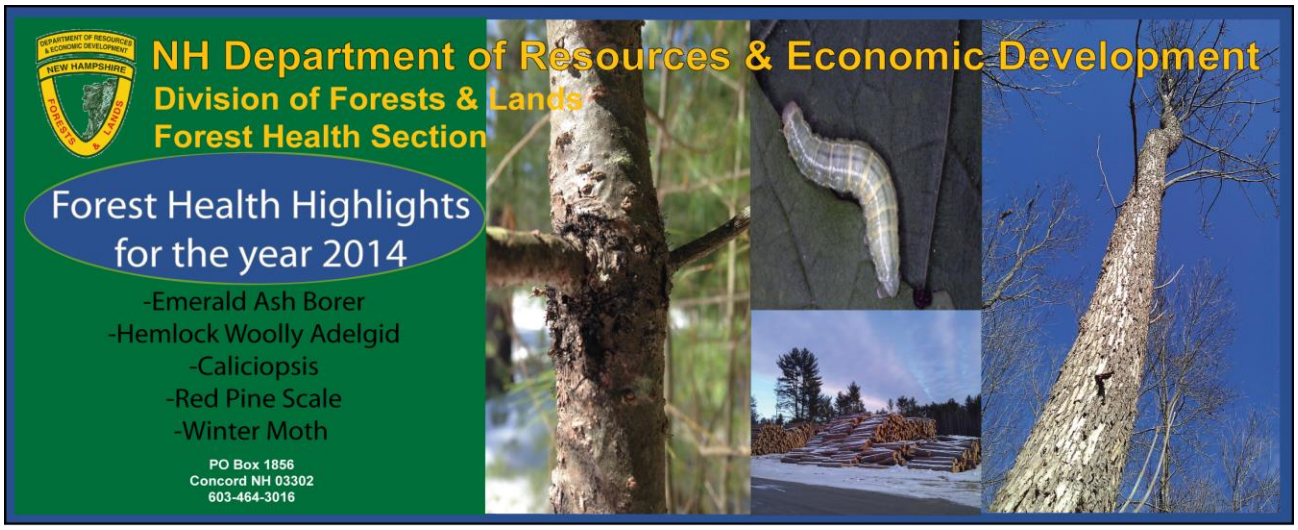


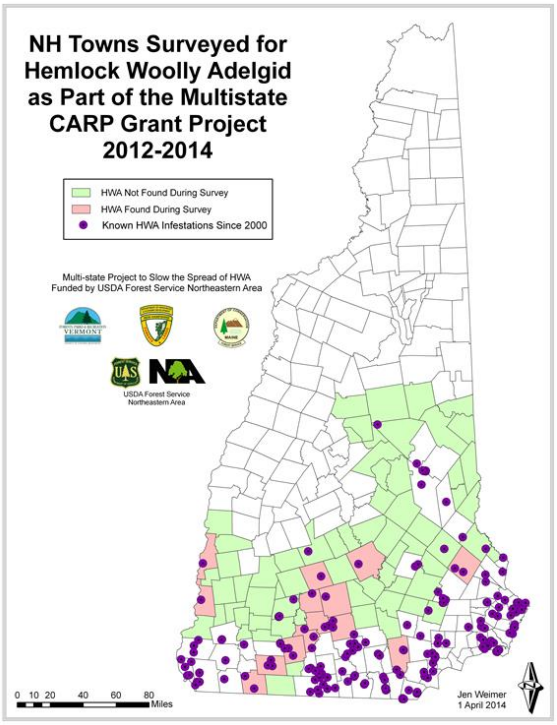
IN THIS ISSUE:

