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The Division of Forest Pest Management within the Department of Conservation and Natural Resources (DCNR), Bureau of Forestry protects forest resources in Pennsylvania from harmful insects and diseases through active monitoring, management, cooperation, and public outreach efforts. Program activities are supported by annual and special USDA Forest Service grants with strong state support.



Program Summary

- § Detected leaf damage by various forest pests in 28,964 acres of forest land, a 95% decrease from 2010;
- § Observed scattered tree mortality in 42,181 acres of forest land;
- § Treated 249 emerald ash borer-infested ash trees with Tree-age® as part of the integrated management project;
- § Released 14,657 parasitoids at three sites for emerald ash borer biological control;
- § Treated 9,834 hemlock trees with imidacloprid or dinotefuran for statewide hemlock woolly adelgid suppression;
- § Conducted a hemlock woolly adelgid survey in 16 leading edge counties;
- § Collected 9,168 bark beetle specimens in the early detection and rapid response exotic bark beetles project;
- § Finished a zip-code based firewood survey for Asian longhorned beetle in 29 state parks;
- § Initiated survey for walnut twig beetle and thousand cankers disease;
- § Continued survey for sudden oak death and canker-resistant butternuts.

Contact Us:

Pennsylvania Department of Conservation and Natural Resources
 Bureau of Forestry
 Division of Forest Pest Management
<http://www.dcnr.state.pa.us/forestry/foresthealth.aspx>
 208 Airport Dr., 2nd Floor
 Middletown, PA 17057-5027
 Phone: (717) 948-3941
 Fax: (717) 948-3957



Weather Conditions

Agricultural weather statistics for Pennsylvania are provided weekly by the USDA-National Agricultural Statistics Service based on 59 reporting stations across 9 regions. The weather pattern in 2011 can be characterized as excessive precipitation and slightly above normal temperatures throughout the growing season, major hurricane activities in August, early snowstorm in late October, and unusually warm days in late fall.

Statewide rainfall trended well above normal (46% higher) from April to May and continued through August, with rain recorded in 50% of the days in those months. Excess precipitation favored anthracnose diseases on maples and oaks. High soil moisture contributed to sugar maple tree



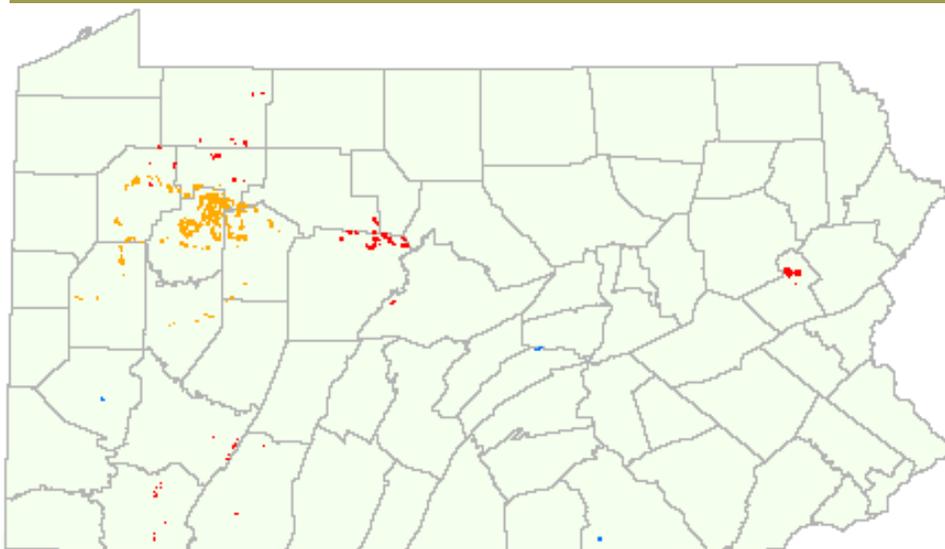
mortality in areas afflicted by severe forest tent caterpillar defoliation during the 2009 - 2010 outbreaks. Hurricane Irene brought historical flooding to northeastern and central Pennsylvania, with massive wind and flood damage to urban forests in many communities along the Susquehanna river. A snowstorm in late October created significant crown damage and tip-overs to many trees along forest roadways.

