USDA

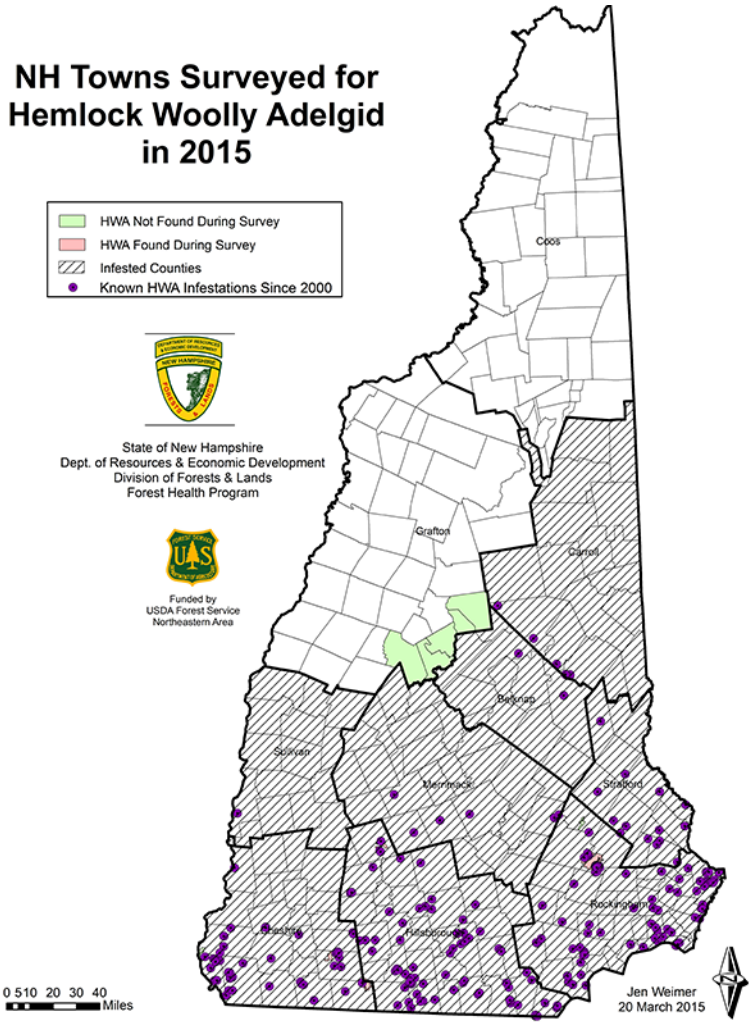
United States Department of Agriculture

2015 Forest Health NEW HAMPSHIRE *highlights*

Field Surveys

Hemlock Woolly Adelgid (HWA)

Hemlock woolly adelgid continues to spread throughout New Hampshire and is beginning to contribute to tree mortality in areas also infested with elongate hemlock scale and *Sirococcus tsugae* (see Feature Creature). HWA Surveys for 2015 were done on high-risk State lands throughout southern New Hampshire and five towns in Grafton County that border the northernmost infested area. Towns surveyed included Holderness, Bristol, Bridgewater, Alexandria, and Ashland. No new infestations of HWA were found during the town surveys. State lands surveyed included Fox State Forest, Pawtuckaway State Park, Monadnock State Park, Annett State Forest, Woodman State Forest, Forest Peters Wildlife Management Area, Bear Mountain State Forest, Northwood Meadows State Park, Shieling State Forest, and Wantastiquit State Forest. New HWA infestations were found at Annett, Fox, Pawtuckaway, Monadnock, Woodman, Bear Mountain, and Shieling. New infestations were also reported by landowners in Bow, Meredith, and Lee.

