NH Department of Resources & Economic Development
Division of Forests & Lands
Forest Health Program

Annual Newsletter
for the year 2015

Hemlock Tip Blight
Emerald Ash Borer
Winter Moth
Caliciopsis Pine Canker

172 Pembroke Rd
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IN THIS ISSUE:

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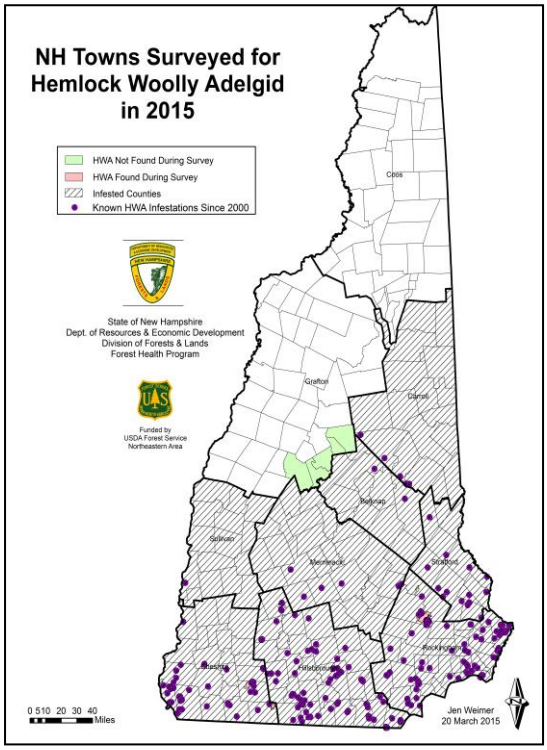
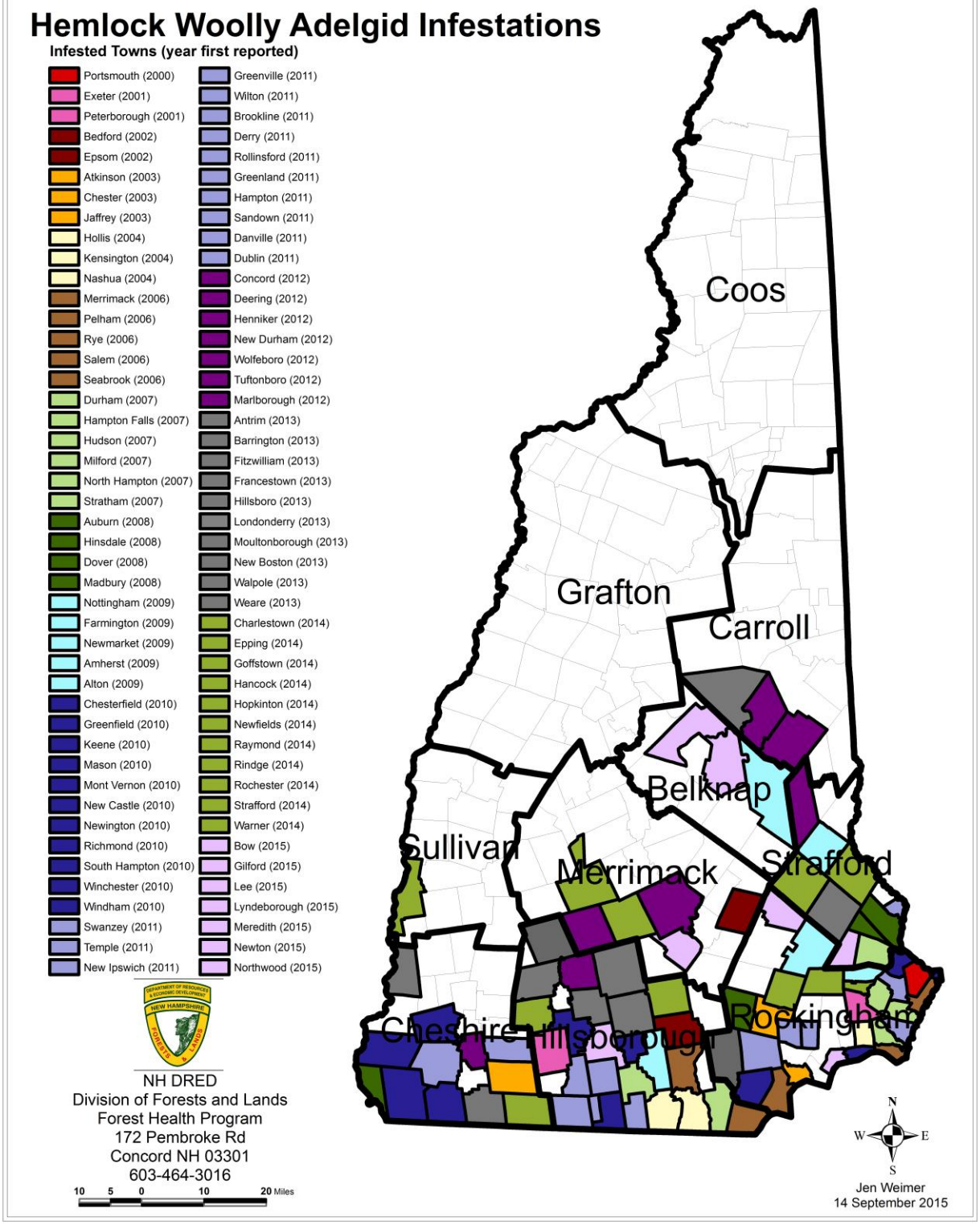
FIELD SURVEYS