Pest Conditions

Forest pest conditions in forested land across the state were monitored through aerial surveys, forest insect and disease reports, and special projects.

Leaf Damage

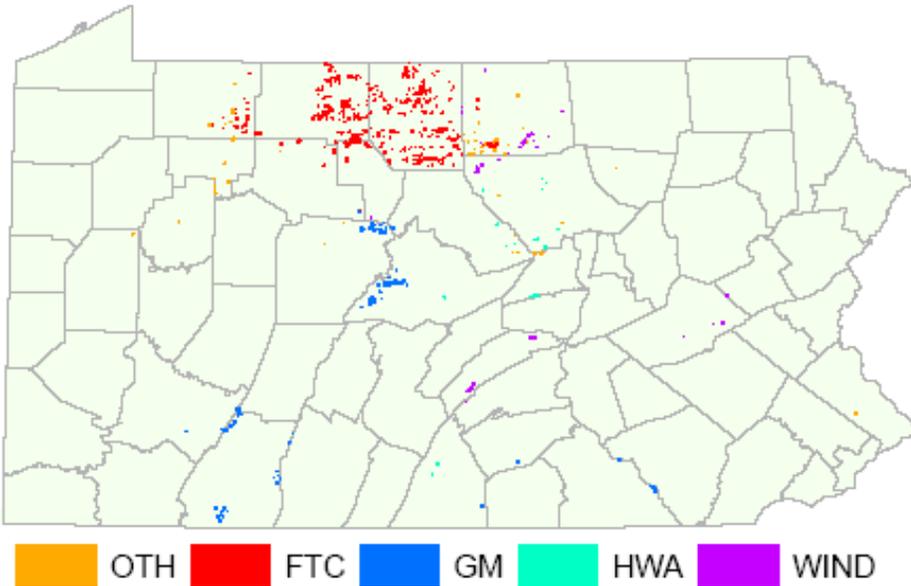
Leaf damage was observed in 28,964 acres of forest land in 2011, a 95% decrease from 2010. Major forest pests in 2011 include a cynipid gall wasp (*Neuroterus* sp.) on white oak in the Northwest (21,166 acres), and oak/maple anthracnose (7,505 acres) scattered across the state (see map below). Other minor leaf damaging pests included forest tent caterpillar (FTC) (*Malacosoma disstria*) and locust leaf miner (*Odontota dorsalis*).



■ Anthracnose
 ■ Cynipid Wasp
 ■ Others

Tree Mortality

Scattered tree mortality was observed on oaks and other species in 42,181 acres of forest land in 2011, a 30% increase from 2010 (see map below). Major mortality factors in 2011 included FTC (25,391 acres) and gypsy moth (GM) (*Lymantria dispar*) from previous outbreaks, as well as hemlock woolly adelgid (HWA) (*Adelges tsugae*) and wind damage (WIND). Other minor causal agents (OTH) included drought, oak decline, forest fire, ash decline, and beaver damage.



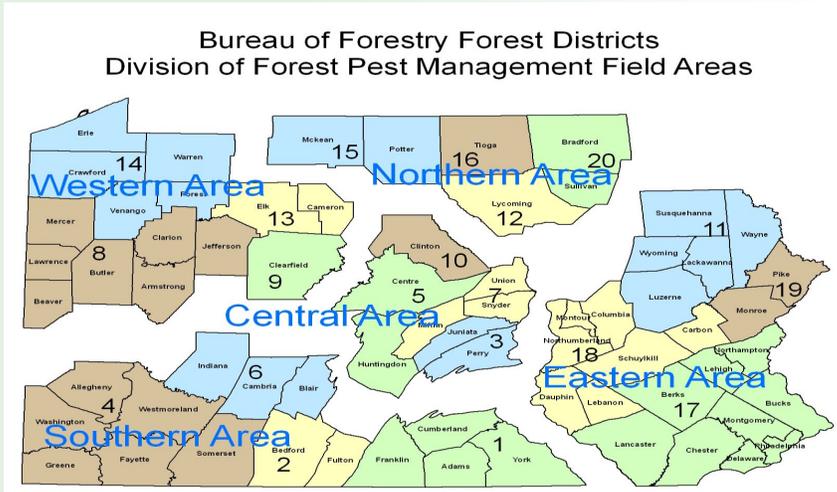
Negative Reports

Negative reports were collected from forest insect and disease (FI&D) and general hemlock surveys to monitor the spread and population dynamics of certain pests. A total of 1,713 negative reports covering 16 pest species were filed in 2011, including elongated hemlock scale (EHS) (*Fiorinia externa*), needle cast (*Fabrella tsugae*), and HWA.

