



## State of New Jersey

DEPARTMENT OF AGRICULTURE  
HEALTH / AGRICULTURE BUILDING  
PO Box 330  
TRENTON NJ 08625-0330

CHRIS CHRISTIE  
*Governor*  
KIM GUADAGNO  
*Lt. Governor*

DOUGLAS H. FISHER  
*Secretary*

### NEW JERSEY DEPARTMENT OF AGRICULTURE DIVISION OF PLANT INDUSTRY REPORT TO THE EASTERN PLANT BOARD

#### SUMMARY OF 2016 ACTIVITIES

##### APIARY INSPECTION

During the 2016 season, New Jersey had 2,285 registered beekeepers, which were up from the 1,920 registered in 2015. There was also a corresponding increase in apiaries from 3,000 apiaries up from 2,650 the previous year. Unofficial estimates indicate that there could be anywhere between 3,500-4,000 beekeepers in the state. Division staff examined 1,221 colonies in 126 apiaries for brood disease and parasites. The program detected three cases of American Foul Brood (0.25%) down from 0.58% the previous year. Overall, 8.8% of the colonies inspected this season had European Foul Brood disease. This is up 2.68% from the previous year. This increase is very significant and has been an ongoing trend over the last five years. This trend is very disconcerting in light of the new FDA regulations regulating the ability of a beekeeper to get antibiotics to treat this disease. The Apiarist certified the bee yards of 21 beekeepers who sell nucs and queens, which increased from last year. A total of 1,500 nuc hives and over 3,000 packages were imported into New Jersey to new or expanding beekeepers.

The winter of 2015-2016 was rather normal. Colonies moved into the state for blueberry pollination during the third week of April, which was about the normal time of pollination. New Jersey had a 29% winter death loss during the winter of 2015-2016, which was down 35% from the previous winter. A statewide survey conducted on winter death loss showed that in 2016, beekeepers that did nothing to control Varroa mites lost 45% of their colonies while Beekeepers that provided some treatment to control Varroa lost 24% of their colonies. After seven years of polling beekeepers in the state about their management practices, we have found that Beekeepers who do nothing to control mites lose on average about 46% of their colonies over the winter. Those that do control Varroa mite lose only about 25% of their colonies. Overall, beekeepers that do a good job on Varroa mite control start their treatments in July and August and experience a significantly lower death loss than those that start later in the year.

The honey crop for New Jersey was average. Some areas did well and others did not. This was noticed during the fall goldenrod crop. The areas that did not get enough rain

in the summer months did not produce while those that did had a great Goldenrod flow.

In 2016, 18,000 honeybee colonies entered into New Jersey from Florida, Maryland, Louisiana, and South Carolina for commercial blueberry pollination of fruit crops, blueberries and cranberries. The number of colonies coming in for pollination has flattened out this year. Overall, the quality of the hives was good among the colonies inspected.

Following Blueberry pollination, three New Jersey commercial beekeepers noticed damage to their colonies for the third year in a row. There were failed queens in about 30% of the colonies as well as a decline in frames of brood. The brood pattern was scattered in a percentage of the affected colonies and another percentage had sealed brood and eggs but no larva. A study was done with researchers from the Rutgers Blueberry Cranberry research station, the State Apiarist, and one of the affected beekeepers to try and understand what is going on with this problem.

The Apiarist gave 28 presentations to various grower groups, health officer trainings, schools, and beekeeper meetings. The Department remains focused on education, because “an educated beekeeper is often a better beekeeper” and an educated public will better understand the importance of honeybees and their behavioral differences from wasps and hornets. There remain many beekeepers that cannot identify bee diseases or mites. There is a group of beekeepers who fail to control Varroa populations in colonies.

The Apiarist is actively encouraging New Jersey beekeepers to develop businesses selling New Jersey raised Nucs and queens. Our goal is for these bee breeders to raise queens from colonies that successfully overwintered in the state and continue to produce a sound honey crop.

The Apiarist and some members of the New Jersey Beekeepers Association developed a beekeeping calendar to remind the beekeeper what needs to be accomplished for their hives on a month-to-month basis. The response to this educational tool in the New Jersey beekeeping community has been great. Over 600 calendars were printed and distributed to beekeepers throughout the state for this season to remind them of the things they should be planning and doing on a monthly basis.

The bee spill plan was updated in 2016. The plan utilizes Department of Agriculture personnel, commercial beekeepers and 40 volunteer helpers. They are located in the north, central and southern areas of New Jersey. They are equipped with protective gear, some equipment and are willing to respond if assistance is needed.

## **NURSERY INSPECTION PROGRAM**

**New Jersey Law** requires that all nursery stock (hardy trees, shrub and perennials) sold in New Jersey be free of injurious pests, ensuring that ornamental plants purchased by consumers do not contain pests that could spread to other plants.

Specific state quarantines and/or inspection programs also exist for Rose plants, Vegetable transplants and blueberry plants.

**Nursery inspection** staff inspected 16,498 acres of nursery stock and 8,977,250 sq. ft. of greenhouse plant material in 2016 at 1,089 locations to certify freedom from dangerous insects and diseases. This was an overall 8-10% decrease in nursery acreage and locations compared to the previous year.

A total of 786 Nursery **Plant Dealers** were inspected in 2016. A current list of certified nurseries and plant dealers can be found at the New Jersey Department of Agriculture's Division of Plant Industry webpage. Plant dealer inspections determine that the sources of plant material are certified and visual inspections are conducted at locations that carry stock.

