

Greetings!!

Welcome to the first edition of the NH Forest Health annual newsletter. This edition and editions to come will include a *feature creature* about a forest pest and a *feature article* of an aspect of our program or forest health issue and highlight NH's forest health issues for the year. Since this is our first edition, an introduction to our program has also been included. For more information about our program and forest health issues check out our [website](#).

Introduction

The Division of Forests and Lands is part of the Department of Resources and Economic Development. The mission of the Division of Forests and Lands is to protect and promote the values provided by trees and forests. This mission is accomplished through responsible management of the State's forested resources; by providing forest resource information and education to the public; and the protection of these resources for the continuing benefit of the State's citizens, visitors, and forest industry.

Within the Division of Forests and Lands, the Forest Protection Bureau is responsible for providing statewide leadership in forest protection. The Forest Protection Bureau consists of three programs: forest law enforcement, forest fire protection, and forest health management. Through these programs the bureau enforces the forestry laws of the state, provides forest fire protection, and monitors and protects our forest health conditions.

Within the Forest Protection Bureau, The Forest Health Section monitors and protects the condition of the State's 4.8 million acres of forest. This is accomplished through regular aerial and ground surveys to look for evidence of damaging insects and diseases as well as damaging weather events such as heavy winds, ice storms and air quality impacts. Special studies are carried out in coordination with the USDA Forest Service, New England states, Canada, State Forest Nursery, and other New Hampshire state agencies. In recent years, studies have included white pine blister rust, butternut restoration, balsam fir and ash decline. Technical advice and mitigation work is provided to hundreds of landowners with pest problems throughout the state each year.

FEATURE CREATURE

Emerald Ash Borer (*Agrilus planipennis*)

Emerald Ash Borer (EAB), an exotic beetle from Asia, is a threat to NH's ash resource. EAB larvae feed on the inner bark of ash trees, disrupting the tree's ability to transport water and nutrients, resulting in tree mortality. Since its discovery in Michigan in 2002, EAB has killed more than 20 million ash trees. Since then EAB has been detected in Ohio (2003), one county in Maryland (2003, 2006), Indiana (2004), and Illinois (2006).



Annual surveys in NH have been ongoing since 2003 to determine if EAB is present in stands of ash including our city landscapes. Surveys have focused on declining ash stands, landscape plantings, and campgrounds. Since the initiation of the survey a total of 9 cities, 19 forested sites, and 10 campgrounds have been surveyed for infested ash. The EAB survey protocols developed by the USDA Forest Service were followed for the surveys. Landscape surveys

consist of looking for EAB signs which include: D-shaped exit holes on the main stem and large branches; vertical bark-splits, 2 to 5 inches long with S-shaped larval galleries in the wood underneath; epicormic sprouting; and green metallic adult beetles or cream colored larvae in the galleries.



Campground surveys utilize trap trees and camper surveys. Trap trees are girdled in May using a chainsaw with 2 cuts 6" apart around the tree. The bark between the cuts is removed. The area above is painted purple as an added attractant. Tanglefoot, a sticky paste, is added as a trapping mechanism just above the girdle. In October the girdled trees are cut and debarked in an effort to find feeding larvae. None were found in 2006.