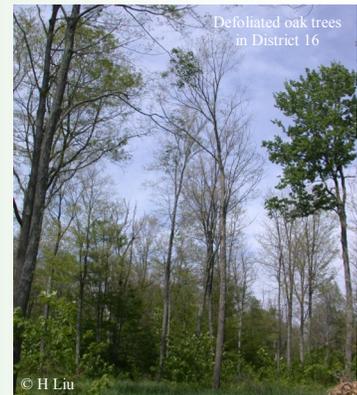
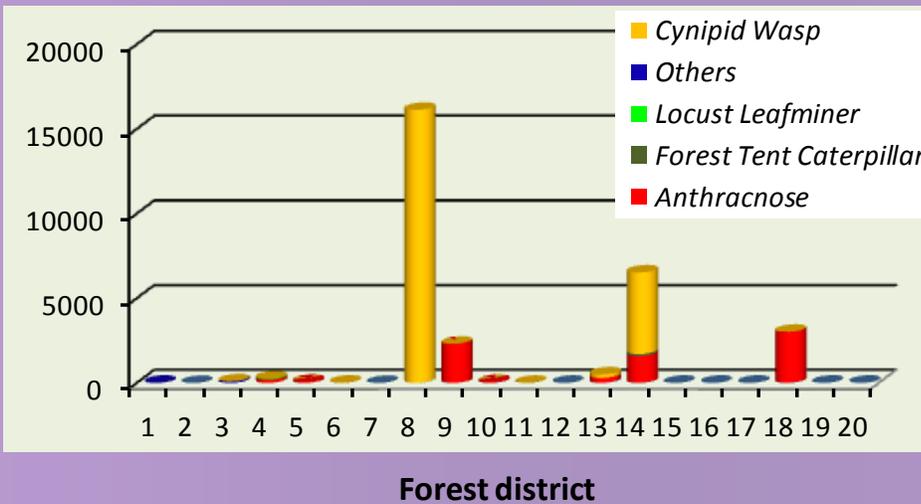


District Highlights

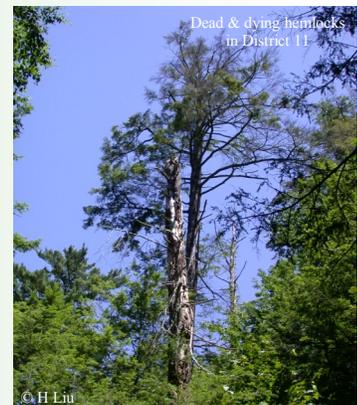
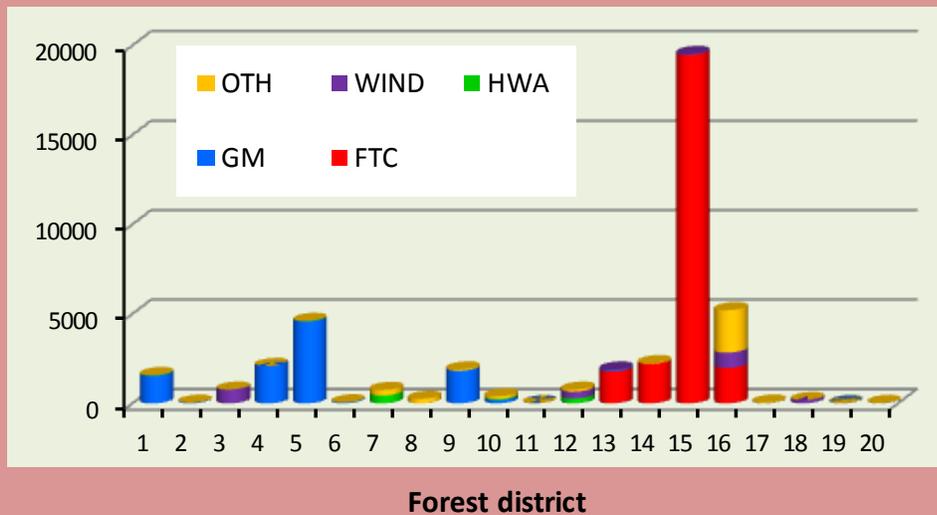
Pennsylvania is divided into 20 forest districts (see map). More than half of the leaf damage in 2011 was reported from district 8. Other noticeable damage was reported from districts 9, 14, and 18. Scattered defoliation was also found in 1, 3, 4, 5, 6, 10, and 13. No damage was reported from other districts. Tree mortality was concentrated in districts 15 and 16, as well as 1, 4, 5, 9, 13, and 14 (see figures below).