**Rose Mosaic Virus Complex:** In order to protect the health and quality of rose plants purchased by New Jersey consumers and growers, and to prevent the movement of virus-infected rose plants into New Jersey, the Division regulates shipments of rose plants into the state. All rose plants that have entered the state must be accompanied by an official certificate or statement issued by an authorized official of the state of origin, certifying that the plants were inspected during the growing season at a time when symptoms would be apparent and found visibly free of plant viruses. The five primary New Jersey nurseries which receive a large volume of dormant rose plants each year provide the Department the required inspection certifications. In 2016, a total of 533,484 dormant rose plants from ten different out-of-state rose producers sent their material to New Jersey nurseries. Horticultural inspectors examine these roses, usually by mid-April, for virus symptoms and reject plants that are not accompanied with the appropriate certification or exhibit visual virus symptoms. Notices of Rejection were issued at eight plant dealer locations in 2016 where infected plants had been identified.

Blueberry plants were inspected during the spring and fall, per the requirements of the New Jersey **Blueberry Plant Certification** Program. There were six blueberry nursery stock growers that participated in the 2016 program. Under the program, a total of 1,557,515 blueberry plants were inspected, (43,731 mother plants, 520,916 nursery plants, 992,450 cuttings & 418 containers). Over 3,814 plants were rejected and destroyed because of infestations of Dodder, stunt, red ring spot, shoestring and mosaic diseases.

A total of 159 **Phytosanitary Inspections** were completed through the USDA-APHIS PCIT system during 2016. State ACO's issued 66 state phytosanitary certificates for the shipment of bulbs, corms & tubers, assorted tree/shrub seedlings, blueberry plants, poinsettia cuttings and assorted annual plugs to various states. A total of 93 federal phytosanitary certificates were issued for the export and re-export of assorted nursery stock, poinsettia cuttings, bulbs, corms & tubers, cranberry plants, and fig trees overseas.

**Certification of Quarantine Compliance:** The Department has six state-compliance agreements permitting New Jersey greenhouses and nurseries to ship plants or plant

products to states where these commodities must be certified free of specific quarantine insect pests or disease. Two greenhouse operations, one bulb supplier, one pepper producer and thirty-four boxwood growers are now certified through these state to state compliance agreements. Among the plant pests covered within these agreements are European corn borer, Japanese beetle, Colorado potato beetle, boxwood blight, blueberry maggot and various blueberry viruses.

A New Jersey pepper grower entered a compliance agreement with the Department for the first time, permitting shipments of fresh New Jersey pepper fruit into Texas. This compliance agreement was designed to safeguard against the introduction of **European Corn Borer (ECB)**; *Ostrinia nubilalis* – an introduced pest of many agriculture crops. The first flight of the ECB for 2016, within the areas of quarantine-compliant pepper production, occurred on June 19<sup>th</sup>. Program staff conducted monthly audits of the participants' recordkeeping (including their moth trap monitoring and pesticide applications) and certified the grower's compliance with the necessary phytosanitary requirements for entry of this material into Texas.

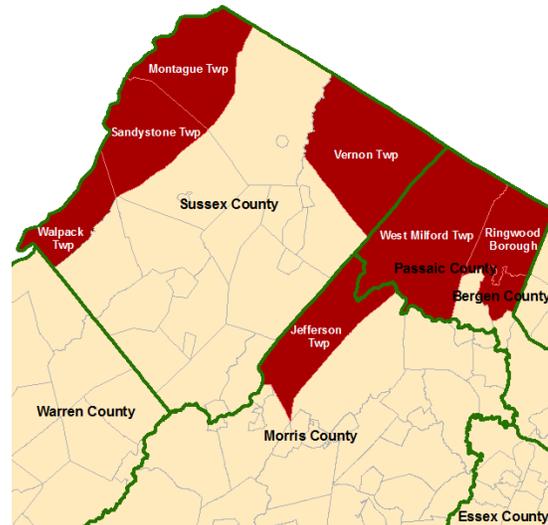
Since 2011, incidents of **Boxwood Blight**; a condition affecting boxwood plants caused by the ascomycete fungi *Calonectria pseudonaviculatum* have become more common for boxwood producers and ornamental landscapes throughout the country. The Commonwealth of Pennsylvania imposed a quarantine of boxwood blight effective: June 25<sup>th</sup> 2016. This quarantine impacted many shipping nurseries in New Jersey as it prohibited the import of boxwood blight host plant material (including ALL *Buxus* sp.) from outside the state unless accompanied by proof of phytosanitary quarantine compliance issued by the state of origin. In November 2016, the nursery inspection program provided a certification meeting and training to facilitate the movement of boxwood nursery stock into the Commonwealth of Pennsylvania. As a result of this meeting, Thirty-four New Jersey nurseries are now approved under the Department's "Boxwood Blight Cleanliness Program" granting them the necessary phytosanitary certifications needed for exporting New Jersey boxwood into Pennsylvania.

A **Compliance Agreement** from the state of California Department of Agriculture (CDFA) was renewed to allow the movement of fresh blueberry fruit into California. This certification prevents the movement of plum curculio and blueberry maggot into California, where these insects are not known to occur. No fresh blueberry fruit was shipped to California in 2016.

