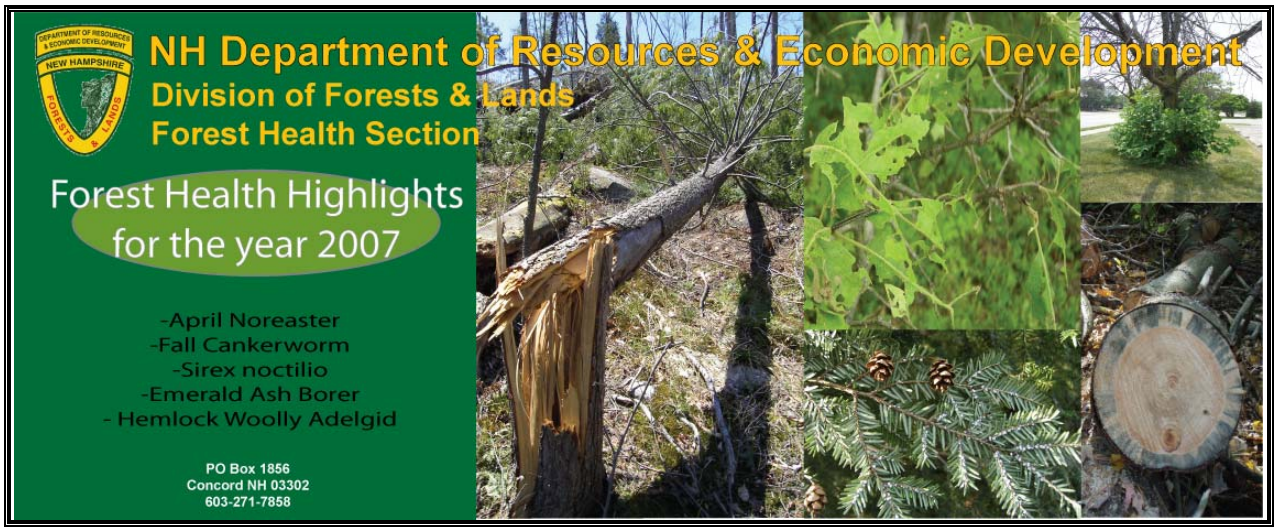
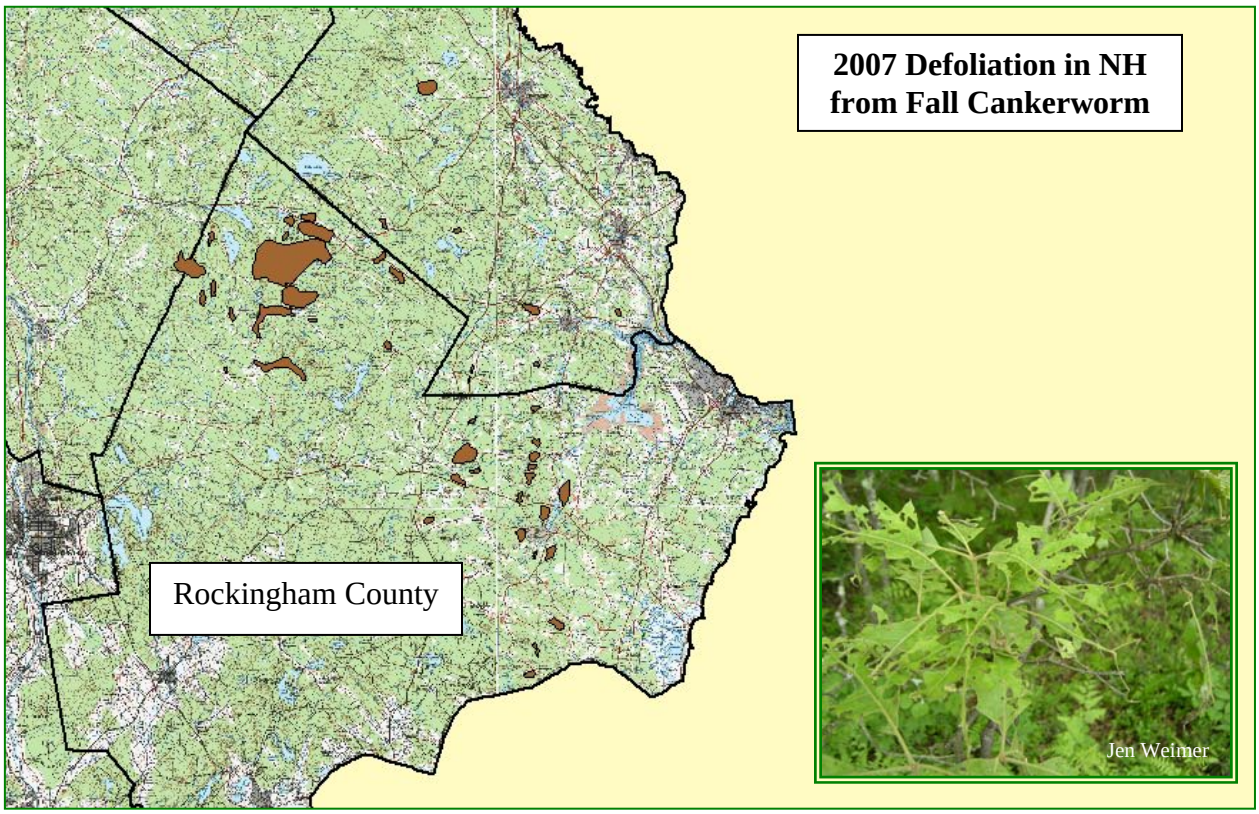


FEATURE CREATURE

Fall Cankerworm (*Alsophila pometaria*)

Fall Cankerworm damage was heavy this past summer and caused defoliation of 11,759 acres in primarily red oak stands throughout Rockingham County. This was down from the 29,000 acres defoliated in 2006. Like most native pests Fall Cankerworm is cyclical with epidemics lasting 2-3 years. During the epidemic native predators build up and eventually control the population. Trees that have been repeatedly defoliated will be stressed and may be more susceptible to other pests.