Hemlock Woolly Adelgid (HWA)

Hemlock Woolly Adelgid continues to spread throughout NH 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 NH and 5 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.



NH Towns with Known Hemlock Woolly Adelgid Infestations



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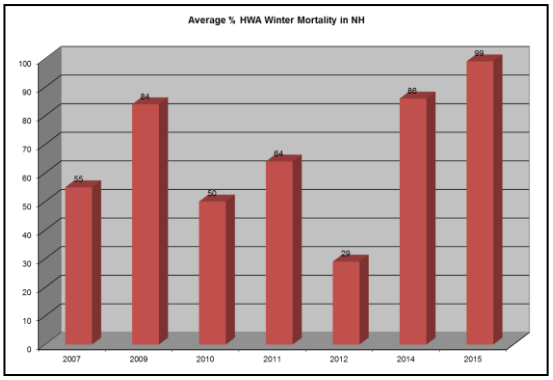
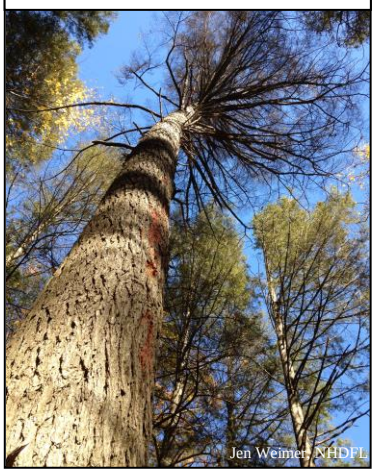
Jen Weimer
14 September 2015



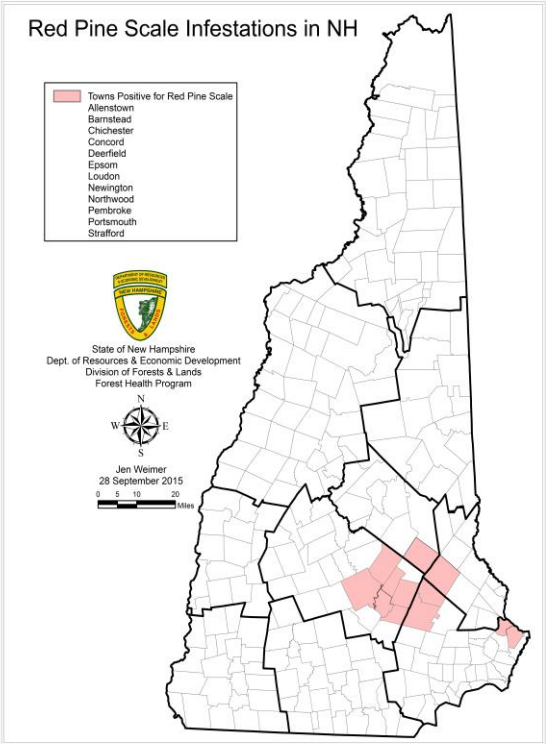
In addition, winter mortality surveys were done at 3 sites and results were consistent with last winter's low temperatures. Mortality of HWA was 98% on the seacoast but up to 100% at inland sites. This was the highest average of HWA winter mortality recorded in NH since we began monitoring in 2007.

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 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 NH 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.

Hemlock Mortality



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 us for hard copies.



Red Pine Scale

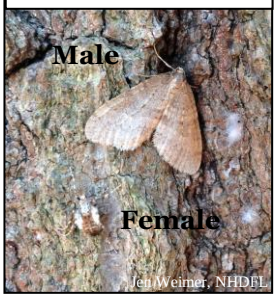
Red Pine Scale was first detected in NH in 2012 and infestations continue to slowly spread in southern NH. Surveys this year were done on high risk state lands in southern NH. No new infestations were found in the surveys. Lands surveyed included Shieling State Forest, Mast Yard State Forest, Pawtuckaway State Park, Woodman State Forest, Litchfield State Forest, Annett State Forest, Pow Wow State Forest, and Eaton State Forest. 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 it is advised to harvest once infestation is detected. Contact us 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 NH. The larvae of winter moth defoliate deciduous trees and shrubs in early spring. Trees heavily defoliated by winter moth for three 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 NH 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 us know if you see large numbers of moths at your porch lights.