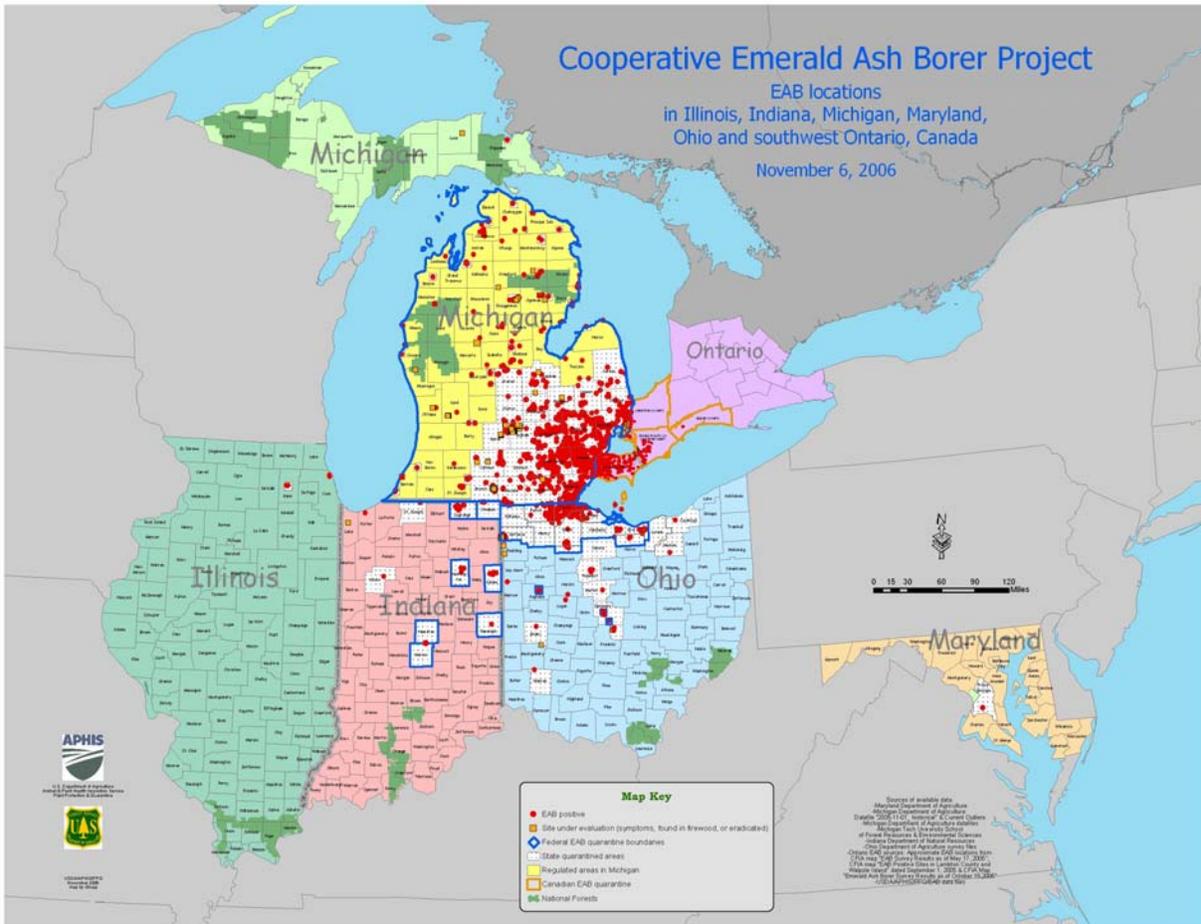
The camper firewood survey was done in cooperation with the NH State Park staff at the Monadnock State Park campground. Mount Monadnock, known as the second most frequently climbed mountain in the world—after Mt. Fuji—is busy most of the year. The survey was conducted on three busy weekends throughout the summer and had some surprising results. A total of 93 campers participated in the survey and 49% brought firewood with them from home. Of those surveyed 57% were from out of state and 42% of the “out of staters” brought firewood to the campground. Of those coming from out of state, 83% were from New England (MA, ME, RI, CT) and 46% brought firewood.



Of those who traveled the farthest—outside of New England—only 18% brought firewood. However, most disturbing is the fact that those traveling the farthest this past year—California and Ontario—actually brought firewood with them. This is of utmost concern to us since parts of Ontario are within the EAB quarantine. Monadnock State Park has been a site of one of our EAB trap trees for the past few years and we will continue to monitor the site closely. Posters to alert campers about the dangers of moving firewood have also been posted at all State campgrounds throughout the state.

In 2006, an additional firewood survey was conducted at retail stores throughout the state to determine the likelihood of exotics moving around the state in processed firewood. While most of the wood found in retail stores was from NH, 15% originated from out of state (Canada, Pennsylvania, Maine and Massachusetts). Only a quarter of the firewood from out of state claimed to be “insect-free”. With firewood movement being difficult to monitor or regulate, EAB will continue to be a threat to NH.