A native pest of hardwood trees in North America, Fall Cankerworms preferred hosts include ash, basswood, beech, black cherry, red maple, sugar maple, red oak, and white oak. It will also feed on the leaves of apple, birch, boxelder, dogwood, elm, hickory, and many other hardwoods.

This pest is named so because adults are active in the fall. There is also a spring cankerworm which is active in early spring but is less abundant and not usually a forest pest. Fall Cankerworm adults emerge from the soil in late fall to mate and lay eggs. Male moths have a 25-35 mm wingspread with brown glossy forewings crossed with irregular white bands. Females are brownish-gray, wingless, and 10-12 mm long. Eggs are less that 1 mm in diameter and are dark grayish-brown with a dot and a ring on top. Eggs hatch at budbreak, and the young caterpillars crawl to new foliage to feed.

Mature larvae are hairless, about 25 mm long and can vary in color. Color can vary from green with white stripes down the back, to green with a large black stripe, to mostly black. Besides the three pairs of legs on the thorax, there are three pairs of primitive legs (prolegs) at the hind end. Larvae feed for about one month and attain a length of about 2 cm before spinning down to the ground to pupate.

Fall Cankerworm Larvae Color Variations

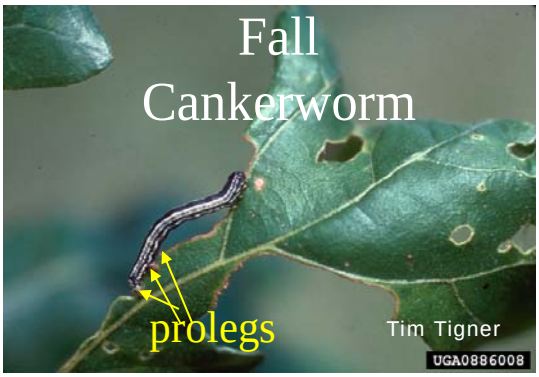
Winter Moth (*Operophtera brumata*), an exotic insect from Europe, has been associated with Fall Cankerworm in Massachusetts and the two are easily confused. Winter Moth gets its name because the adults emerge from the soil in November and December. The male moths are small, light brown in color and have wings with hairy margins. Female moths are wingless and cannot fly. Winter Moths overwinter in egg masses which hatch in early spring. Larvae emerge before budbreak and are pale green caterpillars with a white stripe running down each side. Winter moth larvae differ from fall cankerworm in that they only have two pairs of prolegs. Larvae feed on buds and forming leaves until mid-June. They then move to the soil to pupate.

Winter Moth hosts include oaks, maples, cherries, basswood, ash, apple, and blueberry. Outbreaks in Massachusetts have been in coastal areas from the North Shore to Cape Cod. Winter Moth has been detected in pheromone traps in NH but no defoliation has been detected from this exotic pest. We are keeping a close eye out for it. Please contact the Forest Health Office if you suspect you've sustained damage from this insect.

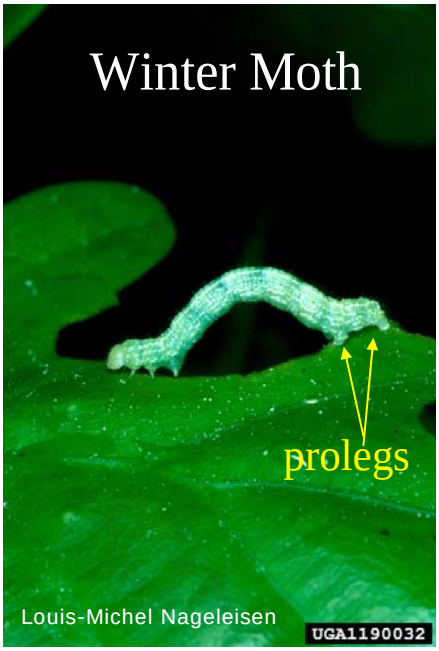
The differences between the native fall cankerworm and the exotic winter moth are displayed on the following page.

Fall Cankerworm or Winter Moth?

The male **Fall Cankerworm** is similar to winter moth males but has a distinctive light colored patch near the distal end of the front wing on the leading edge.



- Pale green with 2 white stripes
- OR green with large black stripe
- 3 pairs of prolegs



- Pale green with 2 white stripes
- 2 pairs of prolegs

Male **winter moths** are drab-colored moths. The hind edge of their wings is fringed with small hairs and the bottom row of dark banding near the tip of the wing appears as a series of hash marks.

