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Maryland Department of Agriculture Plant Protection and Weed Management Section
Annual Report to the Eastern Plant Board
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Summary of 2016 Activities

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Submitted by,

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APIARY INSPECTION

The Maryland Department of Agriculture's (MDA) Apiary Inspection Program works with beekeepers, helping to control honey bee diseases, parasitic mites and other pests, to maintain healthy colonies for the pollination of Maryland crops. Honey bees pollinate crops valued at more than \$40 million. Maryland fruit and vegetable growers rent 5,000 colonies a year to improve pollination. Beekeepers' colonies are essential to Maryland because two parasitic mites have nearly eliminated feral honey bee colonies.

American Foulbrood is the most serious brood disease of honey bees and can destroy a colony in one year. The nine colonies that inspectors found to have American foulbrood, as diagnosed by the USDA Bee Laboratory in Beltsville, MD, were destroyed to prevent the spread of this bacterial disease into healthy colonies. The incidence of disease remains relatively low – .4% of the colonies inspected.

Canine Training and Certification: In 2015, the apiary program trained and certified a dog and handler to detect American foulbrood disease in honey bee colonies. Mack is a yellow Labrador retriever who has been trained to detect, and alert to his handler, the presence of American foulbrood disease. Now that he's on the job, Mack will work to reduce the incidence of American foulbrood in Maryland bee colonies during fall and winter when the bees are dormant. A trained dog can inspect 100 honey bee colonies in 45 minutes; an average human inspector can inspect 45 colonies in one day. Early detection of the disease will save Maryland beekeepers substantial monetary loss from eradication of diseased bees and destruction of infected equipment. Mack inspected over 1,736 colonies in 2016

Varroa mite (*Varroa destructor*) populations were again very high in Maryland in 2016, and brood problems were attributed to this. There are six products available to control varroa mite. One of the serious problems caused by varroa is the transmission to honey bees of viruses, which can be fatal to the hive. Nearly twenty honey bee viruses have been discovered and the majority have an association with varroa mites.

Therefore, controlling varroa populations in a hive will often control the associated viruses and symptoms of the viral diseases.

Tracheal mite (*Acarapis woodi*) populations, as documented by the USDA honey bee laboratory, continue to be so low that tracheal mite is no longer considered a threat to honey bees if colonies are monitored on a regular basis.

Africanized honey bees (AHB): MDA is working with two groups – the Mid-Atlantic Apiculture Research and Extension Consortium (MAAREC) to provide information to the general public about emergency incidents, and the Apiary Inspectors of America (AIA) for information on the control of AHB movement, other than through natural spread.

The small hive beetle (*Aethina tumida*) was detected in packaged bees and reported or detected in all 23 counties in 2016. Colonies are treated and monitored to ensure successful control of the beetles. There have been reports of larval damage to established colonies. The small hive beetle is a major pest of stored equipment and in honey houses, rendering stored honey in the hive unmarketable.

Apiary Inspection Permits: Entry permits were issued for 2,800 honey bee colonies to move into Maryland, primarily for overwintering. Exit permits were issued for 3,367 colonies to move out of Maryland, primarily for pollination services. For the ninth year, Maryland beekeepers have sent colonies to California for almond pollination, 1,600 were transported to California in the winter of 2016-2017.

Surveys: The Apiary Inspection Program assisted with two surveys in 2015. The survey information can be found listed in the Pest Survey section of this report.

NURSERY INSPECTION and PLANT QUARANTINE

The Maryland Nursery Inspection Program serves the state's nursery and greenhouse industry which continues to be a leading component of Maryland's number one industry, agriculture. The most recent census (2012) for the green industry in Maryland currently ranks it second among commodities, with a total

of approximately \$960 million in farm income. Other horticultural products and services boost total gross receipts to more than \$1.96 billion.

A primary goal of state plant protection and quarantine efforts is to facilitate the production, sale, and distribution of Maryland nursery stock. This is accomplished in large part by inspection and certification activities conducted on-site by Maryland Department of Agriculture Plant Protection & Weed Management staff. Maryland law and reciprocal agreements with other states require annual production facility and sales location licensing for all producers and suppliers of nursery stock in the state. Production nurseries are inspected, at minimum annually, to ensure that plant material is free of dangerously injurious plant pests. Additionally, plant dealers are inspected regularly to insure plant materials are received and maintained in a healthy and pest-free condition for wholesale and retail sale.

In 2016, the Maryland Nursery Inspection Program licensed 311 nurseries, as well as 1,434 plant dealers and plant brokers. In 2016, 8,754 acres of nursery stock and nearly 10,000,000 square feet of greenhouse production were certified. Plant Protection & Weed Management staff performed routine inspections at 673 Maryland locations.