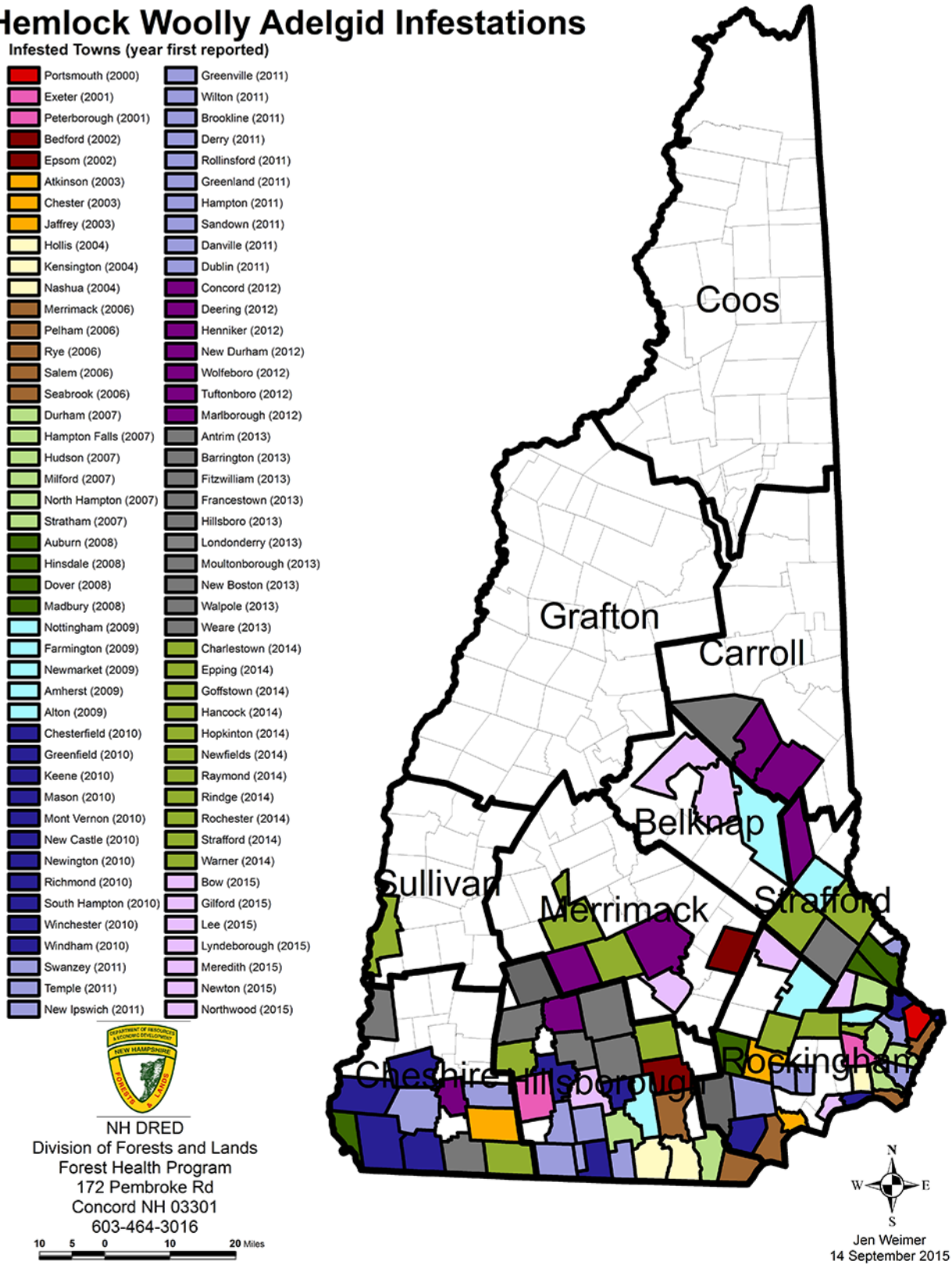


Forest Service
Northeastern Area
State and Private Forestry

New Hampshire Department of Resources and Economic Development

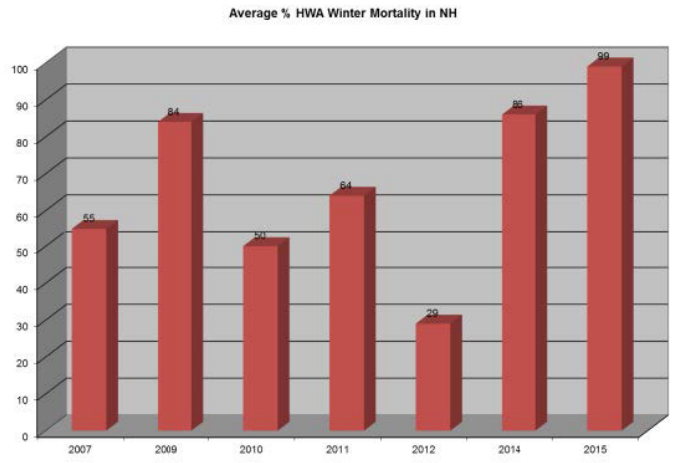
April 2016

NH Towns with Known Hemlock Woolly Adelgid Infestations



NH DRED
Division of Forests and Lands
Forest Health Program
172 Pembroke Rd
Concord NH 03301
603-464-3016

Jen Weimer
14 September 2015



In addition, winter mortality surveys were done at three sites, and results were consistent with last winter's low temperatures. Mortality of HWA was 98% on the seacoast but up to 100% at inland sites. This was the highest average of HWA winter mortality recorded in New Hampshire since we began monitoring in 2007.

Elongate hemlock scale (EHS) 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 2015 scale was reported by landowners at new sites in Rye, Amherst, and Newton. In addition, light infestations were found at Pisgah State Park and Bear Mountain State Forest during HWA surveys. The tip blight fungus (*Sirococcus tsugae*) also continues to infect hemlock throughout New Hampshire, sometimes in conjunction with HWA and EHS. This trifecta of pests has led to areas of mortality in understory hemlock. In addition, trees on sites with shallow soils affected by this year's drought were stressed even further, leading to outbreaks of hemlock borer.

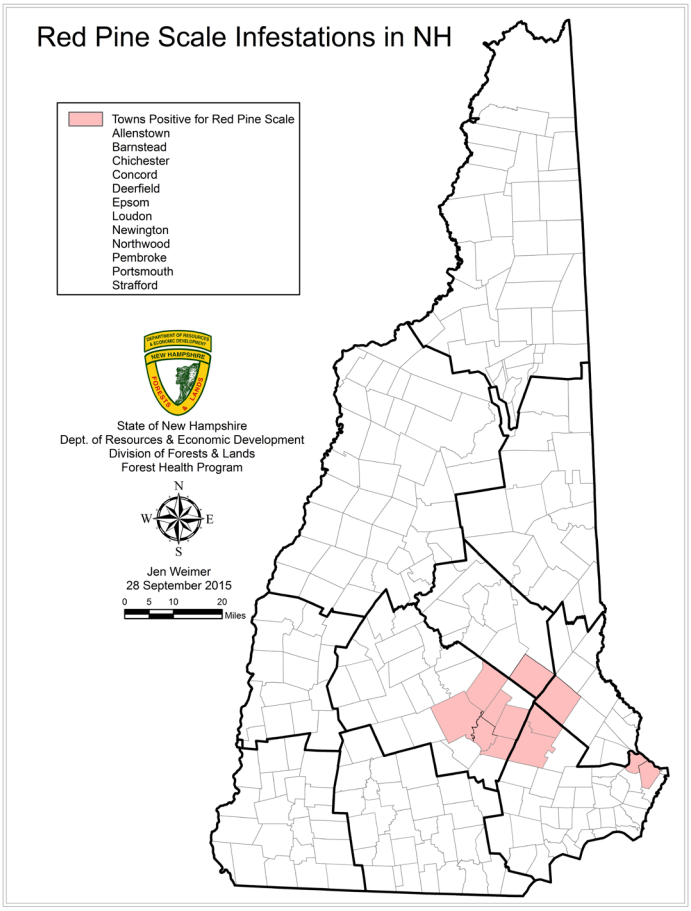
NEW publication! "Managing Hemlock in Northern New England Forests Threatened by Hemlock Woolly Adelgid and Elongate Hemlock Scale" is now available. This collaborative guide funded by the USDA Forest Service provides guidelines for managing hemlock in the Northeast. Contact New Hampshire Forest Health for hard copies.

Hemlock mortality (Photo: Jen Weimer)

Red Pine Scale (RPS)

Red pine scale was first detected in New Hampshire in 2012, and infestations continue to slowly spread in southern New Hampshire. Surveys this year were done on high-risk State lands in southern New Hampshire, including Shieling State Forest, Mast Yard State Forest, Pawtuckaway State Park, Woodman State Forest, Litchfield State Forest, Annett State Forest, Pow Wow State Forest, and Eaton State Forest. No new infestations were found in the surveys. New infestations were reported by landowners in Pembroke, Northwood, and Newington at the Great Bay National Wildlife Refuge this year. RPS was also recently detected in Vermont for the first time in Orange and Rutland Counties.

