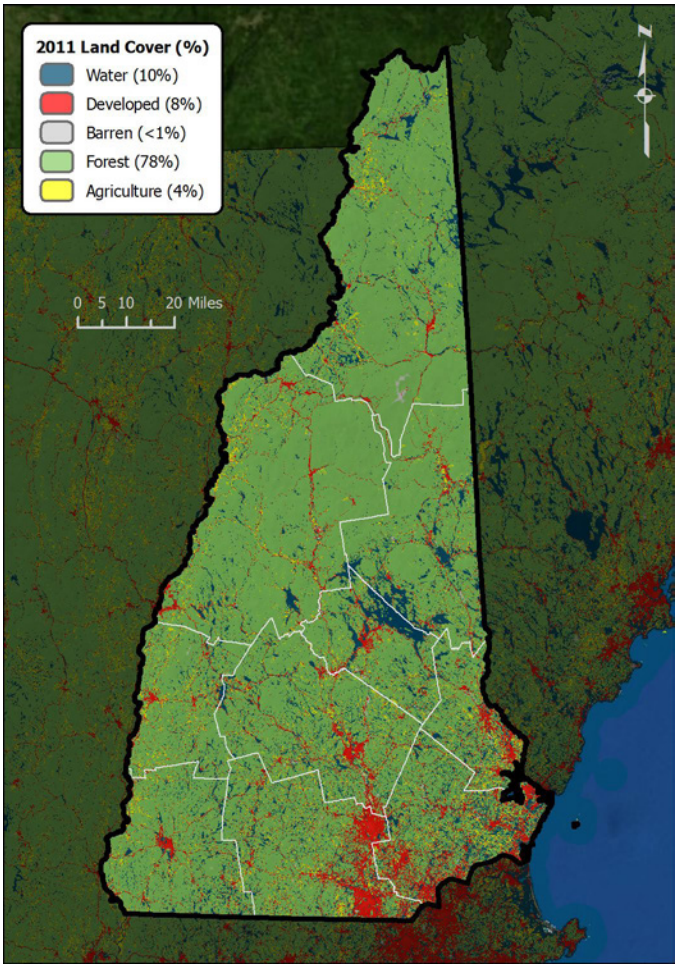
USDA United States Department of Agriculture

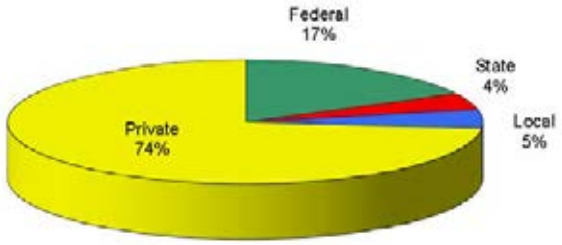
2016 Forest Health NEW HAMPSHIRE *highlights*

Forest Resource Summary

Almost three-quarters of the forest land in New Hampshire is privately owned. Only 17 percent is in Federal ownership, which includes the White Mountain National Forest. The 2015 New Hampshire forest inventory estimates that approximately 4.8 million acres in the State are forested. The forest resource is made up of a variety of forest types comprised of maples, beech, birch, spruce and balsam fir, pine, hemlock, oaks, ash, cherry, and other hardwoods. These forests provide a variety of goods, including recreational opportunities, clean water, and wildlife habitat as well as paper and wood products. Keeping New Hampshire forests healthy enhances the quality of life for those who live, work, and recreate in the State.



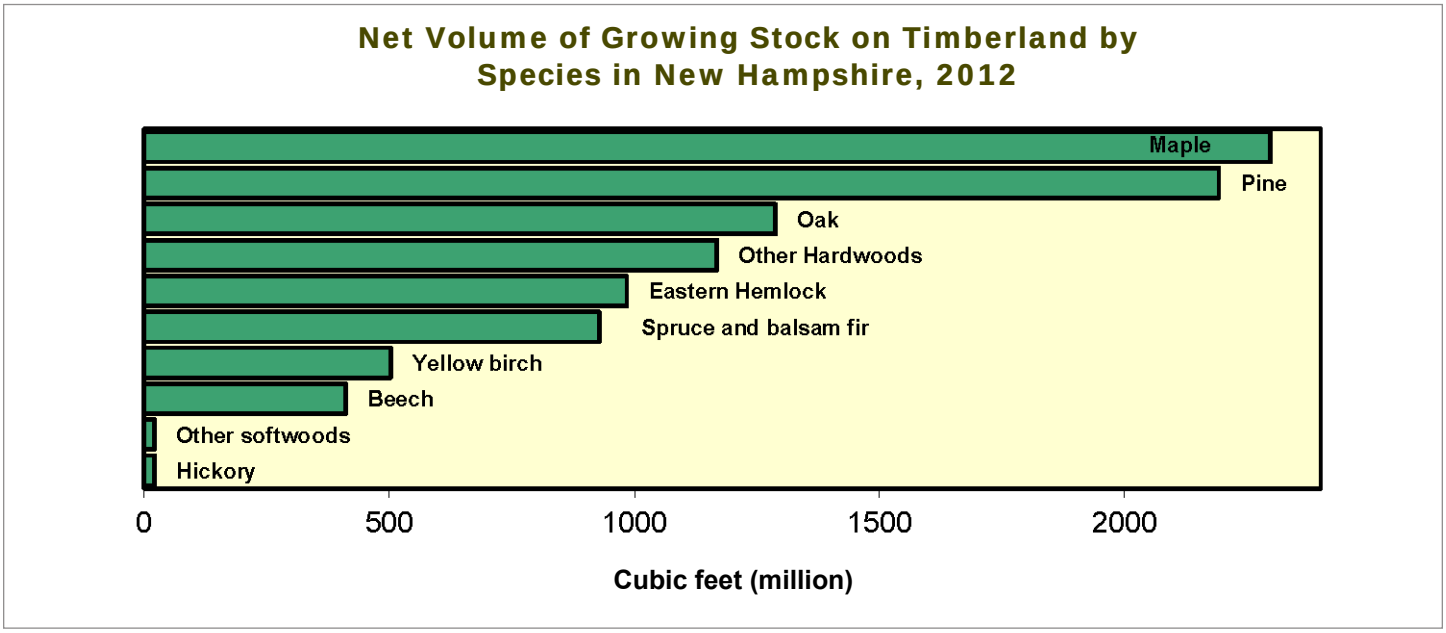
Forest Land Ownership in New Hampshire, 2012



