

# 2007 PENNSYLVANIA ANNUAL PEST CONDITIONS REPORT



Department of Conservation and Natural Resources, Bureau of Forestry, Division of Forest Pest Management

## WEATHER CONDITIONS

Weather conditions for Pennsylvania are reported weekly from April through November by the United States Department of Agriculture – National Agricultural Statistics Service ([www.nass.usda.gov](http://www.nass.usda.gov)). In 2007, the Commonwealth experienced warmer and drier than normal conditions throughout the growth period (April through September). Generally, the latter half of the growing season was influenced by drought conditions. The lack of rainfall was clearly evident throughout the upper elevations of the Commonwealth's forests. The lack of rainfall and higher than normal temperatures experienced during 2007 are expected to influence insect and disease conditions, and increase mortality in some areas of the Commonwealth's forests.

## INSECT AND DISEASE ACTIVITIES

Pennsylvania annually surveys approximately 17 million acres of public and private forestlands to determine the impact of forest pests throughout the Commonwealth. Surveys focus on current pest threats, pests that have historically caused damage to Pennsylvania's forest resources, and potential invasive threats. Some surveys are done in cooperation with other state or federal agencies. Cooperative surveys usually target invasive species and are reported as "presence/not present" surveys. Damage for certain pests is compiled using a number of sources including aerial surveillance, forest insect and disease reports (FID), and special projects. FID reports are filed primarily by forest district personnel and can be specific for a given location or can be filed as a district wide report. There are 20 forest districts in Pennsylvania containing from one to eight counties each. Aerial surveillance reports generally observable damage to trees, while FID reports and special projects comment on tree damage and pest population levels. In addition to surveillance, Pennsylvania has control programs established for certain key pests.

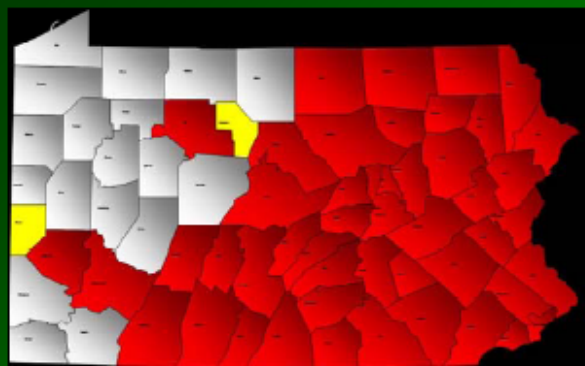
## HEMLOCK WOOLLY ADELGID *Adelges tsugae* (HWA)

This invasive pest of hemlock was first detected in southeastern Pennsylvania in the late 1960s. Since then, HWA has been slowly spreading across the state, causing extensive damage when it infests new areas. As of 2006, it was found in 47 Pennsylvania counties. In 2007, HWA was detected for the first time in Beaver and Cameron counties, bringing the total number of infested counties up to 49. A total of 6,183 acres were reported damaged by HWA in 2007.

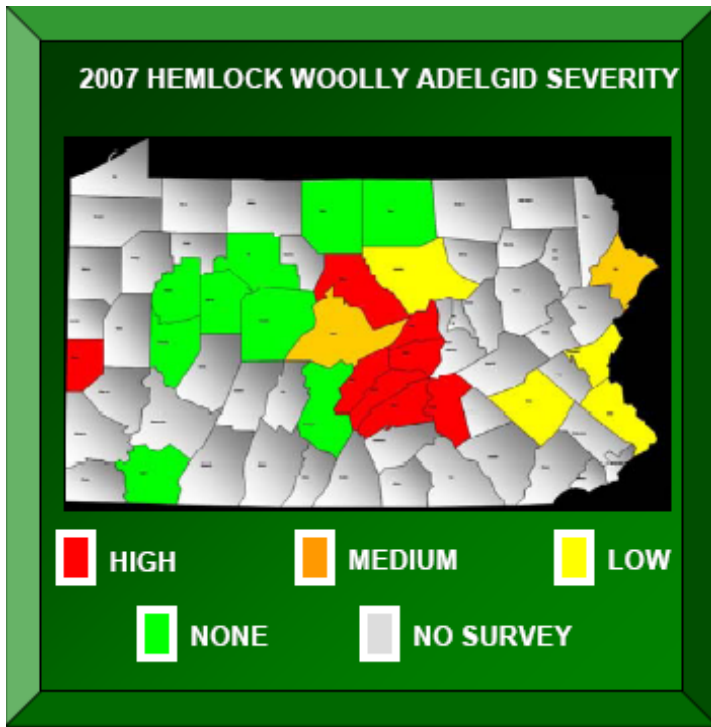
In 2007, Pennsylvania continued efforts to control HWA by continuing already established surveillance, biological control, and chemical suppression programs. The General Hemlock Survey (GHS) program was established in 2004 and provides data on HWA, elongate hemlock scale, other stressors, crown vigor and tree growth. This program continued in 2007, with data collected at 1,414 survey points. This data is combined with FID report data in a statewide map representing HWA severity at the county level.