Thirty one New Jersey blueberry growers were approved for the **2016 Canadian Blueberry Fruit Certification Program (BCP)**. The BCP program is designed to facilitate export of fresh blueberry fruit into Canada while safeguarding against the introduction of blueberry maggot; *Rhagoletis mendax* – a native to northeastern United States. This year the Canadian Food Inspection Agency (CFIA) updated the directive that outlines the criteria of this program (D-95-08) and implemented its changes into their regulatory inspection services. This marks the first significant update to this directive since it was originally drafted. Nursery Program staff members have trained all participants in this year's program on the new protocols and grower responsibilities so they comply with the new regulations. The changes included a new fruit audit method

using a concentrated salt bath and a new schedule for the number of traps required for monitoring production fields under the BCP - IPM method. Division staff monitored the pesticide application, shipping and cooking records for participating growers in accordance with the certification program criteria. Twenty seven of the thirty one approved blueberry growers shipped a total of 512,470 crates into the Canadian fresh fruit market under the BCP throughout the 2016 growing season. This was a 2.5% increase from 2015 (499,866 crates).

The **White Pine Blister Rust**; *Cronartium ribicola* quarantine prohibits the planting of European Black Currant plants anywhere within the state, except under permit, to protect the pine of forested and residential communities throughout New Jersey. This quarantine also limits the movement of red current and gooseberry into specific townships of northern New Jersey (highlighted in red). As a provision, this law allows “special permit for the importation and/or growing of plant cultivars and hybrids of European black currant *Ribes nigrum*”. Currently, there are four New Jersey nurseries actively cultivating European black Currant plants for fruit production under this permit. Two nurseries are located in Hunterdon County; one is located in Middlesex County and another in Morris County. Expiration of these permits will occur in 2018, when there will be no more renewals. Currently, "Consort", "Coronet", "Crusader"; and "Titania" were the cultivars which were initially recognized as being resistant to White Pine Blister Rust when the permits were issued. Recent scientific evidence has concluded that these cultivars are not resistant as originally thought.



Nine Nursery/Greenhouse locations remain under a temporary quarantine after receiving perennial hosta varieties from an out-of-state source that was later found to be infested by an exotic thrips species known as **Japanese flower thrips**; *Thrips setosus* Moulton, a plant pest not known to occur in the United States. Japanese flower thrips feed on foliage and flowers of its host and are known to be associated with various agricultural plants including ornamental hosta and solanaceous crops. Inspections for the presence of Japanese flower thrips were made at nine New Jersey locations. The Nurseries were then given recommendations for adequate preventative control measures. Currently, the presence of Japanese flower thrips has not been detected on any of the stock received at these New Jersey locations. Follow-up inspections will take place in spring 2017, once the host material begins actively growing again.

Nursery Program staff members participated in a voluntary tree survey for **Asian long-horned beetle**; *Anoplophora glabripennis* (ALB) in Linden/Rahway. Each year officers from the USDA-PPQ organize this survey of areas near sites of past infestations. ALB was declared eradicated from New Jersey in 2013. The participants in the 2016 volunteer survey included eight members from the Department, four USDA-APHIS PPQ

officials and four members of the Delaware Department of Agriculture. The survey identified several ALB host trees that require further monitoring for this devastating pest.

Two Nursery Inspection Program staff members attended the 2016 Eastern Chapter Horticultural Inspection Society (HIS) - **Interstate Inspection** conference. This year the conference was held in Concord, New Hampshire. During the conference attendees were updated on the progress being made with the SANC program throughout the Northeast region. The group toured Lēf Farms a fully automated hydroponic greenhouse specializing in baby greens production. During the tour of this facility the group learned about some of the latest technology available and how it can be integrated into greenhouse production. Next the group had a visit with Millican Nurseries where they attended a presentation about invasive plants currently in New Hampshire and surrounding states including New Jersey. During this visit the group discussed methods of invasive plant management, removal and eradication. Finally, the group participated in a mock audit of DS Cole; a greenhouse facility. This audit is required to satisfy the requirements of the Canadian Greenhouse Certification Program (CGCP), which allows participating facilities to ship products into Canada without individual phytosanitary inspections. This purpose of the mock audit was to allow HIS participants to evaluate how similar the CGCP and SANC requirements are and whether the two programs can work together to streamline initiation of the SANC program. In closing, a discussion was led by inspectors of the host state. Comments and recommendations from this discussion will be used to further develop the SANC program requirements and implementation.

***Agrilus smaragdifrons*** - During by-catch screening of the 2016 Emerald Ash Borer survey, two samples containing what appeared to be the same distinct *Agrilus* species were detected by the Nursery Inspection Program entomologist. These *Agrilus* samples were from two separate Emerald ash borer trap locations in the state and were submitted by the NJDEP State Forestry Service. Unlike many of the *Agrilus* samples collected before, these samples did not “key” appropriately to those known to occur in northeastern North America. When a determination for this *Agrilus* species was unable to be made, images were taken using the Departments Leica Microsystems automatic LAS Multifocus Z-stack image capture module and sent to several *Agrilus* identification specialists. The final determination was confirmed and the beetle was identified as: *Agrilus smaragdifrons*. *A. smaragdifrons* is native to East Asia and has not yet been recorded in the United States. The State Plant Regulatory Official (SPRO) and the State Plant Health Director (SPHD) for New Jersey were notified of this determination on July 5, 2016. At the request of the SPHD, an official sample of *A. smaragdifrons* was taken to the USDA APHIS Plant Inspection Station in Linden, New Jersey and an IBP 391 was issued. The specimen was sent to the Research Leader SEL in Beltsville, MD and the determination of *A. smaragdifrons* was confirmed.



Relatively little existing literature is available for this species. The host plant associated with this species in Asia is tree-of-heaven, *Ailanthus altissima*. Once the news of the known host was received, EAB trap sites where *A. smaragdifrons* were previously collected were then resampled. Additional *A. smaragdifrons* were observed and collected on *Ailanthus* trees. While it is unknown what impact this *Agilus* species might have in the United States, it is not known to be a pest of concern in its native region of Eastern Asia.