In general, the health of Maryland-produced nursery stock was found to be excellent. Additional certification activities for 2016 involved shipment specific inspections. These included 239 state phytosanitary certificates issued to 17 states and U.S. territories. Phytosanitary inspection and certification is performed to assure Maryland agriculture and green industry compliance with established U.S and state domestic quarantines and phytosanitary requirements for Maryland produced plant material and grains. In 2016, 87 shipment specific inspections were performed, and federal phytosanitary certificates were issued to export Maryland grown and produced plant material and grain to six foreign countries, assuring Maryland produced agricultural commodities meet international quarantine regulations.

Specific events of note:

As was the case in 2015, 2016 again presented many challenges for the Nursery Inspection Program staff. The effort to prevent the introduction, and slow the spread of boxwood blight (*Calonectria pseudonaviculata*) in Maryland, occupied hundreds of hours of staff time throughout the year. Nursery Inspection Program staff were again involved not only in the process of inspecting for evidence of the disease at the majority of establishments visited, but were also engaged in issuing condemnation/ seizure and treatment orders when infected plant material was found, and tasked with overseeing the destruction of boxwoods infected with this highly destructive, infective and easily spread disease. An additional plant pathogen, *Phytophthora ramorum*, the causal agent of Sudden Oak death, and a plant disease which has many host species that are common in the green industry and nursery trade, was detected by survey. The detection at a single location resulted in hundreds of additional staff hours dedicated to delimitation, eradication and follow-up survey for this very destructive disease. Since the disease is not known to occur in Maryland, and is under federal quarantine, MDA worked with the US Department of Agriculture, taking necessary action. An additional challenge for program staff in 2016 was distribution of information to the green industry and enforcement of new invasive plant regulations that took effect in 2016.

Serious plant pests and diseases are, on occasion, introduced into Maryland on plant material that is not directly regulated by our Plant Pest/Disease Control laws. In addition to chrysanthemum white rust, past examples of serious plant pathogens and pests introduced into Maryland on unregulated nursery stock such as tropical plants and annual or herbaceous plant material include: bacterial wilt (*Ralstonia solanacearum* race 3, biovar 2), daylily rust (*Puccinia hemerocallidis*), daylily leaf miner (*Ophiomyia kwansonis*), imported fire ant (*Solenopsis invicta*), brown garden snail (*Helix aspersa*) and spotted wing drosophila (*Drosophila suzukii*). Onion leaf miner (*Phytomyza gymnostoma*) and Swede midge (*Contarinia nasturtii*) are examples of additional pests that occur in the region and are likely to find their way into Maryland on unregulated plant material. There are many other plant pests and diseases that could easily go undetected if the host plant material is not subject to the scrutiny of inspection regulations. Staff was also involved in the detection of imported fire ant (*Solenopsis invicta*). Survey for this pest is now an annual

event due to the fact that this species, a serious threat to human, animal and environmental health, is regularly re-introduced into Maryland in the soil or root masses of infested tropical plant material (especially palm trees) arriving from the southern United States for seasonal outdoor decorative purposes. Staff continues to be vigilant and participates in inspections and surveys aimed at early detection and slowing the spread of serious pests and diseases such as insect pests; Asian Longhorned Beetle (*Anoplophora glabripennis*) and spotted lanternfly (*Lycorma delicatula*) and the plant diseases; sudden oak death (*Phytophthora ramorum*) as well as thousand cankers disease of Walnut (*Geosmithia morbida*). Two Nursery Inspection Program staff members were hired in late 2015 to replace the two long-time PP&WM, Nursery Inspection Program employees who retired in the fall of 2015. These staff have now completed training, studied for, and passed examinations, and received necessary accreditation, and are fully integrated into the program. Both have assumed regional program responsibilities. In 2016, staff members participated in, and continued to attend, training workshops, professional meetings and field exercises, both in-state and regionally, to remain informed of newly developing issues and to gain expertise in order to better serve the program, the Department , industry stakeholders and the citizens of Maryland. Additionally, field and clerical staff work year-round to ensure that licensing and compliance regulatory statutes are met by industry.

PEST SURVEY

The Cooperative Agricultural Pest Survey (CAPS) and Farm Bill surveys are joint projects between MDA and The United States Department of Agriculture's (USDA) Animal and Plant Health Inspection Service (APHIS) and USDA Plant Protection and Quarantine (PPQ). The USDA recommends specific pests of quarantine export significance as survey priorities and provides funding for these surveys. These cooperative survey programs provide necessary data used to certify Maryland products for export to many countries. These surveys also allow for continued outreach and education.

