



## State of New Jersey

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

#### SUMMARY OF 2006 ACTIVITIES

##### NURSERY INSPECTION

New Jersey law requires that all nursery stock sold in New Jersey be free of injurious pests, ensuring that ornamental plants purchased by consumers are healthy and do not contain pests that could spread to other plants.

The nursery inspection staff inspected over 19,000 acres in nursery stock and 5,732,744 square feet of greenhouse area in 1,290 locations to certify freedom from dangerous insects and diseases. The most frequently observed pests were bagworm, white pine weevil, Japanese beetle, spider mite and a variety of scale insects. These infestations were controlled under Department orders. A total of 807 garden centers, plant dealers and landscape firms were inspected, 644 were certified as plant dealers for the year 2006. This list of certified nurseries and plant dealers is posted on the Division's web site and is updated monthly.

The Division's inspectors issued 216 state and 101 federal phytosanitary certificates, of which 36 were for re-export, enabling export of plants and plant material to other states or countries.

##### CHRYSANTHEMUM WHITE RUST

The Department and USDA-PPQ entered into our second season of survey in the community of Dover in Morris County for Chrysanthemum white rust, *Puccinia horiana* (CWR). In 2005, CWR was discovered in a site in this municipality. State and federal officials subsequently destroyed all infected plants. Based on the 2005 finding, a survey area was created using a 400-meter circle radiating outward from where the 2 infected plants were found. A total of 121 chrysanthemum plants on 212 properties were surveyed and found free of CWR. Another survey of these properties in the 400-meter survey area was completed during the fall. One more year of negative findings for chrysanthemum white rust would be required to end the survey for CWR in this area.

Approximately 100,000 potted Chrysanthemums were placed under an EAN, "Emergency Action Notification", by a USDA-PPQ officer under orders from the officer's superiors. This action followed a one day inspection of fields of these potted plants in a certified Nursery located in Hunterdon County. The EAN was lifted after a second day of inspection was performed by state and federal officials with negative findings of this disease.

## **SUDDEN OAK DEATH**

The Department cooperated with USDA APHIS PPQ in the national SOD survey to determine the nationwide distribution of *Phytophthora ramorum*. State survey staff sampled leaf tissue from host and associated host material from 21 nursery and plant dealer locations in 19 counties throughout New Jersey, which have received nursery stock from California, Washington or Oregon. The Plant Laboratory analyzed 768 samples for ELISA screening. A total of 128 ELISA positive samples collected from 18 locations were submitted to the USDA APHIS laboratory in Beltsville, MD for PCR confirmation, all were negative for *P. ramorum* in 2006.

The third and final season of sampling plant material was conducted at the Cape May location, which previously received SOD positive plant material from the west coast in 2004. All samples tested from this facility were found negative.

## **SOYBEAN RUST**

In November 2004, the Asian soybean rust, *Phakopsora pachyrhizi*, was first found in the United States in Louisiana. Soybean rust is a serious disease causing crop losses in many parts of the world. The Department worked with Rutgers Cooperative Research and Extension and the USDA APHIS National Soybean Rust Surveillance Program to monitor sentinel plots to detect the disease and gauge its severity. Five sentinel plots were monitored weekly throughout the season. Funding was provided by Southern Region IPM based in North Carolina. Soybean rust was not found in New Jersey in 2006.

## **VEGETABLE TRANSPLANT INSPECTION**

In 2006, Division staff inspected 49 lots of vegetable transplants shipped into the state for use by New Jersey farmers for plant disease, insect or nematode problems. Of the total 4,900,000 plants received 465,807 plants were inspected. The predominant crops inspected were pepper, leek, escarole, endive, lettuce and Bok choy. Other crops inspected included beets, tomatoes and kale. No lots were rejected for disease or insect problems during 2006.