## EMERALD ASH BORER

The **Emerald Ash Borer** (*Agilus planipennis*) continued to expand its range and destroy millions of ash trees throughout the Central United States, the Mid-Atlantic States and parts of New England. The Emerald **Ash Borer (EAB)** was initially discovered in New Jersey in May 2014 in two municipalities in Somerset County. Because the findings were in an area at the southern edge of the native ash resources of the state, the Department entered into the Federal EAB quarantine, which quarantined the entire state. Later in August, another EAB adult was recovered from a purple survey trap in Burlington County, another in Mercer County and another trapped in Middlesex County.

An EAB task force was created in the fall of 2015 with representatives from The Department, the USDA APHIS PPQ, the New Jersey Forest Service and Rutgers University to plan out a survey and educational strategy that municipal administrations could use in planning to manage their lands for this invasive insect.

The delimiting EAB survey continued using volunteers and Shade Tree Commissions to set up and maintain purple prism traps to monitor its spread to municipalities immediately adjoining the known areas of infestation. In 2016, a total of 76 EAB traps were deployed in Burlington, Camden, Hunterdon, Mercer, Middlesex, Monmouth, Morris, Somerset and Union Counties. Division staff delivered traps and replacement lures to the volunteers hanging the EAB traps. Positive finds were discovered in 16 more municipalities in the state, which now include finds in Hunterdon and Essex Counties.

A quick summary of the spread of this insect throughout the state is as follows:

- 2014 - Four municipalities in three counties
- 2015 - Twelve municipalities in six counties
- 2016 - Sixteen municipalities in seven counties

The Department completed the field release of Biocontrol parasitoids for EAB in four of the municipalities where EAB was found initially in 2014. Multiple releases of larval (*Tetrastichus spp.*) and egg (*Oobius spp.*) parasitoids were made in wooded ash sites containing low levels of EAB from April through September 2016. Overall, a total of 48,731 parasitoids have been released at these sites over the last two seasons to help suppress EAB populations. Plans are to conduct biocontrol releases next year at four sites located in Burlington, Essex and Mercer Counties.

## PLANT PEST SURVEY

The Department participated in the **Cooperative Agricultural Pest Survey (CAPS) Program**, a cooperative effort between the USDA APHIS Plant Protection and Quarantine Program (PPQ), state universities and state Departments of Agriculture throughout the United States.

A **Bundled Nursery Survey** was conducted on five nurseries in each of five counties (Mercer, Middlesex, Monmouth, Somerset and Union) for a total of 25 nurseries. The target pests for this survey were Summer Fruit Tortrix Moth (*Adoxophyes orana*), Oak Ambrosia Beetle (*Platypus quercivorus*), Maritime Garden Snail (*Cernuella virgata*), Light Brown Apple Moth (*Epiphyas postvittana*), and Asian Gypsy Moth (*Lymantria dispar asiatica*). Traps were deployed at all sites beginning in June and were maintained until the end of August.

Jackson traps with pheromone lures were used for Light Brown Apple Moth, while paper delta traps with pheromone lure were deployed for the Summer Fruit Tortrix Moth and Lindgren funnel traps with lure were deployed for Oak Ambrosia Beetle. All trap catches were delivered to the Rutgers Plant Diagnostic Clinic for screening. No suspects were detected.

Milk carton traps with string lures were deployed at the 25 sites for the detection of the Asian Gypsy Moth (AGM). Suspect moths were sent to USDA CPHST for PCR screening, but no AGM was detected.

Fields at these survey sites were also visually inspected for invasive snails once every two weeks during the three month survey. No suspected *Cernuella* were observed at any of the nurseries.

A ***Phytophthora ramorum* Survey** was also conducted by the Department in 2016. The survey was designed to detect *P. ramorum*, the causal agent of Sudden Oak Death, in nurseries, garden centers and residential landscapes. A total of 231 sites (11 garden centers and 220 residential landscapes) were selected for the survey which spanned five counties and 15 municipalities.

At each site permission was obtained before inspection and only symptomatic host plants were sampled. A total of 25 samples were collected at each garden center and one sample at each residential landscape for a total of 495 samples.

All samples were delivered to the NJDA Plant Laboratory for ELISA testing. Since the ELISA test can only determine if a sample has *Phytophthora* but not which species of *Phytophthora*, further PCR testing is required to determine if a sample has *P. ramorum*. Overall, 86 *Phytophthora* positives were detected (17% of all samples) through the ELISA test. All ELISA positives were sent to the Cornell University Plant Diagnostic Laboratory for PCR testing. All PCR samples were **negative** for *Phytophthora ramorum*.

## **GYPSY MOTH SUPPRESSION**

Following a “blow-in event” of gypsy moth caterpillars in 2015 affecting 290,696 acres in 175 municipalities and 20 counties throughout the state, the Department conducted treatment activities during the spring of 2016, totaling 17,478 acres in Cape May, Hunterdon, Morris, Passaic, Salem, Sussex and Warren Counties.

The 2016 statewide gypsy moth aerial defoliation survey showed an overall 95% reduction in gypsy moth defoliation throughout the state, compared to the levels the previous year. This dramatic reduction of gypsy moth defoliation when compared to the levels experienced the previous year was the result of effective aerial treatments along with increased *Entomophaga maimaiga* activity in the northern region of the state. A total of 13,449 acres of forestland were found to be defoliated in 57 municipalities in 15 counties of New Jersey. The majority of defoliation was observed once again occurred in the four northern counties of the state: Sussex, Passaic, Morris and Warren.