CAPS and Farm Bill surveys document the presence or absence of exotic pests in Maryland, support PPQ exotic pest survey activities and provide state-specific data for exotic pests in the United States. Early detection of exotic pests before they become established aids in eradication or control efforts, and protects Maryland agriculture, nursery stock, and the environment from potential devastating losses. Federally funded CAPS surveys include: exotic wood borers, soybean commodity, and imported fire ant (*Solenopsis invicta*); the farm bill surveys include: *Phytophthora ramorum* (nursery), exotic pests of honey bees, national honey bee, and grape commodity.

In 2016, MDA deployed and monitored 424 insect traps and collected 3,107 samples from these various traps. Survey and trapping techniques vary, depending on the pest being surveyed for. Some trapping devices include bucket traps, delta traps, Jackson body traps and Lindgren funnel traps. All traps include an attractant; pheromone lure, food bait and host volatiles are some examples. There were seven extensive surveys targeting 52 exotic pests that impact trees, apiaries, fields, vineyards, and nursery stock.

CAPS SURVEYS

Red Imported Fire Ant - The red imported fire ant (IFA), *Solenopsis invicta*, a stinging insect native to South America, is occasionally shipped out of its regulated area in the southern United States. Despite its quarantine, which requires a wide variety of commodities to be treated or certified free of fire ants before being transported, some nursery stock does make its way into Maryland, infested with fire ants. The yearly fire ant survey focuses on tropical plants arriving from the southern United States. In 2016, 129 sites were surveyed and two were found positive for IFA. Sites were issued eradication treatment orders under an MDA Treatment Order; they have completed the treatments, have been resurveyed, and were found free of IFA.

Soybean Commodity – Soybean is the second most valuable crop grown in Maryland, behind corn. For this reason, ensuring that our state is free of known exotic pests of this commodity is of great importance. This survey was conducted from early June through mid-October in five counties known to have high production

rates of soybean, based on harvested acreage in previous years. Four sites with planted soybeans were located within each county, and four yellow bucket traps were placed at each of these sites, for a total of 80 traps. Each of the bucket traps was baited with a pheromone lure known to be an attractant of a potentially destructive exotic moth pest. None of the targeted pests were found to be present in any of the traps throughout the sampling period. Additionally, a visual survey was conducted for the bean plataspid (*Megacopta cribraria*), a true bug of particular concern within Maryland, and a known pest of soybean. A visual survey was conducted at each site on a bi-weekly basis, and resulted in no findings of this pest.

Exotic Wood Boring Beetles - USDA regulations require all imported wood packing material to be treated, so that any insect living in the wood should be killed. However, some packing material is not properly treated, which can cause exotic wood borers to be shipped to the US, and thus be introduced into our environment. Bark beetles can be extremely destructive and in parts of the world have been known to destroy large acreages of forest. In 2016, ten sites that receive goods packed with wood dunnage were surveyed for exotic wood boring bark beetles. During the bi-weekly trap checks, a visual survey for spotted lanternfly (*Lycorma delicatula*), a newly introduced invasive insect from Asia, was also completed. This survey ran from late March until late October. Each site had four black Lindgren funnel traps, and each of these traps had a specific lure used as an attractant to one or more of the exotic beetles being surveyed for. All samples were negative for the species being targeted. Additionally, one of the sites surveyed for EWBB pests also housed a blacklight trap. The blacklight trap is used for long-horned beetle detection, and this trap did not detect any of the high priority pests for which we were surveying.

FARM BILL

Exotic Pests of Honey Bees – Honey bees are important for many reasons, but perhaps the most important is that they are the sole or main pollinator of various crops, which makes them a vital part of Maryland's agriculture. As honey bee populations decline from a variety of issues, it is vital to identify and screen for any possible exotic pests which could exacerbate the situation. Honey bees have many exotic and invasive insect pests. A partial list includes members of the same genus, but different species or subspecies, such as the Asian or Eastern honey bee and its subspecies or strains (*Apis cerana species*), the Africanized honey bees (*Apis mellifera scutellata*), and the Cape honey bees (*Apis mellifera capensis*). Asian giant hornets (*Vespa mandarinia*) and its subspecies, the Japanese giant hornet (*V. m. japonica*), the Asian hornet (*V. velutina*), and other *Vespa* species are also included in this list of exotic pests. Rounding out the list are *Tropilaelaps* species, parasitic mites which feed on the hemolymph (blood) of developing honey bees. Although these pests have not been found in Maryland, it is important to have a plan in place to survey for these pests, and react swiftly and appropriately should they appear, to prevent them from becoming established. Eight sites were selected throughout Maryland. Particular emphasis was put on sites near transportation routes or other high-risk pathways, which are known as possible areas of introduction for foreign species. From late May until mid-October, Lindgren funnels and modified bottle traps were placed at each site and examined bi-weekly for the presence of any of these pests, particularly *Vespa* species. No target species were found throughout the survey. This survey was conducted by the apiary inspection staff.