FEATURE ARTICLE

2007 Blue Stain Study

NH Division of Forests and Lands
Forest Health Program
Fox Research and Demonstration Forest, Hillsborough, NH
Kyle Lombard

In April of 2007 a Nor'easter ripped through New Hampshire blowing over more than 10,000 acres of white pine, spruce, fir and mixed hardwoods from southern Grafton County through western Coos County. The heavily damaged forests in Grafton County tended to be large and valuable white pine. With several million board feet of pine blown over the inevitable question was asked; "how long do we have to salvage the trees"? The quick answer is; "it depends". It depends on factors such as if trees were blown over or snapped off, what products you want from the salvage, what condition the trees were in before the blowdown, and the environmental condition of the stands (% of total stand down, aspect, soil type, etc.). The first and foremost issue for salvaging pine from April to October is the forester's race for time against the pathogen known as "blue stain". The stain is generally unacceptable to mills trying to produce quality lumber. Blue stain is a fungus and is an aesthetic problem, not a structural problem like decay fungi. Blue stain fungi in white pine logs, in NH, most often is a species within the *Ophiostoma* genera but could be one of several other fungal species in the genus *Ceratocystis*. This stain fungus seen in almost all dead and dying trees is a saprophytic pest of the tree and is carried around by bark and wood boring beetles. The fugal spores can be wind blown but the major vector is wood colonizing insects. The reasons bark beetles carry this fungus around in a sac called the mycangia, are to inhibit the trees natural defense against bark beetles and as a food source. The stain fungi grow and clog the pores of the sapwood limiting the ability of the tree to pitch out the beetles. All of the ambrosia beetles and many of the larger bark beetles also rely on blue stain for their food source. General conditions the fungus grows well in are 41 degrees F to 95 degrees F, and a wood moisture content of 24% to 60%. Like any living thing the fungus needs water and oxygen, and at moisture contents above 60% the oxygen in the wood is not high enough to sustain fungal life (remember the sawmills that watered their log piles). At moistures below 24% there is not enough moisture to sustain the fungi.

So, how quickly does blue stain start infecting a pine tree? Based on knowledge of the fungus, beetles, and tree condition you could make some reasonable predictions. If the trees are down but still attached to roots with soil you have several years, if the trees are severed at the stump but left tree length you have 3-4 months. If you cut the trees to log length you probably have 1-2 months depending on where you store the logs.

To support our predictions we cut 10 mature white pine trees at Fox State Forest in Hillsborough and measured the growth of blue stain over a 5 month period. This simulation would be for the worse case scenario of a natural disaster where trees are toppled **and severed** from their roots. On May 17, 2007 we felled the 10 trees and left them lying on the forest floor. In four week increments we dissected two trees to determine the extent of blue stain in the sapwood column of the tree.

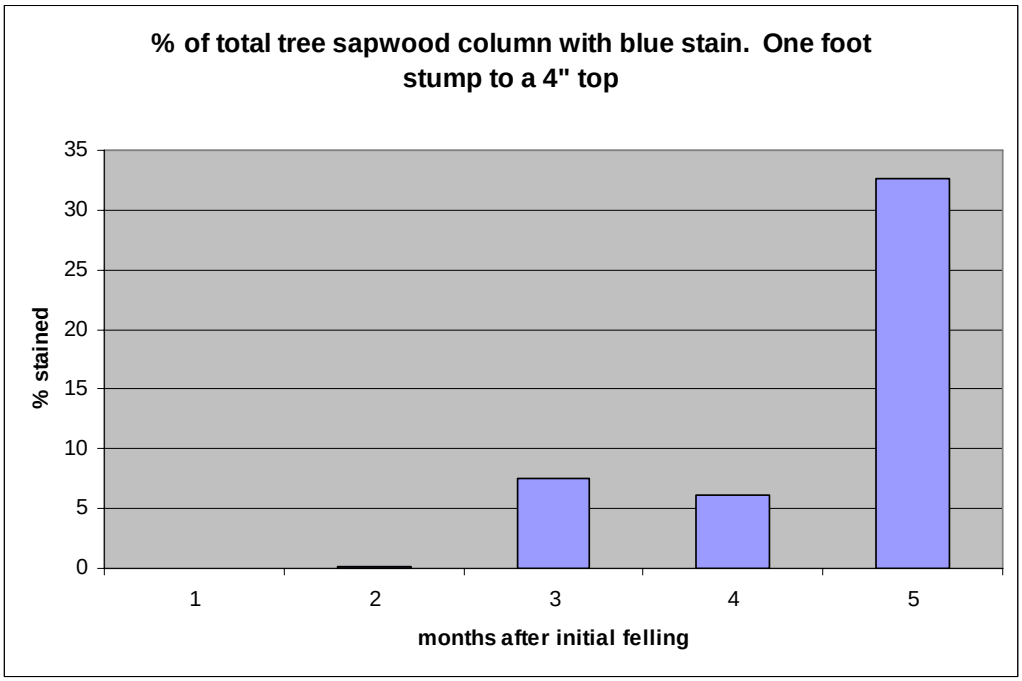


Figure 1. Amount of blue stain after cutting

Figure 1 above represents the total amount of blue stain found between 1 month and 5 months after the initial felling. After one month there was no sign of blue stain in any portions of the dissected trees. After two months an extremely small amount was detected in only the first few inches of the butt log. After three months a noticeable amount of stain started showing up in all portions of the tree. After 5 months of lying on the ground roughly 33% of the sapwood was stained throughout the tree. In 2002 we concluded a similar study only looking at the amount of stain after one year increments and found after 1 year the trees averaged 60% stained, and 95% stained after three years. During this current study we noted the amount and type of beetle infestation. Not surprisingly we found no insect activity after one month, the beginnings of bark beetle attacks and several longhorn beetles snooping around after two months and almost complete attack of bark beetles after three months.

Below are a few pictures depicting results of the study:

This is the cookie cut from the butt of the first log two months after felling. The blue stain was completely gone above four feet from the butt end.

This necrotic spot below (where bark has been removed) with pitching is the beginning of a nuptial chamber for a bark beetle. This picture was taken after 8 weeks on the ground.