## **PLANT PEST SURVEYS**

Projects funded by USDA APHIS through the CAPS Program for 2006 included surveys for the following pests: Giant hogweed (*Heracleum mantegazzianum*), Swede midge (*Contarinia nasturtii*), Copitarsia moth (*Copitarsia sp.*), exotic wireworms (*Agriotes sp.*), Sirex wood wasp (*Sirex noctilio*), Summer Fruit Tortrix Moth (*Adoxophyes orana*) and exotic snails. In addition, nurseries were inspected for the presence of British yellow cap (*Innula sp.*) and exotic snails.

Biological control of Purple Loosestrife continued in 2006 with the release of 26,100 *Galerucella* spp. beetles. These beneficial insects were released in 7 sites in Burlington (2,100 beetles), Mercer (8,000), Ocean (6,000), Somerset (4,000), and Union (6,000) counties. Beetles have now been found in 19 of the state's 21 counties. Field surveys in 2006 of 24 previous release sites resulted in beetle recoveries at 23 of the sites for a 95.8% recovery rate. Fifty-one site surveys were conducted throughout the state resulting in recovery of beetles at 39 of the sites for a 76.5% recovery rate. Data collection from the test sites shows that the beetles are providing

an effective control of the loosestrife, as density and seed production continue to decrease. Increased populations of native wetland plants are also occurring.

Swede Midge survey continued in Northern NJ this season. Twelve farms were used for trapping activities. Trap catches yielded PCR positives for Swede midge at a farm in Sussex County. Morphological confirmation is required for the positive identification of Swede midge, and currently morphological identification has not supported the PCR positives. Swede midge trapping will be continued in 2007. Surveys for *Sirex noctilio* were conducted from June through October. A total of 10 trapping sites in 6 counties throughout the Pine Barrens were monitored bi-weekly. Trap catches were screened in house. Although *Sirex noctilio* was not detected; three native siricid wasps were found repeatedly. Natives species found were *Sirex nigricornis*, *Sirex edwardsii* and *Urocerus cressoni*.

Rutgers University conducted surveys for Copitarsia Moth and exotic wireworm species at over 80 locations throughout the state. To date no suspects have been identified, however screening of trap catches is not yet completed. Rutgers also conducted a survey for Summer Fruit Tortrix Moth at 60 locations throughout the state. Fruit farms containing apples peaches and blueberries were surveyed. No suspects were detected.

Giant hogweed monitoring and eradication continued in at several locations throughout the state. Hogweed plants were sprayed with herbicide. One new giant hogweed infestation was detected this year at Jenny Jump State Park. Treatments were also conducted at this site. Inspection and treatment of all sites will continue in 2007.

Visual surveys of *Hosta* nursery stock for British Yellow Cap were conducted at 167 sites in 18 counties. One suspect was detected but positive identification was not possible because the weed was not in flower. Visual surveys for exotic snails were conducted at 233 nursery sites with no suspects found.

A joint NJDA/USDA snail survey was conducted at 12 non-nursery locations throughout the state. Two exotic snail species were detected as a result of the survey. The Chocolate-band snail, *Eobania vermiculata* was found at a stone importer in Jersey City. Although this species is of foreign origin it is not considered “actionable” by USDA. The other find was the Vineyard snail, *Cernuella virgata* found at the port of Salem. This snail was found clinging to the side of containers in a container yard. Because this exotic snail is considered an “actionable” pest, the Department of Homeland Security-Customs and Border Protection staff are following up on the find in the port. A survey is planned for spring of 2007 to ensure that the snail has not escaped the port environs.

## **ASIAN LONGHORNED BEETLE**

In 2002, Asian Longhorned Beetle was confirmed in Jersey City, New Jersey. As a result, a quarantine area of 3.7 square miles was established in Jersey City and Hoboken. A total of 461 host trees were removed and 1,060 additional host trees were treated with imidacloprid for three years. In 2005, all treatments were completed and the quarantine was lifted. Survey activities continue in the Jersey City unit and should be completed by December 2007. ALB will be considered eradicated in this location if all survey results are negative,