National Honey Bee Survey – Since 2009, USDA-APHIS, in conjunction with Bee Informed Partnership, has sponsored the National Honey Bee Survey (NHBS), a comprehensive examination of colony health among apiaries across the country. Maryland has been a participant in the NHBS since 2011. At each apiary surveyed, samples of bees are collected from eight different hives; half of these bees are kept alive and half are preserved in ethanol, then both live and preserved samples are sent to a laboratory for further testing. In addition, comb debris is collected from all eight hives, preserved in ethanol, and submitted for further testing. The samples were submitted to the USDA Beltsville and the University of Maryland bee labs. Results from these samples have not yet been received. While samples are being collected, any visible signs of disease or distress are also noted. These visual observations have noted symptoms of parasitic mite syndrome, deformed wing virus, small hive beetle infestation, wax moth and malnutrition. An additional objective of this survey is a colony pesticide analysis to assess both the variety and quantity of

pesticides present in honey bee hives. The apiary inspection staff completed two surveys in the fall of 2016 and plans to survey nine more sites in the spring of 2017.

Grape Commodity Survey – Vineyards and wineries are an expanding industry in the state of Maryland. However, as vineyard acreage increases, the opportunities for invasive pests to be introduced and become established also increase. This survey was conducted from the middle of June until late October in 15 vineyards, covering eight Maryland counties, in order to confirm the absence of invasive moth pests. At each vineyard, two standard bucket traps, one delta sticky trap, and one Jackson body trap were placed. Each trap was baited with a lure attractive to a different moth of concern. These traps were checked on a bi-weekly basis throughout the sampling period, and no target species were discovered. During the bi-weekly trap checks, a visual survey for spotted lanternfly (*Lycorma delicatula*), a newly introduced invasive insect from Asia, was also done, although none were found to be present. An additional part of this survey involved a visual survey of grape vines, looking for a grape phytoplasma and a fungal disease, brown rot. PPWM's plant disease specialist ran both surveys. There were 301 leaf samples taken, all samples were negative for both the grape phytoplasma and brown rot.

***Phytophthora ramorum* Nursery Survey** – The *P. ramorum* survey covered nurseries, garden centers, and landscape sites. Staff visited 13 nurseries and garden centers receiving plant material from Oregon, California, and Canada and inspected 15,032 azalea, camellia, kalmia, pieris, rhododendron, and viburnum plants. Less than 6% of plants examined exhibited symptoms similar to those caused by *P. ramorum*. Eight hundred sixty-eight symptomatic samples of different plant species were collected and tested for *Phytophthora* spp. by ELISA kit, and 14% of samples were found positive. Of these samples, rhododendron had the highest percentage (41%) of *Phytophthora* infection, and azalea and camellia were free from the pathogen. All *Phytophthora* spp. positive samples were submitted to the Cornell University Diagnostic Clinic for *P. ramorum* confirmation. At one nursery site, two *Rhododendrons* 'Cunningham White' and one *Kalmia* 'Olympic Wedding', were found positive for *P. ramorum*. Staff visited suspect homeowner properties as trace forwards from the infected nursery, inspecting, sampling and destroying 78 plants. These samples were tested for *Phytophthora* spp. by ELISA kit. Of these trace forward samples, 20 suspect/symptomatic samples were tested for *P. ramorum*. All of these samples were found negative for *P. ramorum* except one *Rhododendron* 'Cunningham White' plant from one homeowner site. The PP&WM plant disease specialist supervised and conducted this survey.

DIAGNOSTIC LABORATORIES

The Plant Protection and Weed Management Section laboratories provide testing, analyses and identifications to support MDA programs, as well as providing answers to inquiries from outside the department.

Entomology Laboratory: Specimens of the balsam woolly adelgid (*Adelges piceae*), were collected from gouty galls on Fraser fir (*Abies fraseri*), in Garrett County at a Christmas tree farm. This tiny, aphid-like, close relative of the hemlock woolly adelgid (*Adelges tsugae*), was accidentally introduced to North America in the early 1900's and feeds on many true firs (*Abies* spp.). Along with the scores of common and uncommon specimens submitted in 2016 by inspectors, survey personnel, outside agencies, and the public, inquiries about bat bug and bed bugs increased from last year. There was also an increase in the number and kinds of insects sent/photographed as possible conenose assassin bugs, although no *Triatoma* spp. (which do naturally occur in Maryland) were seen.