Picture “A” below is complete infestation of sawyer beetles in the thick barked regions of the tree and “B” is complete infestation of bark beetles in the thinner barked regions of the trees. Both of these pictures are taken 5 months after felling.

A

B

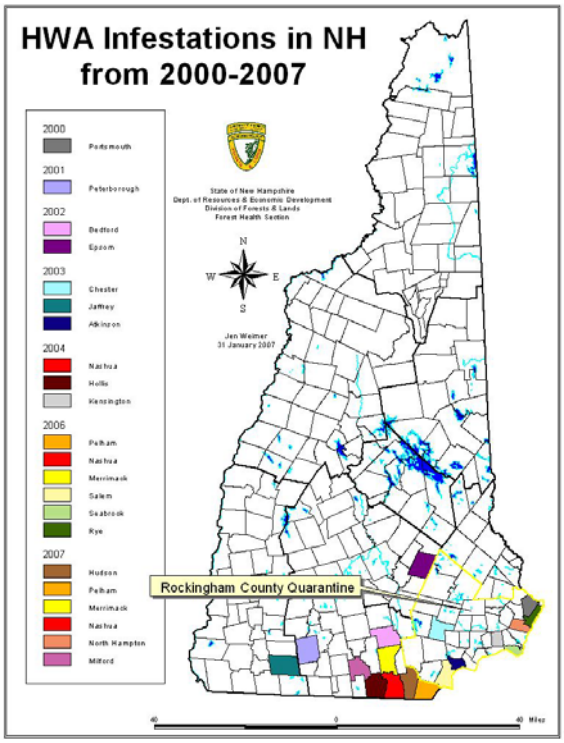
Picture “C” below is of two different trees both dissected 5 months after felling. This shows the extreme differences that can occur in amounts of blue stain depending on such things as bark thickness, tree health, temperature, and insect infestation.

C

Summer Field Surveys

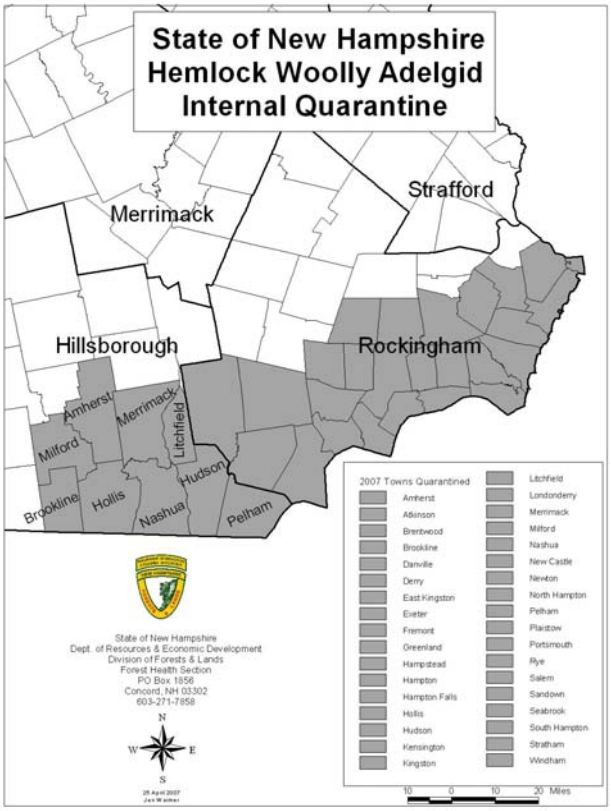
Hemlock Woolly Adelgid

Several surveys for Hemlock Woolly Adelgid (HWA) were conducted in 2007 and several new infestations were discovered in the towns of Pelham, Milford, Nashua, Hudson, Merrimack, and North Hampton. This brings the total towns infested since 2000 to 18.



Surveys focused on towns with current or prior infestations, towns bordering Massachusetts, and towns bordering Rockingham County. Methods included driving around neighborhoods looking for "at risk" trees and walking deeryards and parks in close proximity to ponds. "At risk" trees were those along roads or other openings such as fields and ponds that have the greatest chance of appealing to birds that may be carrying HWA.

Most of the new infestations were found outside of Rockingham County which prompted an amendment of the internal quarantine in April:



9 new towns in Hillsborough County have been added to the internal quarantine for HWA. Additionally 10 towns in Rockingham County have been deregulated. "Any hemlock wood products including but not limited to hemlock logs or pulpwood with bark, hemlock lumber with bark, hemlock chips and uncomposted shipments of hemlock bark received from **quarantined towns in NH** requires a State of New Hampshire **Hemlock Woolly Adelgid Clean Certification,** of either load or lot, which must be signed and dated by a certified inspector in NH. This certificate must state that said load or lot of hemlock is free of any HWA and is required for all twelve months of the year. Regulations also remain in place for infested states south of NH and hemlock products being shipped **into** NH still require a **State Phytosanitary Certificate or Certificate of Origin**, which must be signed and dated by a state regulatory official in the state of origin."

NH towns quarantined for HWA are: Amherst, Atkinson, Brentwood, Brookline, Danville, Derry, East Kingston, Exeter, Fremont, Greenland, Hampstead, Hampton, Hampton Falls, Hollis, Hudson, Kensington, Kingston, Litchfield, Londonderry, Merrimack, Milford, Nashua, New Castle, Newton, North Hampton, Pelham, Plaistow, Portsmouth, Rye, Salem, Sandown, Seabrook, South Hampton, Stratham, and Windham.