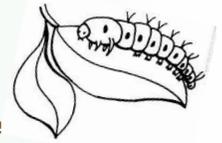


Leaf Damage by Causal Agents for Forest Districts



Tree Mortality by Causal Agents for Forest Districts





Entomology Projects

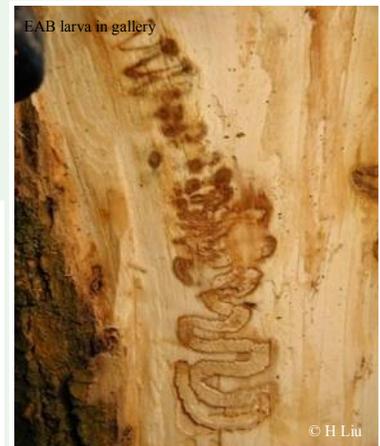
Entomology projects were supported by federal grants from The USDA Forest Service Cooperative Forest Health Program (CFHP) with matching funds from the state. Special projects are awarded yearly through a competitive application process.

Emerald Ash Borer, *Agrilus planipennis* Fairmaire (Coleoptera: Buprestidae)

Integrated Pest Management (CFHP 2010-2012)

A 300-acre study site in North Park, Allegheny County was selected for this project. EAB was first recorded at this site in 2009. The study site was further divided to 15 1/4-acre plots (labeled **A** through **O**). The ash resource and its conditions were documented at the beginning of the project through an inventory survey. EAB populations at the study site were estimated through tree dissection (2010) and adult trapping (2011). Limited tree removal was carried out in combination with normal salvage and sanitation operations in the park to reduce EAB populations. Heavily infested trees along major roads and popular trails within the center were removed first. The chemical insecticide Tree-äge[®] (emamectin benzoate) was used to protect high-value ash trees with ecological, historic, recreational, or aesthetic significance at the study site. Three hymenopterans, including one egg parasitoid, *Oobius agrili* Zhang and Huang (Encyrtidae), and two larval parasitoids, *Tetrastichus planipennisi* Yang (Eulophidae) and *Spathius agrili* Yang (Braconidae) were introduced to plot **I** between June and August 2011.

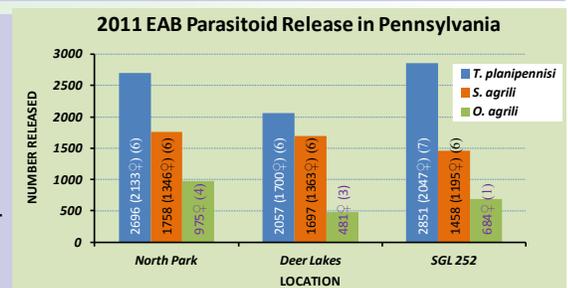
Results showed that the average basal area ranged from 77.0 to 147.0 ft²/acre for the study plots, with green ash accounting for 11.1% to 79.6% at each plot. Other major



