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

SUMMARY OF 2017 ACTIVITIES

APIARY INSPECTION

During the 2017 season, New Jersey had 2,162 registered beekeepers, which was about the same as the previous year. There was an increase in apiaries from 2,900 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 1,421 colonies in 119 apiaries for brood disease and parasites. The program detected four cases of American Foul Brood (0.04%) down from 0.25% the previous year. Overall, 3% of the colonies inspected this season had European Foul Brood disease. This is down from 8.8% from the previous year. This is the first down trend in the last five years. The Apiarist certified the bee yards of 21 beekeepers who sell nucs and queens, which remained the same as last year. A total of 2,500 nuc hives and over 3,000 packages were imported into New Jersey to new or expanding beekeepers.

The winter of 2016-2017 was a rather mild winter followed by a cold wet mid-March to mid-April. Colonies moved into the state for blueberry pollination during the second week of April, which was about normal. New Jersey had a 32% winter death loss during the winter of 2016-2017, which was up from 24% from the previous winter. A statewide survey conducted on winter death loss showed that in 2017, beekeepers that did nothing to control Varroa mites lost 48% of their colonies while Beekeepers that provided some treatment to control Varroa lost 30% of their colonies. After ten 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 45% of their colonies over the winter. Those that do control Varroa mite lose only about 25% of their colonies. Beekeepers that do a good job monitoring Varroa mite levels and control them when the levels go above 2% experience a significantly lower death loss than those that do nothing. Beekeepers who treat two-three times a season using different treatments have a much lower death loss.

The overall honey crop for New Jersey was below average. Honey production can be

very dependent on location, a few areas did well, most did not. The early spring was very cold and rainy, leaving the bees in the box with not much to do but make queen cells. The number of swarms was very high during the main honey flows. Honey bees cannot make a honey crop without a large work force.

In 2017, 13,200 honeybee colonies entered 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 significantly decreased this year. That may be due to increased costs for pollination and the decreased profit margin in blueberries. Overall, the quality of the hives was good among the colonies inspected.

The State Apiarist and a Rutgers Extension agent are continuing to study the damage seen in honey bee colonies after Blueberry and Cranberry pollination. Four years ago, several New Jersey commercial beekeepers noticed damage to their colonies after pollinating these crops. 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. Numerous agrochemicals were found in stored pollen collected from these colonies. Currently we are looking at what can be changed from a production method to try and minimize this problem.

The Apiarist gave 20 presentations to various grower groups, 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.

Five years ago, 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 2017 to remind them of the things they should be planning and doing on a monthly basis.

NURSERY INSPECTION PROGRAM

The **New Jersey Law** (N.J.S.A: Title 4:7-21) requires that all nursery stock sold in New Jersey must be free of injurious insect pests and disease. New Jersey defines nursery stock as “shrubs, trees and vines grown for sale, as well as buds, grafts, stocks, scions and other parts of plants... that may be sold for propagation”. Specific state regulations (N.J.A.C: Title 2:16, 17, and 19) also exist for rose plants, vegetable transplants, tomato plants, pepper plants, and blueberry plants.

Nursery inspection staff inspected 15,941 acres of nursery stock and 7,931,110 sq. ft. of greenhouse plant material in 2017 at 1,041 locations to certify freedom from dangerous insects and diseases. In contrast, during 2016 a total of 1,089 nursery and greenhouse locations comprised of 16,498 acres of Nursery material and 8,977,250 sq. ft. of greenhouse plant material were inspected.

A total of 776 Nursery **Plant Dealers** such as garden centers and landscape firms were inspected in 2017. A current list of certified nurseries and plant dealers can be found at the NJDA Division of Plant Industry webpage. Plant dealer inspections involve verifying that source plant material is certified and visually inspecting nursery stock when present.

Rose Mosaic Virus Complex: To protect the health and quality of rose plants purchased by New Jersey consumers and growers, and to prevent the movement into New Jersey of virus-infected rose plants, the New Jersey Department of Agriculture regulates shipments of rose plants into the state. Rose plants that have entered New Jersey 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. Five of New Jersey's largest rose importers routinely provide the NJDA with the required source-certifications. In 2017, these nurseries received a total of 167,140 dormant rose plants from four different out-of-state rose producers. These roses are physically inspected once they are actively growing, usually by mid-April. Nursery inspectors visually examine roses for virus symptoms and reject plants that are not accompanied with the appropriate certification or exhibit virus symptoms. Notices of Rejection were issued at two plant dealer locations in 2017 where infected plants had been identified.