Click on the HYPERLINKS throughout for more information on topics

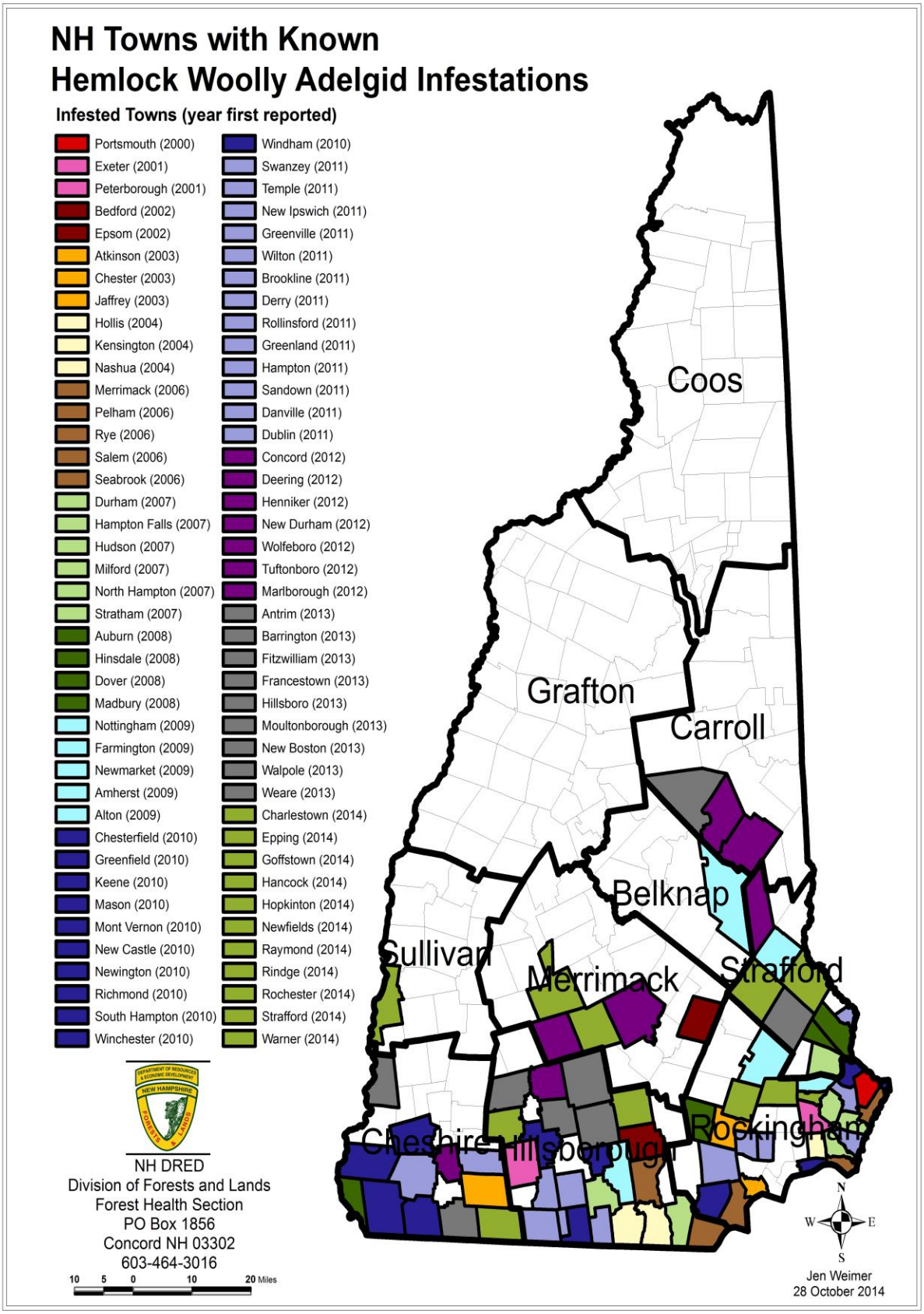
FIELD SURVEYS

Hemlock Woolly Adelgid (HWA)

Hemlock Woolly Adelgid continues to spread throughout NH and is beginning to contribute to tree mortality on the seacoast. Town surveys for HWA were done again this year in cooperation with Vermont and Maine as part of a regional HWA initiative. A total of 12 towns were surveyed in 2014, 33 towns in 2012 and 39 towns in 2013 with a minimum of 200 branches per site at 5 high risk sites per town. New infestations of HWA were found in 6 towns in 2012, 7 towns in 2013, and 1 town in 2014—Charlestown. Infestations were also reported in Barrington, Derry, Exeter, Raymond, Greenfield, Strafford, Rochester, and Warner by the USDA Forest Service as part of a remote sensing project. Additional reports were made in Hancock, Hopkinton, Newfields, and Rindge over the year. There are now 82 towns in NH with known infestations.



NH Towns with Known Hemlock Woolly Adelgid Infestations



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Jen Weimer
28 October 2014

Post suppression surveys were also conducted at all sites treated in 2011 and 2012. At most sites the treated trees were free of HWA but nearby trees that were not treated were heavily infested with HWA indicating that while insecticide treatments are effective on individual trees it is not useful for large scale eradication efforts and treated trees will need to be retreated once the insecticide is no longer effective. In addition, winter mortality surveys were done at 3 sites and results were consistent with last winter's low temperatures. Mortality was 65% on the seacoast but up to 98% at inland sites. This was the highest average of winter mortality recorded in NH since 2007.

***Laricobius nigrinus* Feeding on HWA**

In November, the predatory beetle *Laricobius nigrinus* was released in Antrim to further our HWA biocontrol efforts. Beetles were reared in a lab at Virginia Tech and released on lands owned by NH Audubon. To date we have released over 3000 *Laricobius* beetles at 8 different sites in southern NH and 40,000 *Sasajiscymnus tsugae* beetles at 3 sites on the seacoast.

We continue to prepare 2 sites in NH for our own beetle insectaries. There is great demand for populations of *Laricobius* for bio-control and getting your hands on substantial numbers is difficult. To better take advantage of this emerging tool and the cleverness of many cooperating organizations in NH, we set out to create two insect nurseries or "insectaries". The idea is to create our own dense population of Ln beetles in an area of NH where we can collect beetles and move them annually to new locations around the state. The cooperators involved include the US Forest Service- State and Private Forestry, the University of New Hampshire, the DFL Urban Forestry Center and the Bronnenberg logging Company. The first of two insectary locations was found by Steve Eisenhaure, the woodlands manager at UNH. It's a stand of hemlock at the Horticultural farm and with the help of the Bronnenberg's the large overstory trees were removed leaving just the lush hemlock understory hemlocks. We then selected the 8-15' tall hemlock best suited for collecting beetles from and cleared around them. These selected trees were infested with HWA by hand this spring and by 2015 the population of HWA will be sufficient to support Ln production. The second insectary site is at the Urban Forestry Center in Portsmouth. At this location with the help of the Urban Forestry staff and UNH CE we created a more traditional insectary by planting hemlock in a field. In 2015 our first generation of Ln will be released into these insectaries and a few years later if all goes well we should be able to collect home grown Ln and distribute it to sites across southern NH.

Students and Staff from UNH Helped us Clear Trees:
Marc Ghen, Sean Perrault, Steve Eisenhaure, Jo Lewis

Elongate Hemlock Scale also continues to spread and is often found on trees also infested with HWA. Trees with both insects are more stressed and are expected to have higher rates of mortality. In 2014 EHS was reported at new sites in Milford, Amherst, Hopkinton, Nashua, and Wolfeboro. The Wolfeboro and Hopkinton infestations were on planted landscape trees and are being treated by the homeowners. In addition the tip blight fungus *Sirococcus tsugae* continues to infect hemlock throughout NH sometimes in conjunction with HWA and EHS. This trifecta of pests has led to areas of mortality in understory hemlock on the seacoast.