tree species include black cherry, yellow poplar, black walnut, red maple, red and white oak. A total of 713 ash trees with the DBH ranging from 4.1 to 37.0 inches were selected. Crown dieback varied in trees among different plots in 2010, ranging from 0.9% to 59.7%. Health conditions of ash trees continued to deteriorate from 2010 to 2011. EAB larval density ranged from 0.4 to 13.1 insects/ft², with the highest found at 20 ft above the ground along the trunk. A total of 115 adults were caught in purple panel traps with 69.6% recorded by the week of June 23 in 2011. The population declined toward the end of July, with the last adult recovered in the week of August 31. A total of 17 infested trees were removed. Tree-äge[®] was used to treat 249 ash trees (2,866 inches of total DBH) in 14 plots in 2011. A total of 5,429 parasitoids were released at plot **I** where no chemical treatment was carried out, including 2,696 *T. planipennisi*, 1,758 *S. agrili*, and 975 *O. agrili* through multiple releases between June and August. The treatment efficacy of Tree-äge[®] and the establishment of parasitoids at the study site will be monitored in 2012.

Biological Control (CFHP 2010-2012)

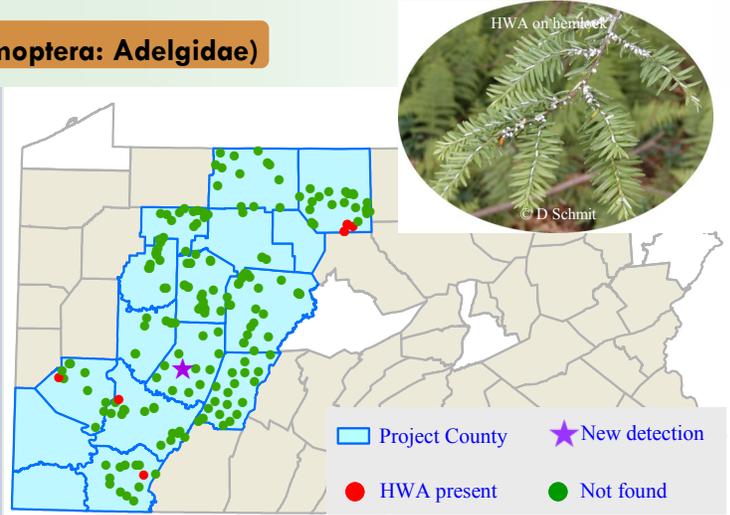
Parasitoids were released in two additional sites in Pennsylvania as part of the biological control project: Deer Lakes in Allegheny County and State Game Land (SGL) 252 in Union County. A total of 4,235 and 4,993 parasitoids were released at Deer Lakes and SGL 252, respectively. Parasitoids were released weekly on 12 pre-selected ash trees multiple times at each site from June to August, including 2,057 *T. planipennisi*, 1,697 *S. agrili*, and 481 *O. agrili* at Deer Lakes; and 2,851 *T. planipennisi*, 1,458 *S. agrili*, and 684 *O. agrili* at SGL 252. Parasitoid establishment at each site will be evaluated through the dissection of some release trees in spring 2012.



Hemlock Woolly Adelgid, *Adelges tsugae* Annand (Homoptera: Adelgidae)

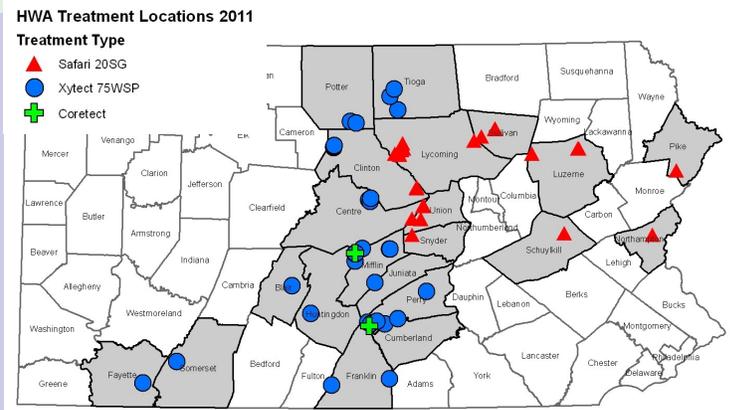
[Multi-state Leading Edge Survey \(CFHP 2011\)](#)

This project was designed to detect and delineate the leading edge of HWA infestation in 16 counties in western Pennsylvania. A total of 199 hemlock trees in 13 counties were surveyed. HWA infestation was found in nine trees in five counties (Allegheny, Fayette, Indiana, Potter, and Westmoreland) (see map). The infestation in Indiana County was new to the state in 2011. Survey activities will continue throughout the winter to include at least 10 geographically distinct sites in each county, with a total of 10 randomly selected branches from three to 10 hemlock trees examined.