The Division of Plant Industry contacted the administrations of the affected municipalities to arrange for ground egg mass surveys. A total of 44 municipalities and one county park system requested gypsy moth egg mass surveys during the fall of 2016. From these surveys, a total of 5,900 acres of gypsy moth infestation had initially been proposed for treatment in the spring of 2017. Only one municipality has opted not to participate in the 2017 Aerial Suppression program, so plans are to treat a total of 4,507 acres beginning May 2017.

## **FARM BILL PROGRAMS**

### **Forest Pest Outreach and Survey**

Since 2009, New Jersey participated in the Forest Pest Outreach and Survey Project (FPOSP) a forest pest outreach and education program sponsored by the USDA APHIS PPQ. This year Department outreach staff attended 37 events over 50 days. A total of 85,179 people were educated about invasive forest pests by staff while visiting our display at outreach events, trade shows, professional conferences or lectures. This year Spotted Lanternfly was included as part of the display to show that this is another destructive foreign pest on trees and agricultural commodities.

There are seven permanent displays at four zoos, two insect museums and a forestry education center that are indirectly educating the public as well. The total attendance of all six locations is well over 1,250,000 people a year. The featured displays are interactive and fun as well as educational, a good medium to promote invasive insect awareness and understanding.

In an effort to stop the spread of injurious insects and diseases through the movement of firewood “*Jersey Grown Firewood*” program was further promoted to the public at events as both a safeguarding and marketing tool. This program complements the goals of the USDA and The Nature Conservancy’s “Don’t Move Firewood” program by educating the public on the spread of invasive insects and diseases through the human

movement of firewood.

### **Exotic Temperate Mollusk Survey**

Surveys of 15 high risk sites were trapped throughout the state with a concentration around the Port of Elizabeth. The survey was composed of visual and trapping methods. Staff placed a total of 58 traps; 15 sites had four traps and two had two traps due to available trapping area. The sites were visited biweekly for twelve weeks. The survey started April 1, 2016 and was completed on June 30, 2016.

The primary focus for the survey was high risk sites. Landfills, stone/tile importers, international food distribution businesses, cast iron importers, fruit/vegetable importers, farms, distribution centers for big box chain stores, international free trade zones (warehouses), railways, seaports and air cargo terminals. Transportation corridors were also examined as they are pathways to other parts of New Jersey and other states.

The following pests were targeted for Exotic Temperate Terrestrial Mollusk commodity survey: *Monacha spp.* (Helicid Snail), *Veronicella spp.* (Veronicellid Slugs), *Theba pisana* (Mediterranean snail), *Cernuella virgata* (Vineyard snail) and *Xerolenta obvia* (Eastern heath snail). There were 348 samples taken and **ALL** samples were **NEGATIVE** for the target species listed above.

### **Solanaceous Commodity Survey**

Traps were placed at 12 farms producing tomatoes, peppers and eggplants throughout the state. At each site one trap was set for each target pest. There were two sets of traps set on farm locations. Traps were deployed at the sites by June 1st and serviced every two weeks through August. Because of issues with the acquisition of trapping supplies from APHIS, the targeted pest for the 2016 solanaceous commodity survey was *Bactericera cockerelli* (Potato/Tomato Psyllid) in order to complete the original 2015 survey.

A total of 144 trap samples from 12 farms throughout the state were collected and submitted to the Rutgers Diagnostic Laboratory for identification. All samples were **NEGATIVE** for *Bactericera cockerelli* (Potato/Tomato Psyllid).

### **SEED CONTROL**

In 2016, 31 samples of seed were submitted to the Division of Plant Industry's Seed Laboratory for analysis. All of the samples collected for regulatory purposes were analyzed to determine seed quality and germination rates. Emphasis for sampling and testing was placed on agricultural crop seed, commercial vegetable seed, native seed and turfgrass seed.

In order to monitor **agricultural seed** sold through farm supply outlets 2,133 lots of vegetable seed were inspected and sampled in 2016 for quality control analysis prior to being used by farmers.

**Giant Hogweed** - During a summer eradication project of three Giant Hogweed (*Heracleum mantegazzianum*) plants discovered at a site in Middlesex County, an additional 26 additional plants were discovered by staff. Several plants had produced a flower head prior to its detection. All plants at the site were treated with an herbicide to destroy them. Staff plans monitoring and treatments at this location until this dangerous invasive plant is fully eradicated.

## **SEED CERTIFICATION**

A total of 14 turf seed samples were taken from lots of certified turf seed shipped to New Jersey from other states. These samples, representing 88,260 pounds of certified turf grass seed, were tested to determine eligibility for the interagency certified seed program. Certification program staff also supervised the mixing of high quality turf seed. New Jersey sod growers used this seed to produce a high quality sod product.

Division staff certified 46 acres of conservation plant material developed at the USDA NRCS Cape May Plant Materials Center. This stock is used primarily for coastal soil stabilization. Because of this important role, the demand for plants is high to replant established sand dunes.

## **PLANT LABORATORY SERVICES**

The Plant Laboratory Services unit provides laboratory support for regulatory inspection, plant certification and insect rearing programs of the Division of Plant Industry. Germination, purity, vigor and noxious weed examinations are performed on seed submitted to the laboratory.