In August 2004 a second infestation of ALB was detected in Carteret, New Jersey. Subsequent survey activities expanded the quarantine area into Woodbridge, in Middlesex County; as well as Linden, Rahway, Roselle, Clark, and Elizabeth, in Union County New Jersey. The newest positive find was made in August 2006, in the city of Linden. This last find expanded the quarantine area to 25 square miles. Since November 2004 a total of 616 infested and over 20,000 high risk host trees have been removed. The trees were chipped and sent to Covanta, a resource recovery facility located within the quarantine area for incineration. Over 15,000 tons of chips have been recycled so far. We are preparing for our third year of treatment in this zone. Over 33,000 trees have been identified for treatment. These treatments extend out to ½ mile from an infested tree location. Host trees are treated with Imidacloprid, a systemic pesticide that safeguards the trees from possible ALB infestation

Surveys in warehouse locations, which receive commodities from countries where ALB is native (Level 3) continued this year, however, the 25-mile grid survey (Level 4) has been significantly expanded as a result of this new infestation

### **BROWN GARDEN SNAIL**

Control treatments for the **Brown garden snail**, *Cryptomphalus aspersus*, were discontinued in North Cape May, New Jersey. Control efforts in this area have shifted from eradication to suppression following four years of eradication and survey activities. Both native and exotic snail populations in the area have remained extremely low as a result of the methalehyde treatments. Surveys on adjoining properties in the area have not shown any spread or population increase of this mollusk. The Brown garden snail was found for the first time in New Jersey during the summer of 1998 in Margate, New Jersey.

### **BLUEBERRY EXPORTS TO CANADA**

During 2006, New Jersey growers shipped fresh blueberry fruit to Canada under protocols developed by the Canadian Food Inspection Agency (CFIA) and USDA APHIS PPQ designed to limit the spread of Blueberry maggot, *Rhagoletis mendax*. Blueberry maggot is a serious pest of fresh blueberries.

Over 616,083 flats of New Jersey grown fresh blueberry fruit were shipped into Canada under this program representing a 9% decrease in the amount of fresh blueberries shipped by New Jersey growers compared to the amount shipped the previous year. Of the 25 growers certified by the Division, a total of 23 growers shipped their product to Canada on the program. The 2006 season was the eighth year that the program was operational.

Under the protocol, under the supervision by Department personnel, growers are required to carry out various monitoring, control and verification procedures to certify that shipments did not contain blueberry maggot. The New Jersey blueberry industry is satisfied that these regulations required by CFIA have not created undue problems for their shipments, or reduced their ability to market fresh berries in Canada.

## **BLUEBERRY PLANT CERTIFICATION PROGRAM**

New Jersey regulations require that all blueberry (*Vaccinium corybosum*) plant growers, who intend to sell or distribute propagating wood, rooted cuttings or plants, to be certified. All participating growers are required to follow guidelines outlined in state regulation. Under the program, field inspections of blueberry plants entered in the program are performed two times a year. The first inspection is accomplished in the spring season and the second inspection is completed in the fall season. Visual inspection of the blueberry plants are conducted for the symptoms of stunt, shoestring, mosaic and red ringspot virus, as well as any other plant disease or insect infestation.

In the 2006 Blueberry Certification Program, inspections were completed at 7 blueberry nurseries (11 locations) in Atlantic, Burlington and Gloucester Counties. Over 1,870,414 blueberry plants were inspected, consisting of 28,187 mother plants, 737,047 nursery plants, 1,104,663 cuttings and 517 containerized plants. A total of 1,356 plants were found infected with stunt, red ringspot, shoestring and mosaic viruses; all infected plants were subsequently destroyed. This was a 67% reduction from the levels found in 2005; dodder, a parasitic plant, was also found on 190 plants and destroyed.

Composite samples representing 2,700 mother plants were collected from 6 New Jersey blueberry growers in Burlington and Atlantic County to certify that their plants were free from Blueberry scorch virus. Blueberry scorch virus is the most economically important virus disease of blueberries in North America. This was the fourth season the Department has offered this service to interested growers who intend to ship blueberry plants out of state and need to certify that their plants are free of this disease. Three mother plants that tested positive for the virus at a plant propagator in Burlington County were promptly destroyed before cuttings were taken.