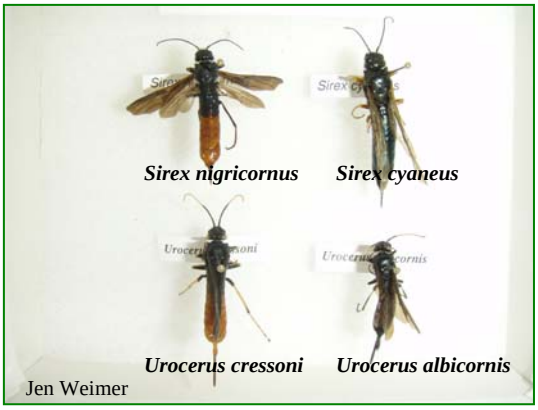
Cutting hemlocks infested with HWA

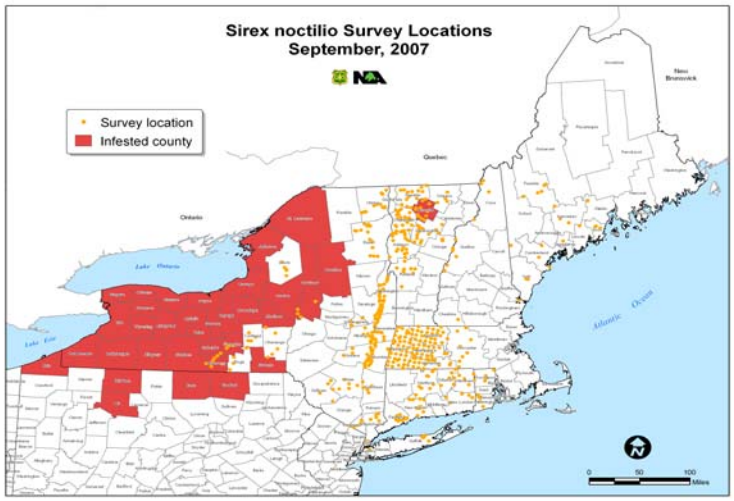
HWA suppression methods undertaken by the Division this past year included cultural, chemical, and biological control. Cultural control was used at two sites where other methods were not an option. Trees at these sites were cut and left onsite. We also treated numerous small infestations on seven properties with soil injections of Imidacloprid. For these treatments we used a Kioritz soil injector with Xytect 75WSP mixed to inject 60 ml per inch of dbh at a rate of 1.5 grams of active ingredient per inch of dbh. We also utilized biological control with the release of 500 *Laricobius nigrinus* beetles in a forested site. *L. nigrinus* is a predatory beetle native to North America and may be better suited to NH than the previously released *Sasajiscymnus (Psuedoscymnus) tsugae* beetles.

Sirex Woodwasp

In 2007 ten traps for *Sirex noctilio* were placed around the state as part of a cooperative trapping effort with APHIS, USDA Forest Service, and NH Department of Agriculture. USDA Forest Service trapping protocols were utilized. The traps were in place June through October during the *Sirex* flight period. Traps were hung in red pine, pitch pine, Scotch pine, and larch stands. No *Sirex noctilio* was found. Several native *S. noctilio* look a likes native to NH were collected including: *Sirex nigricornis*, *Sirex cyaneus*, *Urocerus cressoni* and *Urocerus albicornis*.

***Sirex noctilio* look a likes**

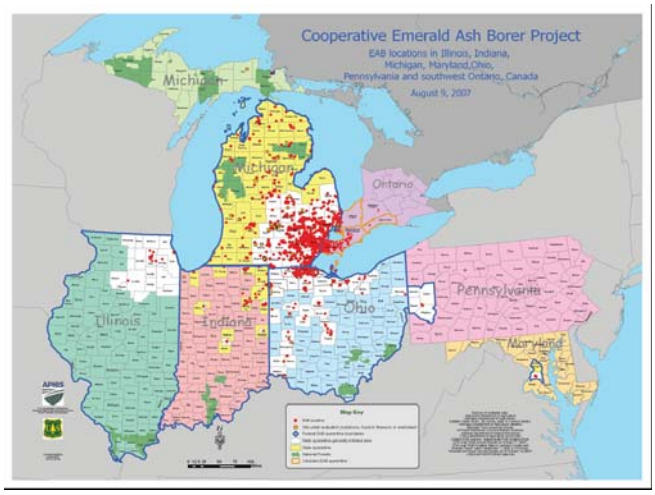




Sirex noctilio

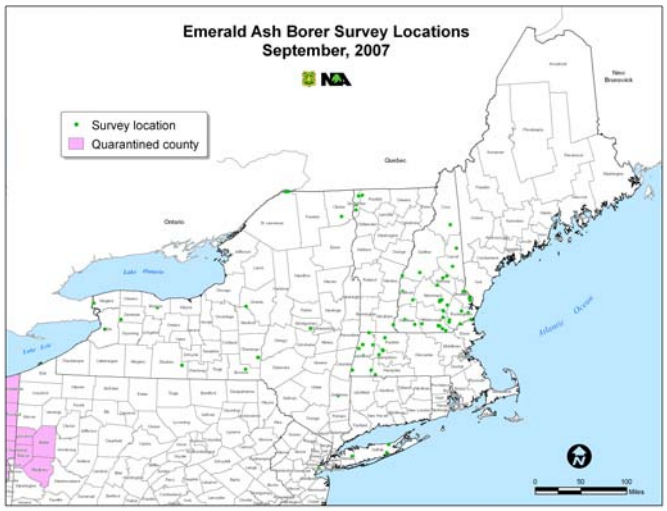
Emerald Ash Borer

EAB continues to spread in the Midwest and threaten NH's ash resource. Firewood continues to be a likely means of travel for EAB. We continue to work with the NH Division of Parks and Recreation to reduce the amount of firewood traveling into NH's campgrounds. Again this year we posted signs at all state campgrounds and mailed info to private campgrounds. We also posted an alert on the state campground reservation website and sent info with each camper registration. In addition we worked with the Department of Transportation to post signs at all interstate and state highway rest areas.