Hemlock Mortality from HWA, EHS & *Sirococcus* Tip Blight

Winter Moth (WM)

The exotic winter moth was first detected in NH in 2005 as part of a regional trapping survey. However, aerial surveys have never resulted in any detections of defoliation. A survey was initiated in the winter of 2013-2014 to document that WM is in the state but not causing serious defoliation. In conjunction with UNH Cooperative Extension we asked homeowners to report sightings of moth flights at their porch lights during November and December when WM adults are active. Towns with reports were surveyed from the air and ground in early summer when defoliation is occurring. WM larvae and defoliation was visible on the ground at all nine sites with reports from Newington to North Hampton but defoliation was very light and not detectable from the air. Most of the defoliation was on Norway maple which is abundant on the seacoast. WM has been causing widespread defoliation on oak in Massachusetts and Maine over the past ten years but remains at endemic levels in NH.

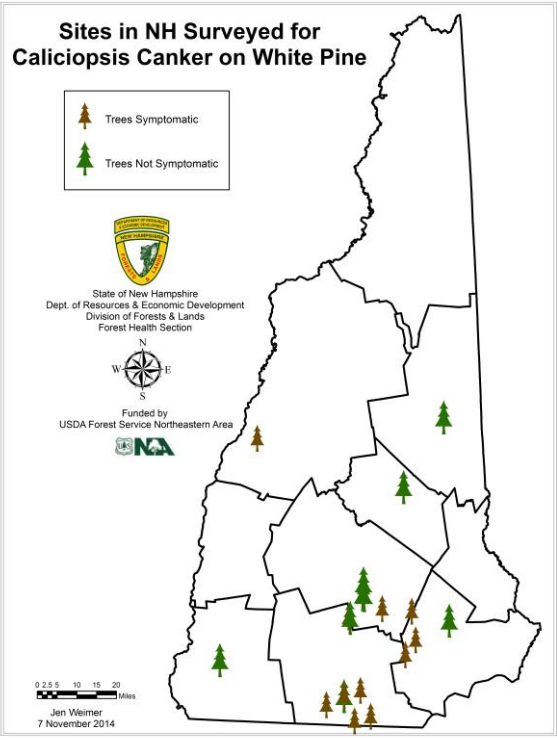
White Pine Blister Rust (WPBR)

A statewide survey was initiated last year to determine the incidence and severity of *Cronartium ribicola* (the fungus that causes WPBR) on planted *Ribes* cultivars in response to the recent discovery of infested immune black currants in CT. With support from the USDA Forest Service 43 sites around the state were surveyed last year and samples tested positive for the disease in all ten counties. A dozen sites were revisited in April to collect spores from aecia—the fruiting bodies of *Cronartium*. A poster summarizing the survey results can be found at: http://www.nhdfl.org/forest-health/white-pine-blister.aspx.

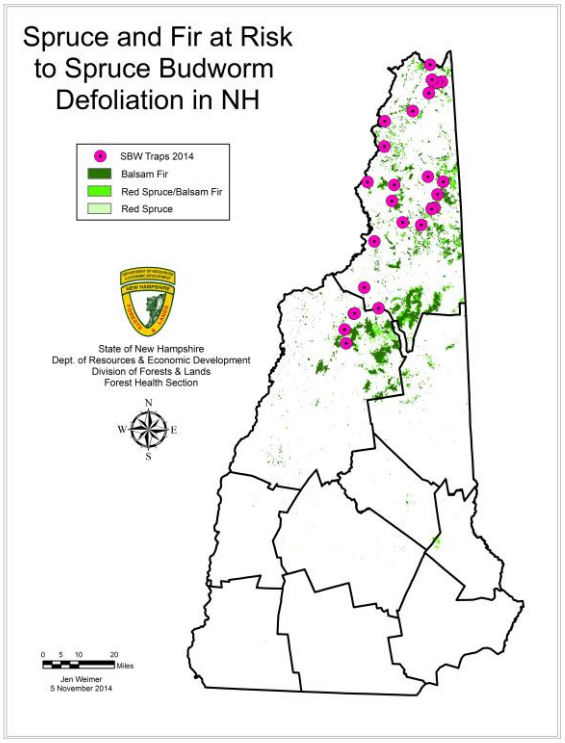
The current list of *Ribes* plants approved for planting in NH with a permit include:

- Black Currants: Crandall, Willoughby
- Red Currants: Rondom
- White Currants: White Currant 1301
- Gooseberries: Jostaberry, Jahns Prairie, Captivator, Careless, Clark, Crown Bob, downing, Howards Lancer, Sabine

Pine Canker (*Caliciopsis pinea*)



Caliciopsis pinea (see feature creature) has been noted in NH since 1997 and has been associated with white pine decline and a reduction in lumber quality. A two year survey was initiated this summer in order to better understand the incidence and severity of the pine canker in the northeast. Sites were randomly selected on public lands that were > 5 acres with > 75% basal area white pine. Trees were evaluated on the presence of pitching in overstory trees and fruiting bodies on regeneration. In NH 11 out of 20 sites surveyed were symptomatic for the disease with 40% of trees in affected stands being symptomatic. Seedlings with fruiting bodies were collected and sent to UNH for DNA analysis. Symptomatic seedlings were also sent to Georgia as part of a regional evaluation of *Caliciopsis* and pine bast scale associations. Next summer a subset of the symptomatic sites will be revisited to harvest trees and confirm the symptoms observed in the upper crowns are indeed caused by *Caliciopsis*. In addition, 6 sites in NH will be evaluated to determine the effects of thinning in affected stands.