Highbush blueberry nursery stock was inspected during the spring and fall, per the requirements of the New Jersey **Blueberry Plant Certification** Program. There were five blueberry nursery stock producers participating in the 2017 program. 1,288,191 blueberry plants were inspected, (35,150 mother plants, 488,361 nursery plants, 763,789 cuttings & 891 containers). A total of 1,124 plants were rejected & destroyed due to disease; seven plants were determined to display symptoms of stunt virus, 1,092 ring-spot virus, four mosaic and 24 dodder infestations were found. Ring-spot virus continued to be the most prevalent viral disease for which plants were rejected. Elliot and Duke were the varieties with the largest incidence of ring-spot virus.

A total of 179 **Phytosanitary Inspections** occurred during 2017. Accredited certification officials (ACO's) issued 90 state phytosanitary certificates for shipments of bulbs, corms & tubers, assorted tree/shrub seedlings, blueberry plants, poinsettia cuttings, and assorted annual plugs to other states. Eighty-Nine federal phytosanitary certificates (PPQ Form(s)-577 & 579) were also issued, facilitating the export or re-export of assorted nursery stock (B&B, grafts, & rooted cuttings), poinsettia cuttings, bulbs, corms & tubers, cranberry plants, and fig trees out of the country.

Program staff participated in **Postentry Quarantine (PEQ)** inspection refresher training during March. Accredited Certification Officials (ACO's) for the USDA/APHIS/PPQ must

conduct PEQ inspections to facilitate the importation of new plant materials and cultivars that are regulated under the criteria of a federal Postentry Quarantine: 7 CFR330.37. The number of PEQ inspections required of ACO's for certification is based on predetermined USDA guidelines. There was one New Jersey PEQ permit holder that imported *Rose* sp. to the United States from the Netherlands under the federal PEQ program in 2017. The duration for this PEQ is two years.

Certification of Quarantine Compliance: The NJDA implemented state-compliance agreements with 73 individual greenhouses and nurseries in 2017. These agreements are in addition to the standard Nursery Certification Program and allow growers to ship plants or plant products to states where specific commodities must be certified free of certain quarantine insect pests or disease. Two greenhouse operations, one bulb supplier, one pepper (fruit) producer, 29 blueberry (fruit) producers, and 36 boxwood growers are now certified this way. 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.

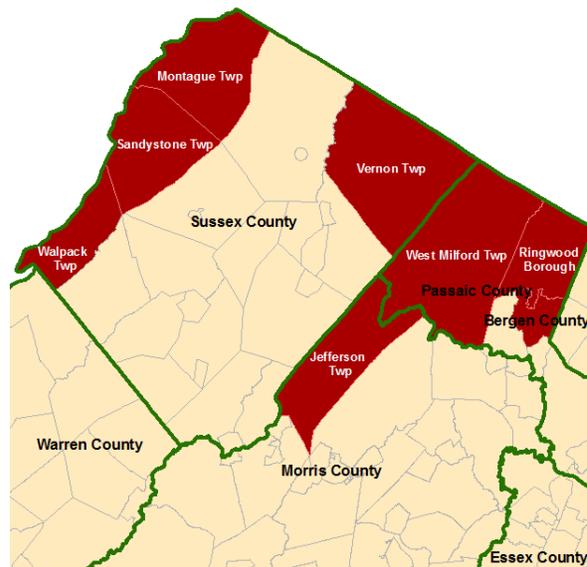
A New Jersey pepper grower entered their second year under compliance with the NJDA permitting shipments of fresh New Jersey pepper fruit into Texas. This compliance agreement was designed to safeguard against the introduction of **European corn borer (ECB)**; *Ostrinia nubilalis* – an introduced pest of many agriculture crops. ECB is established in the northeastern United States and host plants for ECB must meet strict import requirements for Texas. The first bloom date for peppers in the area under compliance was recorded on June 22nd and the first flight of the European corn borer for this year was recorded on June 19th. Program staff conducted monthly audits of the participants' recordkeeping including their moth trap monitoring and pesticide applications, and certified the grower's quarantine compliance. More than 15,000 cases of NJ pepper fruit were exported into the Texas fresh fruit market throughout the 2017 growing season.