This invasive pest of hemlock was first detected in

## 2007 HEMLOCK WOOLLY ADELGID DISTRIBUTION



1967-2006 2007 NOT FOUND



The Department of Conservation and Natural Resources (DCNR) continued our efforts to establish predatory beetles for biocontrol of HWA in 2007. We released 238,186 *Sasajiscymnus tsugae* beetles at 59 sites from 1999 to 2005. Although we are not continuing to release this predator, evaluations of previous release sites yielded the recovery of 26 adult *Sasajiscymnus tsugae* in 2007. A total of 310 adults and 54 larvae have been recovered since releases began.

We continued to release the Derodontidae beetle, *Laricobius nigrinus*, in 2007. A total of 2,821 *Laricobius nigrinus* have been released at seven sites since 2003. Evaluations of previous release sites yielded the recovery of 11 adult *Laricobius nigrinus* in 2006 and 34 recovered so far in 2007, for a total of 45 adults recovered since the program began. Additional releases and evaluations are planned for 2008. We also continued releases of a Coccinellidae beetle from China, *Scymnus sinuanodulus*, in 2007. A total of 2,200 of these beetles were released at two sites in 2007, bringing the total number released to 5,667 at five sites since 2005. No recoveries of this beetle were made in 2007 from the previous year's release site. No additional releases are planned for *Scymnus*

*sinuanodulus* in 2008. PA DCNR sends HWA-infested foliage to the Phillip Alampi Lab (NJDA) each week for rearing HWA predators. NJDA sends us beetles for release against HWA and EHS in return. A total of 2,910 pounds of foliage have been sent to NJDA between November 2006 and November 2007.

Several State Parks and State Forest Districts have recently conducted soil injections of Imidacloprid to manage HWA in high value hemlock sites. The Division of Forest Pest Management has been assisting the managers of these lands with expertise on site selection, application methodology and post-treatment evaluation. This project enables the Division of Forest Pest Management to offer reimbursement for imidacloprid (Merit) used to control HWA for a limited number of sites on non-federal public forests through a federal suppression grant. From August through November of 2006, a total of sixteen sites in five Counties were soil injected with Merit at the rate of .025 oz a.i./5.0 oz water at 1.6 oz of solution per inch of tree DBH using a Kioritz injector. Treatments occurred in the central part of the state in Centre, Huntingdon, Mifflin, Perry, and Union counties.

| <b><i>FY 2007 Merit Soil Injection Treatments in Pennsylvania</i></b> |                      |                   |
|---|----------------------|-------------------|
| <b>Land Type</b>  | <b>Treated Trees</b> | <b>Inches DBH</b> |
| <b>State Forest</b>   | <b>4,331</b>         | <b>25,222</b>     |
| <b>State Park</b>   | <b>1,078</b>         | <b>17,077</b>     |
| <b>Total</b>  | <b>5,409</b>         | <b>42,299</b>     |

**Hemlock Woolly Adelgid Evaluations of Chemical Suppression:** Evaluations of the nine sites treated with imidacloprid (soil or stem injections) during the 2005 suppression program continued in winter 2006-07. Four branches from ten treated and 10 control trees were reevaluated, when possible, in winter 2006-07. The number of terminals with HWA, new growth, and dead tips were recorded. Transparency, live crown ratio (LCR), crown vigor and DBH were also recorded for all study trees. In addition to the above variables, the total number of terminals was recorded for marked branches. Hemlocks treated with imidacloprid in 2005 are showing reduced HWA infestation, increased new growth, and fewer dead tips relative to controls. No additional post-treatment data will be collected for these evaluation sites, as branches marked with cable ties were removed in 2007.

**Post-treatment data on hemlocks treated with imidacloprid (Evaluated 11/14/06 - 02/12/2007)**

| <b>Hemlocks</b>  | <b>HWA Infested Terminals</b> | <b>Total Terminals</b> | <b>Terminals With New Growth</b> | <b>Terminals With Dead Tips</b> |
|------------------|-------------------------------|------------------------|----------------------------------|---------------------------------|
| <b>Treatment</b> | <b>3.78%</b>                  | <b>10,564</b>          | <b>34.86%</b>                    | <b>24.39%</b>                   |
| <b>Control</b>   | <b>17.52%</b>                 | <b>9,809</b>           | <b>18.87%</b>                    | <b>27.00%</b>                   |

| Hemlocks  | Transparency | Live Crown Ratio | Crown Vigor |               |                  |                |
|-----------|--------------|------------------|-------------|---------------|------------------|----------------|
|           |              |                  | Healthy     | Light Decline | Moderate Decline | Severe Decline |
| Treatment | 54.0%        | 93.8%            | 10.0%       | 42.2%         | 40.0%            | 7.8%           |
| Control   | 55.9%        | 94.7%            | 10.0%       | 33.7%         | 44.9%            | 11.2%          |

### ELONGATE HEMLOCK SCALE *Fiorinia externa* (EHS)

The elongate hemlock scale is a non-native, fluid-feeding insect first found in New York in 1908. It is now found in several Eastern states and several eastern Pennsylvania counties. This pest attacks several native conifer species, but is especially destructive to hemlock, spruce, and fir trees. EHS is one of the pests recorded in the general hemlock survey, and was also reported through FID reports and aerial surveillance in 2007. EHS damaged 241 acres this year, and was detected for the first time in Susquehanna and Wyoming counties. Data from the GHS, FID reports, and aerial surveillance are combined in a statewide map representing EHS severity by county.