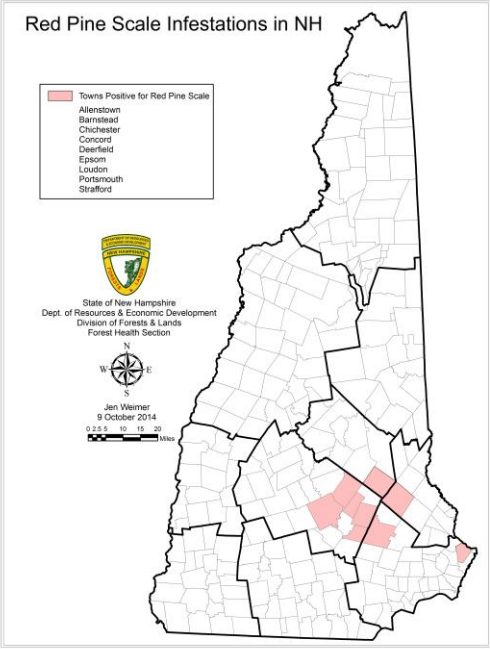


Spruce Budworm Trapping

Each summer pheromone traps are placed around the state to monitor common forest pest populations. In 2014 trapping ceased for forest tent caterpillar and oak leaftier but increased for spruce budworm. New trap sites were added in preparation for a possible outbreak in NH. Sites were selected based on the USDA Forest Service National Insect and Disease Risk Mapper. There is currently an outbreak of spruce budworm in Quebec Canada which is expected to move southward in coming years. Spruce budworm trap counts are on the increase in northern Maine but remain at endemic levels in NH.

Red Pine Scale Update

Red Pine Scale was first detected in NH in 2012 and infestations continue to slowly spread in southern NH. A sanitation harvest at Bear Brook State Park was initiated on 118 acres in 2012 and a second harvest of 100 acres was completed this past winter. Most recently an infestation was found at the Urban Forestry Center in Portsmouth and a sanitation harvest of 6 acres is underway. New infestations were also detected in Barnstead, Loudon, and Strafford this year. There is no control for this pest in plantations or forests and it is advised to harvest once infestation is detected. Contact the forest health office if you would like confirmation of a scale infestation.



NH Aerial Survey Highlights for 2014

NH's annual aerial survey is a cooperative effort between the NH Division of Forests and Lands and the USDA Forest Service Northeastern Area State and Private Forestry. The 2014 NH state aerial survey team mapped 20,036 acres of serious damage or defoliation on state and private lands and the USDA Forest Service mapped an additional 5,151 acres of damage on the White Mountain National Forest (WMNF).

Mortality of balsam fir from **balsam woolly adelgid** was the primary damaging causing agent this year with 15,201 acres mapped. Mortality of northern hardwoods and birch from old **ice storm** damage was mapped on 2,513 acres. Defoliation from **ash leaf rust** was mapped on 808 acres and dieback from **logging damage** was mapped on 848 acres. In addition there was defoliation of red oak from **frost and anthracnose** (261 acres), mortality of spruce and fir from **wind** damage (183 acres), mortality of pine and ash from high **water** (144 acres), mortality of red pine from **armillaria and bark beetles** (73 acres) and mortality of birch and hemlock from **fire** (5 acres) mapped. The USFS mapped 4,529 acres of **white pine needlecast diseases**, 352 acres of spruce and fir **blowdowns**, and 270 acres of unknown defoliation on the WMNF.