WM Adults



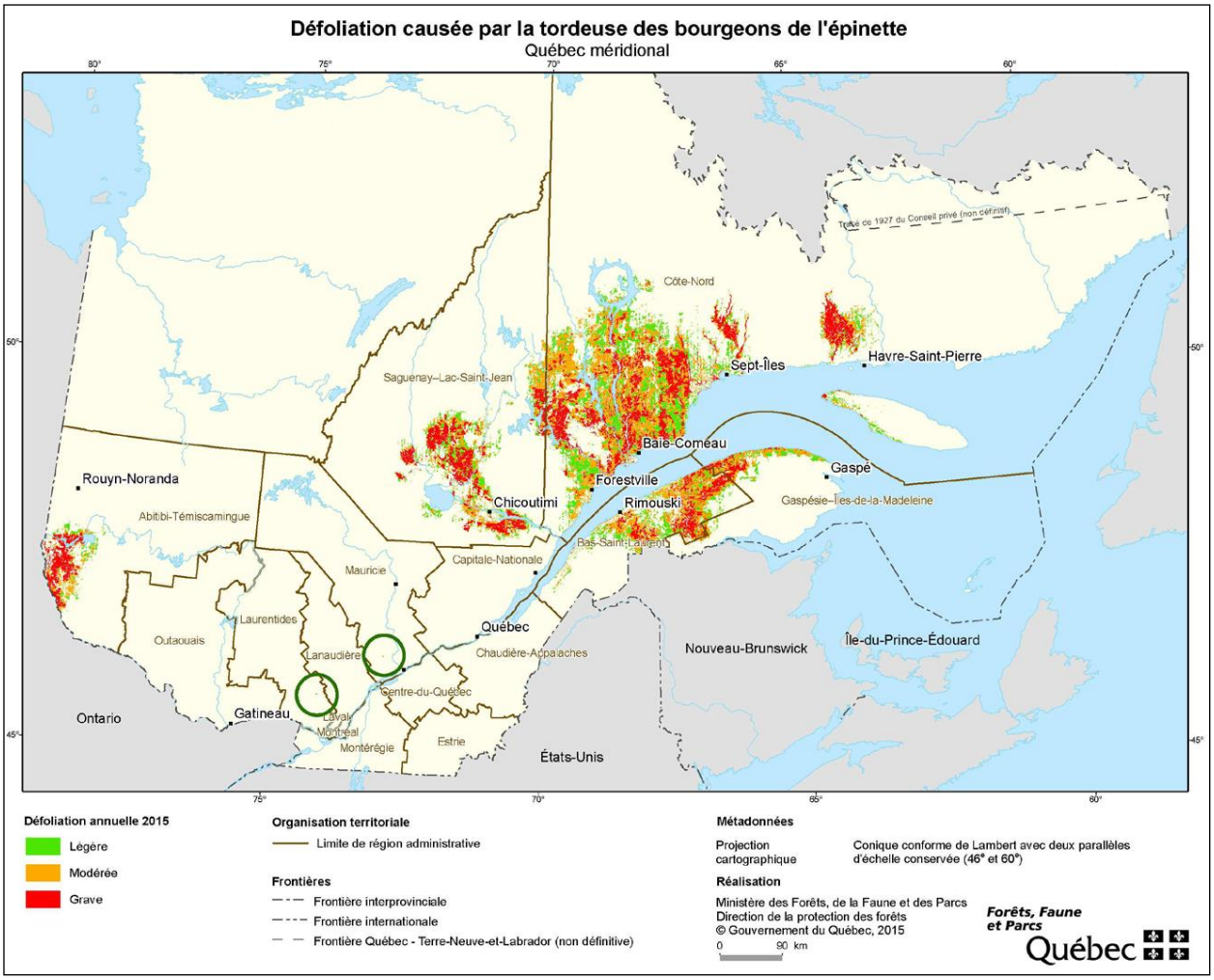
Spruce Budworm & Southern Pine Beetle Trapping