Locations Where EAB has been Detected



<http://www.emeraldashborer.info/>

FEATURE ARTICLE

New Hampshire's Devastating Defoliators

Tree defoliators have been on the rise for the past few years throughout New Hampshire. **Forest Tent Caterpillar** first reappeared in 2004 defoliating 10,000 acres. In 2005 FTC defoliation increased to 70,000 acres in Sullivan County and parts of Grafton, Merrimack, Cheshire, and Hillsborough Counties. Damage was considerably heavy in stands of sugar maple and red oak. In 2006 the severe damage declined to 29,000 acres in many of the same sugar maple and red oak stands as in 2005.

Fall Cankerworm appeared in southeastern NH in 2006. Damage was heavy and caused defoliation of 28,600 acres in primarily red oak stands. **Saddled Prominent** also reappeared in 2006 with 56,000 acres of light defoliation mapped by the USDA Forest Service throughout the White Mountain National Forest. **Gypsy Moth** is one defoliating pest that is not trending upwards. The introduced fungus and virus seem to keep Gypsy moth at endemic levels.

Eastern Tent Caterpillar and **Fall Webworm** are other caterpillars found throughout the state. Each of these attract attention due to the tents they create making trees unsightly. The eastern tent caterpillar constructs tents tightly in branch crotches while fall webworm constructs tents in the tips of branches. They may seem devastating when found but the damage they cause to the tree is typically minimal.

Differentiating between some of NH's caterpillars

	Eastern Tent Caterpillar	Forest Tent Caterpillar	Gypsy Moth	Fall Webworm
				
Larvae	Caterpillars are black with a white stripe along the middle of the back and a row of pale blue oval spots on each side. Full-grown larvae are 2 inches long.	Caterpillars are brown-black with pale blue lines along the sides and whitish keyhole shaped markings down the center. Full-grown larvae are 2 inches long.	Caterpillars are brown-black and hairy, with six pairs of red dots and five pairs of blue dots on the back when mature. Full-grown larvae are 2 inches long.	Caterpillars are covered with silky hairs and are pale yellow to green, with a black stripe on the back and a yellow stripe on each side. Full grown larvae are 1 inch long.
Adults	Moths are yellowish-brown, with two narrow, light lines across the front wings and have a 2 to 2½ inch wingspan.	Moths are buff-colored, with two darker oblique bands on the forewings and have a 1 to 1½ inch wingspan.	Female moths are mostly white with a 2 inch wingspan; males are light tan to dark brown with a 1½ inch wingspan.	Moths are snowy white, usually with dark spots on the wings and have a 1 inch wingspan.
Eggs	Egg masses encircle twigs in bands and are shiny brown.	Egg masses encircle twigs and are coated with a frothy, glue-like substance, which hardens and turns a glossy dark brown.	Egg masses are laid on the main bole and are buff-colored, velvet-textured and 1½ by ¾ inches in size.	Egg masses are laid on the undersides of host leaves and are small, yellow, or light green, and turn gray before hatching.

Forest Tent Caterpillar (*Malacosoma disstria*)

Major forest tent caterpillar (FTC) defoliation reappeared in NH for the first time in decades in 2004. In 2005 FTC defoliation increased from 10,000 acres to 70,000 acres in Sullivan County and parts of Grafton, Merrimack, Cheshire, and Hillsborough Counties. Damage was heavy in stands of sugar maple and red oak. In 2006 the damage declined to 29,000 acres in many of the same sugar maple and red oak stands as 2005 but there was a slight shift northward extending the range of defoliated stands into central Grafton County. Our Trap catches in the North are substantially higher than last year so we expect this migration of defoliation to continue northward.



The FTC, a late spring or early summer defoliator, is native throughout North America and most abundant in the northeast. It prefers sugar maple, aspen, and oak but will also feed upon birch, cherry, basswood and ash. Caterpillars (larvae) are brown-black with pale blue lines along the sides and whitish keyhole shaped markings down the center. Full-grown larvae are 2 inches long. Adult moths are buff-colored, with two darker oblique bands on the forewings and have a 1 to 1½ inch wingspan. Egg masses encircle twigs and are coated with a frothy, glue-like substance, which hardens and turns a glossy dark brown. FTC does NOT make tents, that is left to the eastern tent caterpillar