There is no control for this pest in plantations or forests, and harvest is advised once infestation is detected. Contact New Hampshire Forest Health if you would like confirmation of a scale infestation.

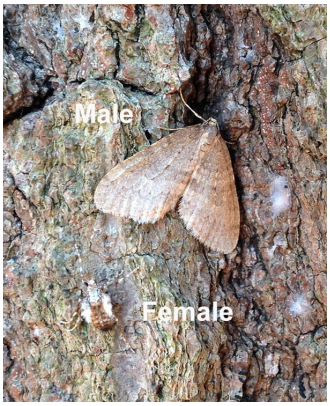


Winter Moth (WM)

Winter moth is an exotic defoliator from Europe that was first reported in Nova Scotia in the 1930s and eastern Massachusetts in the late 1990s. It has since spread west and south to Rhode Island; Connecticut; and Long Island, New York. It has also been found throughout coastal Maine from Kittery to Bar Harbor and is now in southern New Hampshire. The larvae of winter moth defoliate deciduous trees and shrubs in early spring. Trees heavily defoliated by winter moth for 3 or more years can exhibit branch dieback and mortality. Preferred hosts include oak, maple, birch, apple, elm, ash, crabapple, cherry, and blueberry. The larvae will feed on many other plants as well. Winter moth is similar in appearance to the native Bruce spanworm (*Operophtera bruceata*) and fall cankerworm (*Alsophila pometaria*), and it is extremely difficult to tell the species apart.

WM was first detected in New Hampshire in 2006 as part of a regional trapping survey. Larvae and defoliation have been visible on the ground throughout the seacoast from Newington to North Hampton for several years, but most defoliation has been very light and not detectable from the air until now. This year we observed heavy defoliation in Portsmouth and mapped 40 acres of defoliation in North Hampton. Adults are now active and are attracted to lights. Let New Hampshire Forest Health know if you see large numbers of moths at your porch lights.

Wintermoth (Photo: Jen Weimer)



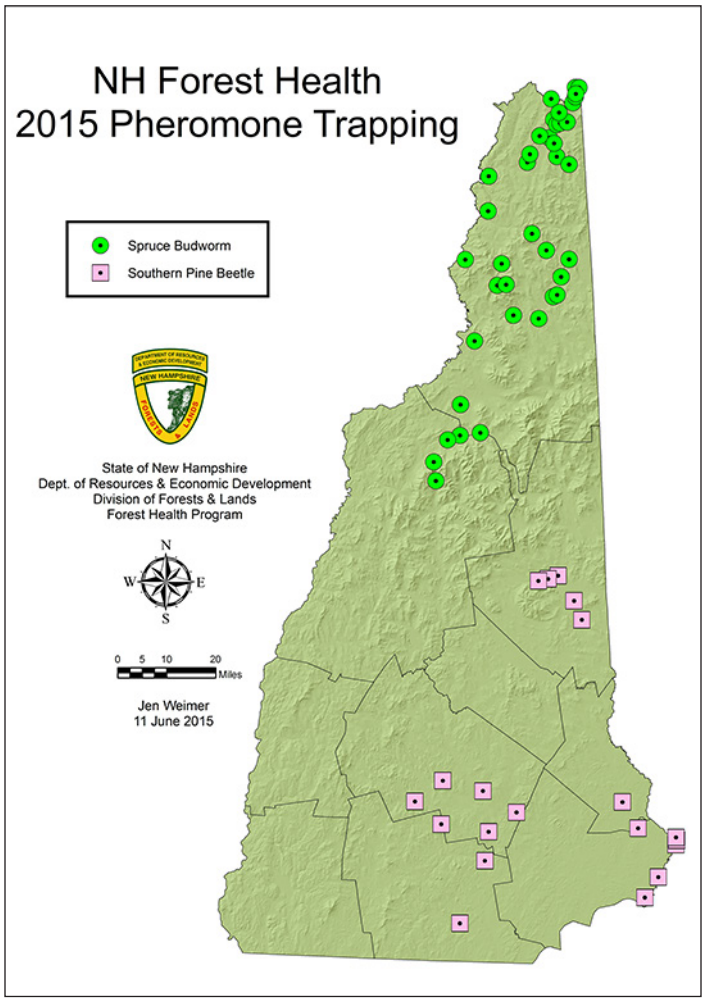
Winter moth adults (male at top, female at bottom) (Photo: Jen Weimer)

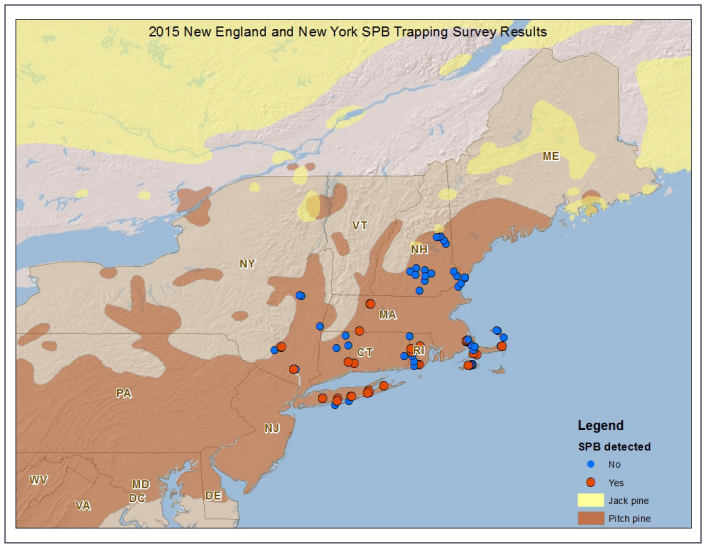
Spruce Budworm and Southern Pine Beetle Trapping

We continue to monitor for spruce budworm and are closely watching the outbreak in Quebec, which increased again this year (see map on next page). Our trap catch is up at a couple of sites, but it still remains at endemic levels and we do not expect any defoliation at this time. Vermont trap catch also continues to remain low. Populations are building in Maine, and they are projecting noticeable defoliation in their State within 2 to 4 years.