Forest Service
Northeastern Area
State and Private Forestry

New Hampshire Department of Resources and Economic Development

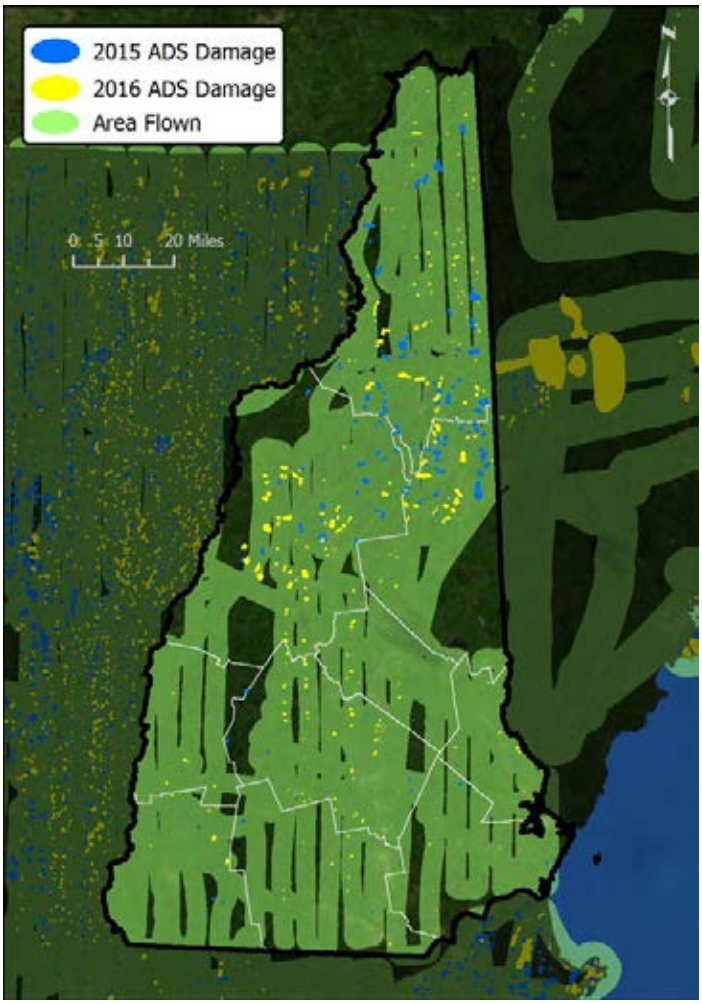
June 2017



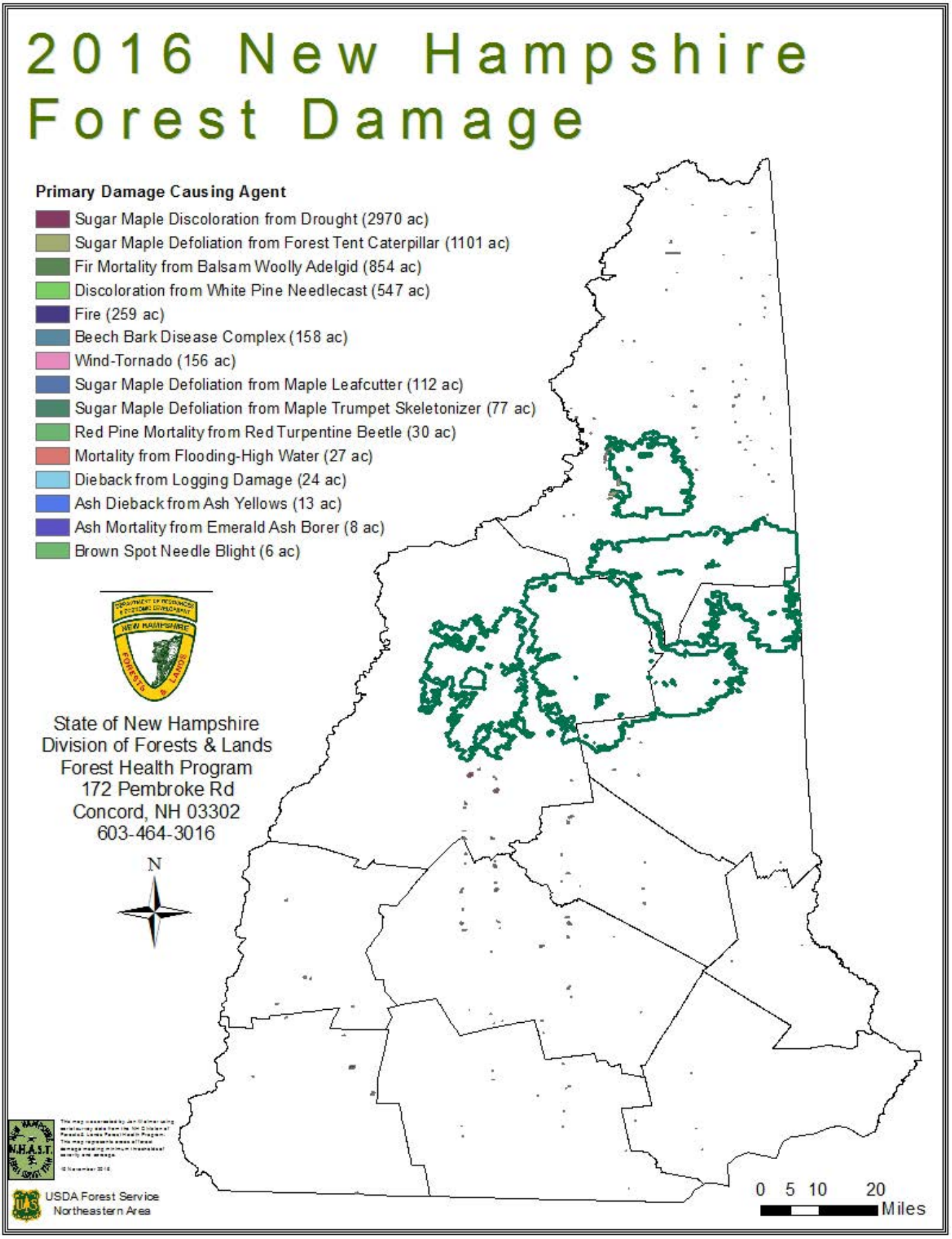
Aerial Survey

New Hampshire's annual aerial survey is a cooperative effort between the New Hampshire Division of Forests and Lands (NHDFL) and the U.S. Department of Agriculture Forest Service, Northeastern Area State and Private Forestry. The 2016 New Hampshire State aerial survey team mapped 6,339 acres of serious damage or defoliation on State and private lands, and the U.S. Forest Service mapped an additional 27,000 acres of damage on the White Mountain National Forest.

The primary damage-causing agent this year was **needlecast disease** on white pine, which was mapped on almost 12,000 acres (NHDFL and U.S. Forest Service). Defoliation from **forest tent caterpillar** was also very heavy this