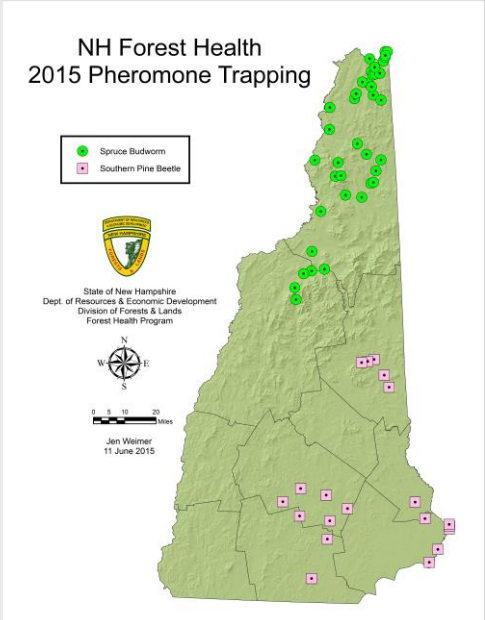
We continue to monitor for spruce budworm and are closely watching the outbreak in Quebec which increased again this year (see map on next page). Our trap catch is up at a couple sites but still remains at endemic levels and we do not expect any defoliation at this time. Vermont trap catch also continues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

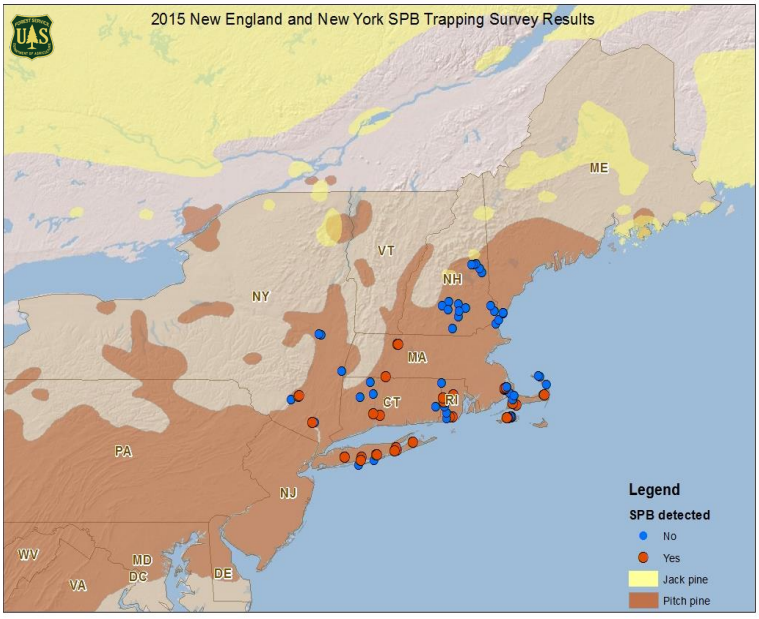
We also began trapping for southern pine beetle this year in response to the recent outbreaks on Long Island, New York and Connecticut. Southern pine beetle (SPB) is a bark beetle native to the southeastern United States that has been recently moving northward. SPB can attack all pines, hemlock, and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