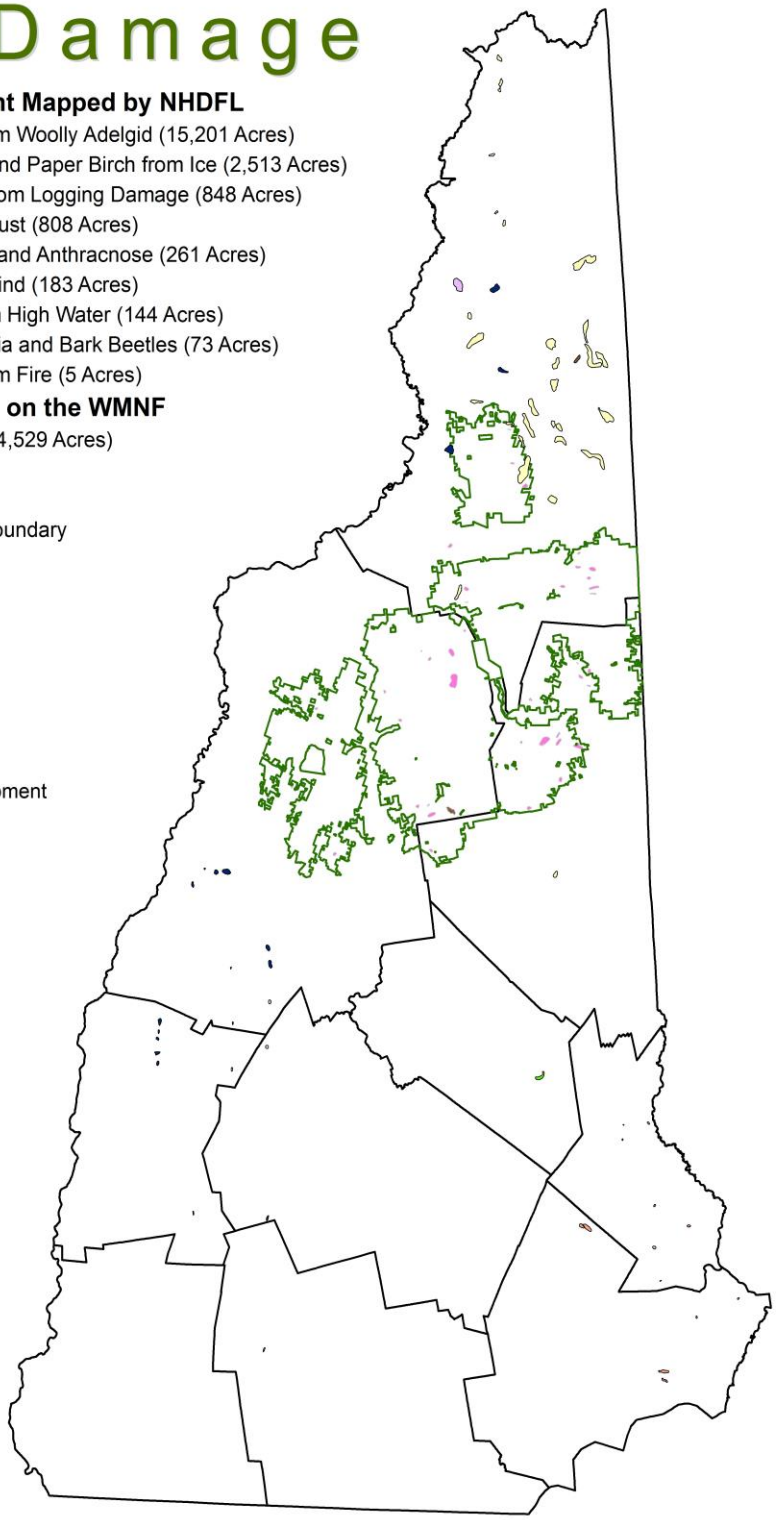
2014 New Hampshire Forest Damage

Primary Damage Causing Agent Mapped by NHDFL

- Mortality of Balsam Fir from Balsam Woolly Adelgid (15,201 Acres)
- Mortality of Northern Hardwoods and Paper Birch from Ice (2,513 Acres)
- Dieback of Northern Hardwoods from Logging Damage (848 Acres)
- Defoliation of Ash from Ash Leaf Rust (808 Acres)
- Defoliation of Red Oak from Frost and Anthracnose (261 Acres)
- Mortality of Spruce and Fir from Wind (183 Acres)
- Mortality of White Pine or Ash from High Water (144 Acres)
- Mortality of Red Pine from Armillaria and Bark Beetles (73 Acres)
- Mortality of Birch and Hemlock from Fire (5 Acres)

Primary DCA Mapped by USFS on the WMNF

- White Pine Needlecast Diseases (4,529 Acres)
- Spruce Fir Blowdown (352 Acres)
- Unknown Defoliation (270 Acres)
- White Mountain National Forest Boundary



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Dept. of Resources & Economic Development
Division of Forests & Lands
Forest Protection Bureau
Forest Health Section
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Concord, NH 03302
603-464-3016

N
W E
S

USDA Forest Service
Northeastern Area

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Miles

This map was created by Jen Weimer using aerial survey data from the NH Division of Forests & Lands Forest Health Program and USDA Forest Service Northeastern Area. This map represents areas of forest damage meeting minimum thresholds of severity and acreage.

30 September 2014

EAB UPDATE

By: Molly Heuss

In March of 2013 the highly invasive emerald ash borer (EAB) beetle was first found in New Hampshire, in Concord and Bow. We responded quickly with an intensive six mile radius survey to determine the extent and severity of the infestation and Merrimack County was placed under quarantine. Details of this survey are included in the 2013 newsletter. The survey resulted in a roughly 24 square mile generally infested area or "GIA" (a one mile buffer is applied to the location of all known EAB-infested trees and stands to make up New Hampshire's GIA).

Ash Trees Killed by EAB in Loudon

The total area surveyed in 2014 increased dramatically from the previous year. In fall of 2013 infested trees were discovered in North Andover, MA, sparking concern for the nearby town of Salem, NH. The following spring a visual survey was carried out within a portion of Salem nearest the infestation in North Andover, with no EAB located. In March a private citizen in Loudon led us to the second identified infestation in New Hampshire. A six mile radius visual survey was employed in Canterbury and Loudon, resulting in a roughly 9 square mile GIA. Surveying continued around the outskirts of the Concord/Bow infestation this year and many additional infested trees were located, increasing the GIA by roughly 13 square miles. EAB was also identified in Hopkinton and Weare, sparking two ongoing surveys and the addition of Hillsborough County to the quarantine. Nine communities at high risk of introduction in southern NH have also been visually surveyed for signs of EAB.

This year we utilized several trapping methods including green prism traps with pheromone lures, an alternative to the traditional purple trap. 29 traps were deployed in Loudon and Canterbury, of which three captured EAB adults. One trap was placed at a known infested site as a control, another was 0.5 miles from known infested trees, and the third was 2.2 miles from known infested trees. Ten traps were deployed in Salem and two caught adult EAB, causing the addition of Rockingham County to the quarantine in October. The remaining traps were placed at reload yards around southern NH and none captured EAB adults.