A biological control program for EHS was established in 2003. The program relies on releases of a predatory Nitidulidae beetle, *Cybocephalus nipponicus*, which is native to Korea. A total of 3,250 *C. nipponicus* were released at 4 sites in Pennsylvania in 2007. This brings the total number of beetles released to 121,250 at 46 sites since 2003. Evaluations of previous release sites yielded the recovery of 539 adult *Cybocephalus nipponicus* beetles in 2007.

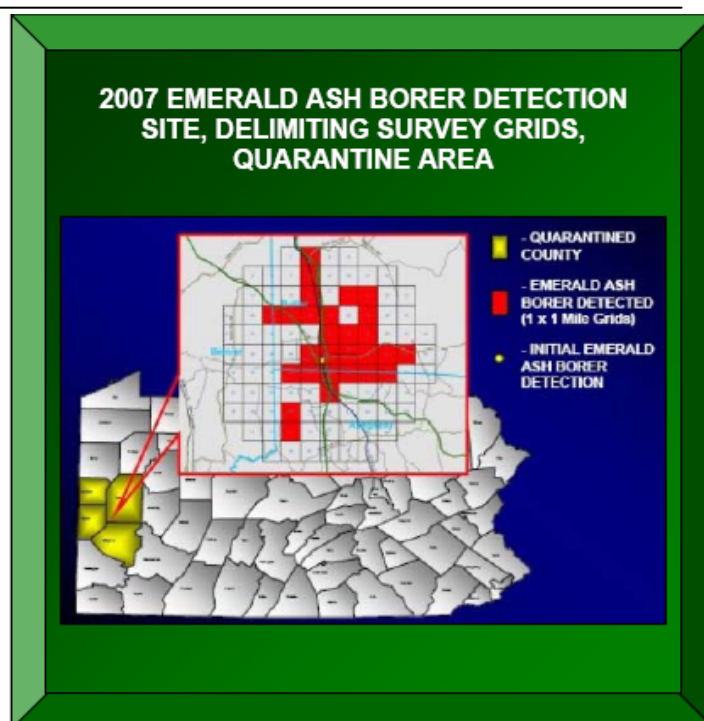
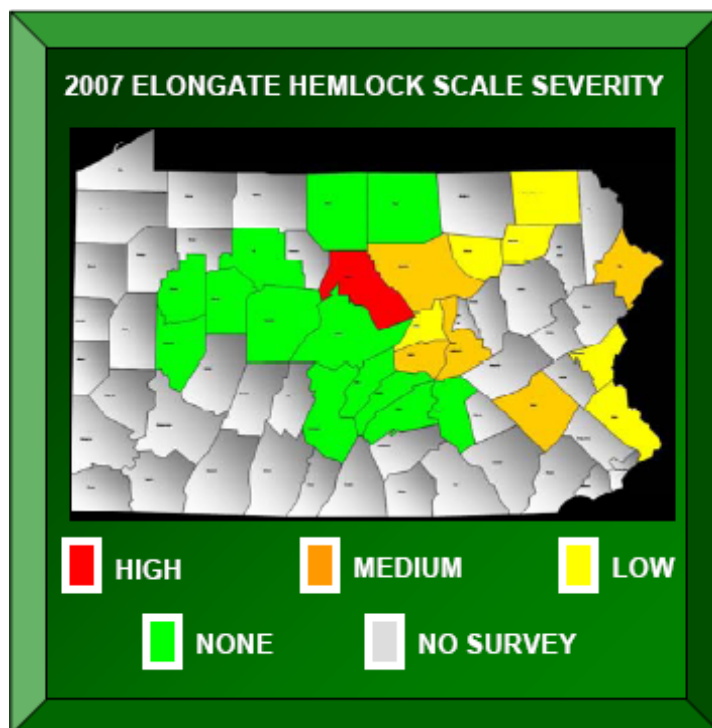
Over 1,397 adults have been recovered since the *C. nipponicus* release program began, indicating that this predator is establishing very well on elongate hemlock scale. We plan to transfer *C. nipponicus* beetles from one field site to another next year, in addition to finishing up evaluations from previous years.

### EMERALD ASH BORER *Agrilus planipennis* (EAB)

Emerald ash borer is a buprestid beetle native to Asia (China, Japan, Korea, Mongolia, the Russian Far East) that attacks ash trees. Since its detection in Michigan in 2002, it is blamed for the mortality of over 25 million ash trees. This insect was detected in Pennsylvania for the first time in 2007. It has also been found in Michigan, Ohio, Indiana, Illinois, Maryland, West Virginia, and Ontario, Canada.