## **GYPSY MOTH SUPPRESSION**

In the spring of 2006, the Department supervised the treatment of 26,668 acres in 19 municipalities and lands owned by five agencies using the non-chemical insecticide, *Bacillus thuringiensis var kurstaki* (*B.t.k.*). Single and double applications of *B.t.k.* were applied at a dosage rate of 36 B.I.U. (96 ounces of Foray 48B) per acre. The treatment blocks were located in Atlantic, Burlington, Ocean, Monmouth, Middlesex, Sussex and Warren Counties.

Because the Department was directly involved in the supervision of the program, New Jersey received \$371,250 in USDA Forest Service funds to cover 25 percent of the aerial spray and survey costs. The municipalities that participated in the voluntary aerial spray program enjoyed greener, healthier shade trees and reduced larval nuisance.

The 2006 statewide gypsy moth aerial defoliation survey showed a substantial increase of gypsy moth defoliation occurring on 125,743 acres, infesting 69 municipalities in 15 counties representing an approximate three-fold increase in defoliation compared to the levels the previous year. Due to dry springtime weather, *Entomophaga maimaiga* activity was relatively non-effective in controlling later instars of caterpillars allowing the population to exponentially increase in the same counties.

In 2007, The Division plans to oversee treatment of approximately 63,885 acres using single and double applications of *B.t.k.* at a dosage of 38 B.I.U.'s in 34 municipalities and lands owned by six agencies located in Atlantic, Burlington, Camden, Cape May, Cumberland, Mercer, Middlesex, Monmouth, Ocean, Somerset and Sussex Counties.

## **APIARY INSPECTION**

Approximately 10,000 colonies entered New Jersey from Florida and Virginia for commercial pollination of fruit crops, blueberries, and cranberries. The Apiary inspection staff examined these colonies to validate the sanitary certificates issued by the shipping states. No significant disease problems were detected.

The Division worked with the NJ Department of Environmental Protection, Pesticide Control Program to secure Section 18 (emergency use) registrations for the use of Checkmite+ (Coumaphous) to control fluvalinate-resistant varroa mites and small hive beetles and Apilife VAR, an essential oils treatment for controlling varroa mites resistant to Coumaphous and fluvinate. Moderate levels of varroa mites continued to be observed during 2006 in colonies that were treated with Coumaphous.

The State Apiarist participated in the Mid-Atlantic Apiculture Research and Extension Consortium (MAAREC), a regional research initiative between New Jersey, Pennsylvania, Delaware, West Virginia and Maryland. MAAREC is funded by each of the participating state universities and beekeeping organizations. Discussions at this year's meeting focused on the Africanized honeybee situation in Florida and implications for the 2007 pollination season in the Mid-Atlantic region.

The Department initiated the "Bee-ginner Beekeeping Program" in 2006. On the program, the first 50 interested first-time beekeepers that successfully complete the Rutgers beekeeping "short course" held in the beginning of April would be eligible for up to \$300 worth of beekeeping equipment. Because of an overwhelming interest by New Jersey residents in the "Rutgers Bee-ginner Beekeeping Course" program, two more sessions were offered by Cook College in the beginning of May and September. Over 102 beginning beekeepers attended the two-day training session and learned the basics of hive management, honeybee biology, and the control of mites and bee diseases.

The Apiary inspection staff cooperated with USDA APHIS PPQ in surveying for Africanized honeybee around Port Elizabeth, New Jersey; all traps were negative for Africanized honeybee.

## **SEED CONTROL**

In 2006, a total of 163 samples of seed were submitted to the Division's Seed Laboratory for analysis. Nineteen percent of these samples, collected by inspectors 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 and turfgrass seed.