year in the White Mountain regions of Coos, Carroll, and Grafton Counties with just over 9,000 acres mapped (NHDFL and U.S. Forest Service). In addition the NHDFL mapped 2,970 acres of **drought**-induced discoloration of sugar maple, 854 acres of balsam fir mortality from **balsam woolly adelgid**, and 250 acres of mortality from **fire**. We also mapped **beech bark disease** (158 acres), **maple leaf cutter** (112 acres), **maple trumpet skeletonizer** (77 acres), **red turpentine beetles** (30 acres), **flooding** (27 acres), **logging damage** (24 acres), **ash yellows** (13 acres), **emerald ash borer** (8 acres), **brown spot needle blight** (6 acres), and **blue spruce needlecast** (2 acres).



Comparison of aerial detection survey (ADS) results for New Hampshire in 2015 and 2016. (Map: U.S. Forest Service, Durham, NH)

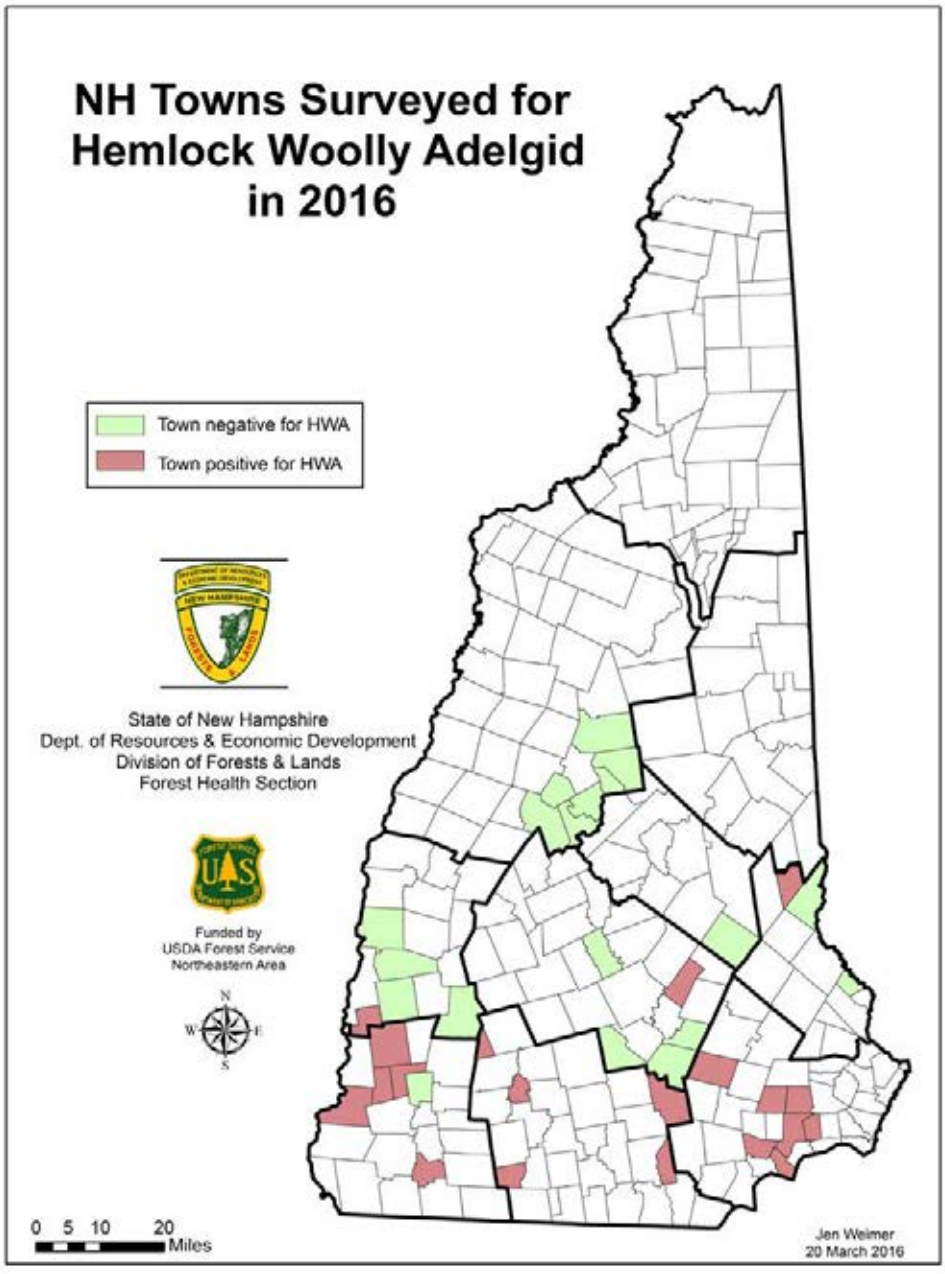


(Map: NH DRED Division of Forests & Lands)