Brood V of *Magicicada* spp, the periodical cicadas, which emerged only in Garrett County as predicted, caused the usual stir due to the large amount of bad information that circulated. Other specimens of note included: *Myrmecophilus pergandii*, the ant nest cricket, a tiny specialized insect that manages to exist and thrive while surrounded by ants that would kill most intruders, and *Micromalthus debilis* the telephone pole beetle, a tiny wood-boring beetle that has several unique methods of reproduction. Identification of a group of beautifully marked orb-weaving spiders- *Verrucosa arenata*- the arrowhead spider, was a first for

the lab. A rather rare *Merope tuber*, earwig-like scorpionfly and an uncommon *Cuterebra* sp. (warble fly) were collected in survey trap catches. Also considered rare, a wasp that parasitizes lacewing larvae, *Helorus anomalipes*, was recovered in perfect condition from an exotics survey trap.

Plant Pathology Laboratory: The plant pathology diagnostic laboratory provides testing, analysis, and recommendation services for problems caused by biotic pathogens such as fungi, bacteria, viruses, and nematodes, as well as abiotic issues, such as soil and environmental related problems, to support MDA programs. It also provides answers to inquiries from outside the department. MDA's plant disease specialist continued relocation, refitting, and updating of equipment in the laboratory as well as obtaining, collecting, maintaining, and calibrating equipment, plus updating and improving the lab's molecular capabilities. The pathology laboratory received more than 239 samples for diagnosis and management solutions during the 2016 growing season. A majority of the samples came from nursery inspectors, some from pesticide inspectors, landscapers, and homeowners. About 10% of samples received were abiotic-related, such as watering issues, soil management, cold damage, etc., while the other problems were caused by biotic pathogens, such as fungi, bacteria, viruses and nematodes. The majority of samples received involved fungal pathogens. Management strategies based on an integrated pest management approach were recommended for these problems.

The exotic disease, boxwood blight, *Cylindrocladium buxicola* (syn. *Calonectria pseudonaviculata*) remained a high priority. Several samples were received, to confirm absence of *C. buxicola* fungi from multiple nurseries and retail establishments. Seven nurseries, three landscaping companies, and one homeowner site were found positive for boxwood blight this year. The plant disease specialist also visited nurseries to investigate the disease in the field and took extensive samples. Several thousand plants in positive nurseries were destroyed in an effort to eradicate this pathogen. Complete destruction of boxwood plants was recommended to a nursery because of continued presence of the pathogen and a potential danger of spreading it by human activities. A boxwood blight presentation was given at an IPM training organized by the University of Maryland Extension.

In 2016, the plant diagnostic laboratory obtained Farm Bill funding for: a survey of *Phytophthora ramorum* in nursery stocks and a grape commodity survey, visually surveying for grape phytoplasm and brown rot, a fungal disease based on symptoms. Both surveys are a continuation of those completed in 2014 and 2015. All information is found in the Pest Survey section of this report.

Greenhouse Laboratory: Mile-a-minute (MAM) weed plants (*Persicaria perfoliata*) were produced for the integrated pest management and biological control program of insect colonies that require food and plant material. Over 1,650 MAM stem cuttings were taken and 1,632 MAM plants were transplanted and grown in the greenhouse to be used as food for colonies of the stem boring weevil, *Rhinoncomimus latipes*.

Virus testing began on eight varieties of strawberry plants in support of a Memorandum of Understanding with a strawberry breeding company. Testing continues on one additional variety (12 plants) of strawberry brought into the greenhouse in 2015. The poor condition of the original plants from the breeding company required testing of the variety to continue into the 2016 season. Indicator strawberry plants and positive control strawberry plants are maintained throughout the year to support this testing.

Virus indicator (plants that show virus symptoms in the presence of certain viruses) plants of fifteen different genera and species, are seeded and transplanted weekly to be used, when needed, to test plants submitted by the nursery inspection staff for the possible presence of virus diseases.

A variety of support programs takes place at the greenhouse on a yearly basis. These include plants produced to support MDA displays at the Maryland Home and Garden Show as well as the Maryland State Fair. Plants are also grown and maintained in support of the Certified Professional Horticulturist (CPH) exam which is given at MDA headquarters twice a year and proctored by PP&WM staff in cooperation with the Maryland Nursery, Landscape, and Greenhouse Association.