Southern Pine Beetle Pheromone Trap

2015 Spruce Budworm Defoliation in Quebec







White Pine Needlecast Update

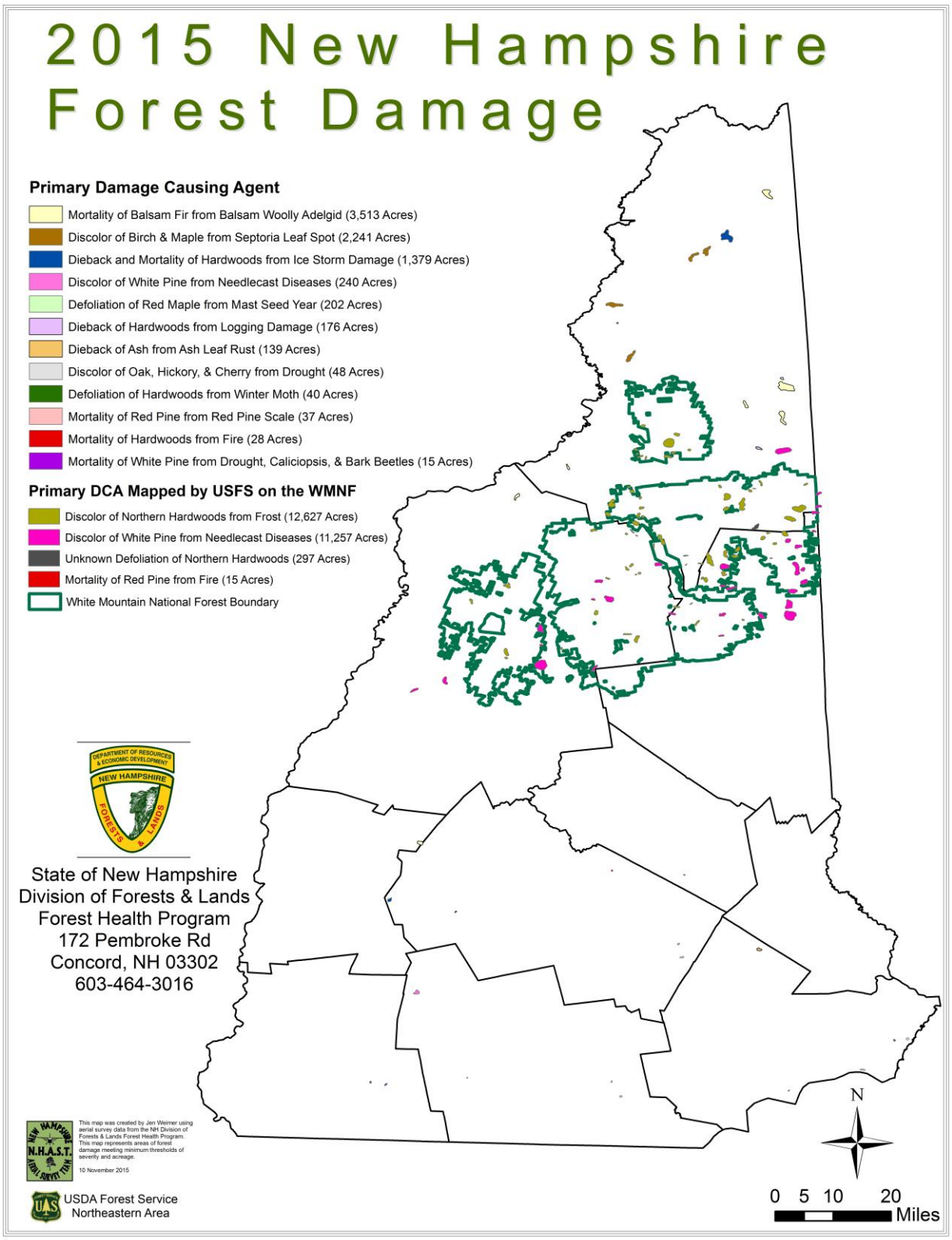
Yellowing and defoliation of white pine from needlecast diseases has been noticeable in NH since 2009. In 2010 surveys found three fungi attributing to the defoliation including *Mycosphaerella dearnessii* (brown spot needle blight), *Bifusella linearis*, and *Canavirgella banfieldii*. The latter is 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.

NH Aerial Survey Highlights for 2015

NH's annual aerial survey is a cooperative effort between the NH Division of Forests and Lands (NHDFL) and the USDA Forest Service Northeastern Area State and Private Forestry (USFS). The 2015 NH state aerial survey team mapped 8,064 acres of serious damage or defoliation on state and private lands and the USDA 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 USFS 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 was first detected in New Hampshire in 2013 in Concord and Bow. The ensuing survey, encompassing a six mile radius around known infested trees, resulted in a 24 square mile generally infested area (GIA) consisting of a one mile buffer around all known infested trees and Merrimack County being placed under quarantine. The GIA 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, Salem, and along the periphery of the Concord infestation. The detections in Weare and Salem were the first in their respective counties resulting in Hillsboro 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, Hillsboro, and Rockingham Counties). In total 18 trap trees were created, 50 green prism traps deployed, and 12 biosurveillance sites monitored. Trap trees and biosurveillance did not reveal any new infestations in counties outside of 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.