Biosurveillance of 12 *Cerceris fumipennis* colonies continued this year with no EAB collected. We also created 23 trap trees, 10 of which surrounded the Loudon/Canterbury infestation to help identify its boundaries. We are currently in the process of removing these trees but two have already been found infested in Loudon, increasing the GIA by roughly eight square miles. Three adjacent counties are now under quarantine in New Hampshire, seven towns host known infested trees, and the collective GIA is roughly 73 square miles.

Due to its widespread impact we have participated in or hosted 22 events this year addressing EAB, 13 of them in partnership with UNH Cooperative Extension and NH Department of Agriculture, Markets, and Food. These events focus primarily on field identification and reporting, management recommendations for woodlots and landscape ash, as well as quarantine compliance. Our outreach events have targeted outdoor enthusiasts, foresters, arborists, landscapers, land surveyors, municipal officials, conservation commissions, land trust volunteer staff, and landowners within known infestations, among others.

Biological control is the only long-term management option available at this time, and as such is a high priority. This year, the first year of EAB biological control in NH, a total of over 14,000 biological control agents were released at two locations in Concord and one site in Canterbury. The control agents consist of two species of parasitic wasps approved for release in the United States, *Oobius agrili* and *Tetrastichus planipennisi*. The wasps infest and consume EAB eggs and larvae, and have now been shown to establish and spread in the United States. The parasitoids were produced and supplied by the USDA Animal Plant Health Inspection Service (APHIS) EAB Parasitoid Rearing Facility in Brighton, MI.

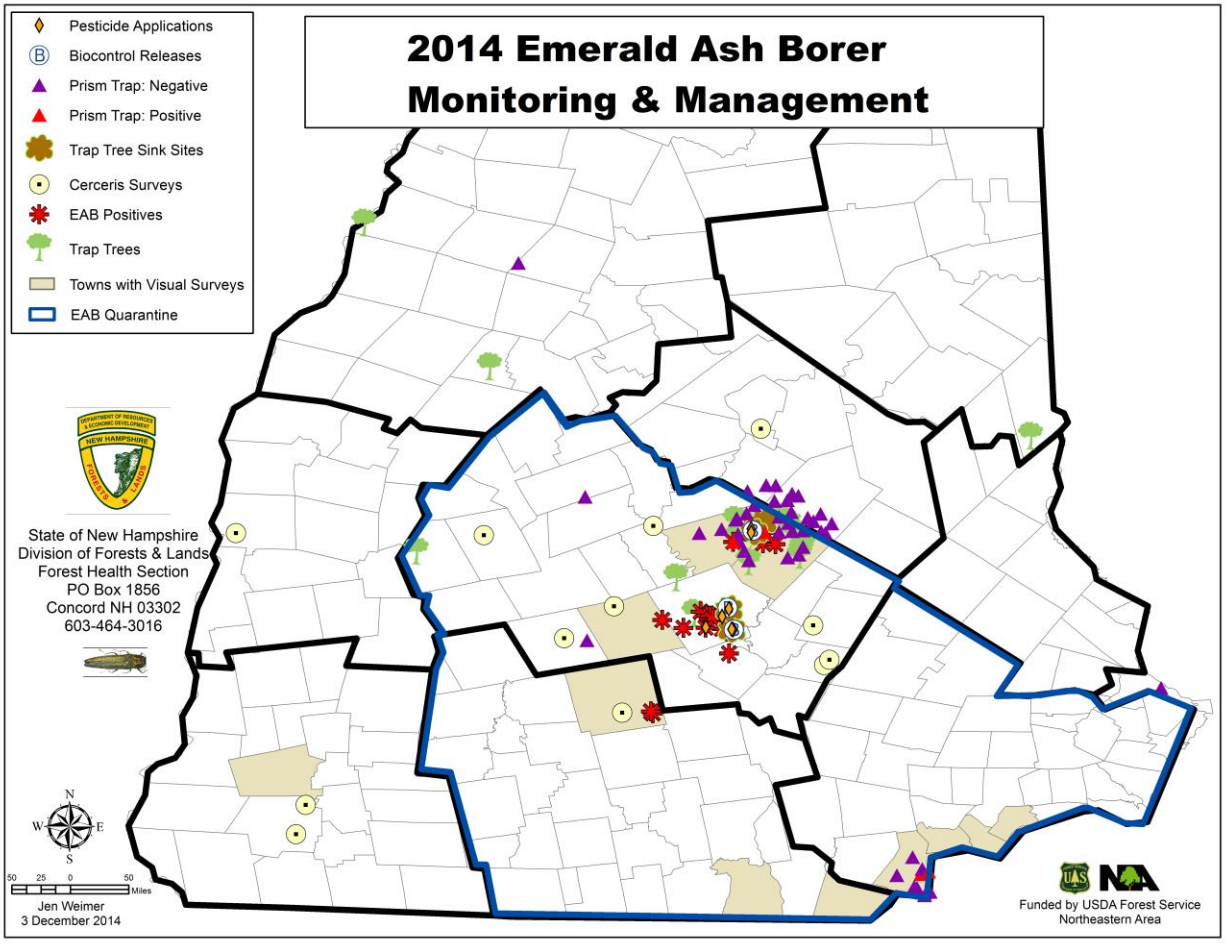
Tim Meeh of North Family Farm Helped us Release Biocontrols in Canterbury

We also began testing more innovative management methods this year, with the guidance of the USDA Forest Service. We helped coordinate three strategic timber harvests to salvage ash while utilizing trap trees within the harvest area. We hope to use the trap tree harvest to decrease the local EAB population, and are measuring this method's feasibility for a broader landowner base. 50 green prism traps were deployed, which were new to us this year and had a promising 10% catch rate. In addition, four of the five positive traps were at locations we were previously unable to find EAB through visual surveying. 75 girdled trees are distributed through five sink sites installed this year, three at the aforementioned timber harvests in Canterbury and Loudon and two in Concord. In Concord we have girdled ten trap trees and coupled them with pesticide treated ash trees which will continue in their EAB-killing efficacy for several years, while most ash in the vicinity will die, creating a more long-term sink site. A team of scent-tracking dog handlers is also consulting with us and training diligently to detect EAB frass, larvae, and adults. The dogs have already passed several field trials and are expected to begin surveying this summer in woodlots as well as public areas like campgrounds.