PLANT CERTIFICATION

The **Maryland Ginseng Management Program** protects American ginseng, *Panax quinquefolius*, by monitoring the harvest, and by licensing diggers and dealers of wild, wild-simulated, woods-grown and cultivated ginseng. MDA conducts a management program in cooperation with the U.S. Fish and Wildlife Service (FWS) that follows established protocols and Convention on the International Trade in Endangered Species (CITES) regulations to ensure the continued viability of this potentially threatened native resource and to protect it from over-harvest. Harvested ginseng is certified through this program to enable licensed dealers to sell the wild-harvested plant product in international markets. MDA also works with growers of wild-simulated and woods-grown ginseng to allow them to market and export their highly valued crops. The dried roots are highly prized, especially in China and Korea, for properties that putatively promote good health. High quality native ginseng root continues to be in great demand on the international market, and prices for wild American ginseng generally increase over time. In 2016, however, prices dropped precipitously, rarely exceeding \$500 per pound for dry ginseng. Possible factors contributing to this decrease are mentioned below. During the 2015-2016 season, the program licensed 19 ginseng dealers and 247 ginseng collectors in the state. For the 2016-2017 season, those numbers are 18 and 209, respectively. Licensing for ginseng dealers and collectors starts after July 1st of each year as the season doesn't begin until September 1st. The harvest season ends December 15th and the sales season ends March 31st of the following year. The harvest numbers reported below are for the program season beginning September 1st, 2015 and ending March 31st, 2016.

Over the 2015-2016 harvest and sales season, the certification program inspected, collected size and age data from, weighed, and certified 223.87 pounds of dry wild ginseng root, 4.75 pounds of green (fresh) wild ginseng root, 25 pounds of wild simulated dry ginseng root, 5 pounds of wild simulated green ginseng root, 45 pounds of green woods grown ginseng root and 1.65 pounds of cultivated green ginseng root. (For the purpose of this report, both artificially propagated and wild simulated ginseng harvests are being recorded as artificially propagated. Both artificially propagated and wild simulated ginseng, distinctions recognized by the U.S. Fish and Wildlife Service and CITES, are being grown as alternative agricultural crops in Maryland).

The 2015-2016 harvest and certification numbers are about 14% greater than the numbers for dry wild ginseng and 64% less than those for artificially propagated dry ginseng, as compared to numbers recorded for 2014-2015. The amount of wild green ginseng root certified in the 2015-2016 season represents about a 16% decline compared to 2014-2015, and for wild simulated green root the decrease was dramatic, as there was about a 98% decrease in wild simulated green ginseng root certified in 2015-2016 as compared to 2014-2015. As reported in 2014 and 2015, changes in certification of green (fresh) ginseng likely parallel market demand for and the domestic use of fresh ginseng in the U.S. domestic market and the rise of a relatively novel type of ginseng buyer. When root is sold in a green (fresh) condition, it generally weighs about 3 times the weight of the same root when dried.

As is generally the case, fluctuations in the amount of Maryland ginseng certified and sold likely reflect the demand and pricing on the international market, (and more recently a specialty sector in the domestic market) and do not necessarily directly reflect the status or abundance of wild American ginseng in Maryland. Many ginseng collectors and growers refuse to sell ginseng in a depressed market, preferring to wait until the price increases with a market rebound. As is done each year, harvest and sales data were gathered and reported in accordance with U.S. Fish and Wildlife Service (USF&WS) and CITES requirements. The USF&WS, Office of Management Authority continues to find Maryland's wild ginseng harvest as sustainable and "non-detrimental" to wild American ginseng populations in Maryland.

The amount of ginseng cultivated, including woods-grown and wild-simulated designations in Maryland, and certified by the department continues to keep pace with the amount of wild ginseng harvested and certified in the state. This reflects both continuing interest in ginseng as an alternative crop, and the ability

of Maryland growers to produce high quality ginseng. There were many calls to the Ginseng Management Program coordinator again this year inquiring about growing ginseng on one's own property. With an increased interest in and production of American ginseng in Maryland as an alternative agricultural crop, harvest pressure on wild ginseng may be reduced, which would, in turn, reduce pressure on wild ginseng populations in Maryland.

Responses to annual questionnaires mailed to ginseng collectors and dealers at time of licensing were modified in 2015, and again in 2016 to gather currently pertinent information on program participants concerns and opinions. Participants responses to the survey questions continued to reflect a substantial amount of support for a State sanctioned "Ginseng Growers Permit" mentioned above.