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 in New Jersey. The Commonwealth of Pennsylvania imposed a quarantine of boxwood blight in 2016 and Tennessee implemented a similar quarantine this year. These quarantines have impacted many shipping nurseries in New Jersey as they prohibit the import of boxwood blight host plant material (including ALL *Buxus* sp.) unless accompanied by proof of phytosanitary quarantine compliance issued by the state of origin. Thirty-six New Jersey nurseries were approved by the NJDA for boxwood blight quarantine compliance in 2017.

An **Import Permit** from the state of California, CDFA, was renewed to allow fresh blueberry fruit to enter that state following the fumigation procedures necessary to prevent the movement of plum curculio and blueberry maggot. These insect pests are not known to occur in California, but are present in New Jersey. No fresh blueberry fruit was shipped to California during 2017.

Twenty-nine New Jersey blueberry fruit producers were approved for the **2017 Canadian Blueberry Fruit Certification Program (BCP)**. This program facilitates the export of fresh blueberry fruit into Canada while safeguarding against the introduction of blueberry maggot; *Rhagoletis mendax* – a native to northeastern United States. Program staff trained all participants in this program on the protocols and grower-responsibilities so that they adequately follow Canadian import requirements. Staff inspected the pesticide application records, shipment logs, and fruit audits for participating growers in accordance with the certification program criteria. Twenty-eight of the twenty-nine approved blueberry growers shipped a total of 517,469 crates into the Canadian fresh fruit market under the BCP throughout the 2017 growing season. This reflects a slight increase (.975%) in fresh blueberry exports to Canada from 2016 - 512,470 crates.

The New Jersey **White Pine Blister Rust**; *Cronartium ribicola* Fisher quarantine (N.J.A.C. 2:20-2) 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 currant and gooseberry into specific townships of northern New Jersey (highlighted in red). Currently, there is one New Jersey permit holder actively cultivating European black currant plants for fruit production under the supervision of the New Jersey Nursery Inspection Program. Two nurseries had permits that expired in 2018 and 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 as resistant as originally believed.



Program staff assisted USDA APHIS PPQ in inspecting and servicing traps for **light brown apple moth (LBAM)**; *Epiphyas postvittana* at several New Jersey facilities which received fresh strawberries from within the California LBAM quarantine area without the necessary inspections to certify for shipment out of the quarantine. Traps were placed around these facilities on June 13th and inspected monthly through August. All trap inspections were negative for LBAM.

Nine Nursery/Greenhouse locations were visited by Nursery Inspection Program staff after receiving perennial hosta varieties from an out-of-state source. The source for this plant material was 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 both foliage and flowers of its host and are known

to be associated with various agricultural commodities including ornamental hosta and solanaceous crops such as tomato and eggplant. Inspections for the presence of Japanese flower thrips were made at all nine New Jersey locations and recommendations for adequate preventative control measures were provided to the nursery personnel. Follow-up inspections took place in the spring. No Japanese flower thrips were detected during these inspections.

Three members of the Nursery Program attended the 2017 Horticultural Inspection Society (**HIS**) - **Eastern Chapter, Interstate Inspection** in College Park, MD during October. This meeting focused on the ongoing (2) phases of the Systems Approach to Nursery Inspection (SANC) pilot program. Throughout the meeting, Agriculture representatives from nine of the twelve-member states participated in SANC discussions, exercises and facility tours designed to promote the program and harmonize individual state-level nursery inspection activities. Attendees were updated on Phase I of this project in which seven of eight Pilot Nurseries have finished external audits and are ready for SANC Certification. The initial pilot effort has led to an overall rising of standards for suppliers of cutting material for many of those involved. To date, 47 States have received nursery stock that is SANC Certified. Attendees also participated in a panel discussion focused on the ongoing circumstances surrounding Boxwood Blight Compliance. An industry representative and Maryland farmer presented their personal challenges in meeting quarantine compliance requirements. The meeting included a tour of the National Agriculture Library (NAL) Beltsville, MD, a guided tour of their "Special Collections", a tour of the USDA\APHIS Plant Germplasm & Quarantine facility (PG&Q), and a tour of the USDA National Arboretum South Farm Nursery & Plant Breeding Center (BARC East) in Beltsville, MD. Here the group was guided through the nursery by the BARC East Nursery Director who presented ongoing breeding and plant selection projects for specific shade trees, broadleaf evergreens and conifers.

Program staff participated in a **spotted lanternfly**; *Lycorma delicatula* survey in Phillipsburg, New Jersey during September. The survey was coordinated by USDA APHIS PPQ and included participants from USDA, NJDA and the Delaware Department of Agriculture. No suspects were found or collected.