Finally, we have produced a series of best management practices (BMPs) for handling ash material in NH, especially infested ash material originating within the quarantine zone. According to the EAB quarantine regulations ash material can move anywhere within the quarantine zone, so long as it does not leave the quarantine without proper processing and paperwork. However, we are deeply concerned with the potential for

movement of EAB to large uninfested areas of the quarantine zone and have produced information (available on NHbugs.org) to guide landowners, firewood producers, and others in how to decrease their risk of moving EAB in simple, easy-to-follow methods.

To find out more about the emerald ash borer, find an upcoming EAB event, or to report a suspect ash tree or insect visit www.NHbugs.org.



FEATURE ARTICLE

By: Kyle Lombard

Imidicloprid in Maple Sap if Treating for Asian Longhorn Beetle

In 2014 the Forest Health Program cooperated with Dr. Richard Cowles at the Connecticut Agricultural Experiment Station and Villanova University to investigate the potential contamination of sap extracted from maple trees which were treated with imidicloprid pesticides to combat infestations of Asian longhorned beetle. Our basic questions were: (1) Is imidicloprid found in sap and syrup the spring season following summer treatments, (2) What, if any, concentrations are found in sap from treated trees, (3) is the concentration different if sap is collected above versus below the insecticide treatment site?

Sugar maples were selected and treated at Fox State Forest in Hillsborough in August of 2013 using soil drenches and basal injections with the Mauget capsules. In February and March of 2014 the trees were tapped and weekly samples sent to the chemistry lab at Villanova. Subsequent analysis and reporting was completed by Dr. Cowles and the results are as follows.

Concentrations of imidicloprid were found in all of the treated trees. The range was up to 2,580 ppb for the samples drawn above the pesticide injection site and up to 982 ppb from samples taken at taps below the injection sites. Further lab experiments also concluded that concentrating sap into syrup through boiling did nothing to reduce the levels of imidicloprid.

The results seem somewhat expected so why perform this work? The EPA has a "Health Advisory Level" for imidicloprid at 399 ppb so it was good to nail down that treating maple trees for Asian longhorned beetle would likely put the products of that tree above this level. Plus, imidicloprid is known as a Xylem mobile pesticide that moves up the tree to plant parts above treatment locations. This experiment showed that some imidicloprid pesticide movement does take place downward even though it was three times less than the concentrations found above injection sites. So the potential to tap below higher treatment sites does not seem to be an option in attempting to keep sap pesticide free.

imidicloprid (purple liquid) treatment using stem injection and Mauget capsules

FEATURE CREATURE

By: Jen Weimer

Caliciopsis Pine Canker (*Caliciopsis pinea*)

Caliciopsis pine canker was first reported in New Hampshire in 1997. Most commonly it is found on *Pinus strobus* (white pine) in New England, New York, Virginia, West Virginia, Quebec and Ontario, but has also been reported on *P. rigida*, *P. pungens*, *P. echinata*, *P. virginiana* in North America, and was first found on *P. resinosus* (red pine) in New Hampshire in 2012. It has also been reported in Europe on *P. pinaster* and *P. radiata* and in Germany on *P. pumilo* and *Abies* species.

Pine Canker Pitch Streaks

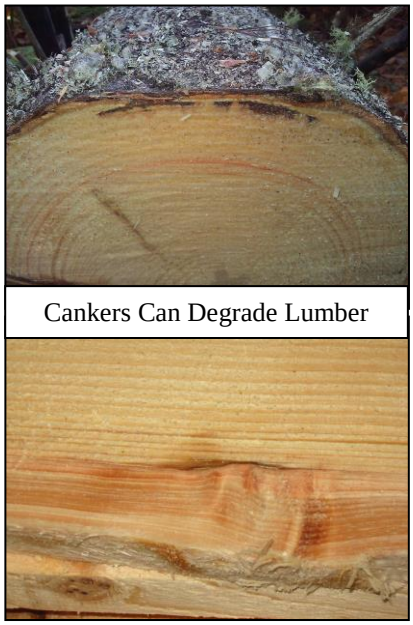
Caliciopsis canker is described in literature as a weak perennial fungus which attacks thin barked areas of the branch and bole. Cankers can be either elongated depressions with profuse pitching on the stem or an extreme roughening of the bark just below the branch whorls. Black hair like fruiting structures persist throughout the year and the spores mature in late winter and spring. Spores are disseminated by wind and rain and typically enter through bark lenticels or small insect wounds. The highest incidence of disease to date has been noted on suppressed, understory trees and trees in very dense stands. Management practices which create increased sunlight in the stand may decrease spore production and dissemination.

Studies of damage by *Caliciopsis* canker were done in the 1930s and are currently being conducted to better understand the incidence and severity in the northeast. While it has not been reported to cause significant tree mortality in the northeast, in 2011 Virginia reported an unusual high incidence of white pine mortality from *Caliciopsis*. Investigations are ongoing to determine the relationship of this mortality with the presence of the pine bast scale insect *Matsucoccus macrocicatrices* which was found within the *Caliciopsis* cankers.