FTC can defoliate extensive areas reducing diameter growth but rarely results in tree mortality. There are several natural controls including parasitic wasps, a parasitic fly (*Sarcophaga aldrichi*), and a polyhedrosis viral disease. Effectively controlling FTC defoliation with insecticides is logistically difficult to accomplish. The preferred material for application is the bacterium *Bacillus thuringiensis* var. *kurstaki* (Btk) and it's most effective on young caterpillars. FTC egg mass populations in a forest stand hatch at separate times within a 2-3 week window. This creates a wide variety of caterpillar sizes within a forest block making the timing of spray difficult. Also, weather during an ideal spray window, in mid to late May, is often poor and postpones application. Be prepared to accept that a spray application may not achieve control worthy of the project's cost.

Recommended forest management practices in FTC-defoliated forests:

We recommend that you postpone timber harvesting in forests that have been defoliated by FTC. Historically FTC only lasts a few years in any one stand and only 3-6 years state-wide. Wait at least two growing seasons after the outbreak subsides to allow depleted energy reserves within the trees time to recover. Adding additional tree stresses from soil compaction, root and basal wounding, and crown breakage during timber harvesting could increase the severity of defoliation impact and cause increased crown dieback, reduced growth, root rots, and mortality of residual trees. The waiting period also allows for trees that will die to succumb helping foresters discriminate between trees to harvest and residual trees. Lastly, FTC outbreaks may last longer in thinned stands because FTC's natural enemies are more effective in closed canopy situations. Tailor your management decisions to specific site factors and landowner objectives. Sites with better soils should minimize tree stress and with one or two defoliations may allow you to enter these stands sooner after the outbreak ends. Landowners who are practicing even-aged management through the use of clear-cutting won't be affected because the outbreak shouldn't effect establishing early successional species.

Recommended actions within an active sugarbush:

The Division of Forests and Lands and the FPAG support the use of aerial applications of registered insecticides in forests and sugarbushes and recommend it for FTC control when: 1) the trees have already been severely defoliated two years in a row; and 2) winter egg mass counts predict a third severe defoliation the next year.

These recommendations have been developed with the approval of the Forest Pest Advisory Group (FPAG) which is comprised of pest specialists representing the NH Division of Forests and Lands, US Forest Service, NH Department of Agriculture Foods and Markets, UNH Cooperative Extension, The Society For the Protection of New Hampshire's Forests, and the USDA Animal and Plant Health Inspection Service.

Fall Cankerworm (*Alsophila pometaria*)

Fall cankerworm damage was heavy this past summer and caused defoliation of 29,000 acres in primarily red oak stands throughout Deerfield and surrounding areas. 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. Mature larvae are about 25 mm long and can vary between light green and dark brownish-green. The light green caterpillars have white lines running down their body from the head to the tip of the abdomen. The dark brownish-green caterpillars have a black stripe the length of their back. 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 than 1 mm in diameter and are dark grayish-brown with a dot and a ring on top. The eggs are being laid on branches as we write this report in late November.



Saddled Prominent (*Heterocampa guttivitta*)

Our old friend the saddled prominent has reared its ugly head in NH for the first time in over 20 years. In 2006 the USDA Forest Service mapped 56,000 acres of light defoliation caused by saddled prominent on the White Mountain National Forest. Numerous larvae were also observed by foresters at many different forests throughout central NH. Several pupal surveys were conducted in response to the outbreak and based on this data and the increase in damage in 2006 we expect the outbreak to increase in intensity in 2007.

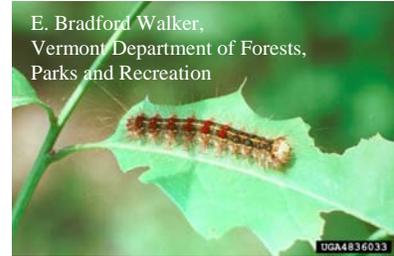


The saddled prominent is a late season defoliator with most damage occurring from late July through early September. Outbreaks of saddled prominent can be severe and several seasons of defoliation may lead to branch mortality and crown dieback. This can be a particularly devastating pest of northern hardwoods because the defoliation comes with just enough time for the tree to try and put out new leaves but not enough time to complete the process before fall frosts kill the tender shoots and twigs. In NH, major outbreaks occurred from 1969-1971 and again from 1980-1981. We still see standing dead maple trees from those outbreaks throughout

the hardwood regions of the Upper Valley. Saddled Prominent is a native pest of hardwood trees in North America. They favor American beech, sugar maple, yellow birch, and paper birch. Other hosts include apple, cherry, mountain maple, oaks, poplar, and witch hazel.