EMERALD ASH BORER

The **Emerald Ash Borer** (*Agrilus 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 in 2017 using volunteers, USDA field personnel 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 2017, a total of 96 EAB traps were deployed in Bergen Burlington, Camden, Essex, Gloucester, Hunterdon, Mercer, Middlesex, Monmouth, Morris, Passaic, Sussex, Union and Warren Counties. Division staff delivered traps and replacement lures to the volunteers hanging the EAB traps. Positive finds were discovered in 33 more municipalities in the state, which now include finds in Morris, Sussex and Warren Counties.

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

- 2014 - Four municipalities in three counties
- 2015 - Ten municipalities in six counties
- 2016 - Seventeen municipalities in eight counties
- 2017 - Thirty-three municipalities in ten counties

The Department completed the field release of Biocontrol parasitoids for EAB in five new locations for 2017 in Burlington, Essex and Mercer Counties. 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 2017. Overall, a total of 53,706 parasitoids have been released at these sites over the last two seasons to help suppress EAB populations. Plans for 2018 are to continue biocontrol releases in five new areas located in Sussex, Morris and Warren 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 six counties (Camden, Cape May, Cumberland, Gloucester, Sussex and Warren) for a total of 30 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*). All traps were deployed beginning in June and were maintained through 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 screened in-house at NJDA. No suspects were detected.

Milk carton traps with string lures were deployed at the 30 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 **Potato Disease and Nematode Survey** was also conducted by Rutgers University using Farm Bill funding secured by NJDA in 2017. The survey was designed to detect the following pests on potato farms in New Jersey: black leg of potato caused by *Dickeya solani*, Potato cyst nematode (*Globodera pallida*) and Golden Nematode (*Globodera rostochiensis*). *Dickeya solani* is a bacterial pathogen not known to occur in the United States but is found in continental Europe. Potato cyst and Golden nematode have been found in New York State and Idaho respectively but never in New Jersey. The goal was to test symptomatic or asymptomatic potato plants and test irrigation water for *Dickeya* and to test the soil for both nematode species. A total of eight farms were selected for the survey.

During recent years black leg of potato caused by *Dickeya Dianthicola* had been causing major damage to New Jersey's potato crop. It was felt that sampling symptomatic plants would be advantageous to the survey and so sampling was delayed while awaiting a disease outbreak. Disease did not develop as anticipated and as a result the survey was not completed. During the 2017 survey season only 11 of 48 plant samples, zero of eight water samples and zero of 16 soil samples were collected. Of the samples that were collected all were negative for *Dickeya Solani*. NJDA has received a no-cost extension for one year. All sampling will be completed in 2018.

GYPSY MOTH SUPPRESSION

The 2017 Gypsy Moth Aerial Defoliation Survey began on June 19, 2017 in the southern counties of the state and was completed by June 29th in the north. There was only a 1% increase in defoliation observed on this year survey compared to the levels found in 2016. The majority of defoliation was observed once again in three northern counties of the state: Sussex, Passaic and Warren.

A total of 13,547 acres of forestland were found to be defoliated in 68 municipalities in 17 counties of New Jersey. Severe defoliation (75-100%) was observed on 2,783 acres, heavy defoliation (50-75%) was observed on 10,124 acres and 640 acres experienced moderate defoliation (25-50%).

The Division of Plant Industry contacted the administrations of the affected municipalities to arrange for ground egg mass surveys. A total of 3,878 acres in 11 blocks had been proposed for treatment in six municipalities in Burlington, Morris, Passaic and Warren

Counties for the 2018 season. The breakdown of the proposed blocks follows:

	Municipality	Acres
Burlington	Tabernacle Township	81
Morris	Rockaway Township	409
Passaic	Ringwood Borough	1,463
	West Milford Township	1,477
Warren	Blairstown Township	246
	Hardwick Township	202
Total		3,878

A total of 65 municipalities requested gypsy moth egg mass surveys during the fall of 2017. From these surveys, a total of 3,878 acres of gypsy moth infestation had initially been proposed for treatment in the spring of 2018. Two municipalities, both in Passaic County have opted not to participate in the 2018 Aerial Suppression program, so plans are to treat a total of 938 acres beginning May 2018.

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 36 events over 56 days. A total of 255,092 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 became first and foremost part of the display to make people aware that this is another destructive foreign pest on trees and agricultural commodities, even with its attractive coloration.