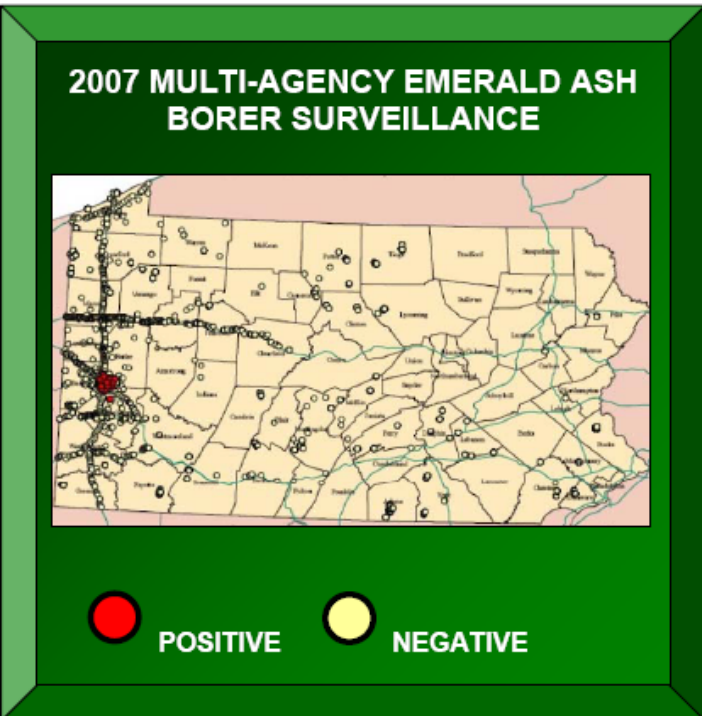
Two emerald ash borer adults were collected by APHIS surveyors north of Pittsburgh in Butler County, Cranberry Township on June 22, 2007. Positive determination of EAB was confirmed on June 26, prompting emergency delineation surveys in the western part of the state between 06/29 and 07/06/07. A 1x1 mile grid survey was established that extended to five miles from the initial detection point. Two person survey teams from APHIS, PA Department of Agriculture (PDA), PA DCNR, USFS, PSU Extension, and local arborists were assigned grids for EAB inspection. Approximately 30 of the 98, 1x1 mile grids turned out to be

The elongate hemlock scale is a non-native,



positive for EAB, as confirmed by the presence of adults that were collected by hand or sweep netting, larvae extracted from galleries, or the presence of S-shaped galleries and D shaped exit holes in ash trees located within a grid (Figure 1). Six townships in Butler (Cranberry, Jackson, and Adams) and Allegheny County (McCandless, Pine, Marshall) have been confirmed to be positive for EAB to date, as a result of initial grid surveys and landowner calls that have come into the EAB hotline since the initial detection.

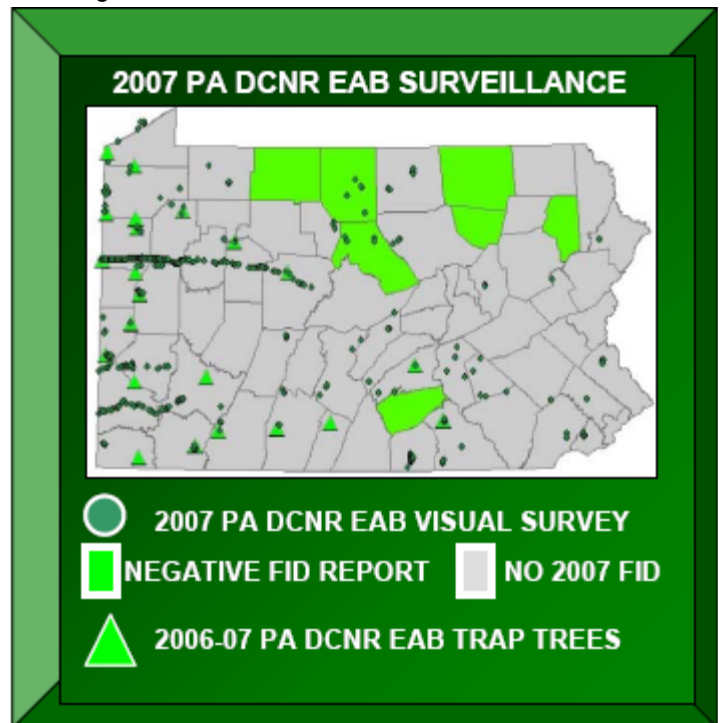
PDA imposed two quarantines as a result of the detection of EAB and other invasive, wood-inhabiting insects threatening PA Forest Health. The first is PA's EAB quarantine, which restricts movement from the quarantined area (Butler, Allegheny, Lawrence, and Beaver County) of ash nursery stock, green lumber and any other ash material, including logs, stumps, roots and branches. Due to the difficulty in distinguishing between species, all hardwood chips, bark and firewood are quarantined. The second is an out-of-state firewood ban, which prohibits the movement of firewood of all types and species into the Commonwealth of Pennsylvania. Firewood includes all wood, processed or unprocessed, coniferous or hardwood, meant for use in a campfire or other outdoor or indoor fire.



Once initial visual surveys were completed, additional visual surveys along major interstate highways were allocated to participating agencies. PA DCNR also completed visual surveys in state parks and other public land areas around the state. These surveys conducted in July and August yielded no additional EAB positives in PA. PA DCNR also established 5 new trap tree locations in May 2007 (Gifford Pinchot State Park, Shawnee State Park, Oil Creek State Park, Dague White Ash Seed Orchard, Clear Creek State