### **Seed Testing**

Routine sampling of seed offered for sale assures farmers that seed will perform at the germination percentages specified on the seed labels under ideal conditions. A total of 14 turf-grass seed samples were tested for germination to verify label claims for the distributor. Cape May PMC submitted seven samples of native seeds which are used in coastland restoration projects for germination testing. Crop seed samples were also submitted by four New Jersey farmers for germination testing prior to planting. Some seed lots do not germinate and perform well when planted in the field early, and conditions are less than optimal. Low vigor seed could have a disastrous financial impact on growers. Vigor testing of seed, conducted by the Plant Laboratory upon request, provides valuable information to the farmer to better manage planting times as well as growing and storage conditions. Growers of sweet corn, beans, spinach, parsley, and peppers find these tests extremely beneficial to their operations. In 2016, a total of 19 tests for vigor were conducted for growers of sweet corn.

### **Disease Testing**

Leaf tissue samples were collected from blueberry and cranberry plants for Blueberry

Scorch Virus (BBSV), Blueberry Shock Virus (BIShV) and Tobacco Streak Virus (TSV) testing. Blueberry scorch is the leading disease in New Jersey blueberries. Plants tested include mother plants used for propagation, wild plants surrounding farms where virus might be harbored and transmitted to farmed crops with insect vectors, and fruit production plants. Testing is done using Enzyme Linked Immunosorbent Assay (ELISA) on a composite of leaves from multiple plants so that each sample screens approximately ten plants. A total of 2,624 samples were submitted for BBSV testing, 176 samples for combined BBSV and BIShV testing, and 50 samples for a combination of all three viruses. One sample was confirmed to have blueberry scorch virus.

The Plant Laboratory tested stone fruit material collected by Division staff to be tested for Plum Pox Virus and Tomato Ring Spot Virus. Leaf samples were collected and tested from a stone fruit nursery. A total of 105 and 113 samples (for tomato ringspot and plum pox, respectively) were collected and submitted for ELISA testing by the Division's Plant Laboratory. All samples were negative for plum pox and tomato ring spot.

Two samples were taken from fig trees, during the growing season, and were tested for *Xylella fastidiosa* by using Enzyme-Linked Immuno Sorbent Assay (ELISA) method and found to be free of *X. fastidiosa*. This bacterium has a large number of host species. Samples are tested to facilitate shipments to Japan. The testing is a phytosanitary requirement and all samples tested negative for the presence of *Xylella fastidiosa*.

## Apiary

The Laboratory supported the Apiary Inspection program through the analysis of bees for *Varroa* mites and *Nosema* spores. *Nosema* is a microsporidia with possible links to colony collapse disorder. Eighty samples from 50 different beekeepers were analyzed. Forty samples had high enough *Varroa* levels to be recommended treatment, and 23 samples submitted had treatable levels of *Nosema*.



Figure 1 Dorsal and Ventral View of *Varroa destructor* an external parasite of honeybees.

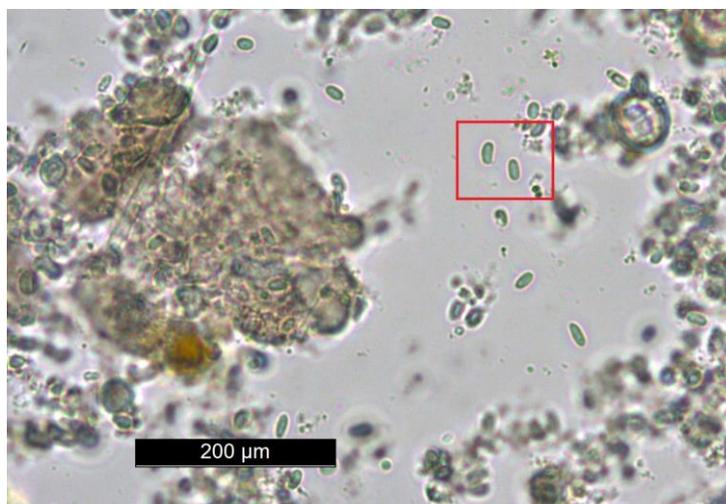


Figure 2: *Nosema* sp. spores in a honeybee gut sample.

### **Sirex woodwasp**

The sirex woodwasp (*Sirex noctilio*) is an invasive species of insect, which can cause severe damage to pine wood and pine forests. Areas in Australia and South America have had success using nematodes (*Beddingia siricidicola*) as biological control agent against this forest pest. These nematodes parasitize Sirex wasps and prevent the female wasps from laying eggs, causing her to instead spread the nematode eggs. Colonies of these nematodes are being maintained by the Plant Laboratory for use in the event of a Sirex infestation in New Jersey pinelands.

### **AGRICULTURAL CHEMISTRY**

The Agriculture Chemistry program entered its third year of implementation in 2015. The objective of the Agriculture Chemistry program is to provide laboratory support for regulation of fertilizer/soil conditioner and pet food. Commercial fertilizer, soil conditioner, and pet food that are for sale and distributed in New Jersey must be sampled and analyzed to ensure sufficient nutrient quantity.

During 2016, the Agriculture Chemistry program received a total of 145 regulatory fertilizer samples. The Agriculture Chemistry program documented and ground all of the samples to prepare for tests on the following label claims for N, P, K, Ca, Mg, S, Zn, Cu, Fe, Mn, B, and Mo. The program prioritized its testing on samples that were taken from farmers. This modification in sample testing decreased the turnaround time of providing official tests to less than five business days, significantly serving farmers by promptly returning fertilizer inspection reports. There were 58 fertilizer samples identified to be deficient and another 44 that received official warnings. Official inspection reports and penalty assessment letters were issued through the Division of Marketing and Development. The fertilizer chemistry program also significantly decreased testing costs to farmers with this in-house testing.