We also began trapping for southern pine beetle this year in response to the recent outbreaks on Long Island, New York; and Connecticut. Southern pine beetle (SPB) is a bark beetle native to the southeastern United States that has been recently moving northward. SPB can attack all pines, hemlock, and spruce but prefers southern pines including pitch pine. While SPB can be present in low numbers, outbreaks in southern states have historically led to significant tree mortality and economic losses. All traps in New Hampshire were negative, but traps in New York, Connecticut, Rhode Island, and Massachusetts were positive this year. We will continue to monitor for this new potentially invasive pest.

Southern pine beetle pheromone trap (Photo: Jen Weimer)





2015 Spruce budworm defoliation in Quebec

White Pine Needlecast Update

Yellowing and defoliation of white pine from needlecast diseases have been noticeable in New Hampshire since 2009. In 2010 surveys found three fungi contributing to the defoliation, including *Mycosphaerella dearnessii* (brown spot needle blight), *Bifusella linearis*, and *Canavirgella banfieldii*. The last is now referred to as *Lophophacidium dooksii* (Dooks needle blight) after taxonomists found the two fungi to be identical. These fungi cause yellowing and browning of needles on mature trees and regeneration. The average severity of yellowing continues to increase in monitoring plots, and we continue to map defoliation in our aerial surveys. Needle damage will likely continue in years with wet springs when conditions favor the development of the fungi.

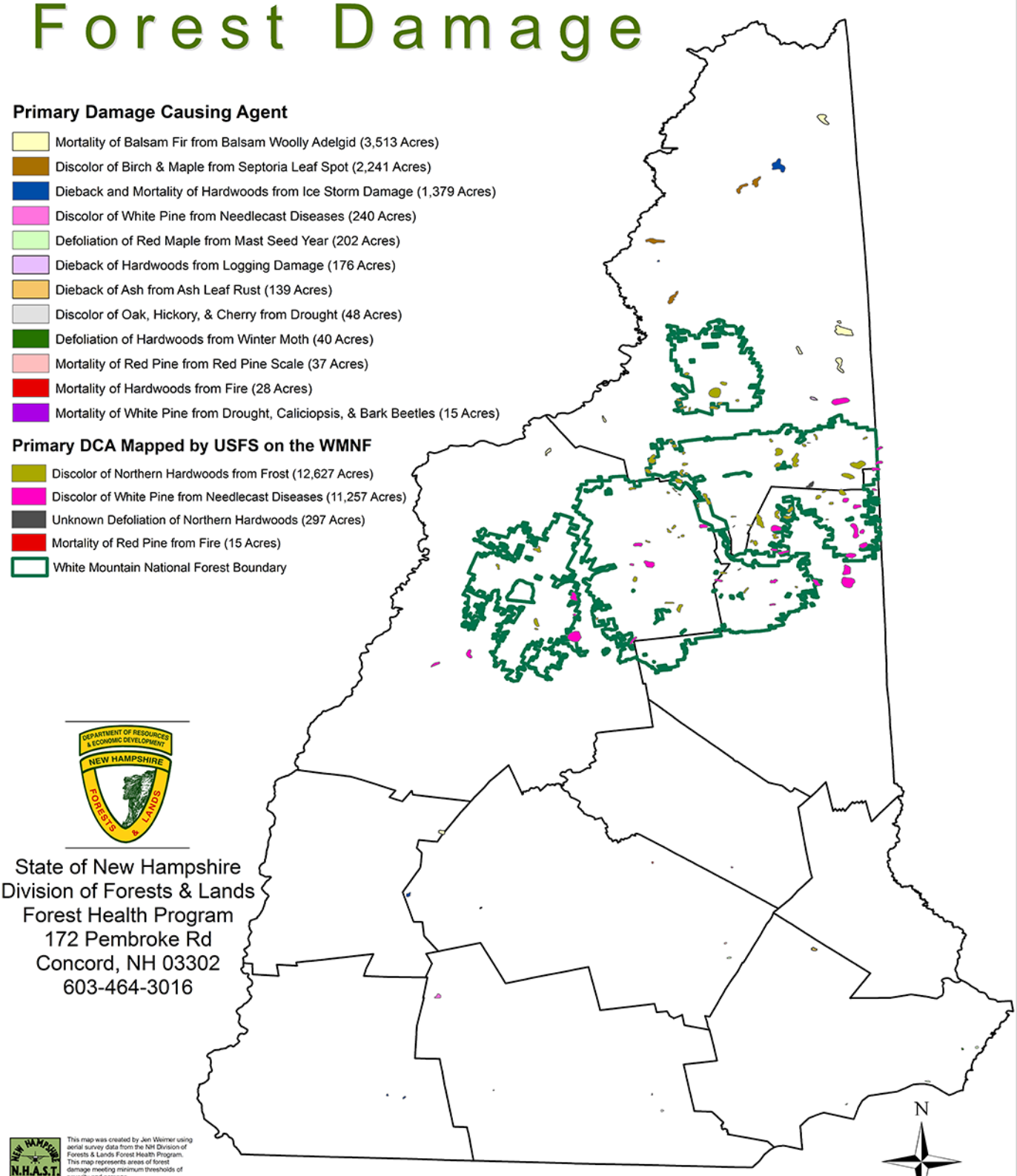
(Photo: Jen Weimer)

Aerial Survey Highlights

New Hampshire's annual aerial survey is a cooperative effort between the New Hampshire Division of Forests and Lands (NHDFL) and the USDA Forest Service Northeastern Area State and Private Forestry (U.S. Forest Service). The 2015 State aerial survey team mapped 8,064 acres of serious damage or defoliation on State and private lands, and the U.S. Forest Service mapped an additional 24,196 acres of damage on the White Mountain National Forest (WMNF).