There are eight permanent displays at four zoos, an insect museum, state park, cooperative extension office, and a forestry education center that are indirectly educating the public as well. The total attendance of all six locations is well over 1,500,000 people a year. The featured displays are interactive and fun as well as educational, a good medium to promote invasive insect awareness and understanding.

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.

Spotted Lanternfly Pathway Survey

Division staff conducted an extensive visual inspection at high risk sites starting in late summer to mid-November for the presence of adult spotted lanternflies. Over 50 locations were surveyed along the roads and crossings of the Delaware River. The survey focused primarily on adults because they feed on *Ailanthus* for the cytotoxic alkaloids and secondary metabolites to protect their eggs. Importers of stone, metal and other goods along with transport companies, warehouses, truck stops, gas stations and rest areas that may harbor the insect were also surveyed near the Delaware River corridor. The outreach manager also looked at orchards, vineyards and nurseries that were in close proximity to these commodities and did not find any adults at any of the high-risk sites.

A joint state and federal survey of Phillipsburg, New Jersey and Easton, Pennsylvania areas were also conducted. These towns are linked by a major commercial interstate (I78) and part of the Pennsylvania Spotted Lanternfly quarantine. State and federal teams from New Jersey and Delaware inspected 20 high risk sites during this survey. All survey results were negative in New Jersey.

High risk sites for future surveys would include but not be limited to landfills, stone/tile importers, international food distribution businesses, cast iron importers, fruit/vegetable importers, farms, big box chain stores, distribution centers, international free trade zones (warehouses), railways, seaports and air cargo terminals. Transportation corridors will also be examined as they are pathways to other parts of the state.

Solanaceous Commodity Survey

A statewide Solanaceous Commodity Crop Survey was conducted by Division staff. Traps were placed at ten farms producing tomatoes, peppers and eggplants throughout the state. At each site one trap was set for each target pest. There were two repetitions of traps per farm location. Traps were deployed at selected sites by June 1st and serviced every two weeks through the end of August. The following pests will be targeted for solanaceous commodity survey: *Tuta absoluta* (Tomato Leaf Miner), *Autographa gamma* (Silver-Y Moth), *Chrysodeixis chalcites* (Golden Twin Spotted Moth), and *Bactericera cockerelli* (Potato/Tomato Psyllid).

A total of 480 trap samples from ten farms throughout the state were collected and submitted to the Rutgers Diagnostic Laboratory for identification. All samples were NEGATIVE for the target pests.

Exotic Wood Boring Beetle Survey Program

Department Staff surveyed eight high risk sites around seaports and airports in four counties, one trap per site for each of the five species and one visual survey. All survey activity followed the approved methods and survey guidelines presented in 'The Exotic Wood Borer/Bark Beetle Survey Reference' guide. Trapping consisted of multi-funnel

wet traps, and cross-vane panel (intercept) traps with pest specific lures. All traps were coated with USDA recommended silicone spray. Traps were deployed by June 1st, 2017 and were checked bi-weekly through the end of August 2017. The following target pests were selected due to commodity and climate attributes in NJ:

<i>Monochamus alternatus</i>	Japanese Pine Sawyer
<i>Monochamus sutor</i>	Small White-marmorated Longhorned Beetle
<i>Monochamus urussovii</i>	White Mottled Sawyer
<i>Hylobius abietis</i>	Large Pine Weevil
<i>Tetropium castaneum</i>	Black Spruce Longhorned Beetle
<i>Tetropium fuscum</i>	Brown Spruce Longhorned Beetle
<i>Trichoferus campestris</i>	Velvet Longhorned Beetle
<i>Trypodendron domesticum</i>	European Hardwood Ambrosia Beetle

This trapping season the survey focused on an overlooked pathway of granite and marble tombstones from importers and wholesalers of funerary monuments coming from China and India. These commodities pose a high-risk pathway for the movement of exotic wood boring beetles. Again, we defined high risk sites as landfills, stone/tile importers, international food distribution businesses, cast iron importers, fruit/vegetable importers, farms, distribution centers of 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 NJ and other states.

The survey followed the national survey guidelines in the Exotic Wood Borer/Bark Beetle National Survey Guidelines. Staff conducted both a visual inspection and a trapping survey during the ideal collection season for non-native wood boring beetles in the state.