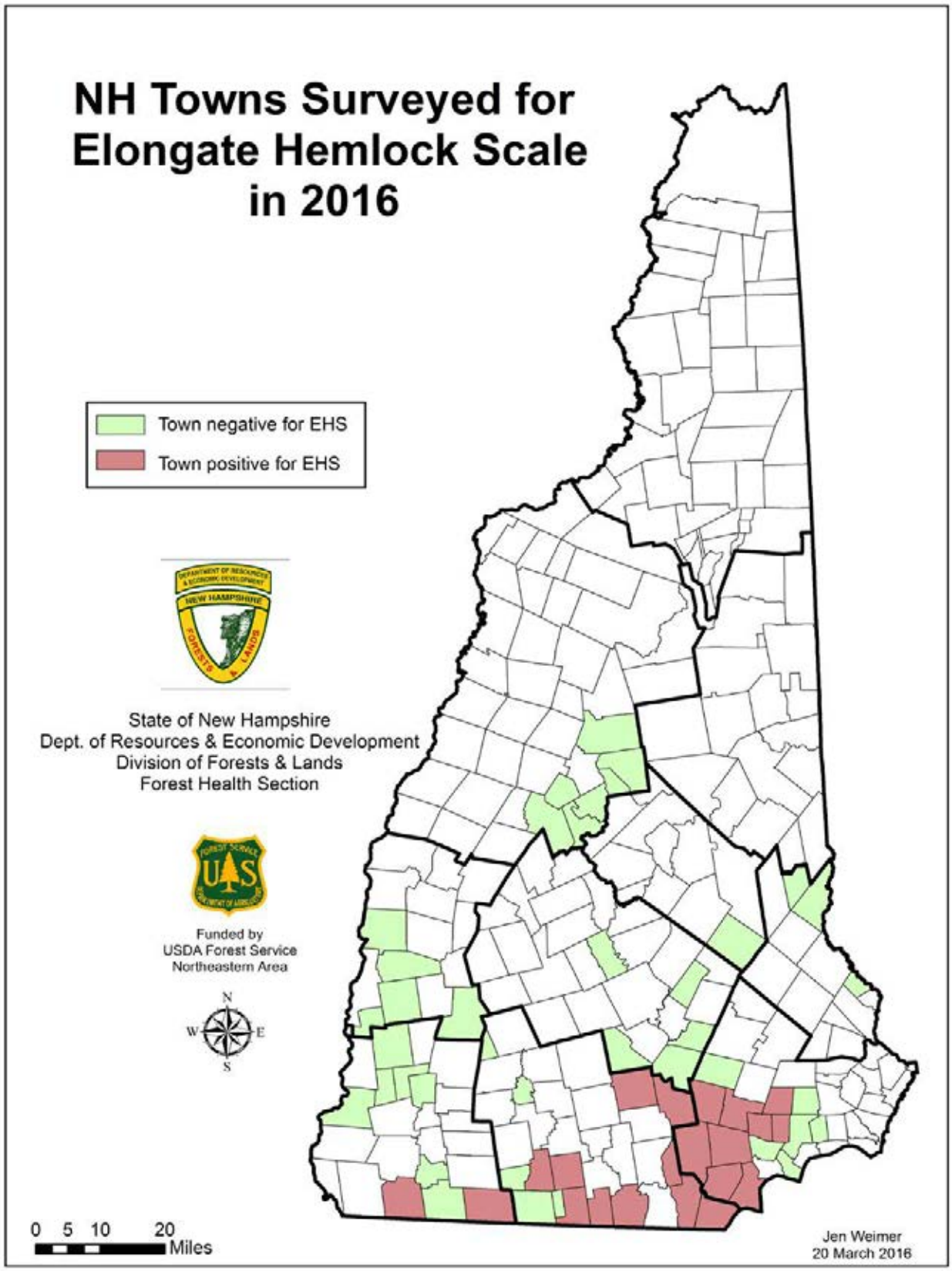
Forest Health Highlights

Hemlock Woolly Adelgid and Elongate Hemlock Scale

Hemlock woolly adelgid (HWA) surveys for 2016 were done in high-risk areas of southern New Hampshire where HWA infestations had not yet been detected and seven towns in Grafton County that border the northernmost infested area. Towns surveyed included Acworth, Alexandria, Allenstown, Alstead, Ashland, Barnstead, Bennington, Boscawen, Brentwood, Bridgewater, Bristol, Campton, Candia, Chichester, Claremont, Dunbarton, East Kingston, Fremont, Gilsum, Hampstead, Hebron, Holderness, Hooksett, Kingston, Langdon, Litchfield, Manchester, Middleton, Milton, Plaistow, Sharon, Somersworth, Sullivan, Surry, Troy, Unity, Washington, Westmoreland, and Windsor. Infestations were found in Alstead, Bennington, Brentwood, Candia, Chichester, East Kingston, Fremont, Gilsum, Hampstead, Kingston, Langdon, Litchfield, Manchester, Middleton, Plaistow, Sharon, Surry, Troy, Westmoreland, and Windsor.