In order to monitor **agricultural seed** sold through farm supply outlets, 60 lots of vegetable seed and 53 lots of field crop seed totaling 182,330 pounds were inspected and sampled in 2006 for quality control analysis prior to being used by farmers. In addition, 20 lots of **turfgrass seed** totaling 63,700 pounds were sampled from wholesale distributors and sod growers. This turfgrass seed was also analyzed for germination and purity quality. Laboratory testing of these lots found that all samples germinated at or above the percentages listed on the label and were free of any noxious weed seeds.

The general quality of **vegetable seed** sold in New Jersey directly to farmers is excellent and is accurately labeled. Seed companies do not provide vigor test information on their labels, and are not required by law to do so. Vigor testing, conducted by the seed laboratory upon request, has provided valuable information to several vegetable growers. Low vigor seed could have a disastrous financial impact on growers who plant seed early when germination conditions are less than optimal. In 2006, 37 tests for vigor were conducted for growers of sweet corn, spinach, peppers and green beans.

## **SEED CERTIFICATION**

Turf seed samples were taken from lots of certified turf seed shipped to New Jersey from other States. These samples, representing over 142,100 pounds of certified turfgrass seed, were tested to determine eligibility for the interagency certified seed program. Certification program staff supervised the mixing of 62,050 pounds of high quality turf seed. New Jersey sod growers used this seed to produce a high quality sod product.

In 2006, Division staff certified 42 acres of conservation plant material developed at the USDA NRCS Cape May Plant Materials Center. Stock from this Center is used primarily for coastal soil stabilization. Because of the important role the soil conservation plant material plays in coastline stabilization, the demand for plants to replant established sand dunes continues to remain high.

## **PLANT LABORATORY SERVICES**

The Plant Laboratory Services unit provides laboratory support for regulatory inspection and insect rearing programs of the Division of Plant Industry. This year the laboratory supported the Seed Certification and Control program by monitoring the seed sold by seed companies directly to farmers, as well as seed sold on the retail market. Germination, purity, vigor and noxious weed examinations were performed on seed submitted to the laboratory.

Our survey of seed germinations has assured the farmers that their seed will perform at the germination percentages specified on the seed labels under ideal conditions. Vigor testing information allowed the farmer to modify planting times as well as growing and storage conditions. Vigor tests conducted on certain seeds indicated that many of the high germination seed lots did not perform well under stressed conditions. Growers of sweet corn, spinach, and peppers find these tests extremely beneficial to their operations.

The laboratory routinely employed five basic biochemical types of analysis. Gas chromatographic analysis of hydrocarbons and fatty acids has proved useful in identifying insects and plant diseases. Liquid chromatography was used to identify plant and seed varieties.

Electrophoresis is also used to identify plants, seeds, as well as insects. Polymerize Chain Reaction (PCR) techniques were also used in the identification of insects, fungi, bacteria, and plant varieties; and immunological tests (ELISA) were used in the identification of plant viruses and mycotoxins.

The laboratory supported the Apiary Inspection program through the analysis of bees for Varroa and tracheal mites, and testing for American foulbrood, which is a bacterial disease of bees.

Mycotoxin fungi can be potentially dangerous to animals if they produce toxins in significant quantities on feed materials. The Division's Plant Laboratory has set up a sophisticated mycotoxin protocol to screen and quantify the concentration of mycotoxins. The techniques involve a combination of ELISA tests, thin layer chromatography and liquid chromatography.

The field and laboratory staff coordinated the testing of plant material for SOD, blueberry scorch, and plum pox.

## **BIOLOGICAL CONTROL OF PLANT PESTS**

Under the Division's Biological Control Program, insects are raised 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 valuable pesticides. The reduction of pesticide applications in the field also allows the native population of beneficial insects to increase, adding more pressure on the pest population.

This year, the Division conducted nine 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, gather efficacy on new biological control programs and monitor established beneficial insect populations on a variety of crops to evaluate the need for augmenting those populations. Seven of these programs required laboratory rearing of beneficial insects for release into the field. The goal is to reduce or maintain specific pest populations below economically significant levels.