During the camping season we visited several state campgrounds and surveyed campers about their firewood habits. We surveyed 104 campers and found that many of them were aware of the firewood issue from our posters. This may have resulted in false survey data since many campers were apprehensive about breaking any rules. Our survey data showed that 37% of those surveyed brought firewood with them from home. This was down from last year's survey which showed that 49% brought firewood from home. We also swapped local wood with firewood campers brought from home in order to collect wood for a firewood study. The firewood was sealed in barrels and the study will continue into next year as we rear out any insects that may be in the wood. We hope this will give us a better understanding of what is entering NH in firewood.

Visual surveys and trap trees for EAB were also utilized at numerous sites around the state. A total of 700 ash trees were inspected during several city surveys and a box store study. For the box store study we surveyed planted landscape material in parking lots of three of NH's large box store chains. A total of 51 stores were surveyed and each chain had 50% of its parking lots planted with ash species. Six trap trees were also felled and peeled to look for larvae. No signs of EAB were found in any of the surveys.



Early Detection and Rapid Response of Non-native Bark Beetles

This year NH joined the Early Detection and Rapid Response Team (EDRR). The team is a cooperative effort of USDA Forest Service, APHIS, university and state representatives to detect, monitor and respond to introductions of exotic bark beetles. Five exotic bark and ambrosia beetles have been detected for the first time in North America since the implementation of the pilot project in 2001. In 2007, we collected an exotic ambrosia beetle that hadn't been found in NH prior to this EDRR survey.

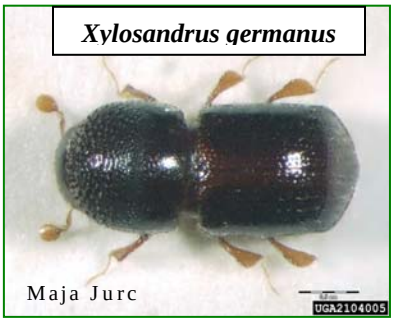
Entomologist Ray Boivin prescreening collections

Thirteen threatening species of exotic bark beetles were specifically targeted for the survey but all bark beetles captured were identified. Funnel traps were set at nine sites around the state. Each site had 3 traps with different combinations of lures (Ips, Pinene + Ethanol, or Ethanol). Traps were collected from every other week for 20 weeks for a total of 10 collections per site. Collections were prescreened at our lab at Fox Research and Demonstration Forest and then sent to a taxonomist at Cornell University for verification. Data from collections was also entered into an online database developed by the Forest Service Forest Health Technology Enterprise Team.

Nearly 3800 beetles were collected in NH representing 38 different species. The most abundant species collected was the native ambrosia beetle *Xyleborus sayi*. This native beetle feeds on a fungus which causes cankers in oaks. The second most abundant species collected was *Xylosandrus germanus*, an exotic ambrosia beetle from Asia. This beetle attacks both healthy and weakened hardwoods. A small number of another hardwood exotic ambrosia beetle, *Xyleborinus alni*, was collected for the first time in NH. This Asian beetle was first detected in North America in the Pacific Northwest in the late 1990s and just recently for the first time in the Northeast. Like most other introduced exotics, it's introduction is associated with wood packing materials. Known hosts include Asian species of *Alnus*, *Betula*, *Corylus*, *Quercus*, *Salix*, and *Tilia*.