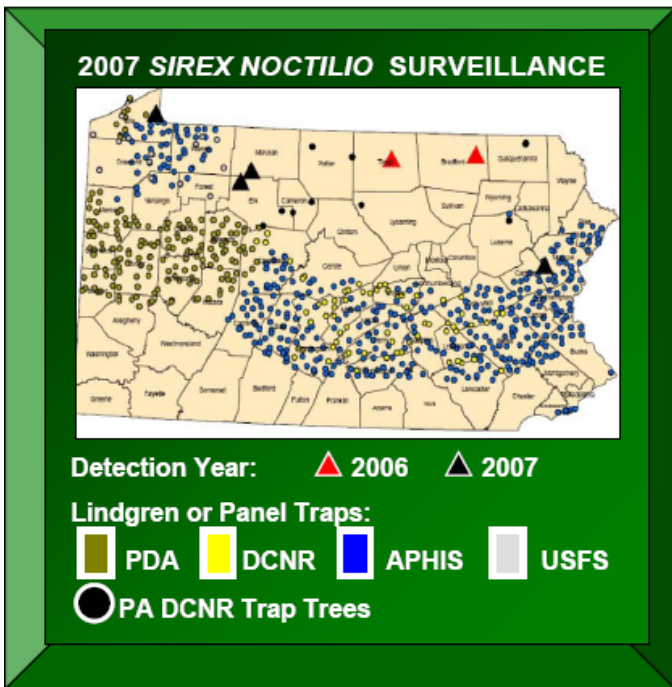
Park) (Figure 2). In November 2007, we peeled and inspected one of the trap trees established this season at each site, along with 16 trees that were girdled at previous sites in 2006. All trap trees were negative for EAB. Thanks to Steve Bullington, USDA-APHIS for the multi-agency EAB visual survey map and Sven-Erik Spichiger PDA for the EAB detection map displayed in this report.

Seed was collected for the Natural Resources Conservation Service and Penn Nursery from 3 pumpkin ash (*Fraxinus profunda*) trees at Asbury Woods (N 42.05794, W -80.18078 and N 42.05794, W-80.18097) and Erie Bluffs State Park (N 42.00719, W -80.40042) in Erie County, PA on September 10 and 11, 2007. *F. profunda* is a proposed endangered species in PA whose distribution is limited to Erie and Crawford Counties. At least 1000 seeds were collected from each tree and sent to the Natural Resource Conservation Service and Penn Nursery for preservation and use in resistance and tolerance research. A percentage of the seed was somewhat immature (green or yellow as opposed to brown), but logistics necessitated that we collect the material when resources, namely our tree climber, were available. PA DCNR Forest Pest Management and the BOF-Ecological Services Section plan to increase seed collection efforts in 2008, pending funding availability.



## SIREX WOODWASP *Sirex noctilio*

Native to Europe and Northern Africa, *Sirex noctilio* was first detected in PA in Tioga and Bradford counties in 2006. After the initial detection at Hills Creek State Park in Tioga County, six paired red pines were felled and inspected in March 2007. Although felled trees were not attacked by *Sirex noctilio*, additional small symptomatic pines that were felled contained *Sirex noctilio* larvae which were collected and confirmed by Nathan Schiff using DNA analysis. In addition, APHIS personnel reared out several *Sirex noctilio* adults from symptomatic logs they collected from the site at their Syracuse, NY laboratory.



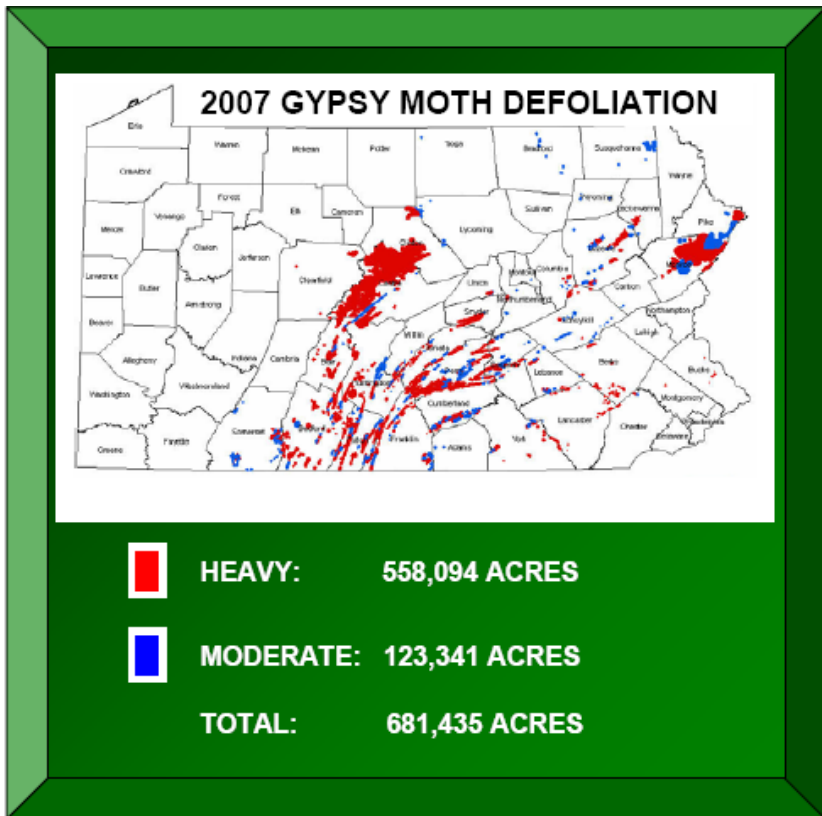
In May and June 2007, PA DCNR placed 67 Lindgren traps baited with alpha and beta pinene in grids located within a 50-100 mile band from the nearest positive detection site in 2007. PDA and APHIS also placed traps in grids within this zone. The USFS placed Lindgren traps near girdled trees in additional counties in NW PA. As a result of these efforts, the USFS and APHIS have obtained *Sirex noctilio* in Erie, Elk, McKean, and Monroe counties in 2007. PA DCNR has obtained small numbers of native siricids, including *Urocerus cressoni*, *U. albicornis*, *Tremex columba*, and *Sirex nigricornis* in our Lindgren traps, which were taken down during the week of October 15. PA DCNR forest technicians checked an additional 73 traps for PDA in order to keep traps out during the peak siricid flight period. PA DCNR traps are being screened for *S. noctilio* at our Middletown laboratory. Any siricids in the genus, *Sirex*, will be sent to Dr. Rick Hoebeke for verification. No PA DCNR traps are suspected to contain *S. noctilio*. In addition to Lindgren trapping, PA DCNR also girdled pairs of pine trees at nine locations within the 0-50 mile zone from the nearest positive detection. These trees are being split and inspected for siricid larvae in December 2007. Map provided by Steve Bullington, USDA-APHIS.