WEED INTEGRATED PEST MANAGEMENT (IPM)

Maryland Department of Agriculture (MDA) Plant Protection and Weed Management Section entomologists and staff continued to work with the Maryland Department of Transportation, State Highway Administration (SHA) to conduct an integrated pest management (IPM) program aimed at providing biological control for certain targeted weed species on SHA right of ways. In 2016, continuing a program that dates back nearly 30 years, weed IPM research and demonstration activities were conducted on SHA right of ways, using funding from SHA and the U.S. Department of Agriculture, Animal and Plant Health Inspection Service, Plant Protection and Quarantine (USDA /APHIS/PPQ). MDA weed management and biological control research and demonstration projects have been conducted over each of the past 18 years under current program management, and have involved cooperation with the Maryland State Highway Administration, the Howard County Department of Recreation and Parks, the Maryland National Capitol Park and Planning Commission, the Maryland Department of Natural Resources, the U.S. Department of Agriculture (both the Agricultural Research Service (ARS) and APHIS), the U.S. Forest Service, The U.S Fish and Wildlife Service, the U.S. Geological Survey and, in certain cases, private Maryland businesses and landowners.

Over the past 18 years, research has focused on one or more of the following: the evaluation and release of organisms for biocontrol of thistles, purple loosestrife, and mile-a-minute weed, testing herbicide formulation efficacy for thistle (*Cirsium* and *Carduus* spp.) and Japanese stiltgrass (*Microstegium vimineum*) management, testing the effects of the rose rosette disease on multiflora rose (*Rosa multiflora*) and other rose species and cultivars, and evaluating the use of competitive vegetation (including native grasses and forbs) in an effort to provide environmentally sound and cost-effective methods for suppression of noxious thistle species in Maryland.

Currently MDA is focused on biological control of mile-a-minute weed, *Persicaria perfoliata*, and purple loosestrife, *Lythrum salicaria*, using very specific insect biological control agents. In 2016-2017, MDA is finishing the second year of a two year agreement, and beginning in July 2017, entering into a new two year agreement, with the Landscape Operations Division of the Maryland State Highway Administration to administer a program to continue biological control driven suppression of mile-a-minute weed, and to reinitiate a program aimed at suppression of purple loosestrife on state highway right of ways. These programs include lab, greenhouse rearing, and field release and monitoring of the weevil, *Rhinoncomimus latipes*, and field release and monitoring of *Galerucella* (*Neogalerucella*) leaf beetles. Funding for rearing, release and monitoring of the weevil and purchase, release and monitoring of the leaf beetle is provided in part by SHA. An additional source of funds for this project comes from a cooperative agreement with USDA APHIS PPQ that has been renewed on an annual basis.

In 2016, a long term MDA staff member with over 16 years experience, including many years working with the MDA Weed Biological Control Program retired. The program was able to hire an entomologist part time in June of 2016 to work with the retiring staff member, and to take over and continue the lab-rearing and field release and monitoring components of the program. The program also involves greenhouse growing of the host plant, *Persicaria perfoliata* (mile-a-minute weed). The host plants are grown in the MDA

greenhouse in Annapolis, MD. In 2016, nearly 1,682 *Persicaria perfoliata* plants were grown. At the MDA Plant Protection and Weed Management Section Insect Rearing Lab, MDA staff reared 4,433 weevils in 2016. Release numbers were supplemented by 4,000 additional weevils acquired from the New Jersey Department of Agriculture, Phillip Alampi Beneficial Insects Laboratory. In 2016, 7,615 adult weevils were released at a total of 14 sites statewide, 6 of which were new locations.

Rhinoncomimus latipes has now been released by MDA staff and is established in at least portions of the following Maryland counties: Allegany, Anne Arundel, Baltimore, Carroll, Cecil, Charles, Frederick, Garrett, Harford, Howard, Montgomery, Prince George's, Queen Anne's, Somerset, Washington, and Wicomico.

NOXIOUS WEED MANAGEMENT

The purpose of this program is the control and eradication of designated noxious weeds in order to reduce their economic and aesthetic impact on farmers and landowners. Noxious weeds (Johnsongrass, shattercane, thistles) cause losses in excess of \$25 million annually to Maryland agriculture due to reduced yields and quality of crops and forages and increased control costs. Increased expenses are also incurred for roadside and non-crop property management.