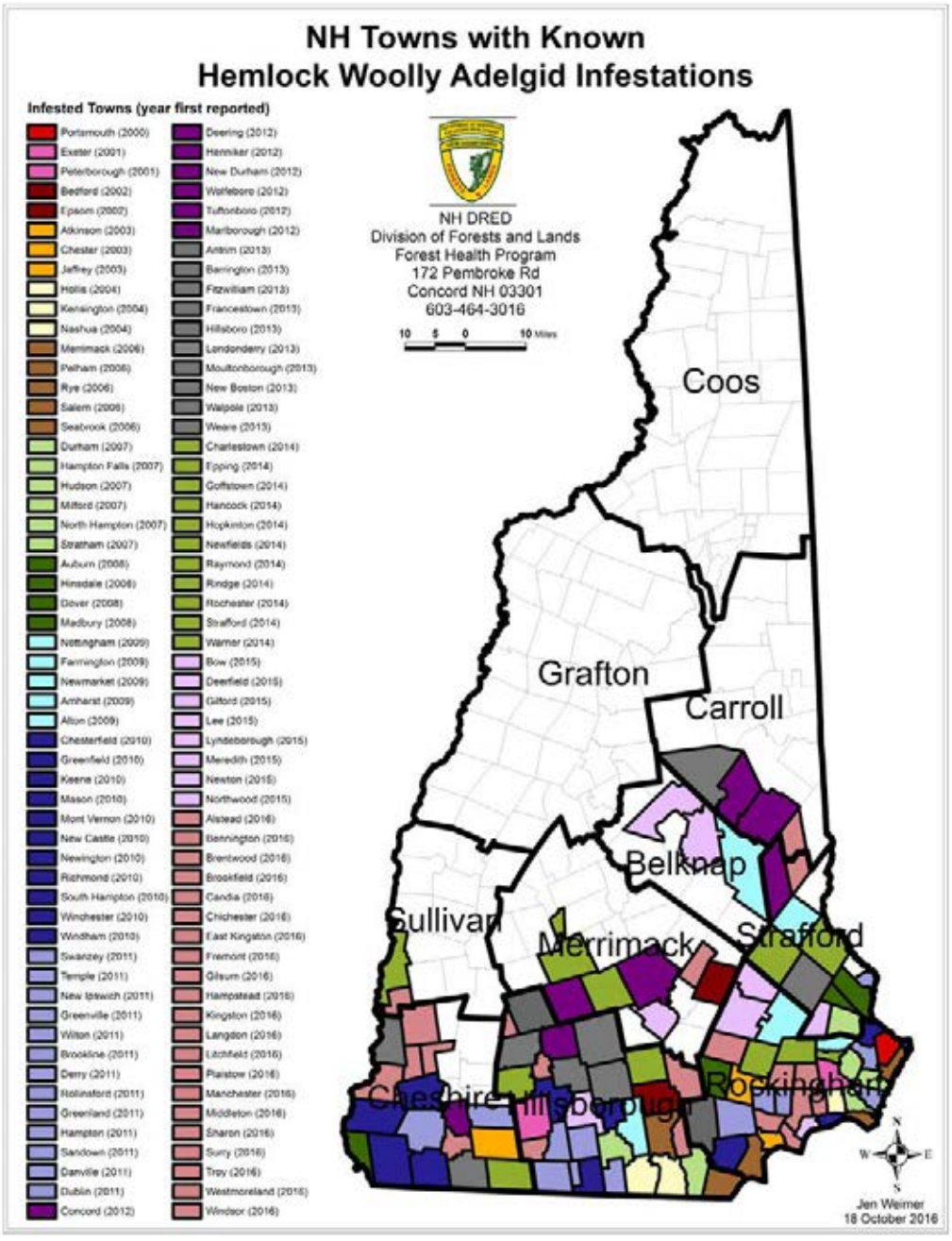


(Map: NH DRED Division of Forests & Lands)