Gypsy Moth (*Lymantria dispar*)

The gypsy moth is **not** a native insect. It was introduced into the United States in 1869 by a French scientist living in Massachusetts. The first outbreak occurred in 1889 and by 1987, the gypsy moth had established itself throughout the Northeast.

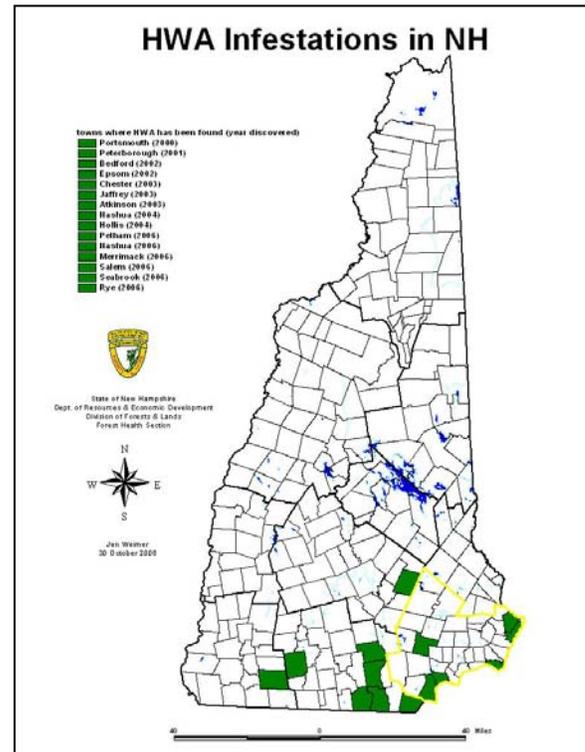


Gypsy moth is now effectively controlled biologically by a fungus and a virus. The fungus, *Entomophaga maimaiga* was introduced from Asia in 1904 to control gypsy moth populations in North America. By 1992 this fungus was recovered throughout the range of the gypsy moth in North America and can be found in gypsy moth populations throughout New Hampshire. The virus, nucleopolyhedrosis virus (NPV) causes a wilt disease specific to the gypsy moth and kills both the larvae and pupae. With these two biological controls in place gypsy moth is no longer a major pest in NH.

Other Surveys

Hemlock Woolly Adelgid

In 2006, new infestations of Hemlock Woolly Adelgid (HWA) were found in 6 towns throughout southern NH. These include the towns of Pelham, Rye, Salem, Seabrook, Nashua, and Merrimack. Of the towns infested in 2006, Pelham, Nashua, and Merrimack are outside the Rockingham County Quarantine. The infestations in these towns must be eradicated according to current rules. However, infestations within the quarantine area need only be eradicated as the landowners request such measures. Infestations inside the quarantine zone provide us an opportunity to release predator beetles known to control HWA in its native range throughout Japan. To date we have release more than 50,000 beetles at two sites in Portsmouth and one site in Rye.





Kyle using the Kioritz soil injector to treat HWA

HWA suppression methods undertaken by the Division this past year included cultural, chemical, and biological control. Cultural control included the cutting and burning of infested trees from urban areas as well as a pending timber sale to remove infested trees from a park. Chemical control was both contracted out and conducted by the Forest Health staff. We treated numerous small infestations on nine different properties with soil injections of Merit. For our treatments we used a Kioritz soil injector with Merit 75WP mixed at 1oz active ingredient per 58 fluid oz with a rate of 1 gram active ingredient per inch of dbh. We also utilized biological control with the release of 10,000 *Sasajiscymnus tsugae* beetles in a forested site.