The **Mexican bean beetle** (MBB), (*Epilachna varivestis*, Coleoptera: Coccinellidae) biological control program involves the mass production and release of small beneficial wasps (*Pediobius foveolatus*, Hymenoptera: Eulophidae) to control MBB. The Mexican bean beetle feeds on snap 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 soybean fields each summer. A total of 174,000 parasites were released into 55 nurse plots in 2006.

New Jersey farmers planted about 100,000 acres of soybeans in 2006. 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, to manageable levels, that no pesticide applications have been required on soybean acreage since 1993. In 2006, this savings has amounted to approximately \$375,000 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 Phillip Alampi Beneficial Insect Laboratory discontinued production of the coccinellid *Sasajiscymnus* (= *Pseudoscymnus*) *tsugae* to rear the newly described Chinese beetle, *Scymnus sinuanodulus* (Coleoptera: Coccinellidae) a predator of **Hemlock woolly adelgid**, (HWA) (*Adelges tsugae*, Homoptera: Adelgidae) a serious pest of the natural hemlock stands of the northeast.

Since 2003, the Division has worked to increase and improve an initial rearing stock of 50 beetles received from the USDA Forest Health Research Laboratory at Hamden, Connecticut, and to develop a mass production method that would supply *S. sinuanodulus* to HWA control programs in New Jersey and other states. Within that time, NJDA has become the primary producer of *S. sinuanodulus* and has provided 18,000 of the predators for release in New Jersey and four other states (West Virginia, Maryland, North Carolina, and Pennsylvania). New Jersey has also shared its technology for raising the beetles with workers at the University of Georgia and at the North Carolina Department of Agriculture, who anticipate starting rearing programs there.

In an extension of the USDA Forest Service agreement, the Alampi Laboratory is scheduled to begin work in 2007 with a newly collected Japanese Derodontid predator of HWA (tentatively named *Laricobius osakanus*), now being described and evaluated in Federal quarantine. In preparation for that work, the Alampi Laboratory, received 100 adults from Virginia Polytechnical Institute and began to rear *Laricobius nigrinus* in order to gain a general understanding of the needs and behavior of insects in this genus. The goal in working with *L. nigrinus* is not predator production, but solely to gain experience with this insect and lay the foundation for the mass production of *L. osakanus* when available. Any *L. nigrinus* produced, however, will be released in New Jersey's hemlock stands.

Evaluation of release sites confirms field reproduction of the beetles since larvae of the predatory beetle have been recovered in past seasons. Although very few *S. tsugae* are recovered in the field surveys, data collected this season to determine hemlock health has shown the hemlocks are rebounding. Even though the hemlock woolly adelgid population in New Jersey remains low, *S. tsugae* was recovered for the first time in the Delaware Water Gap National Recreation Area. *S. tsugae* was also recovered in Worthington State Forest, over 2.5 miles from the 1998 release site showing that the beetles are dispersing and colonizing other areas.

Since 1988, Division staff has monitored eleven permanent study plots in an effort to document the impact of hemlock woolly adelgid on the State's natural hemlock stands. New growth counts have been recorded annually to determine the quality and health of the trees at each site. When the trees become stressed, less new growth develops. Significant tree mortality was first observed in heavily infested HWA study plots in 1995. Since that time tree mortality has steadily increased with some stands reaching as high as 100%. Usually within two to three years of a heavy infestation tree decline becomes evident. Although mortality varies from plot to plot, the plots that have been heavily infested the longest time have demonstrated the most mortality. Stands with secondary pest problems, such as scale or mites, decline more rapidly than stands infested only with HWA

An exotic freshwater wetland plant, **Purple Loosestrife**, (*Lythrum salicaria*, Lythraceae) displaces the native flora of the marsh environment and threatens the habitat of many animals that depend on native plants for nesting, food and shelter. 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 is mass-producing two foliage feeding beetles of purple loosestrife, (*Galerucella pusilla* and *Galerucella californiensis*, (Coleoptera: Chrysomelidae), as part of a cooperative program with the New Jersey Department of Environmental Protection (NJDEP), Division of Fish & Wildlife (DF&W) and a grant from the USDA, APHIS. In 2006, the Alampi Laboratory produced 260,000 *Galerucella* spp. 26,100 of which were released in New Jersey's loosestrife-infested wetlands, the remainder being sold to purple loosestrife control programs in other states.