The Maryland General Assembly enacted the first Nuisance Weed Law on Johnsongrass in 1969. In 1987, it was rewritten and renamed the Noxious Weed Law (Title 9, Subtitle 4, Agriculture Article, Annotated Code of Maryland). The Noxious Weed Law requires that a landowner, or a person who possesses and manages land, eradicate or control the noxious weeds on that land by using practices prescribed by the department, including mowing, cultivating, or treating with an approved herbicide. The law prohibits the importation of these weeds into or within the state and it also prohibits transportation of viable noxious weed seed and rhizomes in seed, topsoil, mulch, nursery stock, on farm machinery, or any other method.

The Noxious Weed Law has a provision that the Maryland Department of Agriculture may enter into a cooperative agreement with a county or political subdivision to provide management, technical assistance, training, and education for implementing a noxious weed control program. The county weed control programs are supervised by state personnel as specified by these cooperative agreements.

In the 16 participating counties, a weed control advisory committee with representatives from farming organizations, governmental agencies, local farmers, and property owners, provides guidance for the noxious weed control program in that county. A county weed control coordinator is employed to determine noxious weed infestations within the county, inspect uncontrolled infestations, provide information on appropriate control practices, and initiate control agreements with landowners to implement control. In many counties, the weed control coordinator also performs herbicide treatments for a fee on private lands, Maryland State Highway Administration and county rights-of-way, as well as parks and other public lands. Spray revenues support program activities in the county. Statewide, spray revenue for all the county programs was in excess of a million dollars.

In 2016, noxious weed advisory notices were sent to 318 managers of property infested with noxious weeds. Generally, these notices were effective in obtaining compliance. When notifications are unsuccessful the Department may take legal action.

The weed control program also responds to citizens' requests for technical assistance in controlling invasive, difficult to control, persistent weeds such as *Phragmites*, multiflora rose, kudzu and Callery pear trees. The weed control program also monitors giant hogweed, a federal noxious weed, that was first detected in Maryland in 2003. It exists on sites in Baltimore, Harford and Garrett counties. In 2016, six sites were treated, two in Baltimore county, two in Garrett county and two in Harford county. County weed control programs provided the spray crews and materials to treat the giant hogweed infestations. Eradication is a multi-year effort and the weed control program will treat infestations at the landowners' expense.

The weed control staff partnered with the Maryland Department of Natural Resources (DNR) for the sixteenth year in providing a *Phragmites* management program. Upon request from landowners or

managers, the weed control program staff supplies technical and spraying assistance for control. The DNR provided 100 percent of the herbicides applied in the nine eastern shore counties for spraying *Phragmites*. Spray program revenues for *Phragmites* control totaled more than \$100,000 for treating approximately 88 acres at 121 locations in 17 counties.

In all counties, due to the likelihood of weed problems, the noxious weed control program's technical and spraying services are provided to landowners participating in the Conservation Reserve Program (CRP), Conservation Reserve Enhancement Program (CREP), as well as assisting with wildlife and pollinator plantings. On land in these programs, services were provided for noxious weed control.

OTHER ACTIVITIES

During 2016, the Plant Protection & Weed Management staff continued to administer basic and specialist examinations for the Maryland Certified Professional Horticultural program. The program was developed by the Maryland Nursery, Landscape, and Greenhouse Association (MNLGA) to raise and improve the professional standards of Maryland's nursery, landscape, and garden center industry by giving special recognition to individuals who have shown a high level of attainment, and allowing them to be recognized by the gardening public. The program has also expanded to high school programs that specialize in horticultural curriculum, approximately 70 Maryland high school students participated in the exam in 2016. The Plant Protection and Weed Management program was busy earlier in the year, preparing and hosting the Eastern Plant Board meeting which was held April 4-7, 2016 in St. Michaels, MD. The meeting participants include members of plant pest regulatory agencies in twelve states throughout the Northeast and Mid-Atlantic region, along with USDA program staff. Program staff was instrumental in making a very successful meeting and enjoyed attending, learning new information, introduction to new people, and reacquaintance with professional colleagues from other states and agencies.

Plant Protection and Weed Management Summary of Activities

	CY2014	CY2015	CY2016
Beekeepers Registered	1,838	1,895	2,017
Honey bee Colonies Registered	14,412	14,594	15,550
Honey bee Colonies Inspected	4,515	2,224	2,095
Ginseng Dealers Registered	15	19	18
Ginseng Collectors Licensed	257	247	209
Nurseries Certified	309	315	311
Plant Dealers and Brokers Licensed	1349	1315	1434
Phytosanitary Certificates Issued	466	247	326
Plant Pest Surveys # target pests	41	52	52
Plant Pest Surveys # samples processed	2,656	2,906	3,107
Target Pests Detected	2	9	6
Number of noxious weed advisory notices issued	303	361	318