## GYPSY MOTH *Lymantria dispar*

Gypsy moth defoliation increased in 2007. A total of 681,435 acres of

defoliation were reported through aerial and ground surveys. *Entomophaga maimaiga* infection of gypsy moth was generally low in most infested areas due to the dry spring conditions. Several areas of the Commonwealth reported extremely high gypsy moth infestations. The extensive defoliation that resulted from these high gypsy moth populations is believed to be the result, in part, of high larval migration, including blow-in, and extensive larval feeding resulting from favorable host tree condition. Host trees were generally stressed as a result of drought in most regions of the State.

The operational period for the 2007 gypsy moth suppression program was May 7 through May 29. Suppression activities were conducted in twenty counties: Bedford, Blair Centre, Clinton, Cumberland, Dauphin, Franklin, Fulton, Huntingdon, Juniata, Lackawanna, Lebanon, Luzerne, Mifflin, Monroe, Perry, Pike, Somerset, Union, and Wayne. A total of 64,515 acres in 324 spray blocks were treated. Products applied were Foray 48F (62,947 acres, 320 blocks) applied at 24 BIU, and Foray 76DF (749 acres, 1 block) applied at 24 BIU per acre (0.5 gallon per acre), and Gypchek applied on 819 acres (3 blocks) at 1 gallon per acre. Seventy-five percent of spray blocks treated with *Bacillus thuringiensis* met the operational goal of sustaining less than thirty percent defoliation of favored host trees (100 percent in treated blocks with third-year infestation). Gypchek block had a sixty-five percent rate of success, and the Foray 76DF block was 100 percent successful.



## AMERICAN CHESTNUT SEEDLING STUDY

The study was initiated in 2000 to evaluate Pennsylvania sources of American chestnut provenience, evaluations are continuing. Measurements for 2007 have not been taken in time to incorporate performance and survival information into this report. Evidence of seed production has been observed but only in a few of the larger surviving trees. Chestnut blight remains prevalent in each of the four

plantings, blight affected trees that survive are producing stem sprouts at the root collar; however many of the infected trees remain viable but are not in good condition.

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## ANTHRACNOSE *Discula sp.*

Anthracnose was not evident throughout the 2007 growth period due to prolonged periods of dry weather conditions. However, 34 acres of damage were reported statewide on maples and sycamores in Potter, McKean, Tioga and Wayne County. Negative reports were filed for anthracnose in Clinton, Sullivan, and Bradford County.

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## ASIAN LONGHORNED BEETLE *Anoplophora glabripennis (ALB)*

ALB continues to be reported through FID reports and when suspect reports from the public are received. We received ten survey reports for ALB in 2007, all of which were negative. Areas surveyed included parts of Bradford, Clinton, Lebanon, McKean, Potter, Schuylkill, Sullivan, and York Counties.

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## BEECH BARK DISEASE

Thirty-four acres of moderate beech bark disease damage, including cankers and dieback, were reported from Potter, McKean, Wayne and Monroe counties in 2007 FID surveys. Negative reports for beech scale were filed in Pike and Fayette counties.

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## EASTERN TENT CATERPILLAR *Malacosoma americanum*

Extensive eastern tent caterpillar damage was evident in several areas of the state in 2007, with 576 acres of damage reported on black cherry in Bradford, Centre, Potter, McKean, Huntingdon and Sullivan counties this spring. Reports were generated from aerial surveys and FID reports.

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## ELM YELLOWS *Phytoplasma ulmi*

Damage caused by elm yellows was widespread in PA in 2007, with nineteen acres of heavy damage to elms reported in Cambria, Centre, Clearfield, Dauphin, Juniata, and Potter counties in July.

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## FABRELLA NEEDLE CAST *Fabrella tsugae*

Ongoing survey for *Fabrella* needle cast on hemlock has progressed slowly. Signs of sporulation by this fungus are a key diagnostic feature but extensive casting of needles prior to sporulation, or failure to retain needles into the early or late summer with sporulation has made diagnosis more difficult. Nevertheless, hemlocks with symptoms associated with this disease are visible, in particular the city of Kane, Pennsylvania in McKean county has an extensive population of hemlocks in Founders City Park that appear to be exhibiting significant needle casting and crown dieback. The symptoms may be associated with *Fabrella* needle cast and other stress factors. *Fabrella* was also confirmed in Cameron, Fayette, Luzerne, Pike, Potter, Susquehanna, and Tioga counties, with 34 acres of damage reported from FID ground surveys.