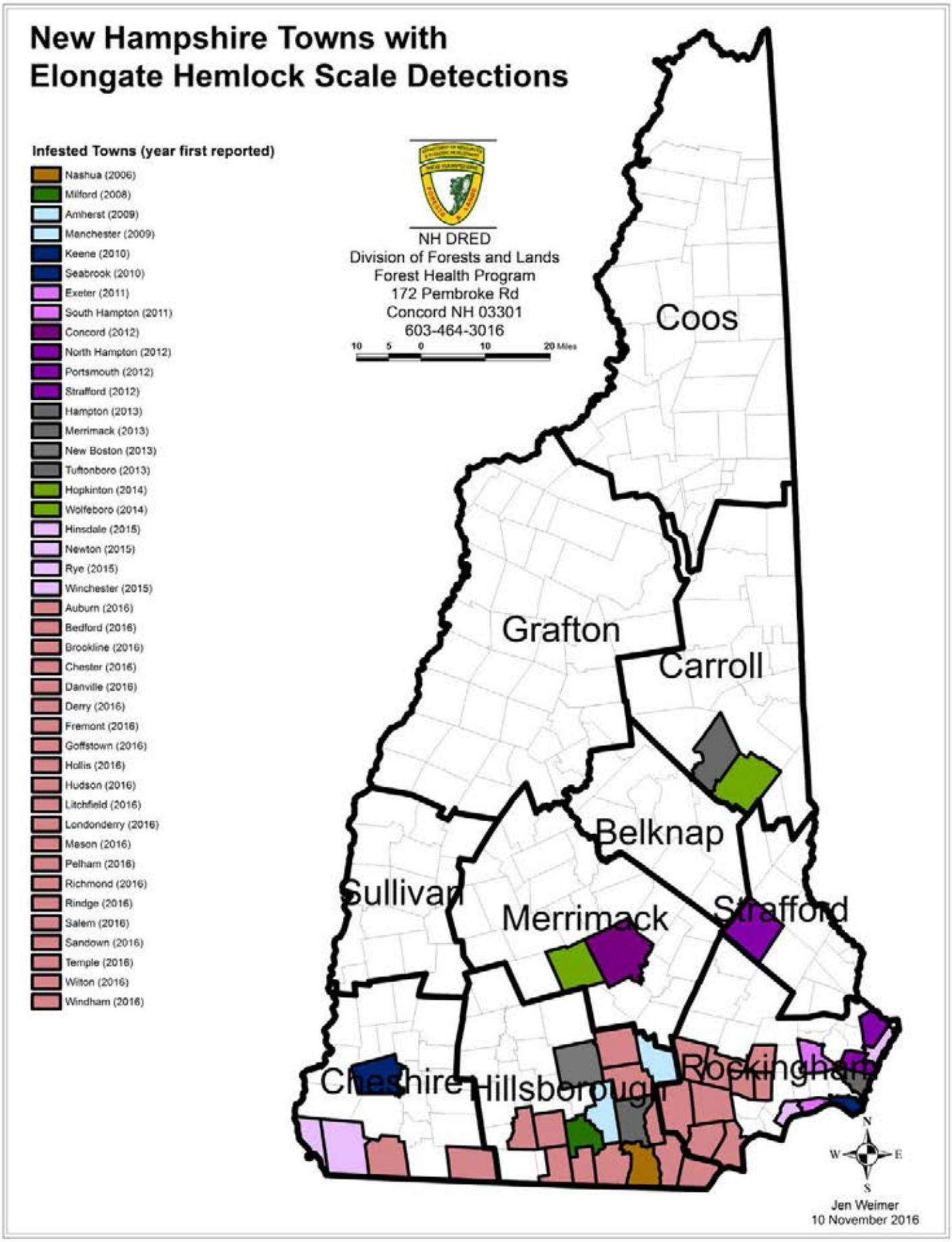


(Map: NH DRED Division of Forests & Lands)

Elongate hemlock scale surveys for 2016 were done in conjunction with HWA surveys and in southern towns abutting towns with known infestations. Towns surveyed included Acworth, Alexandria, Allenstown, Alstead, Ashland, Auburn, Barnstead, Bennington, Boscawen, Brentwood, Bridgewater, Bristol, Brookline, Campton, Candia, Chester, Chichester, Claremont, Danville, Derry, Dunbarton, East Kingston, Fitzwilliam, Fremont, Gilsum, Goffstown, Greenville, Hampstead, Hebron, Holderness, Hollis, Hooksett, Hudson, Kingston, Langdon, Litchfield, Londonderry, Manchester, Mason, Middleton, Milton, New Ipswich, Pelham, Plaistow, Richmond, Rindge, Salem, Sandown, Sharon, Somersworth, Sullivan, Surry, Temple, Troy, Unity, Washington, Westmoreland, Wilton, Windham, and Windsor. Infestations were found in Auburn, Brookline, Chester, Danville, Derry, Fremont, Goffstown, Hollis, Hudson, Litchfield, Londonderry, Mason, Pelham, Richmond, Rindge, Salem, Sandown, Temple, Wilton, and Windham. An infestation in Bedford was also reported by a homeowner.



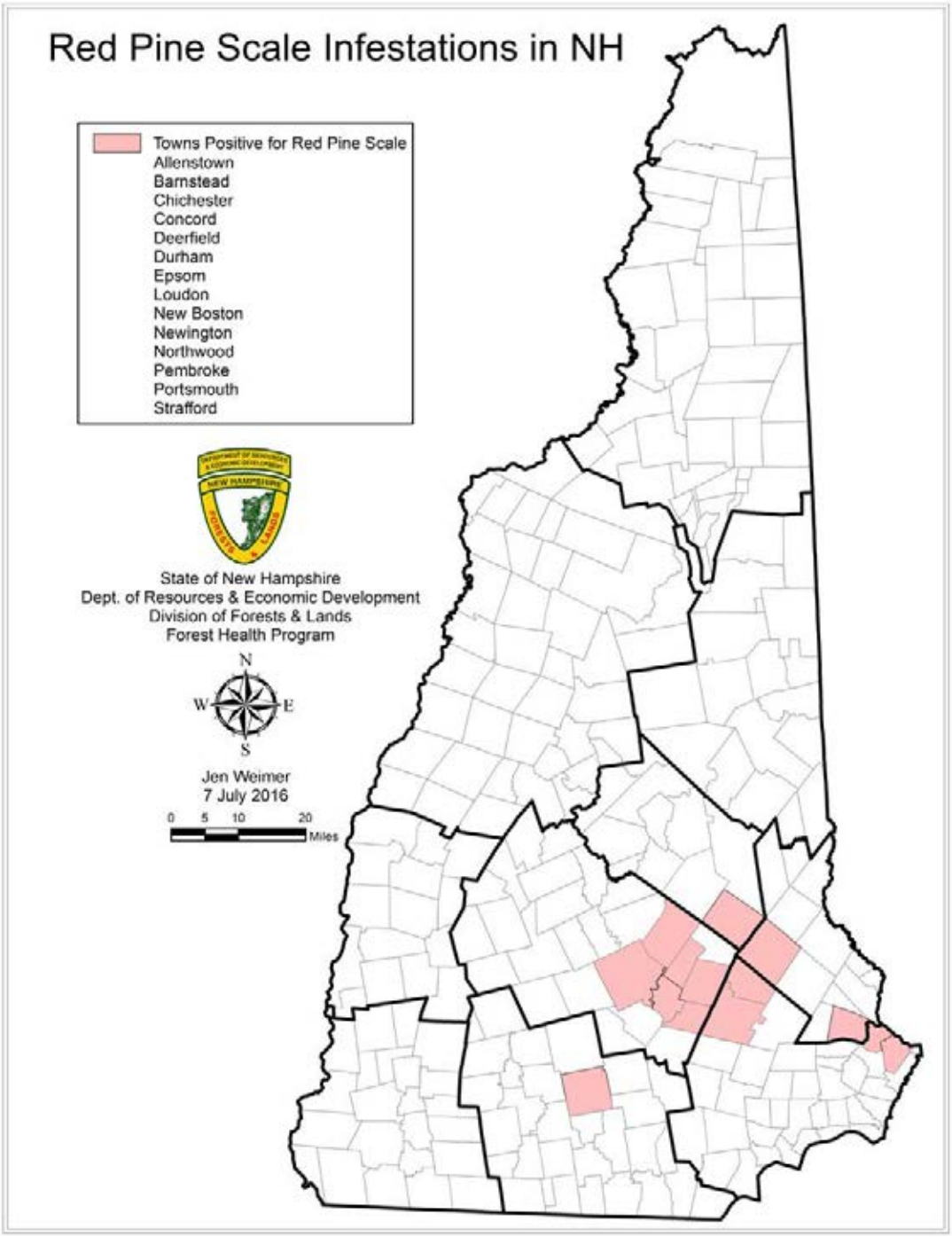
(Map: NH DRED Division of Forests & Lands)



