counties.

NATIVE BEE SURVEY:

Native bee surveys were conducted in Pennsylvania from 2008 through 2013. Due to the listing of the species *Bombus affinis,* a scaled-back version of the PA Native Bee Survey (PANBS) was revived in 2017 and continued in 2018 and 2019. Apiary Inspectors established a site for the season, placing 5 yellow and 5 blue cups for 8 or more hours, every two weeks. A total of 89 Hymenoptera were collected.

PENNSYLVANIA'S POLLINATOR PROTECTION PLAN (P4):

In 2014, the Environmental Protection Agency (EPA) directed state agencies to develop pollinator protection plans to mitigate risk to honey bees and other pollinators. This was one part of the federal government's plan to help pollinators. While the guidelines for the state pollinator plans are voluntary and not regulatory, the P4 has several goals, including increasing knowledge and communication between farmers, pesticide applicators, beekeepers, and the public about pollinators. While pollinator protection plans were originally geared to managed pollinators, PA and many other states realized the value of native pollinators and expanded the plans to include all pollinators.

Dr. Christina Grozinger, Director of the Center of Pollinator Research at Penn State University worked with PDA to organize a task force and advisory groups to contribute to the plan, editing the input from more than 36 individuals representing 28 state organizations, national organizations, and stakeholder groups. The P4 is housed on the Penn State Center for Pollinator Research's website, with links from PDA and numerous other websites. Various members of this task force met several times in 2019 to work on P4 goals.

Pennsylvania beekeepers and specialty crop growers can now register online on the Bee Check and Drift Watch sites (Field Watch). This website serves as a voluntary communication tool for crop producers, beekeepers, and pesticide applicators to work together to protect specialty crops and apiaries through the use of mapping programs.

PLANT DIAGNOSTIC SAMPLE REPORTS (PDSR):

In support of the PDA Plant Merchant Program, the Entomology Lab identifies Plant Inspector-collected samples from routine plant merchant inspections where a pest of regulatory concern is suspected. In addition, plant inspectors are asked to target certain pests of concern during their inspections. In 2019, Plant Inspectors were asked to look for SLF, Red-necked Longhorn Beetle (*Aromia bungii*), Yellow Spotted Stink Bug (*Erthesina fullo*), and Lily Leaf Beetle (*Lilioceris lilii*). A total of 52 samples were submitted to PDA, with no targets identified.

GENERAL SURVEY SAMPLES AND OTHER DETECTIONS OF NOTE:

In addition to the Entomology Program's regulatory and funded surveys samples from cooperative extension, private industry, and the public also submit samples for identification. The program records these samples as GENERAL SURVEY samples. The majority of these are submitted by commercial pest control companies and private citizens. Samples from this survey can lead to early detections of new pests to PA. In 2019, PDA received 55 samples totaling 480 specimens from 15 counties. Notable finds include the peacock lice *Ambylcera minuta* and *Goniodes pavonis*, and dog chewing louse (*Trichodectes canis*) on whitetail deer.

Cooperators with the DNCR, Bureau of Forestry submitted to PDA samples of Eastern Hemlock Scale (*Fiorinia externa*) from Fulton County and Hemlock Woolly Adelgid (*Adelges tsugae*) from Lawrence County. These records both represent the first record for each county, respectively.

PDA INSECT REFERENCE COLLECTION:

The PDA Entomology program maintains an active and growing collection of insects of agricultural importance. This collection serves as a reference tool for identification and a resource for historical information on insects of Pennsylvania and the mid-Atlantic states. The collection seeks to improve it holdings in both areas of agricultural importance as well as areas in need of curatorial improvement.

The collection added several hundred new specimens in 2019 with emphasis on bees (Apoidea), jewel beetles (Buprestidae), and other wood destroying beetles. A substantial portion of this added material was current holdings identified from our bee collection, adding 24 new species to the collection. These identifications included nine genera (*Bombus*, *Anthophora*, *Megachile*, *Melitta*, *Melissodes*, *Halictus*, *Andrena*, *Caenochrysis*, and *Pseudomalus*). The collection also added holdings of notable inclusions such as *Graphisurus triangulifer* (Pictured), *Agrilus malvastri*, and *Phorodon cannabis*, the first specimens in our collection. The collection also traded with contacts to receive specimens of agricultural significance including receiving *Trypodendron domesticum* from Washington Department of Agriculture.

Graphisurus triangulifer

INVASIVE SPECIES HOTLINE, SLF REPORTING APP, AND E-MAIL REPORT SYSTEM:

In 2019, the invasive species hotline, badbug@pa.gov e-mail account, and SLF reporting application generated 95,210 reports, with the majority being the Spotted lanternfly. This was the first year the Entomology program used an online reporting tool to track an invasive insect (SLF). The effort was extremely successful as an early detection tool in areas where SLF had not been found as well as a tool to identify hot spots where SLF was extremely common. The Reporting tool was hosted by Penn State Extension which also provided users with immediate access to resources for homeowners and businesses, further streamlining the reporting experience and improving user experiences.