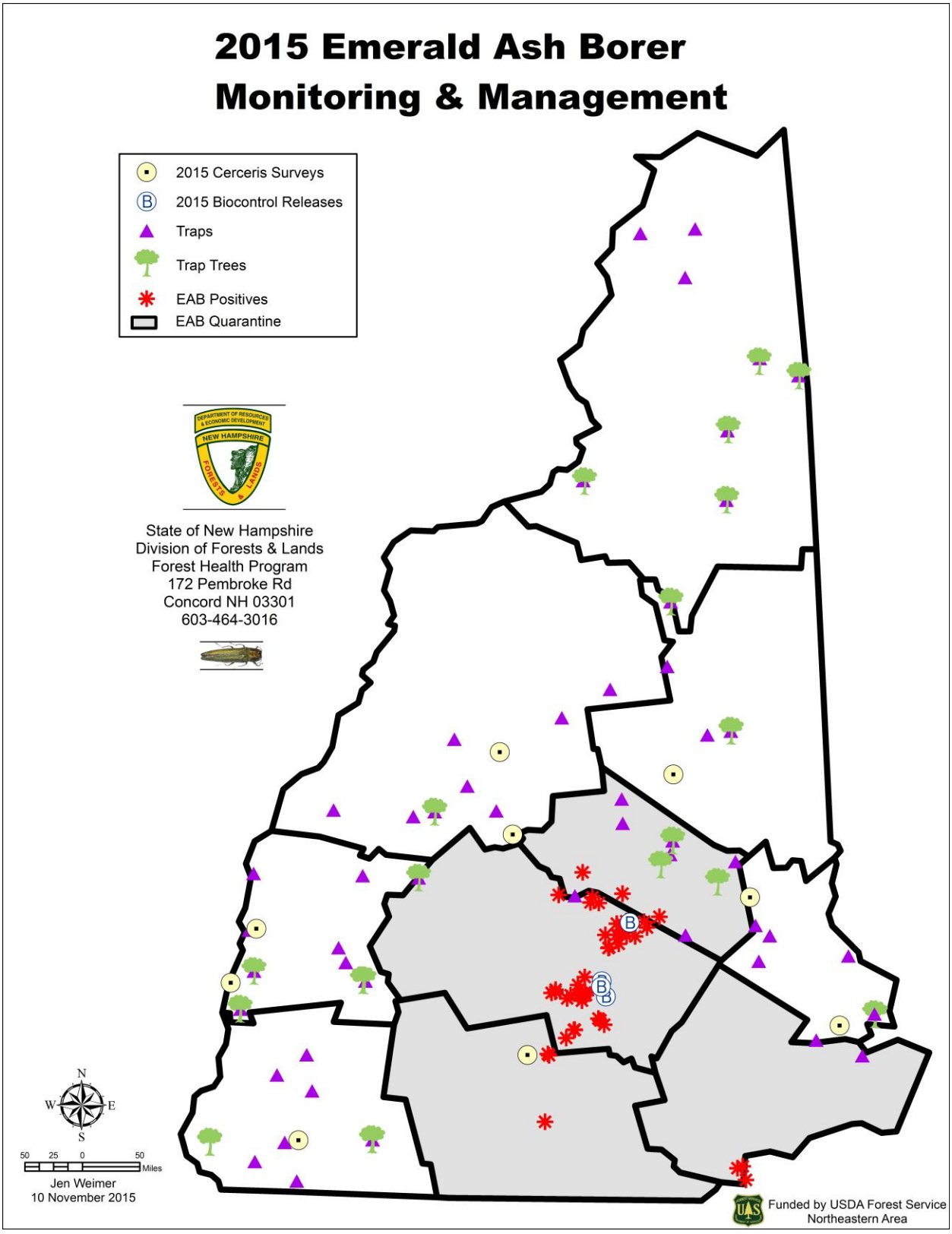
Wasp Release Tree

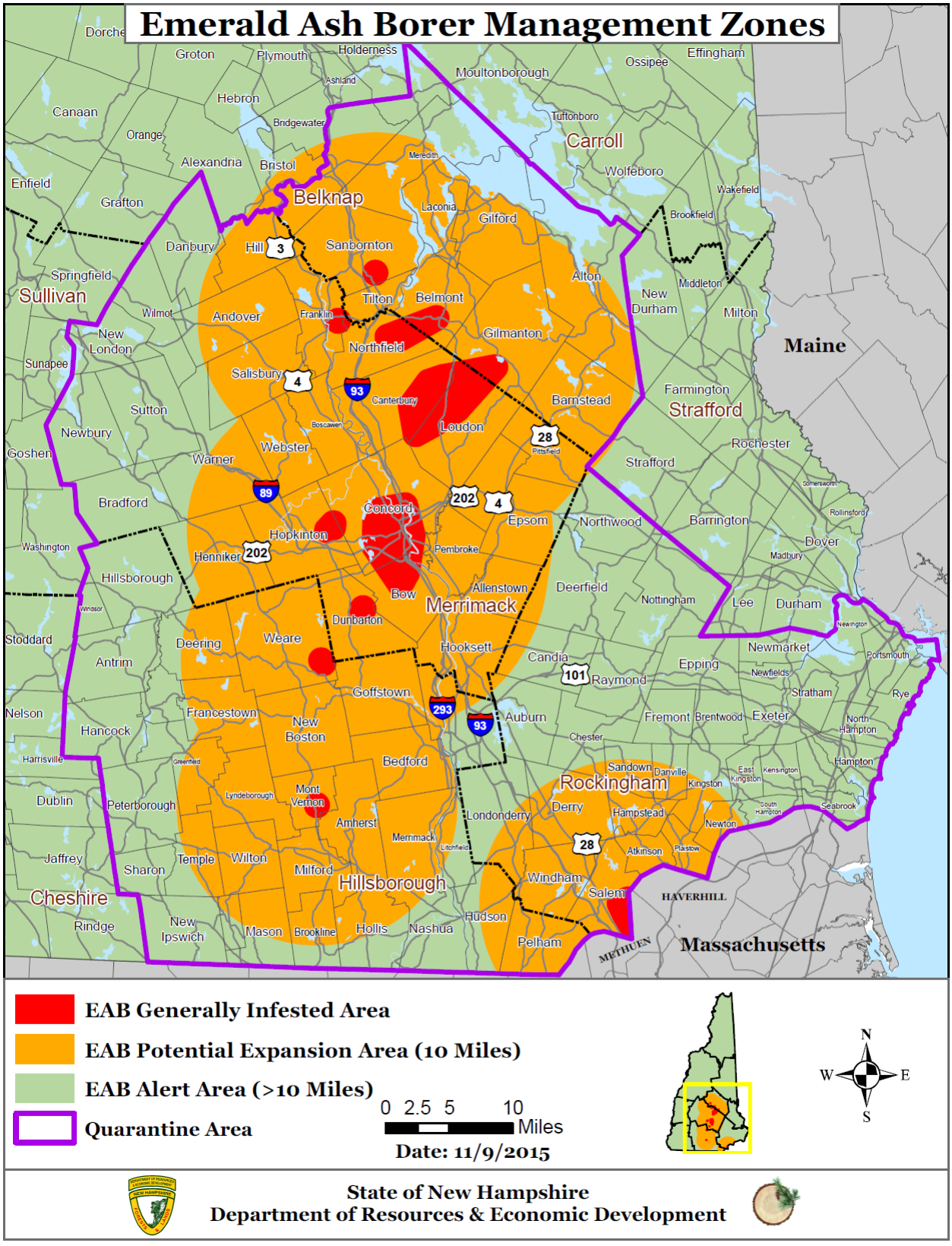
Jen Weimer, NHDFL

We are utilizing biological control as part of a long term management plan to combat emerald ash borer in New Hampshire. This was the second year that releases were made of two species of parasitic wasps (*Oobius agrili* and *Tetrastichus planipennisi*). These wasps, which were provided to us by the APHIS rearing facility in Brighton, MI, prey upon immature emerald ash borer and may help regulate beetle populations once they 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 there are large areas that are currently unaffected by this pest and therefore discourage the movement of ash material originating from within, or nearby, known infestations to non-infested areas. More information about our BMPs, events related to emerald ash borer, and information about other forests pests visit www.NHbugs.org.

2015 Emerald Ash Borer Monitoring & Management




Emerald Ash Borer Management Zones
Belknap
Carroll
Sullivan
Strafford
Maine
Massachusetts
Cheshire
Hillsborough
Merrimack
Rockingham
Concord
Laconia
Gilford
Sanbornton
Tilton
Belmont
Northfield
Gilmanton
Canterbury
Loudon
Barnstead
Alton
Farmington
Rochester
Strafford
Epsom
Northwood
Barrington
Dover
Durham
Lee
Nottingham
Deerfield
Allenstown
Pembroke
Bow
Dunbarton
Hooksett
Candia
Raymond
Epping
Newmarket
Auburn
Chester
Fremont
Brentwood
Exeter
Goffstown
Weare
Deering
Francestown
New Boston
Bedford
Amherst
Mont Vernon
Milford
Hollis
Nashua
Hudson
Londonderry
Derry
Hampstead
Windham
Salem
Pelham
Atkinson
Newton
Seabrook
Hampton
North Hampton
Rye
Portsmouth
Stratham
Newfields
Epping
Kingston
Danville
Sandown
Kensington
East Kingston
South Hampton
Plaistow
Litchfield
Merrimack
Lyndeborough
Greenfield
Harrisville
Dublin
Peterborough
Jaffrey
Sharon
Temple
Wilton
Rindge
New Ipswich
Mason
Brookline
Hancock
Nelson
Stoddard
Antrim