The survey was to determine if invasive plant pests have become established in New Jersey as well as safeguarding the nursery stock industry in NJ. A total of 192 trap samples were submitted to Rutgers Plant diagnostic laboratory for identification. All Traps samples were negative for the target pests.

SEED CONTROL

In 2017, 43 samples of seed were submitted to the Division of Plant Industry's Seed Laboratory for analysis. All 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. This year we collected samples and tested 18 samples of turf grass seed, 18 samples of sweet corn and seven samples of rye.

Giant Hogweed - This summer staff conducted an herbicide eradication of an additional 24 Giant Hogweed (*Heracleum mantegazzianum*) plants that were discovered at a site in Middlesex County. Several plants had produced a flower head prior to its detection in

2016. In 2017, staff found an additional plant in the underbrush. All plants at the site were treated with the herbicide Garlon 3A and destroyed.

SEED CERTIFICATION

A total of 18 turf seed samples were collected from lots of certified turf seed shipped to New Jersey from other states. These samples, representing 113,477 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.

The Nursery Inspection Program assisted the Seed Certification and Control program during their annual Plant Dealer inspection activities during the spring and summer of 2017. Inspection staff surveyed 2,356 containers of agricultural, vegetable, flower, and turf seeds. These materials were inspected for germination test expirations. Violations were reported to the Seed Certification and Control program manager. Eight minor violations were found, resulting in the removal of two cases of organic flower & vegetable seed packages without a posted expiration date & over 100 packages of expired turf, grain, and agricultural seeds.

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. Jersey Seed submitted 18 samples of grass seeds for germination testing. Eighteen hybrid sweet corn samples were tested for cold emergence and germination.



Figures 1 and 2. Rye grass seeds (left) and laboratory germination of seeds in blotter paper (right).

Disease Testing

Leaf tissue samples were collected from blueberry and cranberry plants for Blueberry Scorch Virus (BBSV), Blueberry Shock Virus (BBSHV) 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 1,991 samples were submitted for BBSHV testing, and 182 samples for a combination of Shock, Scorch, and Tobacco Streak Viruses.

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 79 and 80 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.

Apiary

The Laboratory supported the Apiary Inspection program through the analysis of bees for *Varroa destructor* mites and *Nosema apis* spores. *Varroa* is a parasitic mite and *Nosema* is a microsporidian parasite, both with possible links to colony collapse disorder. Sixty samples from 15 different beekeepers were analyzed. Thirty-six samples had high enough *Varroa* levels to be recommended treatment, and 18 samples submitted had treatable levels of *Nosema*.



Figure 3. Dorsal and Ventral View of *Varroa destructor* an external parasite of honeybees.

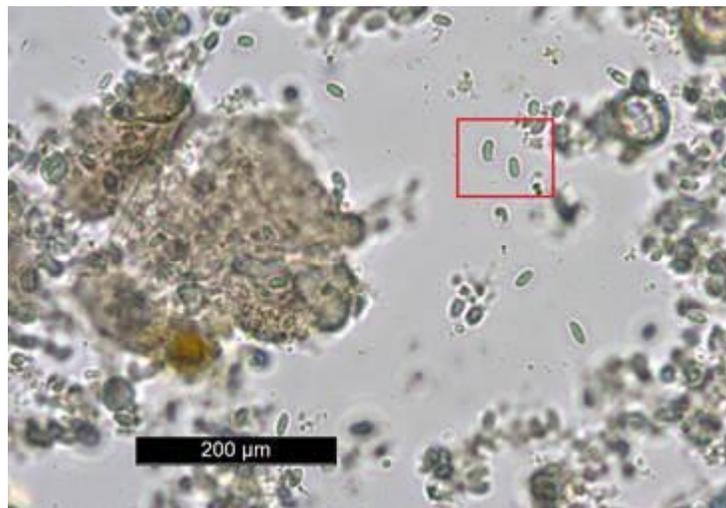


Figure 4. *Nosema* sp. spores in a honeybee gut sample.

Propagation of *Tsuga canadensis* Resistant Hemlock

Hemlock cuttings were collected on January 19, 2017 from the Delaware water gap. The laboratory prepared the cuttings according to a journal article titled **Production and evaluation of eastern hemlocks (*Tsuga canadensis*) potentially resistant to the hemlock woolly adelgid (*Adelges tsugae*)** with the exception of using manual misting instead of automated and not providing a bottom heat source. The cuttings were placed in a Conviron A1000 for observation and misted several times a day. Unfortunately, none of the plants propagated from the January cuttings established sufficient roots to survive. This was most likely due to insufficient humidity. A second round of cuttings was collected on May 23, 2017 which deviates from the literatures ideal time. This group of cuttings were covered individually with 1-gallon zip lock bags to maintain humidity. Once sufficient needle growth was observed several pots were examined for root development. Root development was observed in approximately 50% of the pots that were examined. Currently the plants are being maintained in a cool environment for winter vernalization.