[HWA Suppression \(CFHP 2010-2012\)](#)

This multi-state project focuses on protecting and conserving high priority hemlock trees and stands through the suppression of HWA populations on DCNR managed lands. Study sites consisting of relatively healthy large (mostly intermediate, dominant, or co-dominant) hemlock trees with moderate HWA infestations were considered. A total of 62 State Forest/Park sites in 21 counties were selected to receive treatment in 2010. Field activities were carried out in 2011. A total of 9,834 hemlock trees (121,473 inches of total DBH) on 1,554 acres of state land were treated with imidacloprid (Xytext™ 75 WSP, CoreTect™ Tablets) or dinotefuran (Safari® 20 SG) through soil injection (using Kioritz® injector) or subsurface application (see map). Treated trees were permanently marked for future reference. Suppression efficacy and host conditions will be evaluated in 2012.



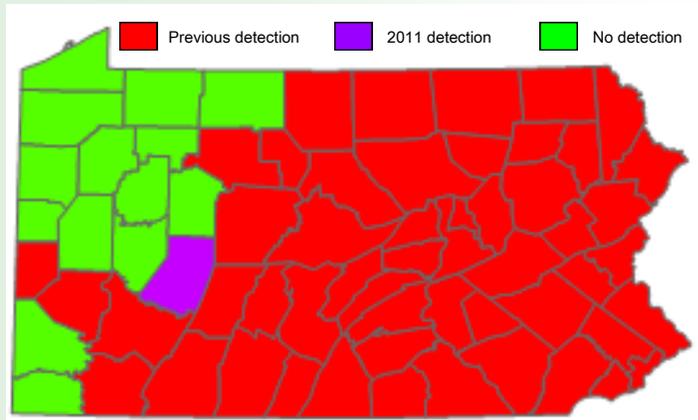
[Biological Control \(DCNR 2010, reported in 2011\)](#)

Biological control of HWA continued in 2010, with 1,000 laboratory-reared *Laricobius nigrinus* released at one site in Blue Knob State Park. A total of 100 adult beetles were released on the lower branches of 10 selected hemlocks.



[General Hemlock Survey \(DCNR 2011\)](#)

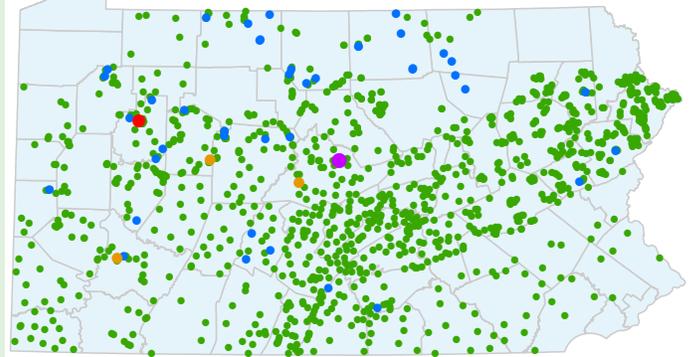
Survey for general hemlock health continued in 2011. For the 969 hemlocks visually inspected for insect pests, HWA and EHS were found on 52.9% and 30.3% of the trees, respectively. *Fabrella* needle cast was detected on 80.9% of the 747 hemlocks examined. HWA is now found in 53 of the 67 counties in Pennsylvania (see map).