The primary damaging-causing agent this year was **frost**, which was mapped by the U.S. Forest Service on 12,627 acres of northern hardwoods. They also mapped 11,257 acres of **white pine needlecast diseases**, 15 acres of mortality of red pine from **fire**, and 297 acres of unknown defoliation on the WMNF. In addition the NHDFL mapped mortality of balsam fir from **balsam woolly adelgid** on 3,513 acres, discolor of birch and maple from **septoria leaf spot** on 2,241 acres, mortality of northern hardwoods and birch from old **ice storm** damage on 1,379 acres, discolor of white pine from **needlecast** diseases on 240 acres, defoliation of red maple from **heavy seed** on 202 acres, dieback of ash from **ash leaf rust** on 139 acres, and dieback from **logging damage** on 176 acres. Discolor of oak, hickory, and cherry was mapped on 48 acres from **drought**. In addition there was defoliation of hardwoods from **winter moth** (40 acres), mortality of red pine from **red pine scale** (37 acres), mortality of hardwoods from fire (28 acres), and mortality of white pine from **drought**, **caliciopsis**, and **bark beetles** (15 acres).

2015 New Hampshire Forest Damage



EAB Update

by Bill Davidson

The invasive and highly destructive emerald ash borer (EAB) was first detected in New Hampshire in Concord and Bow in 2013. The ensuing survey, encompassing a 6-mile radius around known infested trees, resulted in a 24-square-mile generally infested area consisting of a 1-mile buffer around all known infested trees and Merrimack County being placed under quarantine. The generally infested area was expanded to roughly 73 square miles in 2014 after a combination of purple prism traps, trap trees, and visual survey revealed infestations in Loudon/ Canterbury, Hopkinton, Weare, and Salem, and along the periphery of the Concord infestation. The detections in Weare and Salem were the first in their respective counties, resulting in Hillsborough and Rockingham Counties being added to the quarantine.

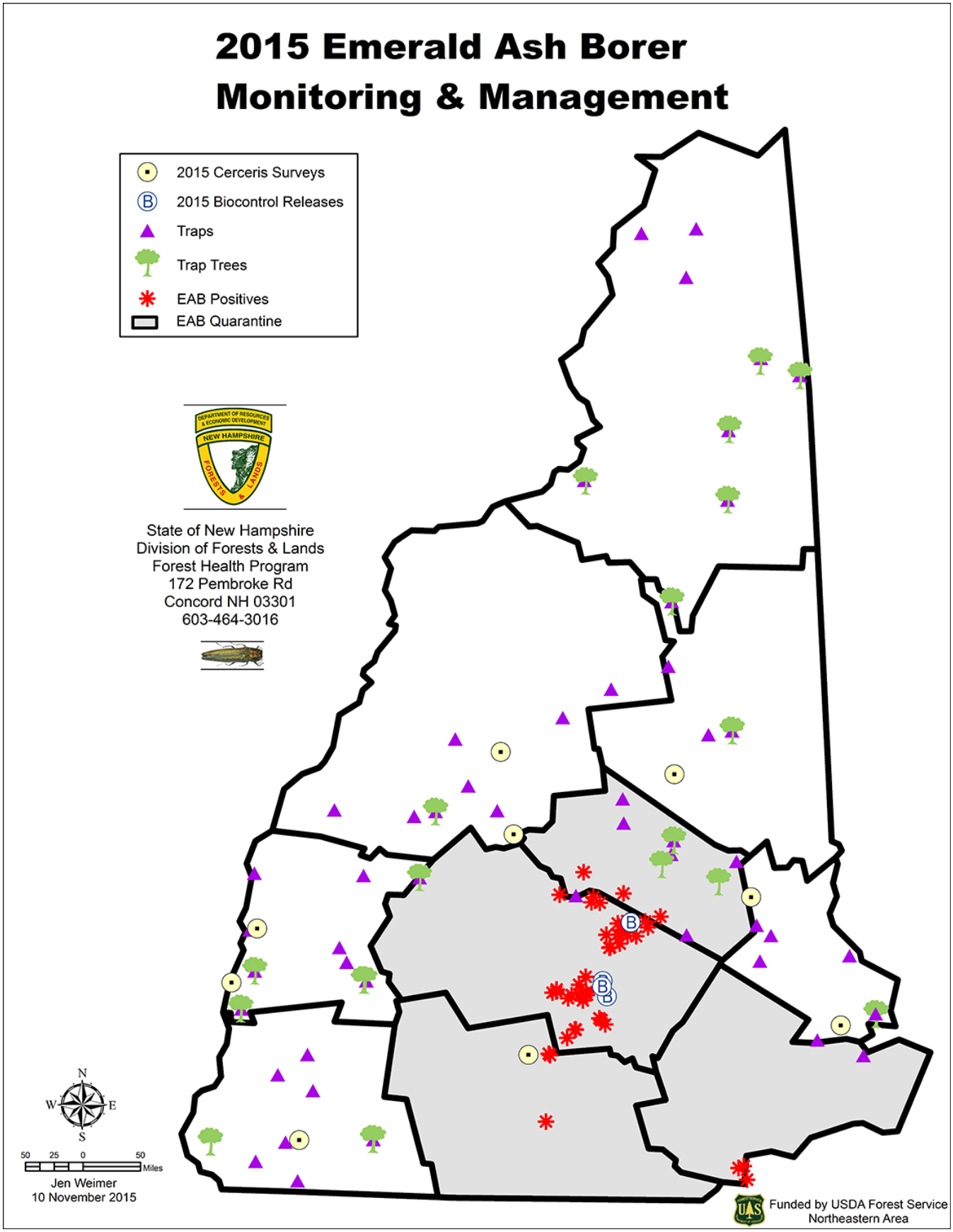
Detection efforts in 2015 consisted of green prism traps, visual survey, trap trees, and biosurveillance and were focused along the periphery of quarantined area (Merrimack, Hillsborough, and Rockingham Counties). In total, 18 trap trees were created, 50 green prism traps deployed, and 12 biosurveillance sites monitored. Trap trees and biosurveillance revealed no new infestations in counties outside the quarantine; however, a funnel trap in Gilmanton and purple prism trap in Sanbornton each captured adult emerald ash borer, which resulted in Belknap County being added to the quarantine. Additionally, an infestation was visually detected in Belmont, also within Belknap County.