(Map: NH DRED Division of Forests & Lands)

Red Pine Scale

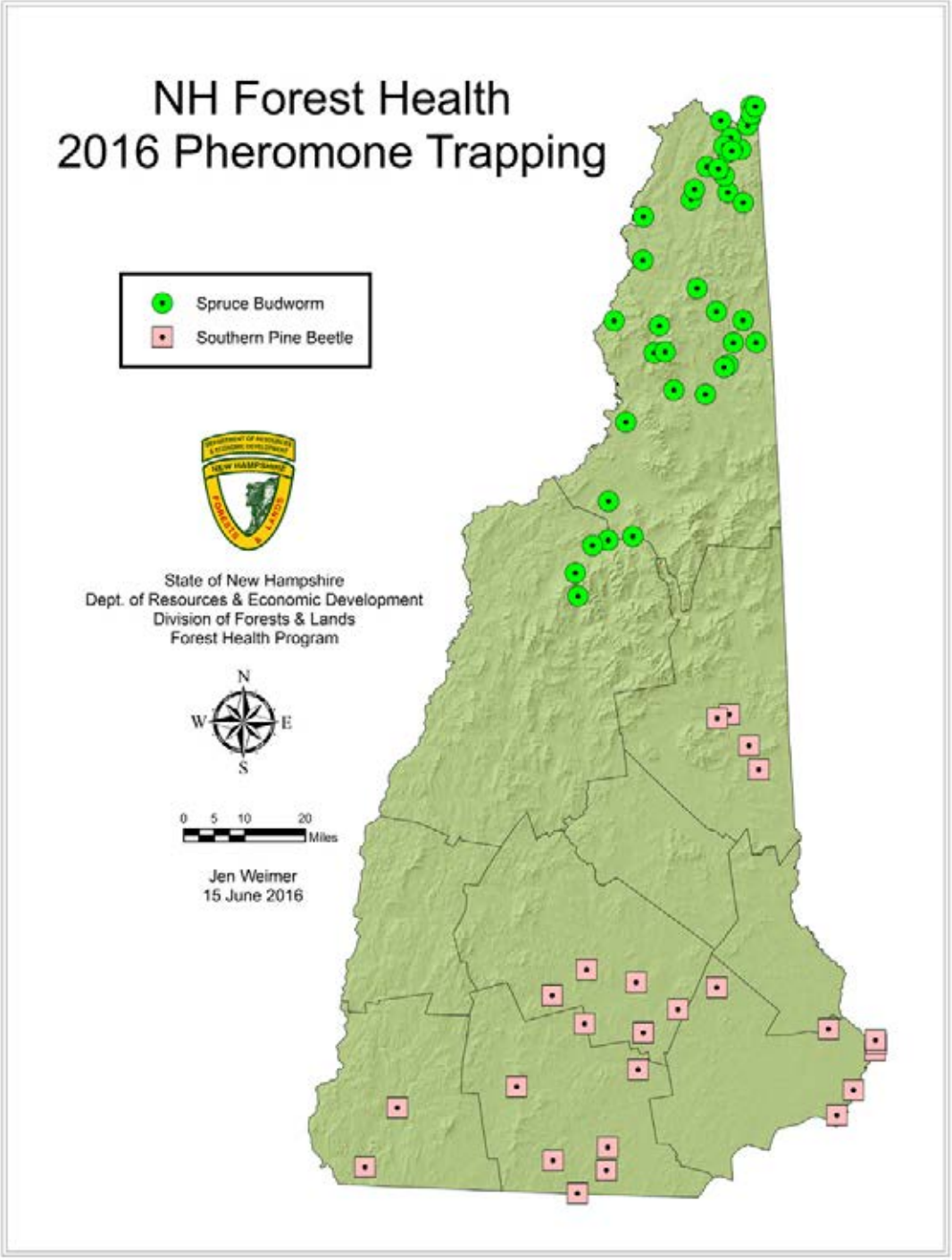
Red pine scale surveys for 2016 were conducted on high-risk State lands and several towns in Grafton County along the Connecticut River in response to the infestations found in Rutland and Orange Counties of Vermont. State lands surveyed were Litchfield State Forest, Little Pine River State Forest, Black Mountain State Forest, and Merrimack River State Forest. Private lands with red pine were also surveyed in the towns of Hanover, Lyme, Orford, Piermont, and Haverhill. No new infestations were found during these surveys. New infestations were found in Durham at Adams Point Wildlife Management Area during other surveys. In addition a report of dying trees in New Boston led to a new county detection.



(Map: NH DRED Division of Forests & Lands)

Spruce Budworm and Southern Pine Beetle Trapping

Spruce budworm trap catches are down from last year and remain at endemic levels. While we continue to see no signs of an outbreak anytime soon, Maine is anticipating major defoliation within a few years as the outbreak in Canada spreads southward. A task force of Maine forestry officials, academia at the University of Maine, and the Maine Forest Service are leading an effort to inform the public about the moth. A new website has just been launched as the primary clearinghouse for all things budworm.