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 fifth year of implementation in 2017. 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.

The laboratory purchased an Elementar Combustion Analyzer (Rapid N Exceed) for the crude protein and nitrogen testing last year. The combustion analyzer uses the high temperature Dumas combustion method for N-protein analysis according to AOAC, DIN/ISL, EN and several other international standards. A validation study was performed on the system in March 2017, which confirmed the method accuracy. The lab has started using the instrument for testing dry pet feed and fertilizer samples.

During 2017, the Agriculture Chemistry program received a total of 156 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.

A total of 81 pet food samples were collected, samples were documented, ground and sent to a third-party testing lab for the crude protein, fat, and water analysis. All samples 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.

FDA Grant

The laboratory received the Thermo Scientific Orbitrap LC/MS/MS 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 Extactive 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. The newly hired Chemistry staff will be given training on the LC/MS/MS.

A total of 31 AFRPS pet feed samples were received by the laboratory. The samples were ground and tested for the crude protein, fat and water.

The newly hired chemistry staff was trained on ISO 17025 regulations and quality system.

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, harmful byproducts caused by some fungi's metabolic activities, in medical marijuana samples. A total of 58 samples were tested in 2017 for aflatoxins B1, B2, G1, G2, and ochratoxin A and each sample was under the limit of detection for all mycotoxins.

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 234,000 adult *P. foveolatus* were released into 40 monitored soybean sites during the 2017 soybean growing season. Additional soybean, lima bean and organic farm field releases totaling 241,000 parasitoids were made to keep pressure on Mexican bean beetle populations. Thus, during the 2017 season a total of 475,000 *P. foveolatus*

were released statewide. There were no reported insecticide treatments for Mexican bean beetle in soybeans in 2017.

New Jersey farmers planted over 100,000 acres of soybeans in 2017. 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 2017, 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 2017, *L. nigrinus* beetles were recovered from six new sites in Northwestern New Jersey and from one site in Northeastern Pennsylvania. The beetles have dispersed throughout 35 miles north to south and 65 miles from east to west occupying an area of 2,240 square miles. *L. nigrinus* beetles have also been recovered 33 miles westward into Pennsylvania and 32 miles eastward into New Jersey. This suggests that *L. nigrinus* has firmly established itself in the area. 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 calmariensis*. 2017 was the last year for the program as the program has accomplished its purpose and the beetles no longer need to be reared as they are well established in the Northeast.

In 2017, Division staff released no *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* spp. Can be recovered from anywhere in NJ where the purple loosestrife is growing.

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.

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 was 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***. USDA-APHIS has been providing funds to support the program and the laboratory has been shipping to out-of-state APHIS cooperators.

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 2,500 phytophagous weevils were released in New Jersey in 2017 and an additional 33,400 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 2017, ***R. latipes*** weevils were recovered from 100% of all the plants examined. 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 2017, 3,662 *P. relictus* were shipped to California with 200 released in NJ. Additionally, 1,675 *P. digoneutis* were shipped to a cooperator in California.

During 2017, 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, and ARS PABIL continued a 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 range of the exotic parasitoid, *Trissolcus japonicus* (Hymenoptera: Scelionidae) in New Jersey. This potential biological control candidate may have been accidentally introduced into the environment and one biotype is currently under quarantine at the USDA ARS BIIL in Newark, Delaware.

The non-native egg parasitoid *T. japonicus* was recovered again in 2017 in NJ so its presence has been confirmed.

During 2017, a total of 201 stink bug parasitoids successfully emerged from sentinel BMSB egg masses with **38** of these being the exotic Asian parasitoid, *T. japonicus*, which were recovered from two sentinel egg masses attached to a euonymus plant at the nursery survey site in Gloucester County, NJ. The other **163** native parasitoids recovered were in the *Trissolcus*, *Telenomus* and *Anastatus* genera. One native parasitoid, *Telenomus podisi* was recovered from all six survey sites and *Anastatus reduvii* was only recovered from the orchard and vineyard survey sites.