Since the initial releases in 1997, approximately 1.7 million beetles have been released at 101 sites in 17 counties of the state. *Galerucella* has been recovered from approximately 98% of the release sites. After releasing the beetles for only five years, the purple loosestrife population collapsed at one site in Hunterdon County. Since the collapse of the population at the Hunterdon site, purple loosestrife populations in four Sussex County sites have also collapsed due to beetle feeding. Loosestrife populations at additional release sites are also showing signs of stress and imminent collapse. *Galerucella* spp. have been recovered at 39 non-release sites in 2006 with one recovery made 29 miles away from the closest release site. The beetles are dispersing to new sites every year and have been found at 67 new sites in the past four years.

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 NJ, Mercer County Park Commission, Union County Park System, Allentown Borough, Rider University, property managed by the NJ Meadowlands Commission, a number of mitigation sites and private landowner properties. Also, since 1997, 770,400 beetles have been shipped to other states including Maine, Massachusetts, Rhode Island, New York, Delaware, Pennsylvania, Tennessee, Michigan and New Hampshire in an effort to establish field colonies within those states.

In 2004, as part of a cooperative effort, including the USFS, University of Delaware and the NJDA, forty-six beetles, *Rhinoncomimus latipes* (Coleoptera: Curculionidae), host specific to an exotic invasive plant, **Mile-a-Minute** (MAM), *Polygonum perfoliatum*, were shipped to the Alampi Beneficial Insect Laboratory from specimens collected in China for the development of a mass rearing technique. Over 200 beetles remaining from the shipment were released into a MAM site in South Jersey. In 2005, the beetle was recovered from the release site, documenting establishment of this beneficial insect this location.

Since receiving the beetles from the University of Delaware, the Alampi Laboratory has made enormous progress in understanding the requirements necessary to produce this predatory weevil, *R. latipes* and its host, *P. perfoliatum*. The Laboratory devised a method for producing the plant from rooted cuttings and established a stock of plants in the greenhouse sufficient enough to continue developing and evaluating rearing techniques and increase production of the weevils to levels high enough to allow for releases in New Jersey and other states. In 2006, the Laboratory's production capacity reached a sustained level of 1000 new weevils emerging each week, permitting 22,462 predators to be released in New Jersey in 2006, with an additional annual total of 6,350 predators released in Pennsylvania, West Virginia, and Maryland.

*R. latipes* weevils were recovered from all of the 2005 release sites for an establishment rate of 100%. Field evaluations of the release sites showed decreases in seed production at the release sites and two of the release sites were completely defoliated by the weevils, one in the spring and one in the fall.

Currently the New Jersey Department of Agriculture is the sole source of *R. latipes* in the United States; every effort is being made to continue increasing New Jersey's production capacity and to make an increased portion of that capacity available to researchers and mile-a-minute control programs in other states.

From 1992 to 2004 a predatory beetle from China (*Cybocephalus nipponicus* (Coleoptera: Cybocephalidae) was reared in the laboratory and released in the landscape on shrubs and trees infested with **Euonymus scale** (*Unaspis euonymi*, Homoptera: Diaspididae) and Euonymus Alatus Scale, *Lepidosaphes yangicola*, (Homoptera: Diaspididae). Establishment of the beetle has been verified statewide. Observations at previous release sites have also verified its ability to colonize and reduce scale populations in both shady and sunny locations. A total of 677,930 have been released on euonymus scale since program started.