A total of 342 pet food samples were collected, 119 samples were documented, ground

and analyzed in 2016. All of them were in conformance with their label claims. In addition, the New Jersey's pet food chemistry program is participating in the AAFCO Performance Test program.

The Agriculture Chemistry program reviewed seven new fertilizer license applications, which followed the AAPFCO labeling protocol. New applicants received scientific advice from control officers to ensure that the fertilizer applications conform to the New Jersey fertilizer law, in particular, the newly implemented fertilizer application regulation. The Agriculture Chemistry program recommended the approval of these applications to the Division of Marketing and Development.

## **MEDICAL MARIJUANA**

The Compassionate Use of Medical Marijuana was officially implemented in the state in 2012. The Plant Laboratory entered a cooperative effort with the New Jersey Department of Health and Senior Services to test for mycotoxins in medical marijuana samples. A total of 53 samples were tested in 2016 for both aflatoxins and ochratoxin A on this effort with no positives to report.

Mycotoxin fungi can be potentially dangerous to humans and animals if they produce toxins in significant quantities on feed and plant materials. The Division of Plant Industry's Plant Laboratory has set up a protocol to screen and quantify the concentration of aflatoxin and ochratoxin A using high performance liquid chromatography (HPLC). Plant materials are tested prior to use for prevention of possible illnesses, such as kidney disease, liver disease, and cancer. ELISA tests can also be used to screen for additional mycotoxins.

## **FDA Grant**

In September 2015, the laboratory applied and received approval of a five year Cooperative Agreement Program from the Food and Drug Administration (FDA) to implement Animal Feed Regulatory Program Standards (AFRPS). Among a number of AFRPS CAP deliverables, the laboratory proposed to purchase its first LC/MS/MS equipment to strengthen chemistry testing capability. The laboratory received the equipment in December 2016. With the new equipment, the laboratory will expand its chemical testing scopes to pesticides, antibiotic drugs, and Mycotoxin tests on animal feed and pet food samples.

The newly acquired LC/MS/MS is a Thermo Fisher Scientific High Resolution Accurate Mass (HRAM) Q Exactive Focus with an Ultimate 3000 UPLC. The Q Exactive Focus is ideal for routine labs performing food safety residue analysis, environmental analysis, forensic toxicology, sports doping, clinical research, metabolomics, and pharmaceutical analyses.

## BIOLOGICAL CONTROL OF PLANT PESTS

Under the Division of Plant Industry's Biological Control Program, beneficial parasitoids and predators are laboratory reared for release into the field to control agricultural and forest pests, as well as to protect the state's natural resources and other open lands. The release of beneficial insects reduces the need for pesticides, reduces the amount of pesticide residue in the environment and minimizes pest resistance to chemicals. The reduction of pesticide applications in the field also allows the native beneficial insect populations to increase adding more pressure on the pest populations.

During the year, the Bureau of Biological Pest Control conducted seven biological control programs designed to establish new beneficial species in the state, reduce pest populations in certain crops, monitor pest populations to determine impacts, and gather base line data for new biological control programs. Previously established beneficial insect populations were also monitored and evaluated to plan for future augmentation.

The **Mexican bean beetle (MBB)**, *Epilachna varivestis*, biological control program involves the mass production and release of small beneficial wasps, *Pediobius foveolatus*, to control MBB. The Mexican bean beetle feeds on snap bean, lima bean and soybean foliage. The imported wasps, known as parasitoids, attack and kill MBB larvae. The exotic parasitoids cannot over-winter in New Jersey, and must be reared in the laboratory and released into the field each summer.

A total of 98,000 adult *P. foveolatus* were released into 40 monitored soybean sites during the 2016 soybean growing season. Additional soybean, lima bean and organic farm field releases totaling 126,500 parasitoids were made to keep pressure on Mexican bean beetle populations. Thus, during the 2016 season a total of 224,500 *P. foveolatus* were released statewide. There were no reported insecticide treatments for Mexican bean beetle in soybeans in 2016.

New Jersey farmers planted over 100,000 acres of soybeans in 2016. Approximately 80% (80,000 acres) of the total acreage was susceptible to feeding damage by the Mexican bean beetle. The parasitoid release program has been so successful in reducing MBB populations that no pesticide applications have been required on soybean acreage since 1987. In 2016, potential savings amounted to more than \$1,300,000 in reduced pesticide costs. This program receives financial support from the New Jersey Soybean Board.

Under a cooperative agreement with the USDA Forest Service (USFS), the Division of Plant Industry's Phillip Alampi Beneficial Insect Laboratory (PABIL) began work in 2007 with *Laricobius nigrinus*, a Derodontid beetle predator of **Hemlock Woolly Adelgid (HWA)**.

In 2015, *L. nigrinus* beetles were recovered from four new sites in the Delaware Water Gap region of North Western New Jersey and North Eastern Pennsylvania. The beetles have dispersed throughout the 34 mile length of the Delaware Water Gap National Recreational Area. The beetles have also been recovered 33 miles westward into

Pennsylvania and twelve miles eastward into New Jersey. This suggests that *L. nigrinus* has firmly established itself in the state, despite the effects of the polar vortex which severely reduced the hemlock woolly adelgid population. The beetles have dispersed very well and are likely having an impact on the hemlock woolly adelgid population.

**Purple loosestrife, *Lythrum salicaria***, the invasive exotic freshwater wetland plant, had been displacing the native flora in wetlands and threatening many animals that depend on these plants for survival. Large monotypic stands of this plant have the capacity to reduce ground water recharge, decrease water storage capacity of a wetland, reduce the marsh's ability to attenuate floods, reduce open water space, reduce species diversity, and jeopardize the health and vitality of the marsh ecosystem. Until recently, the only methods of control were chemical, physical or mechanical, all of which are expensive, temporary and often impact non-target species.