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## FALL WEBWORM *Hyphantria cunea*

This insect was widely reported in Chester, Pike, Wayne and Monroe counties in late summer and fall 2007, with 30 acres of damage reported on black cherry and walnut.

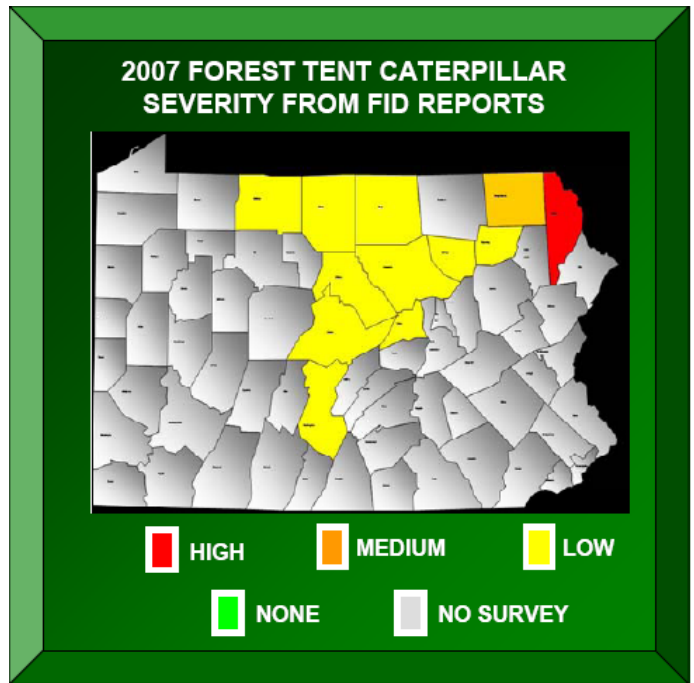
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## FOREST TENT CATERPILLAR *Malacosoma disstria*

Forest tent caterpillar continued to play a major role in impacting PA forest health in 2007, with 9,246 acres of defoliation reported from the ground, and 38,547 acres reported in aerial surveys. Damage was reported to sugar maple, red oak and various northern hardwoods in Centre, Clinton, Huntingdon, Lycoming, Potter, McKean, Susquehanna, Tioga, and Wayne Counties.

The impact of the 2006 forest tent caterpillar outbreak in Wayne County on sugar maple followed by sugar maple anthracnose during the refoliation phase has resulted in significant areas of sugar maple mortality or crown dieback. However, the parasitoid, *Sarcophaga aldrichi*, was also noticeably prevalent in many previously defoliated areas. We expect the forest tent caterpillar outbreak to decline in Wayne Co, PA in 2008, while it may be building in other areas of the state.

In 2006 there was an extensive flowering event of sugar maple across the Northern Region. In Wayne County the flower crop in FTC defoliated stands was eliminated, consequently many defoliated stands had little or no seed deposition and no seedling cohort established for the 2007 growth period. Stands where FTC defoliation did not develop had an excellent seed crop of viable seed deposited that resulted in a plentiful supply of sugar maple seedling cohort for 2007 in non-defoliated stands. Many landowners decided to have sugar maple stands sprayed to reduce or prevent additional FTC defoliation using *Bacillus thuringiensis* or synthetic chemical sprays applied by private aerial applicators. During the 2007 outbreak period in May and early June approximately 60,000 to 70,000 acres of sugar maple stands were aerially treated by private vendors in Wayne County to suppress forest tent caterpillar on private woodlands.



**GEOMETRID DEFOLIATORS**  
Lepidoptera: Geometridae

920 acres of damage due to elm spanworm, Bruce spanworm, fall cankerworm and half-wing geometer were reported on sugar maple, basswood, and other northern hardwoods in 2007. Damage was reported through FID reports and aerial surveys. Counties where damage from geometrids was observed include Potter, McKean, Berks, Lackawanna and Montour. Damage was light in most areas. Negative reports were received from Bradford, Clinton, and Sullivan Counties.

**SAWFLIES ON OAK**  
Hymenoptera

Several species of hymenopteran oak sawflies (Pergidae: *Acordulecera* sp., *Pamphilius phyllisae*) were reported as lightly to moderately damaging red oak across 1,003 acres in Forest, Lycoming, Potter and Venango counties. Negative FID reports were submitted for Bradford, Centre, Huntingdon, and Sullivan counties.

**OAK WILT**  
*Ceratocystis fagacearum*

Symptoms of oak wilt in white oak and red oak were noted at five sites in Venango and Potter County. Negative reports were filed for oak wilt in Bradford, Centre, Huntingdon, and Sullivan counties.

**ORANGE-STRIPED OAKWORM**  
*Anisota senatoria*

We had two reports of heavy, late season damage to 1,050 acres of red oaks in Juniata and Perry County in 2007. Many of the same areas suffered gypsy moth defoliation earlier in the season, so increased oak mortality is expected in these areas.