*Cybocephalus* will feed on a number of Diaspid (hard shell) scale species. Elongate Hemlock Scale (EHS), (*Fiorinia externa*, Homoptera: Diaspididae) is a hard shell scale species that is commonly found on hemlock needles often causing a decline in hemlock vigor. Initial laboratory studies confirmed that *C. nipponicus* larvae and adults would feed on EHS. In 2005, all efforts were focused on rearing beetles for release on elongate hemlock scale in an effort to gather efficacy data on the beetles' ability to feed and reproduce on EHS in a native hemlock stand. Surveys of the release sites indicated that the beetles not only remained on the hemlock needles, but also reduced the scale population significantly.

A total of 74,000 *C. nipponicus* were released in 14 hemlock sites in 2006. The beetles were recovered at 10 new sites, all of which had received releases in the past. *C. nipponicus* is expanding its range in New Jersey and establishing itself on hemlocks infested with EHS. Also in 2006, a total of 22,000 adult predators were shipped to the PA Dept. of Conservation and Natural Resources, Bureau of Forestry. Besides evaluating the release plots, sixty additional natural hemlock stands were surveyed resulting in beetles being observed in seven of them. Since the observations were made in stands far removed from the release site, it is believed the beetle, which is established on euonymus plants throughout the state, dispersed naturally to these scale infested hemlock stands.

In New Jersey, a native pest, **Tarnished plant bug** (TPB), (*Lygus lineolaris* Hemiptera: Miridae) 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 Division received an exotic European Mirid parasitoid (*Peristenus relictus* Hymenoptera: Braconidae) from the USDA, Beneficial Insect Research Laboratory, 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 is now feasible, making it possible to dramatically increase parasitoid production. Since 2004, the laboratory has made significant rearing progress utilizing this egg-based artificial diet. Host and parasitoid colonies are at their highest levels of production and vigor, with 2,000 – 3,000 parasitoids produced weekly.

A total of 21,500 *P. relictus* were released among 13 fields in Mercer, Cumberland, Salem and Gloucester Counties. Nine *Peristenus* specimens were recovered in 2006 from field-collected tarnished plant bug nymphs. One specimen was identified as *Peristenus relictus*, which is the first overwintering recovery of that species in the Eastern United States. The specimen was recovered from a 2004 release site planted with a wildflower mixture at the Rutgers University Agricultural and Research Center at Bridgeton (Cumberland County). Since only a single female was recovered, it is premature to consider *P. relictus* established. However, the confirmed recovery after only two seasons is very encouraging.

With the increasing threat of mosquito-borne illnesses such as West Nile virus and eastern equine encephalitis, that affect humans and economically important animals, the Alampi Beneficial Insect Laboratory cooperated with the New Jersey Department of Environmental Protection (NJDEP), Office of Mosquito Control Coordination, to develop a biological control program for mosquitoes breeding in standing water.

**Copepods**, which are nearly microscopic crustaceans, are efficient mosquito larvae predators. At the request of the NJDEP) Office of Mosquito Control Coordination, the Division of Plant Industry Phillip Alampi Beneficial Insect Rearing Laboratory established cultures of various native species of copepods, and evaluated procedures for mass-production.

Throughout 2005 the Alampi Laboratory collected and established cultures of copepod species native to New Jersey and thought to be of value for inclusion in a mosquito biological control program. Having concurrently developed a mass production method for copepods and their associated food organisms and with the intent of starting field trials, the Alampi Laboratory focused in 2006 on the mass culture of the predatory copepod, *Macrocyclus albidus*, a species successfully used to control mosquitoes in discarded tires and other containers in subtropical climates.

Having devised a way to collect copepods *en masse* from their culture medium and dispersing them in the field, the Laboratory established field trials in four counties in cooperation with NJDEP's Office of Mosquito Control Coordination and the Mosquito Control Commissions of Mercer, Hunterdon, Monmouth, and Morris Counties. The trials yielded particularly valuable information on the logistics of transporting, releasing, and monitoring copepods, and provided unexpectedly encouraging information on the rate with which copepods can build their populations and suppress certain mosquito species in tires. Field experiences with *M. albidus* in 2006 have laid a firm foundation on which to plan more extensive field tests in 2007.