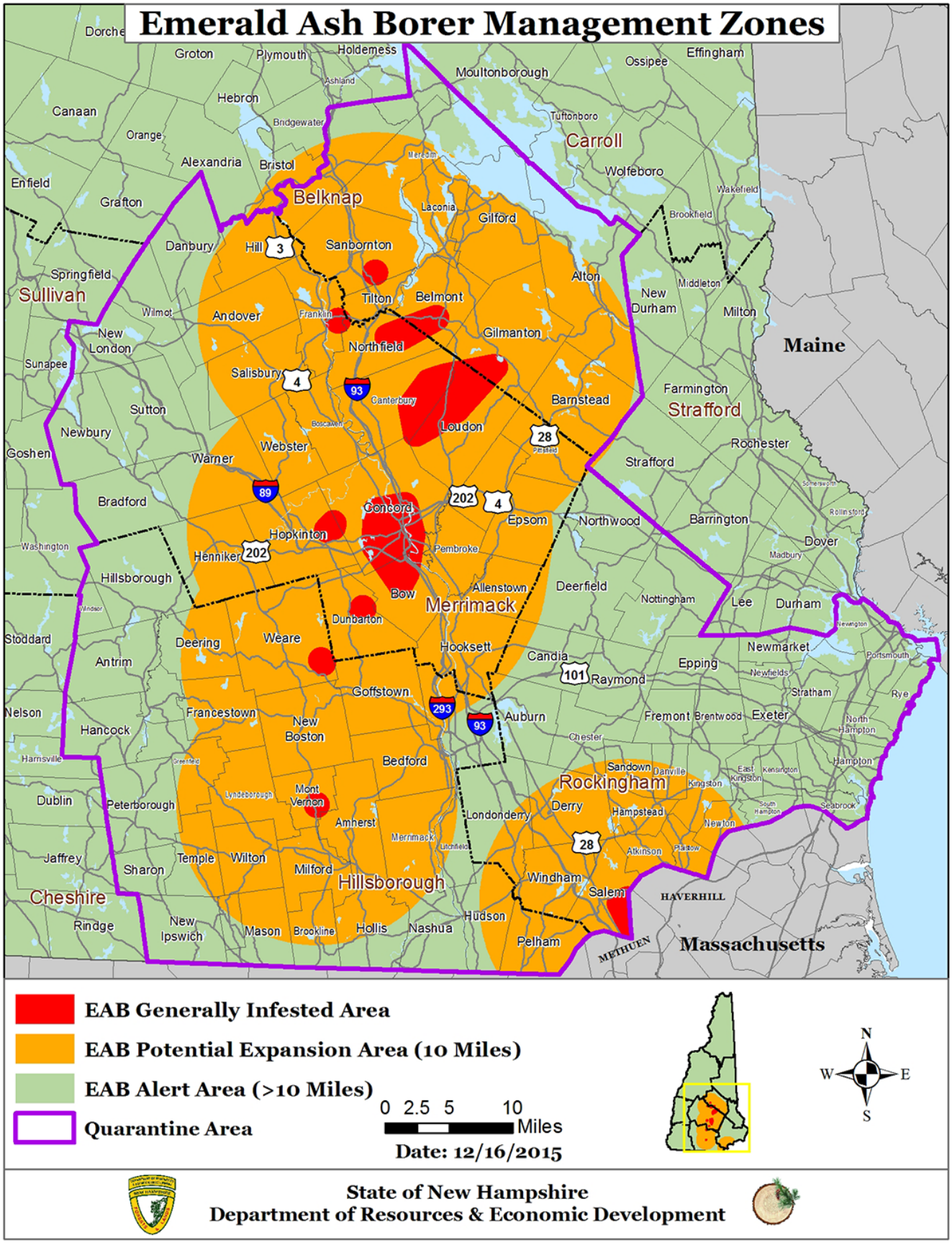
We are using biological control as part of a long term management plan to combat EAB in New Hampshire. This was the second year that two species of parasitic wasps (*Oobius agrili* and *Tetrastichus planipennisi*) were released. These wasps, which were provided to us by the APHIS rearing facility in Brighton, MI, prey upon immature emerald ash borers and may help regulate beetle populations once the wasps become established in our forests. This year we released about 33,000 wasps between four sites located within the Concord/ Loudon generally infested area. Biological control continues to be a high priority as we are monitoring establishment success of parasitoids and evaluating additional sites for future use.

We have also developed a set of Best Management Practices (BMPs) for handling ash material in New Hampshire. These BMPs supplement the federal quarantine in an attempt to slow the spread of emerald ash borer within infested counties. We recognize that within the quarantine zone large areas are currently unaffected by this pest and, therefore, discourage the movement of ash material originating from within, or nearby, known infestations to noninfested areas. For more information about our BMPs, events related to emerald ash borer, and information about other forests pests visit www.NHbugs.org.

Wasp release tree (Photo: Jen Weimer)

2015 Emerald Ash Borer Monitoring & Management




Emerald Ash Borer Management Zones
Belknap
Carroll
Sullivan
Strafford
Cheshire
Hillsborough
Rockingham
Merrimack
Maine
Massachusetts
EAB Generally Infested Area
EAB Potential Expansion Area (10 Miles)
EAB Alert Area (>10 Miles)
Quarantine Area
0 2.5 5 10
Miles
Date: 12/16/2015
N
W
E
S
State of New Hampshire
Department of Resources & Economic Development