**TORTRICID DEFOLIATORS**  
Lepidoptera: Tortricidae

Approximately 2,000 acres of damage were observed in aerial surveys in 2007 that was attributable to oak leafroller and oak leaftier. Counties reporting light to moderate defoliation include: Centre, Clinton, Mifflin, Potter, Somerset, and Union.

## PEAR THRIPS *Taeniothrips inconsequens*

Pear thrips lightly damaged 122 acres of sugar maple in Potter, McKean, Clinton and Tioga counties this year. This pest may become increasingly significant in the future if populations build in the same areas where forest tent caterpillar outbreaks occur.

## SUDDEN OAK DEATH *Phytophthora ramorum* (SOD)

The *Phytophthora ramorum* stream baiting program has progressed into a second year. In 2006 we baited 10 streams during the months of May, June, July, August, September, and October. Three streams were sampled in Pike County (the Pocono Region), three streams in the South Central Region of PA, and four streams in the North Central Region.

During the 2006 pilot study we did not recover any *Phytophthora ramorum*, and molecular diagnostic tests for *P. ramorum* detection were all negative. In 2007 the stream baiting program was reduced to four streams. Two streams were located in the Northwestern Region (Clear Creek State Forest and the Moshannon State Forest, and two streams in the Southeast Region (Radnor Township). The latter two streams (Darby Creek and Ithan Creek) are located within the drainage area of a *P. ramorum* introduction associated with a small retail nursery in Delaware County. Bait samples have been processed for May, June, and July with no indication of *P. ramorum* being present in either cultured plant material or through molecular diagnostic testing. Presently the August samples are being processed. Samples from the September and October sampling period remain to be collected and processed. A debriefing meeting will be held in Portland, Oregon around the middle of November, 2007 to discuss program accomplishments and to plan for future survey activities.

## RED OAK SEEDLING PROVENANCE STUDY

In 2005 a study was initiated on the Delaware State Forest in Pike County to evaluate *Quercus rubra* seedlings of different nursery grades for survival, growth, and resilience to insect and disease stressors. Seedlings grown from sixteen families of *Quercus rubra*, located at the United States Military Academy Reservation at West Point, N.Y., were separated into cull, fair, and good grades. Seedling grades are based on root collar caliper, stem height, and number of

primary lateral roots. For comparison, seedlings from the Bureau of Forestry Penn Nursery were included in the study to evaluate typical native seed source material. Seedlings were planted inside a deer enclosure, initial seedling heights were recorded, and performance under ambient conditions was recorded. As of 2007, the planting has advanced through three growing seasons with many seedlings appearing to have survived multiple defoliation events due to gypsy moth and ongoing drought conditions. The gypsy moth outbreak began in 2005 and progressed through 2006. In 2007 the prevalence of gypsy moth was much lower than in 2006 due to caterpillar mortality and egg mass parasitism. Measurements for 2007 have not been taken in time to incorporate performance or survival information into this report.

## AFFECT OF LIME ON SUGAR MAPLE GROWTH STUDY

A long-term liming study was initiated in 1985 and conducted jointly by the Pennsylvania Bureau of Forestry and the USDA Forest Service- Northern Research Station at four locations on unglaciated soils in Potter County, PA. Four replicates, of four treatment combinations of lime (22.4 Mg ha<sup>-1</sup>, or 10 tons per acre), herbicide (glyphosate), lime plus herbicide, a non-treated control, and either fenced or unfenced were conducted. Soils were sampled and analyzed for exchangeable calcium, magnesium, potassium, manganese, phosphorus, acidity, and aluminum from 1985 to 1989, in 1993, 1996, 2001, and 2006. Soil chemistry has been monitored at various soil depths to evaluate migration of base cations through the soil profile down to 55 centimeters in 2006.

The long term liming study initiated in 1985 is now in its twenty second year of evaluation. Foliage samples taken in August 2006 and soil samples taken in October 2006 were processed and submitted to testing laboratories for analysis. Results from these tests are pending and will be published in the near future. In 2007 measurements were made to estimate flower and seed production and to record growth and crown vigor. No flower production was observed in May 2007; however, a region-wide seed crop of sugar maple was deposited in the autumn of 2006. The subsequent 2007 seedling cohort that has developed in many non-defoliated sugar maple stands represents an important regeneration cycle that will be monitored on the lime study plots. Results will be reported on in future years.

## OTHER INSECT PESTS AND DISEASES

Bacterial leaf scorch of red oak has been observed in urban areas, including FDR Park in Philadelphia, the Morris Arboretum, and adjacent communities in southeastern Pennsylvania. During drought periods, the symptoms of bacterial leaf scorch are likely to be more prevalent on stressed trees. In addition, *Armillaria* root and butt rot activity will be advantaged in hardwood stands where additional stressors are prevalent (i.e. drought, defoliation damage, flooding, and decline conditions). *Botryosphaeria* twig blight and *Mycosphaerella* leaf spot were reported as damaging 1,100 acres of mountain laurel in Lycoming County. Pine spittlebug was observed on 100 acres of hemlocks and pines in Adams and McKean counties. We had one report for *Rhizosphaera* needle cast on Norway Spruce in Berks County. Frost damage was reported in 100 acres of red maple and other species in Potter and McKean counties in May 2007.