Xyleborus sayi

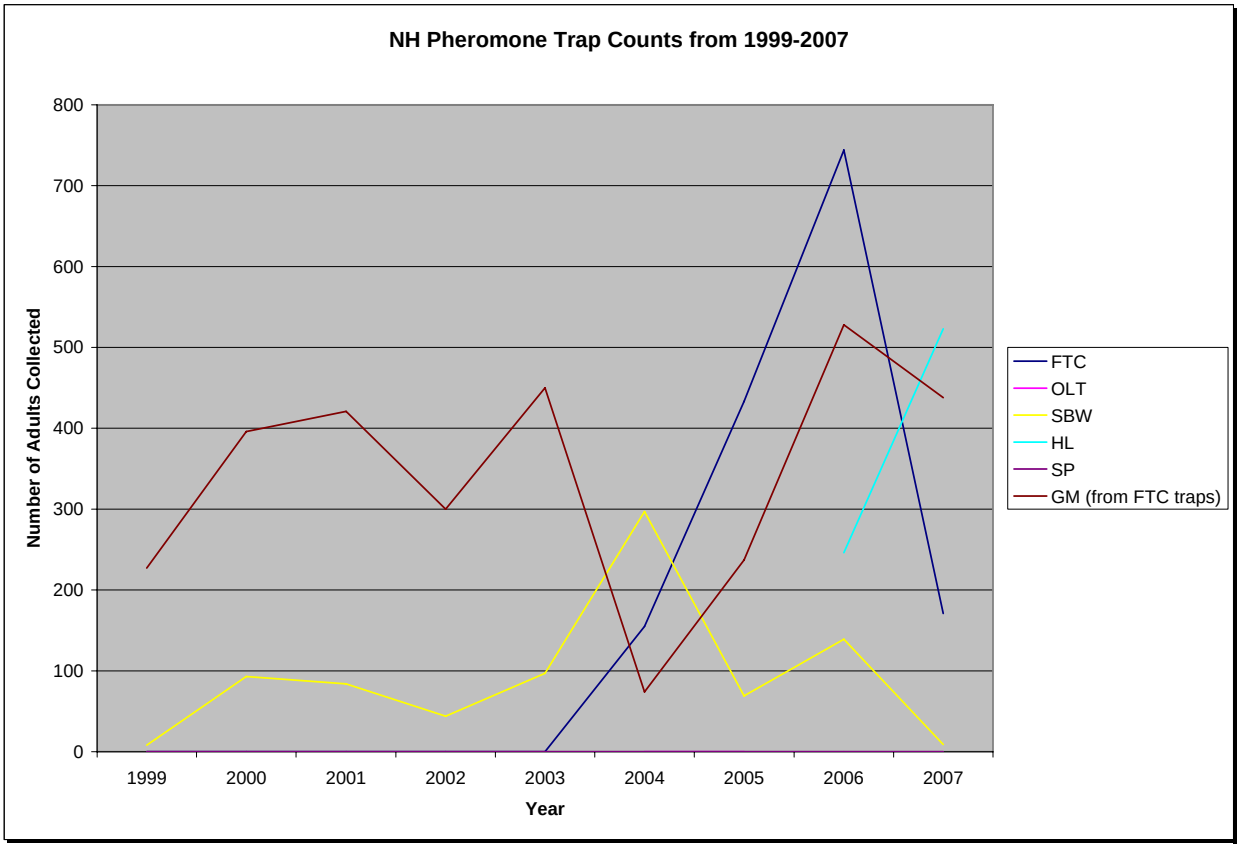
Xylosandrus germanus



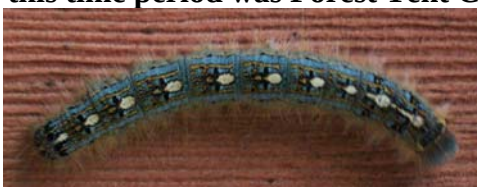
Xyleborinus alni

Pheromone Trapping of Forest Pests in NH

Each summer pheromone bucket traps are placed around the state to monitor common forest pest populations. Epidemics can be predicted by analyzing trends over time. In 2007 pheromone traps were put out for Spruce Budworm (SBW), Hemlock Looper (HL), Saddled Prominent (SP), Oak Leaf Tier (OLT), and Forest Tent Caterpillar (FTC). Spruce Budworm, a defoliator of balsam fir, remains at endemic levels. Hemlock Looper counts rose from last year but remain at endemic levels. This caterpillar last caused major defoliation to hemlock in southern NH in the early 1990's. Forest Tent Caterpillar counts fell after a three year epidemic. This is consistent with the decline in defoliation seen in our aerial survey. Gypsy Moth (GM) populations are also recorded when caught in FTC traps. Their numbers also declined this year along with FTC. This connection could be contributed to the presence of natural controls that attack both species. No Saddled Prominent or Oak Leaf Tier were collected.



This table represents the trend of some of NH's common forest pests trapped from 1999-2007. The number of adults collected is the total of all traps for each pest. The number of traps varies from year to year and for each pest. The only pest in this survey to reach epidemic levels during this time period was Forest Tent Caterpillar (2004-2006).



NH Aerial Survey Highlights for 2007

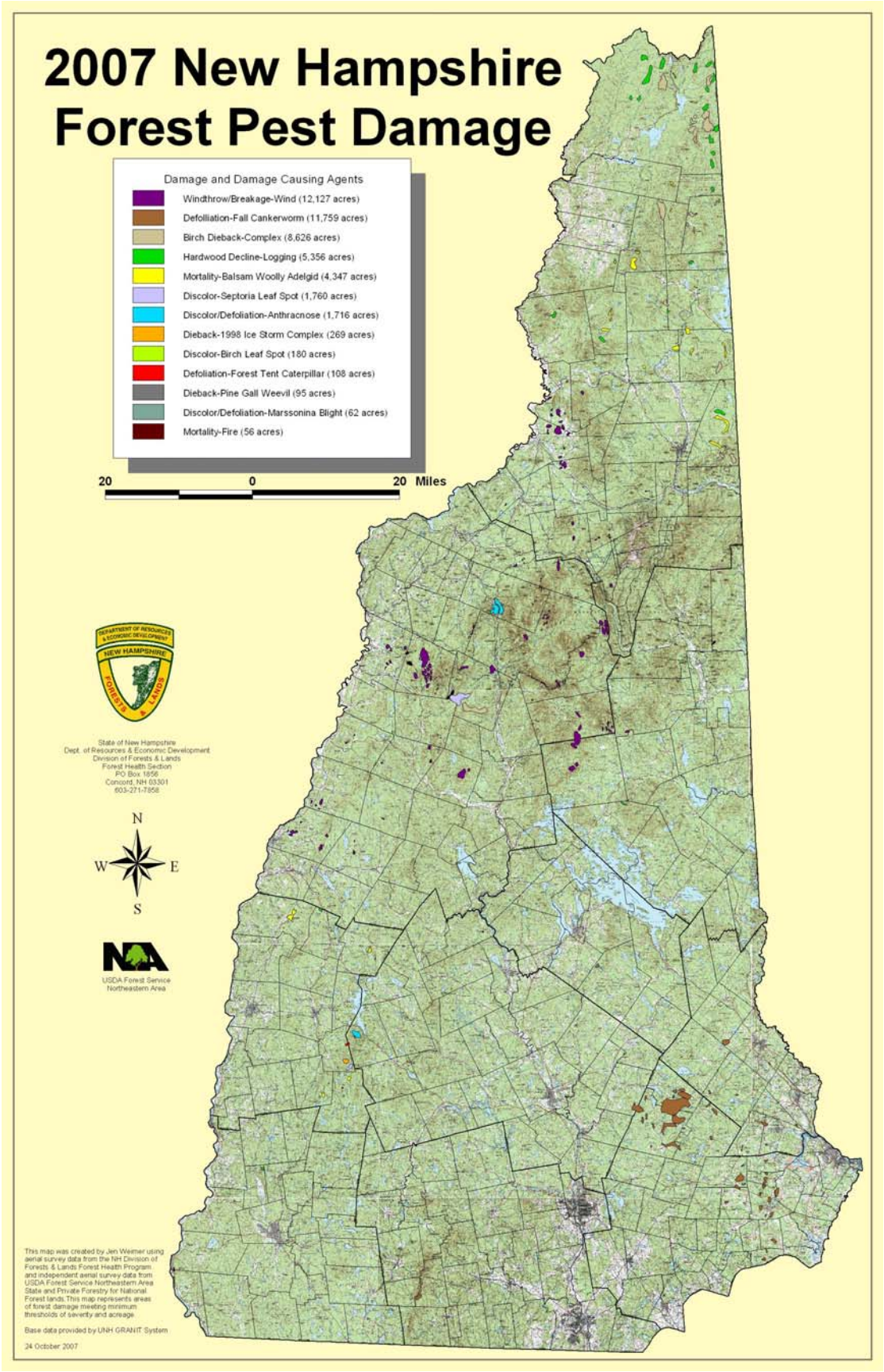
NH's annual aerial survey is a cooperative effort between the state and the USDA Forest Service Northeastern Area State and Private Forestry. The 2007 aerial survey mapped 36,893 acres of serious damage or defoliation on State and private lands (excluding WMNF data). The USDA Forest Service mapped an additional 10,258 acres of damage on the White Mountain National Forest.