FEATURE ARTICLE

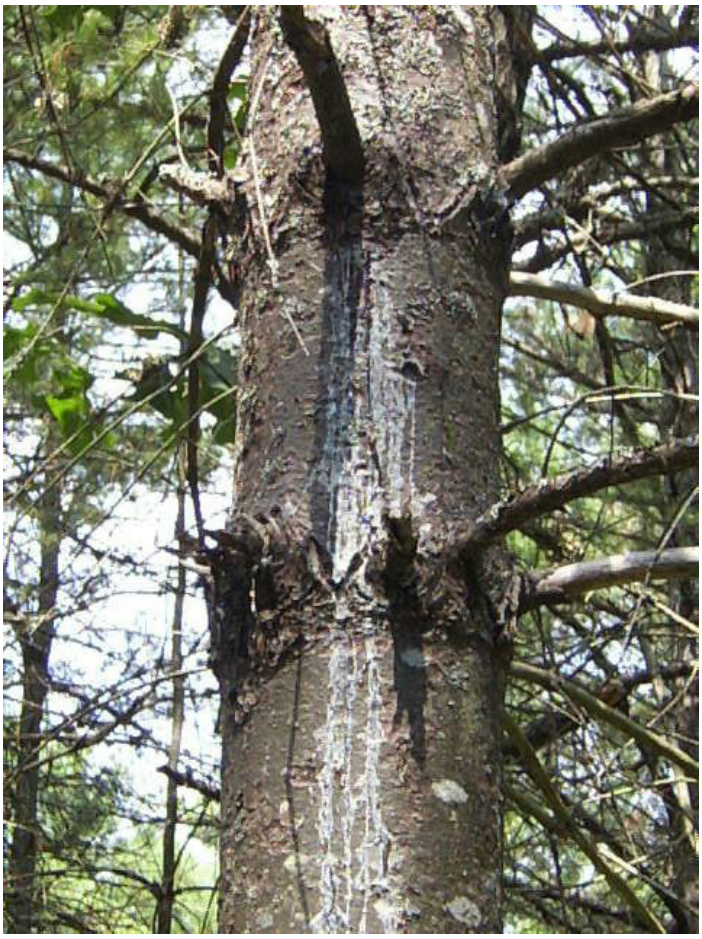
By Kyle Lombard

Pine Canker *(Caliciopsis pinea)* Study Underway in 2015

In 2015 we had success generating research funding to study *Caliciopsis pinea* canker damage on eastern white pine. Currently three funded initiatives are now underway in New Hampshire. Cooperative funding (and boots on the ground) for these projects is coming from the USDA Forest Service Northeastern Area State and Private Forestry, the USDA Agricultural Research Service, University of Maine, University of New Hampshire (UNH), Maine Forest Service, the Northeastern Lumber Manufacturers Association (NELMA), and the New Hampshire Division of Forests and Lands. The major goals of the study are to (1) understand where in the forested environment caliciopsis canker is most common and what factors are most influential in effecting disease occurrence, (2) determine how silvicultural practices (specifically thinning) may affect occurrence and severity of canker occurrence, and (3) assess how caliciopsis damage affects lumber yield, grade and value.

A good portion of the Statewide survey looking for caliciopsis has been completed by Jen Weimer at the NHDFL and Dr. Isabel Munck at the U.S. Forest Service; cankers were found at 72% of the sample sites. Of the 3,000 sampled white pines, 35% show evidence of caliciopsis. While additional work needs to be done regarding the relationship of soil and stand densities to canker occurrence, it seems that poor soils have a higher incidence of occurrence (78%) than the more productive soil groups (59%). In the coming year stocking levels and size classes will be surveyed at different pine sites to assess the influence of light and growing conditions.

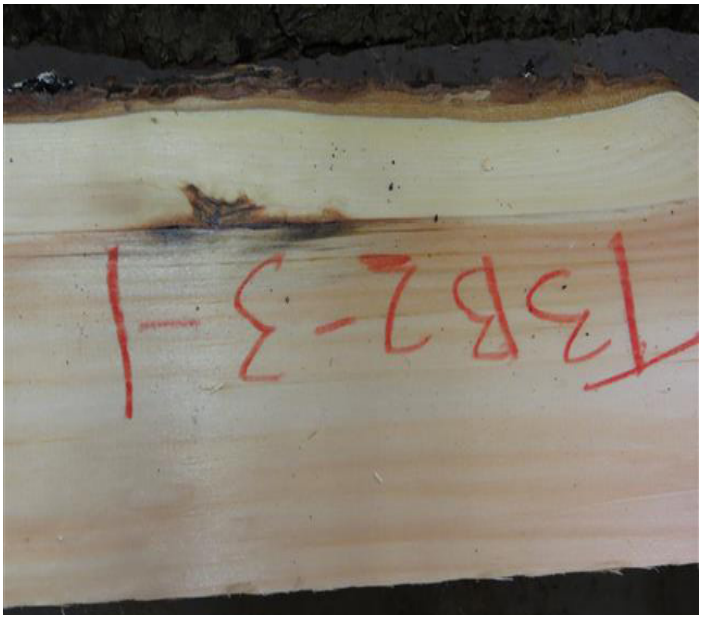
Two study sites in New Hampshire and one site in Maine were identified for lumber yield and quality studies. These sites have thinned and unthinned pine stands. All sites had high infection levels before thinning. Logs from the first of three areas at the Blackwater Flood Control Area site in Salisbury, NH, have been cut, milled at the UNH Thompson School, kiln dried at the University of Maine, and graded by NELMA. While analysis of grade loss and economic impact is not complete, it appears that while caliciopsis canker is having an effect on lumber grade, it may not be as significant as predicted. Caliciopsis generally is found on the upper bole of trees and therefore coexists with the large knots associated with lumber coming from that location. In the coming year, analysis of grade loss and value will be completed; more sites will be harvested, milled, graded, and analyzed, to get a better handle on the economic influence of caliciopsis.



Pitch response from C. pinea *infection, Salisbury, NH (Photo: Kyle Lombard)*

Caliciopsis infected lumber entering the kiln at the University of Maine in Orono, 2015 (Photo: Kara Costanza)

White pine trees cut and sampled every foot along the tree (Photo: Kara Costanza)



Pine board with caliciopsis canker damage (Photo: Kara Costanza)

The white pine trees from thinned and unthinned sites at both New Hampshire locations (Blackwater Flood Control Area and Mast Yard State Forest in Hopkinton) were dissected by Kara Costanza and her crew from the University of Maine. Costanza is a doctoral candidate in Forest Pathology and the project lead for this multi-State project under the guidance of Dr. William Livingston and Dr. Isabel Munck. Data were taken on size, occurrence, and severity of cankers, at 1-foot increments up the entire length of the study trees. Preliminary results suggest trees in thinned areas have fewer cankers in post-harvest years. Also, highly symptomatic trees left in the thinned area responded and grew better than symptomatic trees in unthinned stands. In the coming year more dendrochronology work will be performed on the samples taken at these sites, as well as the sites in Maine.

After the first year of a 3-year project cycle, we have made significant progress identifying infested sites in New Hampshire and Maine, working on research protocols, making preliminary summaries of findings, and planning future analysis. Stay tuned for more findings and eventual recommendations on silvicultural treatments that could lessen the impact of caliciopsis damage in pine stands.