Sirex Woodwasp



Jen putting up a sirex trap

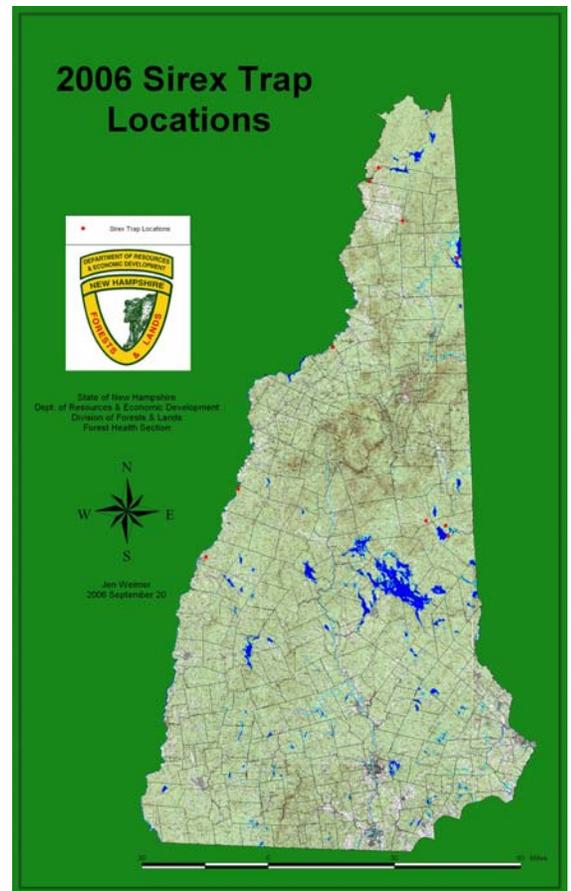
In 2006 ten traps for *Sirex noctilio* were placed around the state as part of a cooperative trapping effort with APHIS, USDA Forest Service, and NH Department of Agriculture. USDA Forest Service trapping protocols were utilized. The traps were in place June through September during the *Sirex* flight period. Lindgren funnel traps with alpha-pinene and beta-pinene lures were hung with the bottom of the trap 6 feet off the ground. Traps were hung in red pine, pitch pine, jack pine, and larch stands. Trap collections were made once every two weeks and the lures were changed once a month. No *Sirex noctilio* was found. The only Siricids trapped were two specimens of the native White-horned Horntail *Urocerus albicornis*.

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Sirex noctilio



Urocerus albicornis



Sudden Oak Death

We began surveying for Sudden Oak Death (SOD)—caused by the pathogen *Phytophthora ramorum*—in 2004 as part of a national survey. Survey protocols as designed by the USDA Forest Service were followed to survey nursery sites with forested perimeters and forested areas containing host species. Five sites, three nursery perimeter and two general forested sites were surveyed in 2004. In 2005 ten sites, five of each were surveyed and in 2006 surveys were continued for SOD. Eight sites, four nursery perimeter and four general forest sites were surveyed. The nursery perimeter inspections in 2006 included two trace forward sites where infested material had been shipped. No *Phytophthora* has been found in NH to date.



Winter Moth

Another exotic pest knocking at our door is Winter Moth (*Operophtera brumata*). This exotic gets its name because the adults emerge in November and December. The hosts include



oaks, maples, cherries, basswood, ash, apple, and blueberry. Surveys conducted in 2005 found several adults throughout coastal NH. Currently a huge pest in



Massachusetts winter moth defoliation has yet to be observed in NH. This year we are participating in another survey in cooperation with other state and federal agencies and have placed 3 universal pheromone traps throughout the southwestern part of the state. This survey is designed to aid researchers in understanding more about hybridization among *Operophtera* species. The survey will also help us determine where the moth currently is in NH. The traps will be out through December.

NH Aerial Survey Highlights for 2006



The Forest Health Section has conducted statewide, annual aerial sketch mapping surveys for over thirty years. During this period the Division has identified and mapped millions of acres of damage generated by dozens of forest pests and forest health stressors. Aerial survey is a critical component contributing to the Division's mission of protecting the state's forest resources and reducing timber value loss. Aerial survey is the most cost effective method of identifying, mapping, and monitoring annual forest pest damage. It is a cooperative effort between the state and the USDA Forest Service Northeastern

Area State and Private Forestry. The 2006 aerial survey mapped 76,828 acres of serious damage or defoliation on State and private lands (excluding WMNF data). The USDA Forest Service mapped an additional 266,334 acres of damage on the White Mountain National Forest.