The Division of Plant Industry's Phillip Alampi Beneficial Insect Laboratory (PABIL) continued to mass produce and monitor two foliage feeding beetles of purple loosestrife, ***Galerucella pusilla* and *Galerucella californiensis***.

In 2016, Division staff released 8,166 ***Galerucella spp.*** statewide. Since the initial releases in 1997, over two million beetles have been released at 119 sites in 18 New Jersey counties. ***Galerucella*** has been recovered from all of these monitored sites.

All sites showed signs of purple loosestrife stress and collapse. Plants at these sites are a full meter shorter than they were when the releases began and the purple loosestrife is no longer the dominant species in the wetland. There is greater diversity of plant species in New Jersey wetlands versus the virtual monoculture of purple loosestrife observed in the 1990's. ***Galerucella spp.*** have been recovered at 98 non-release sites since 2002 with one recovery made 31.5 miles away from the closest release site made in 2008.

In addition, releases have been made at a number of sites, including National Park Service lands and sites managed by Natural Lands Management, The Nature Conservancy of New Jersey, Mercer County Park Commission, Union County Park System, Allentown Borough, Rider University, Rutgers University, property managed by the New Jersey Meadowlands Commission, a number of mitigation sites and private landowner properties. Since 1997, more than one million beetles have been shipped to cooperators in Maine, Massachusetts, Rhode Island, New York, Delaware, Pennsylvania, Tennessee, Michigan and New Hampshire to support their weed suppression programs. Due to the decline in demand for the beetles, the fact that they are well established and because of the reduction of purple loosestrife in the environment, this program will be phased out in 2017.

In 2004, the Beneficial Insect Laboratory entered into a cooperative effort with the US Forest Service and the University of Delaware, to develop mass rearing techniques for ***Rhinoncomimus latipes***, a host specific weevil collected in China that is a predator of the exotic invasive plant, **mile-a-minute (MAM), *Persicaria perfoliata***.

Since initially receiving the beetles from the University of Delaware, PABIL has made tremendous progress in understanding the requirements necessary to produce this ***R. latipes*** and its host, ***Persicaria perfoliata***, allowing for the mass production of weevils for releases in the state and shipments to cooperators in other states.

The Beneficial Insect Laboratory's production capacity reached a sustained level of more than 2,000 new weevils emerging each week. A total of 5,550 phytopagous weevils were released in New Jersey in 2016 and an additional 30,700 weevils shipped to USDA/APHIS/PPQ and Forest Service cooperators in Pennsylvania, West Virginia, Maryland, Connecticut, New York, Rhode Island, Virginia, Massachusetts, and North Carolina.

During 2016, ***R. latipes*** weevils became established and were recovered from 100% of the release sites. Field evaluations of monitored release sites showed decreased cover and seedling numbers. Since 2005, the beneficial weevils have been recovered from 240 non-release locations. Generally, there are no mile-a-minute sites in the state that do not have weevils or exhibit evidence of their feeding.

In New Jersey, a native pest, **tarnished plant bug (TPB)**, ***Lygus lineolaris***, is often observed in alfalfa, but seldom causes economic damage to this crop. However, large numbers of TPB can cause significant damage to stone fruit, strawberries and many other plant species of economic importance.

In 2001, the Phillip Alampi Beneficial Insect Laboratory received an exotic European parasitoid, ***Peristenus relictus*** from the USDA, Beneficial Insect Research Laboratory, in Newark, Delaware to investigate the feasibility of utilizing it as a biological control agent for TPB. With the development of an inexpensive, high quality TPB diet by researchers at the USDA, ARS Biological Control and Mass Rearing Unit, Mississippi State University, the potential to rear tens of thousands of host TPB nymphs in the laboratory has made it possible to significantly increase parasitoid production.

In 2016, a total of 2,875 ***P. relictus*** were released into alfalfa and fallow fields in Cumberland and Salem Counties. However, no overwintering recoveries were made.

During 2016, the PABIL field staff surveyed for the presence of the **Brown Marmorated Stink Bug, *Halyomorpha halys* (BMSB)**, in early and late season soybean fields in Monmouth, Mercer, Burlington, Gloucester, Salem and Cumberland Counties. No significant BMSB activity was detected.

Under terms of a cooperative agreement with USDA APHIS/PPQ, PABIL initiated BMSB egg parasitoid field survey. The objectives of the survey were (1) to determine the occurrence and distribution of native stink bug egg parasitoids in various New Jersey habitats and (2) to determine if the exotic parasitoid, ***Trissolcus japonicus*** (recently found in Maryland and Virginia) is established in New Jersey. This potential biological control candidate may have been accidentally introduced into the environment is currently under quarantine at the USDA ARS BIIL in Newark, Delaware.

During the 2016 survey, the following native egg parasitoids were recovered and positively identified by the USDA BIL in Newark, Delaware: (1) ***Trissolcus brochymenae***, (2) ***Trissolcus euschisti*** and (3) ***Telenomus podisi*** from the family Scelionidae, (4) ***Anastatus redivii*** from the family Eupelmidae and (5) ***Ooencyrtus sp.*** from the family Encyrtidae. The non-native egg parasitoid ***Trissolcus japonicus*** from the family Scelionidae was also recovered for the first time in NJ in Mercer and Gloucester counties so its presence has been confirmed. PABIL continued to successfully rear an ***Anastatus redivii*** laboratory colony to learn more about its' biology, behavior and development.