Hillsborough
Windsor
Washington
Henniker
Hopkinton
Concord
Bradford
Newbury
Goshen
Warner
Webster
Boscawen
Salisbury
Andover
Franklin
Wilmot
New London
Sunapee
Sutton
Springfield
Enfield
Grafton
Danbury
Hill
Alexandria
Bristol
Meredith
Wolfeboro
Brookfield
Wakefield
Middleton
Milton
New Durham
Tuftonboro
Moultonborough
Ossipee
Effingham
Holderness
Ashland
Plymouth
Groton
Hebron
Canaan
Orange
Bridgewater
Somersworth
Rollinsford
Madbury
Newington
Lee
Durham
Chester
Fremont
Brentwood
Exeter
Kingston
Danville
Sandown
Kensington
East Kingston
South Hampton
Plaistow
Atkinson
Seabrook
Hampton
North Hampton
Rye
Portsmouth
Stratham
Newfields
Epping
Newmarket
Lee
Durham
Nottingham
Deerfield
Northwood
Barrington
Dover
Madbury
Newington
Somersworth
Rollinsford
Strafford
Rochester
Farmington
Barnstead
Alton
Gilmanton
Belmont
Tilton
Laconia
Gilford
Sanbornton
Hill
Danbury
Springfield
Enfield
Grafton
Alexandria
Bristol
Meredith
Wolfeboro
Brookfield
Wakefield
Middleton
Milton
New Durham
Tuftonboro
Moultonborough
Ossipee
Effingham
Holderness
Ashland
Plymouth
Groton
Hebron
Canaan
Orange
Bridgewater
Carroll
Belknap
Sullivan
Maine
Massachusetts
Cheshire
Hillsborough
Merrimack
Rockingham
Strafford
3
4
89
93
202
28
101
293
HAVERHILL
METHUEN
EAB Generally Infested Area
EAB Potential Expansion Area (10 Miles)
EAB Alert Area (>10 Miles)
Quarantine Area
0 2.5 5 10
Miles
Date: 11/9/2015
N
W
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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, Northeast Area State and Private Forestry Program, the USDA Agricultural Research Service, the University of Maine, the University of New Hampshire, the Maine Forest Service, the Northeastern Lumber Manufacturer's Association (NeLMA) and the New Hampshire Division of Forests and Lands. The major goals of the study are 1.) To 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 effects lumber yield, grade and value.