The 2006 survey was conducted using a digital sketchmapping system consisting of two Hammerhead PC tablets running GeoLink software with a built-in GPS. The Hammerhead system is compact and can be run solely off of battery power, eliminating the need for a power converter.



Forest Tent Caterpillar defoliated 29,000 acres in many of the same sugar maple and red oak stands as in 2005. **Fall Cankerworm** appeared in southeastern NH in 2006. Damage was heavy and caused defoliation of 29,000 acres in primarily red oak stands. **Saddled Prominent** reappeared in 2006 with 56,000 acres of light defoliation mapped by the USDA Forest Service throughout the White Mountain National Forest.

Pine Needleminer has been abundant from 2004 through 2006 in pitch pine throughout the state. Damage has been most noticeable in the Ossipee Pine Barrens with damage peaking to over 4,000 acres in 2005. In 2006 *Lophodermium* needlecast disease was also found in these same pitch pine stands along with the needleminer. Other fungal diseases including **Anthracnose** have been highly prevalent in NH in the past few years due to very wet spring and early summer weather. In 2006 anthracnose was severe on over 175,000 acres of birch in late summer. This was most prevalent throughout the White Mountains and Coos County.

Fir mortality from **Balsam Woolly Adelgid** in NH has been increasingly noticeable in the past few years. From 2000 to 2006 over 16,000 acres of mortality has been mapped during annual aerial surveys. BWA populations throughout NH fluctuate with winter temperatures but are expected to remain in stands below 1500 feet. BWA populations above 1500 feet are expected to be controlled by cold winter temperatures.

Other damage causing agents mapped throughout NH (including WMNF) this year include **Birch Leafminer** (1344 ac.), **Maple Tar Spot** (611 ac.), **Gypsy Moth** (144 ac.), **Beech Bark Disease** (83 ac.), Wind (70 ac.), High Water (51 ac.), **Hemlock Borer** (43 ac.), and **Armillaria** (27 ac.).