Wind was the primary damaging causing agent in NH this year. Blowdown and broken stems were found on 12,127 acres as a result of a Nor'easter in April. **Fall Cankerworm** defoliated 11,759 acres in southeastern NH in 2007. This was down from the 29,000 acres defoliated in 2006. **Forest Tent Caterpillar** populations crashed with only 108 acres defoliated in 2007. This was down from the 29,000 acres defoliated in 2006. Balsam Fir mortality from **Balsam Woolly Adelgid** continues in NH with 4,347 acres mapped.We also continue to see widespread **dieback of birch** (8,626 ac.) associated with the 1998 ice storm, armillaria root rot and bark beetles, as well as hardwood decline from **logging damage** (5,356 ac.).

Other damage causing agents mapped throughout NH this year include **Septoria Leaf Spot** (1,760 ac.), **Anthracnose** (1,716 ac.), **Birch Leaf Spot** (180 ac), **Pine Gall Weevil** (95 ac.), **Marssonina Blight** (62 ac.), and **Fire** (56 ac.).

Oak Mortality from fire damage on Wantastiquet Mountain

Map of 2007 major forest damage on the following page


2007 New Hampshire
Forest Pest Damage
Damage and Damage Causing Agents
Windthrow/Breakage-Wind (12,127 acres)
Defolliation-Fall Cankerworm (11,759 acres)
Birch Dieback-Complex (8,626 acres)
Hardwood Decline-Logging (5,356 acres)
Mortality-Balsam Woolly Adelgid (4,347 acres)
Discolor-Septoria Leaf Spot (1,760 acres)
Discolor/Defoliation-Anthracnose (1,716 acres)
Dieback-1998 Ice Storm Complex (269 acres)
Discolor-Birch Leaf Spot (180 acres)
Defoliation-Forest Tent Caterpillar (108 acres)
Dieback-Pine Gall Weevil (95 acres)
Discolor/Defoliation-Marssonina Blight (62 acres)
Mortality-Fire (56 acres)
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State of New Hampshire
Dept. of Resources & Economic Development
Division of Forests & Lands
Forest Health Section
PO Box 1856
Concord, NH 03301
603-271-7858
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USDA Forest Service
Northeastern Area
This map was created by Jen Weimer using aerial survey data from the NH Division of Forests & Lands Forest Health Program and independent aerial survey data from USDA Forest Service Northeastern Area State and Private Forestry for National Forest lands. This map represents areas of forest damage meeting minimum thresholds of severity and acreage
Base data provided by UNH GRANIT System
24 October 2007

Office Notes

The Forest Health Office welcomed Ray Boivin back this summer as a part time entomologist. Ray worked for several offices in the Division over the past 30 years and recently retired as Regional Forester. He was employed in the Forest Health Office from 1976 to 1981. Ray has great passion for entomology and was an essential part of our EDRR survey. Ray prescreened all of our collections this summer and will be helping with the firewood study. He is also working on a reference collection that will aid us for years to come. We are fortunate to have him back!

We hope you enjoyed the second edition of the NH Forest Health annual newsletter. The first edition was a great success. Thanks to all of you who responded to the first edition and welcome to any new readers. For more information about our program and forest health issues check out our website.

We would love to hear from all of you as you observe forest damage, tree pests, or any other forest health issues. These observations are investigated and often prove helpful to other foresters and specialists working in the woods.

Please forward this newsletter to anyone who may be interested. If this newsletter or a link was not emailed to you directly and you would like to be included on the email list please send us a note. If you have received this in error or received multiple copies also inform us so that we can update the distribution list.

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Image modified by Ray Boivin in 2007 from an original painting by artist Larry Hackett in the 1960's.
Larry worked on the Blister Rust program for at least 30 years.