Gypsy Moth, *Lymantria dispar* (L.) (Lepidoptera: Lymantriidae)

[Egg Mass Survey \(DCNR 2011\)](#)

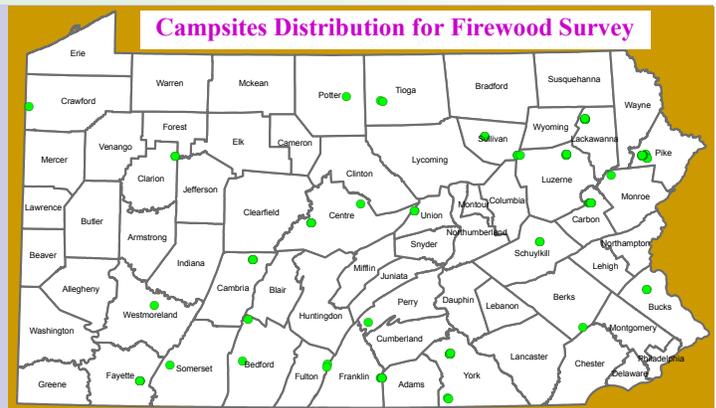
A total of 1,167 sampling sites (1/40 acre) were surveyed across Pennsylvania between winter 2010 and spring 2011 (see map). Gypsy moth egg masses were found in 47 sites (ca. 4% surveyed) in 20 counties. There were 11 sites with more than three egg masses per site in seven counties (Bradford, Centre, Clarion, Jefferson, Potter, Tioga, and Westmoreland). One site in Centre County had 20 egg masses. Surveys for egg masses that will hatch in spring 2012 are ongoing. Preliminary results showed that about 20% of the visited sites contained at least one egg mass.



Asian Longhorned Beetle, *Anoplophora glabripennis* (Motschulsky) (Coleoptera: Cerambycidae)

[Firewood Survey \(CFHP 2010-2011\)](#)

DCNR managed campgrounds visited by campers from 23 Asian longhorned beetle (ALB) infested zip-codes in Massachusetts from 2006 to 2010 were selected for this survey. A total of 84 campsites within 29 State Parks across the state were identified in 2010 based on camper reservation data. Host trees within a 33 ft radius of each campsite were visually examined from the ground for ALB signs and symptoms using a pair of binoculars. A total of 548 host trees, including 312 red maple, 201 sugar maple, 25 American elm, 4 river birch, 2 paper birch, 2 hackberry, 1 Norway maple, and 1 white ash trees were inspected. No ALB infestations were detected. Outreach efforts at high-risk campgrounds were also carried out during the survey. These same campsites were re-visited in 2011, with no positive detections recorded.



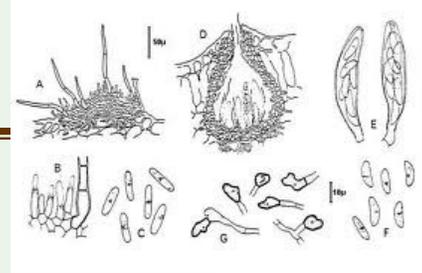
Exotic Bark Beetle (Coleoptera: Curculionidae: Scolytinae)

[Early Detection and Rapid Response \(CFHP 2011\)](#)

An early detection and rapid response project was initiated in 2010 to detect, delimit, and monitor newly introduced exotic bark and ambrosia beetles at selected high-risk forest areas in Pennsylvania. Twelve sites in 10 counties were selected for this study. Survey activities were repeated at those sites using the same methodologies in 2011. A total of 9,186 beetles from 60 species were collected. *Xylosandrus germanus* (Blanford) was again the most abundant species, making up 25% of the beetles collected. Other frequently encountered species included *Anisandrus sayi* (Hopkins), *Gnathotrichus materiarius* (Fitch), *Xyleborinus alni* (Niijima), and *Xyloterinus politus* (Say). No significant important species were recovered from this survey.



Pathology Projects

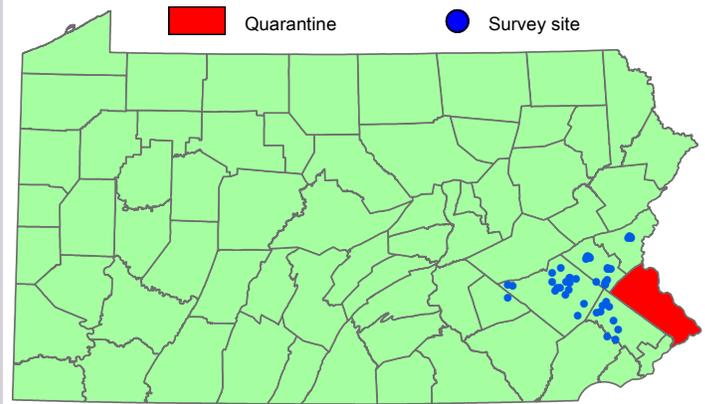


Pathology projects were supported by federal grants from The USDA Forest Service Cooperative Forest Health Program (CFHP) with matching funds from the state. Special projects are awarded yearly through a competitive application process.