Map of 2006 major forest pest damage on the following page

2006 New Hampshire Forest Pest Damage

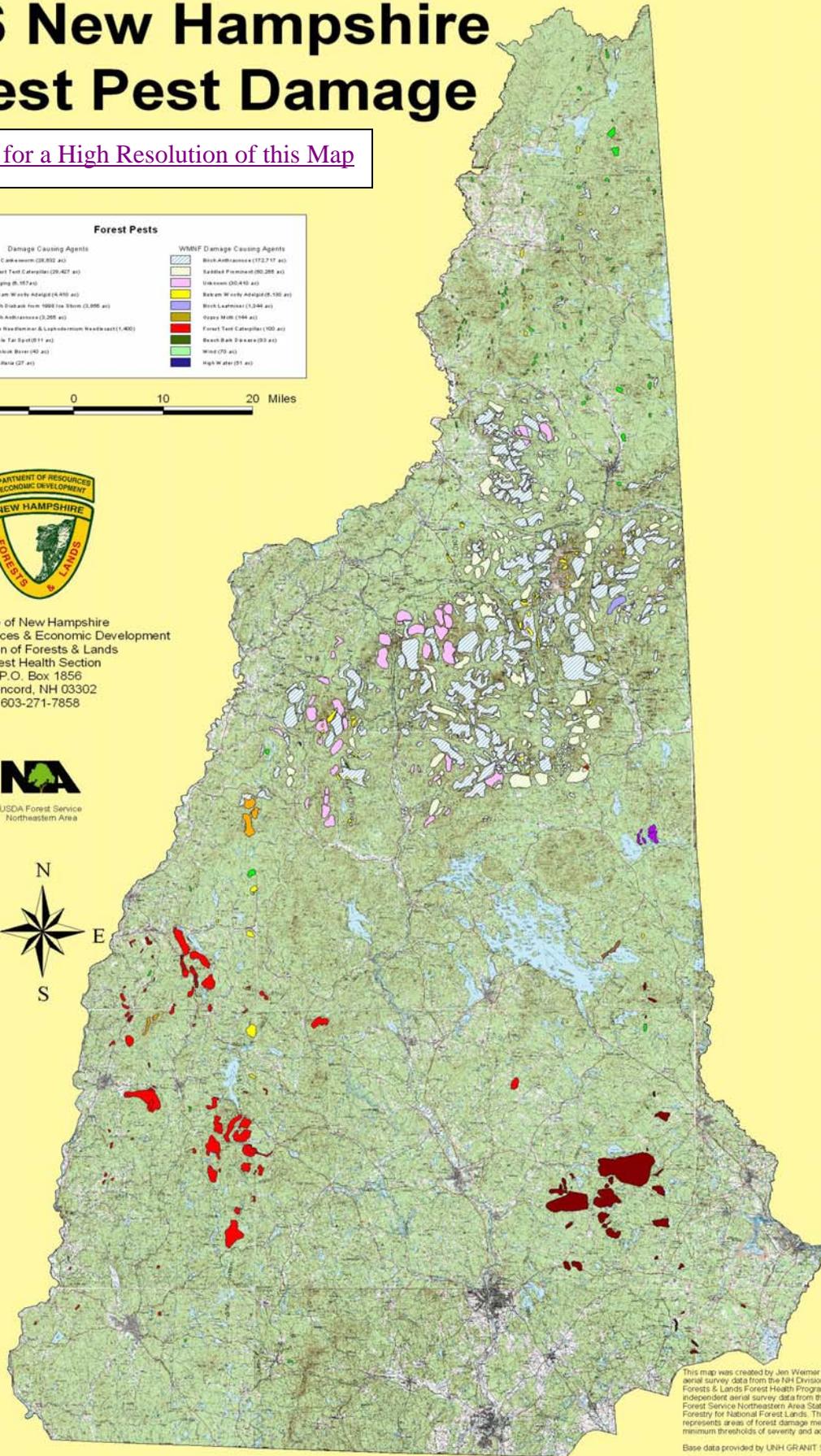
[Click Here for a High Resolution of this Map](#)

Forest Pests	
Damage Causing Agents	
	Fall Caterpillars (28,832 ac)
	Forest Tent Caterpillar (29,427 ac)
	Logging B. Moths (9,167 ac)
	Balsam Woolly Adelgid (4,410 ac)
	Black Striped Pine 1998 (on Strain) (3,899 ac)
	Black Striped Pine (2,286 ac)
	Pine Woodborer & Lyptodermium Woodborer (1,400)
	Maple Tar Spindle (11 ac)
	Hemlock Borer (82 ac)
	Ambrosia (27 ac)
WMF Damage Causing Agents	
	Black Anthracnose (172,717 ac)
	Reddish Pinkrot (80,285 ac)
	Unknown (35,413 ac)
	Balsam Woolly Adelgid (8,195 ac)
	Black Larch (3,344 ac)
	Striped Moth (266 ac)
	Forest Tent Caterpillar (100 ac)
	Beech Bark Disease (33 ac)
	Wind (70 ac)
	High Water (51 ac)

10 0 10 20 Miles



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This map was created by Jan Weimer using aerial survey data from the F&L Division of Forests & Lands Forest Health Program and independent aerial survey data from the USDA Forest Service Northeastern Area State & 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
 28 November 2006



Office Notes

There have been several staff changes to note over the past few years. In January of 2005 Brad Simpkins became the new Chief of the Forest Protection Bureau. Brad is an experienced forester and previously worked as a Forest Ranger. His interest in Forest Health and his strong leadership abilities will serve NH well. In the summer of 2005, our Forest Entomologist Jennifer Bofinger left to pursue opportunities within her family business and Kyle Lombard, then a Forest Health Specialist, replaced her as Forest Health Program Coordinator. Jen Weimer, a recent UNH grad became the new Forest Health Specialist in January of 2006. We all look forward to protecting the health of NH's forests for years to come and hope you have enjoyed our first newsletter. Please feel free to get involved with our activities. We would love to hear from all of you as you observe forest damage, tree pests, or any other forest health issues. These observations can be investigated and often prove helpful to other foresters and specialists working in the woods.

Please pass 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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