These projects and the current breadth of study on caliciopsis canker in New Hampshire would not be possible without the help of many organizations and talented experts from many fields. Those who have contributed to the project so far include Sarah Smith at University of New Hampshire (UNH) Cooperative Extension, Dr. William Livingston, Dr. Shawn Fraver, Dr. Robert Rice and Kara Costanza at University of Maine, Shaun Bresnahan at New Hampshire Division of Forests and Lands (NHDFL), Don Quigley at

UNH Thompson School, Dr. Isabel Munck at the USDA Forest Service Northeastern Area State and Private Forestry, Jen Weimer and Dr. Bruce Allen at NHDFL, A. J. Dupere at NHDFL-Urban Forestry Center, Dr. Kirk Broders at UNH, and Jeff Easterling and Marc Moore from Northeastern Lumber Manufacturers Association.

Feature Creature

by Jen Weimer

Hemlock Tip Blight *(Sirococcus tsugae)*

By now most have heard of hemlock woolly adelgid (HWA) and maybe elongate hemlock scale (EHS)—exotic insects attacking hemlocks throughout the eastern United States, but not many are familiar with a third threat known as hemlock tip blight (*Sirococcus tsugae*). Tip blight is a fungus that attacks the new growth resulting in dieback of the tips. This fungus is believed not to be native to eastern North America, and how it got here is unknown. The recent wet springs and summers are likely exacerbating the issue, and this trifecta is putting hemlocks in the Northeast under tremendous stress, from which they may not be able to recover.

Reported to infect hemlock and cedar species and previously known to occur only in western North America—Alaska, Oregon, Washington, and British Columbia—*S. tsugae* has been turning up recently in new regions. The fungus was first noticed in the northeast in central and southern Maine beginning in 2006 and shortly thereafter in New Hampshire and the rest of New England. By 2010 it had been noticed as far south as Georgia, and last year it was reported for the first time in Germany, England, Wales, and Scotland on cedar species.

S. tsugae causes shoot tip blight and is characterized by brown hanging tips, which appear in spring on the current year's growth. The dead tips persist for several months, and small black fungal fruiting bodies may be visible with a hand lens.

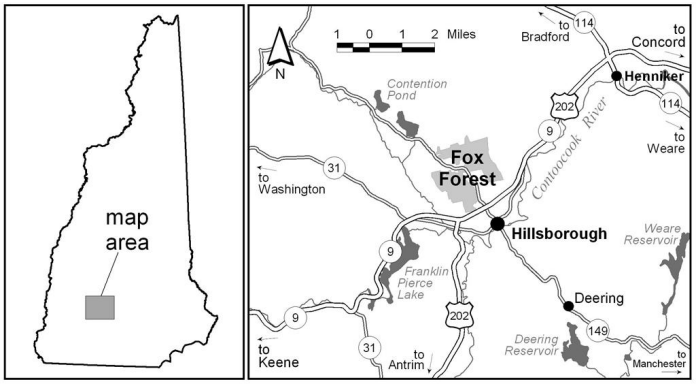
Symptoms of sirococcus tip blight (Photo: Jen Weimer)

The dead tips eventually snap off, and the damage looks similar to the dieback associated with hemlock woolly adelgid. Damage can be found in all tree size classes but appears to be heaviest in the understory, especially in dense stands near standing water.

In New Hampshire it is not unusual to see large areas of hemlock regeneration mortality, with or without the presence of other stressors such as HWA or EHS. What the extent of damage will be to overstory trees is unknown; but if HWA or EHS or both are present in the stand, the prognosis is not good. There are no known effective controls for *S. tsugae*, but good silvicultural practices that thin overstocked stands and increase light and air circulation may be useful.

Dieback and mortality of hemlock regeneration from sirococcus tip blight (Photo: Jen Weimer)

Office Notes



The New Hampshire Forest Health Program office and lab is located at the Caroline A. Fox Research and Demonstration Forest in Hillsborough. The program consists of three full-time staff and a seasonal part-time technician. We had a change in staff this year as Molly Heuss moved on in May to work on her Master's degree at the University of Vermont. Bill Davidson joined us in October and will be taking over the lead on EAB. Bill recently completed a master's degree program in forest entomology at the University of Kentucky, where he worked on methods to manage EAB with biocontrols and insecticides.

Jen Weimer continues to work on trapping, surveys, and mapping of all other forest pests. Ray Boivin was unable to return this year and was greatly missed in the lab. Our technician this year was Bruce Allen, who assisted with EAB surveillance and the caliciopsis projects.

Please do not hesitate to contact us if you observe any forest damage, and follow us on social media to keep up to date on forest health issues. In addition to this annual newsletter we are now sending out quarterly updates in March, June, and September. If you are not already on the mailing list you can sign up on our Web site.

Recent Research Publications:

Impact of White Pine Blister Rust on Resistant Cultivated *Ribes* and Neighboring Eastern White Pine in New Hampshire. APS Journals October 2015, 99(10): 1374-1382.

Extent and Severity of Caliciopsis Canker in New England, USA: An Emerging Disease of Eastern White Pine (*Pinus strobus* L.). Forests 2015 (6): 4360-4373.

Forest Health Program Contacts

Program Coordinator
Kyle Lombard
603–464–3016
Kyle.Lombard@dred.nh.gov

Forest Health Specialist
Jen Weimer
603–464–3016
Jennifer.Weimer@dred.nh.gov

Forest Health Specialist
Bill Davidson
603–464–3016
William.Davidson@dred.nh.gov

Find more information about New Hampshire's forest health at these Web sites: nhdfl.org/forest-health/ and nhbugs.org

Forest Health Programs

State forestry agencies work in partnership with the U.S. Forest Service to monitor forest conditions and trends in their State and respond to pest outbreaks to protect the forest resource.

U.S. Department of Agriculture
Forest Service
Northeastern Area
State and Private Forestry
11 Campus Blvd., Suite 200
Newtown Square, PA 19073
http://www.na.fs.fed.us

Forest Health Protection
Northeastern Area
State and Private Forestry
271 Mast Road
Durham, NH 03824
603–868–7714

New Hampshire Department of Resources and Economic Development
Division of Forests and Lands
Forest Health Section
PO Box 1856
Concord, NH 03302
603–464–3016
http://nhdfl.org/forest-health/

8531