Thousand Cankers Disease, *Geosmithia morbida* Kolarik, Freeland, Utley & Tisserat (Hypocreales: Bionectriaceae)

Detection Survey (CFHP 2011)

Thousand Cankers Disease (TCD) on walnut is caused by the aggressive feeding of the walnut twig beetle (WTB) (*Pityophthorus juglandis*) and subsequent canker development from the infection of *Geosmithia morbida* around beetle galleries. Widespread morbidity and mortality of black walnut, *Juglans nigra*, has been reported in the western USA for the past few decades. In Pennsylvania, TCD was first discovered in Bucks County on August 9, 2011. An internal quarantine was established on August 10 by the Pennsylvania Department of Agriculture to restrict movement of black walnut materials out of the affected county. DCNR participated in the detection survey after the initial discovery in 2011. A total of 51 susceptible host trees - black walnut and butternut, *Juglans cinerea*, were examined in five surrounding counties, including Adams, Berks, Lehigh, Montgomery, and Northampton (see map above). No new infestations of this disease were detected.



Sudden Oak Death, *Phytophthora ramorum* Werres, de Cock & In't Veld (Oomycetes: Pythiaceae)

Detection Survey (CFHP 2011)

Survey for sudden oak death (SOD), *Phytophthora ramorum*, continued in 2011 with stream baiting extended to western Pennsylvania. Four streams were monitored during the 6-week period in both spring and fall when stream temperatures were conducive for pathogen detection (10 - 20 °C). Nylon mesh bags containing *Rhododendron* leaves were floated for 2 weeks to detect *P. ramorum* from the upstream watershed. No detection has been made in 23 streams surveyed since 2003.



Federal Agencies

- USDA Forest Service
 - Aerial survey for leaf damage, defoliation & tree mortality
 - Aerial survey procedures & safety
 - EAB integrated pest management & biological control
 - HWA survey, biological control & suppression
 - Asian longhorned beetle & exotic bark beetle survey
 - Ash seed collection
 - TCD & SOD Survey
 - Butternut & beech conservation
 - Oak decline
- USDA APHIS
 - EAB survey, biological control & national framework
 - Sirex* biological control
 - TCD survey

Across the Country

- NAASF Forest Health Committee - Representation
- Northeastern Forest Pest Council - Representation
- Continental Dialogue - Representation
- National Gypsy Moth Management Board - Representation
- University of Missouri - Butternut conservation
- The Connecticut AES - Butternut conservation
- North Carolina State University - Hemlock seed collection
- University of Kentucky - Red-headed pine sawfly collection
- Cornell University - *Sirex* biological control & EAB survey
- University of Massachusetts - HWA biological control
- University of Maryland - Oak decline
- University of Notre Dame - Butternut genetics
- University of Delaware - Forest health
- SUNY-ESF - *Sirex* natural enemies

Extension & Outreach

DCNR has been actively involved in public education on forest health issues across the state through training, demonstration, seminars, trade shows, forest health updates, pests diagnostics, and awareness campaigns. As a result, 24,768 copies of pest alerts, brochures, posters, booklets, ID kits & wallet cards, tattoos, magnets, and CDs & DVDs were provided to a wide range of concerned clientele. In addition, more than 2,000 people were trained through various extension and outreach activities (see table below).



| Activity | Number | Audience |
|---------------------|--------|----------|
| Forest Health | 8 | 1, 506 |
| Pest Diagnosis | 16 | 44 |
| Invasive Species | 5 | 280 |
| Pest Control | 6 | 230 |
| Information Seminar | 5 | 106 |
| Total | 40 | 2,166 |

Examples of Outreach Audience

- Woodland Owners Associations
- Other professional associations and clubs
- Local communities (county, city, township, and borough)
- Resource management agencies
- Media (newspapers, magazines, radios, TVs, etc.)
- Professional pesticide applicators
- Private citizens



TCD field day

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Forest pest update

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