Pine bast scale has historically been reported in New Hampshire, Massachusetts, and Eastern Canada but has recently been found in Georgia, North Carolina, South Carolina, Tennessee, Virginia, and West Virginia. There are reportedly no known specimens in museums in the southeast suggesting it may be expanding its range.

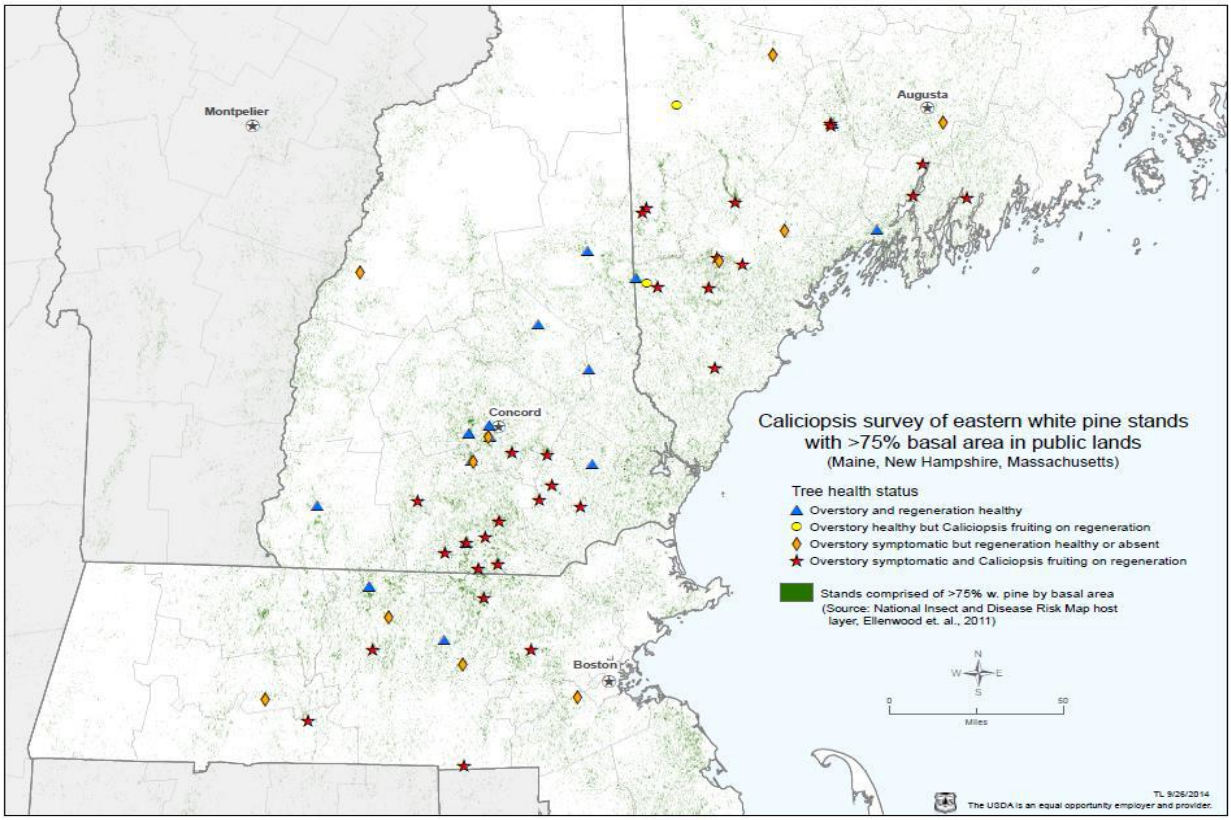
Pine Cankers with Black Fruiting Bodies

In addition there is a known association of the scale with the fungus *Septobasidium pinicola*. It is believed to be a symbiotic relationship in that the scale uses it as cover and the fungus derives nourishment from the scale. This fungus has not been found to damage trees and is also often overgrown with lichens. The scale and fungus have both been found in association with *Caliciopsis* in NH.



Cankers Can Degrade Lumber

This disease deserves attention as it is complex, understudied, increasingly found within native pine stands, and recognized as degrading log quality in NH. Studies initiated by the NH forest health section in 2001 suggest that *Caliciopsis* infections can be found in up to 70% of the stand, affect all size classes and stocking levels, and is highest on soils not optimal for growing pine. Infected trees were noted as having reduced crown densities and increased crown transparencies indicating a reduction in tree vigor and growth. Studies conducted in NH and Maine during the summer of 2014 show similar results with 40% of trees in infected stands being symptomatic in all size classes. Infection was greatest in intermediate and suppressed pole sized trees and trees with live crown ratios of 70%. Studies will continue next summer to look at the effects of thinning.



Office Notes

The NH Forest Health office and lab is located at the Caroline A. Fox Research and Demonstration Forest in Hillsboro. We have moved out of our EAB headquarters at the NH DOT building on Stickney Avenue in Concord which was established during our EAB delimitation survey. Our EAB efforts are now being coordinated out of our Fox Forest office.

The NH Forest Health Program consists of three full time staff and seasonal part time staff. Jen just finished her 10th field season with the program and continues to work on all survey and monitoring projects. EAB has kept Molly busy her first year and she continues to work on EAB monitoring, management, and outreach. Ray Boivin, our part time Entomologist, worked with us again this year to keep our lab running smoothly and our technician this year was Maia Beh who assisted with EAB surveys and the *Caliciopsis* project.

Please don't hesitate to contact us if you observe any forest pest damage and follow us on social media to keep up to date on forest health issues in NH.

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