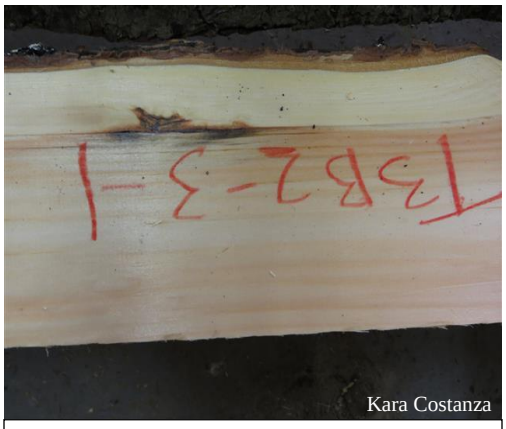
Pitch response from *C. pinea* infection. Salisbury, NH.

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 USFS NA and cankers were found at 72% of the sample sites. Of the 3000 sampled white pines 35% of the 3000 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.

Caliciopsis infected lumber entering the kiln at the University of Maine in Orono. 2015

Two study sites in New Hampshire and one site in Maine were identified to conduct lumber yield and quality studies in. These sites have thinned and un-thinned pine stands. All sites had high infection levels prior to 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 complete 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 is generally 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 and more sites will be harvested, milled, graded and analyzed to get a better handle on the economic influence of caliciopsis.



Pine board with caliciopsis canker damage

The white pine trees from thinned and un-thinned sites at both locations in NH (Blackwater Flood Control Area and Mast Yard State Forest in Hopkinton) were dissected by Kara Costanza and her crew from the University of Maine. Kara 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 was taken on size, occurrence and severity of cankers at every one foot increment up the entire length of the study trees. Preliminary results suggest trees in thinned areas have fewer canker in post-harvest years. Also, highly symptomatic trees left in the thinned area responded and grew better than symptomatic trees in un-thinned 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.

White pine trees cut and samples every foot along the tree

After the first year of a three year project cycle we've made significant progress identifying infested sites in NH and Maine, working on research protocols, making preliminary summaries of findings and planning future analysis at sites in Maine and NH. 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 wouldn't 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 UNHCE, Dr. William Livingston, Dr. Shawn Fraver, Dr. Rober Rice and Kara Costanza at U. Maine, Shaun Bresnahan at NHDFL, Don Quigley at UNH Thompson School, Dr. Isabel Munck at the USFS NA, Jen Weimer and Dr. Bruce Allen at NHDFL, A.J Dupere at NHDFL-UFC, Dr. Kirk Broders at UNH, Jeff Easterling and Marc Moore from NELMA.

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) which are 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 not believed to be native to eastern North America and it is unknown how it got here. 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 only to occur in western North America— Alaska, Oregon, Washington, and British Columbia—*S. tsugae* has been recently turning up 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.

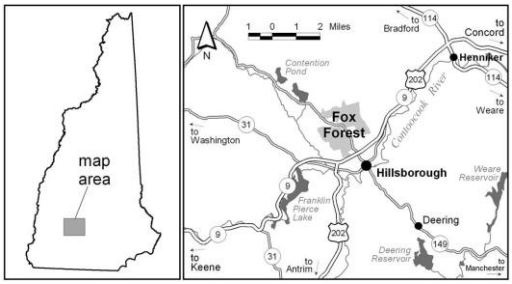
Symptoms of Sirococcus Tip Blight

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

Dieback and Mortality of Hemlock Regeneration from Sirococcus Tip Blight

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. It is unknown what the extent of damage will be to overstory trees but if HWA and/or EHS 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.

Office Notes



The NH Forest Health Program office and lab is located at the Caroline A. Fox Research and Demonstration Forest in Hillsboro. 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 don't 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're not already on the mailing list you can sign up on our website.

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, Volume 99, Number 10 Pages 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.

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