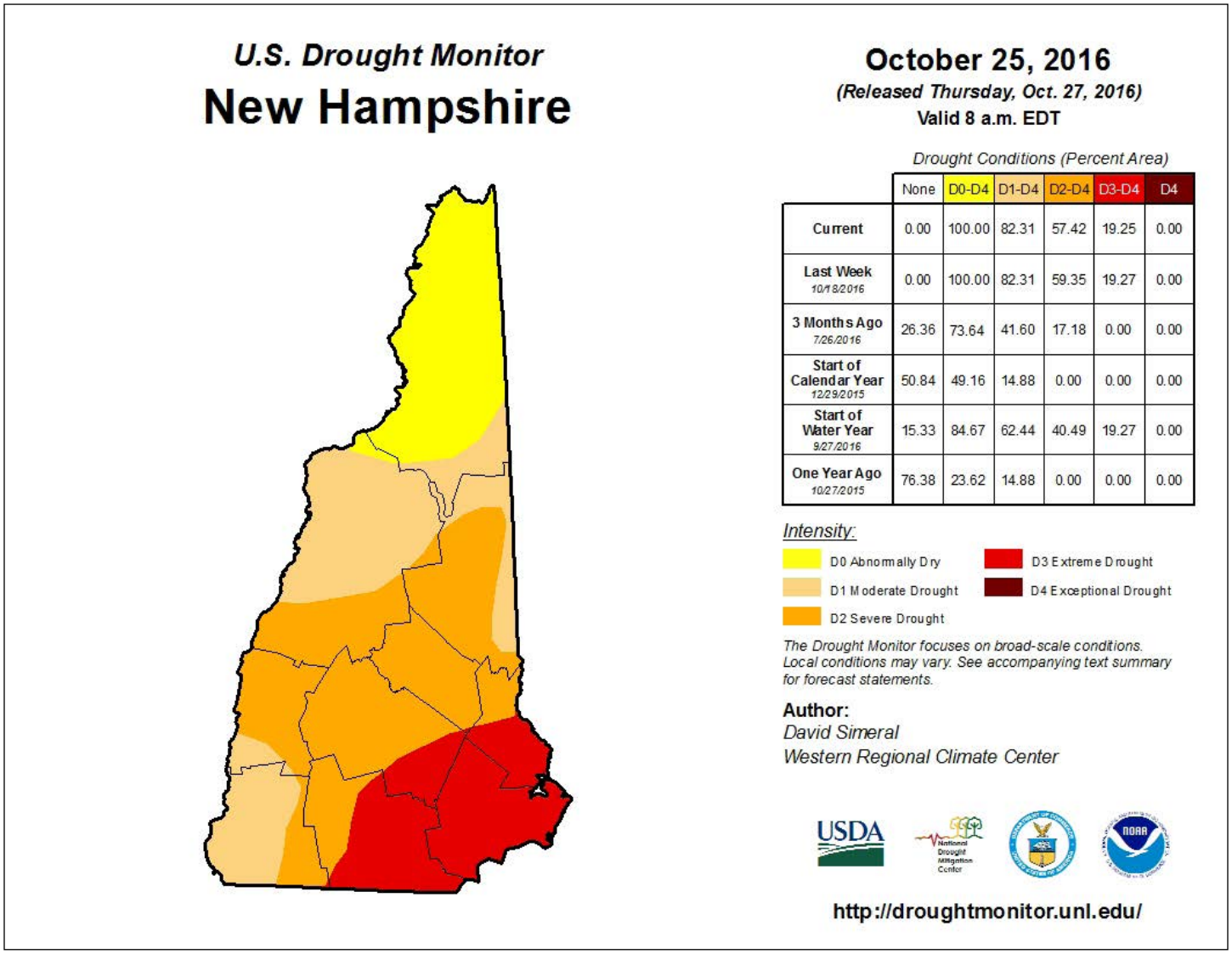


(Map: NH DRED Division of Forests & Lands)

This was our second year trapping for **southern pine beetle** (SPB) in response to the recent northern spread of the beetle. We added additional traps in the southwestern corner of the State in response to the detections in western Massachusetts last year. This year Massachusetts only had detections on the Cape and coastal areas. We did not detect any SPB again this year.

Drought

The weather for most of the State has been abnormally dry this year resulting in extreme drought conditions in some areas. Dry conditions have led to an increase in brush fires, defoliation from caterpillars, and early leaf senescence. Fires crews were very busy battling fires on over 500 acres so far this year. The lack of rain also led to a decrease in fungal biological controls for defoliating caterpillars, resulting in heavy defoliation. We had numerous reports of heavy gypsy moth in isolated areas of southeastern New Hampshire, and forest tent caterpillar defoliated just over 9,000 acres in the White Mountain region. In addition, other native defoliators were in abundance throughout the State such as maple leafcutter, maple trumpet skeletonizer, and beech leaftier. The full effects of the drought conditions may not be seen for some time as stressed trees succumb to invasions from insects and pathogens that prey on stressed hosts.



(Map: National Drought Mitigation Center)

Special Pest Surveys

Butternut Update

Our butternut grafting project had its 20th anniversary in 2016, and we thought it would be a good time to take another look at the butternut trees in the program and report on their health. By 1996, butternut canker disease (*Ophiognomonia clavigignenti-juglandacearum*) had spread throughout New Hampshire, and heavy mortality rates were eliminating butternut everywhere. In 1996, with cooperative funding from the U.S. Forest Service, Forest Health Program personnel set out to find resistant butternut remaining in New Hampshire forests and create seed orchards from those healthy trees. Requests for help went out in several major newspapers and the response was amazing. People really love their butternuts. We visited 300 sites and looked at 3,000 trees where folks thought they may have met our strict definition of a resistant tree. Of those 300 sites we found 20 sites that had a tree worthy of grafting scion material. Grafting was done at the State Forest Nursery in Boscawen, and grafted seed orchards were established at the Caroline Fox Research and Demonstration Forest in Hillsboro and the State Nursery in Boscawen.

Hybrid butternut in Portsmouth, NH. (Photos: NH DRED Division of Forests & Lands)

Unfortunately, surviving trees in both seed orchards were identified as Butternut x Japanese walnut (*Juglans ailantifolia*) hybrids in 2015.

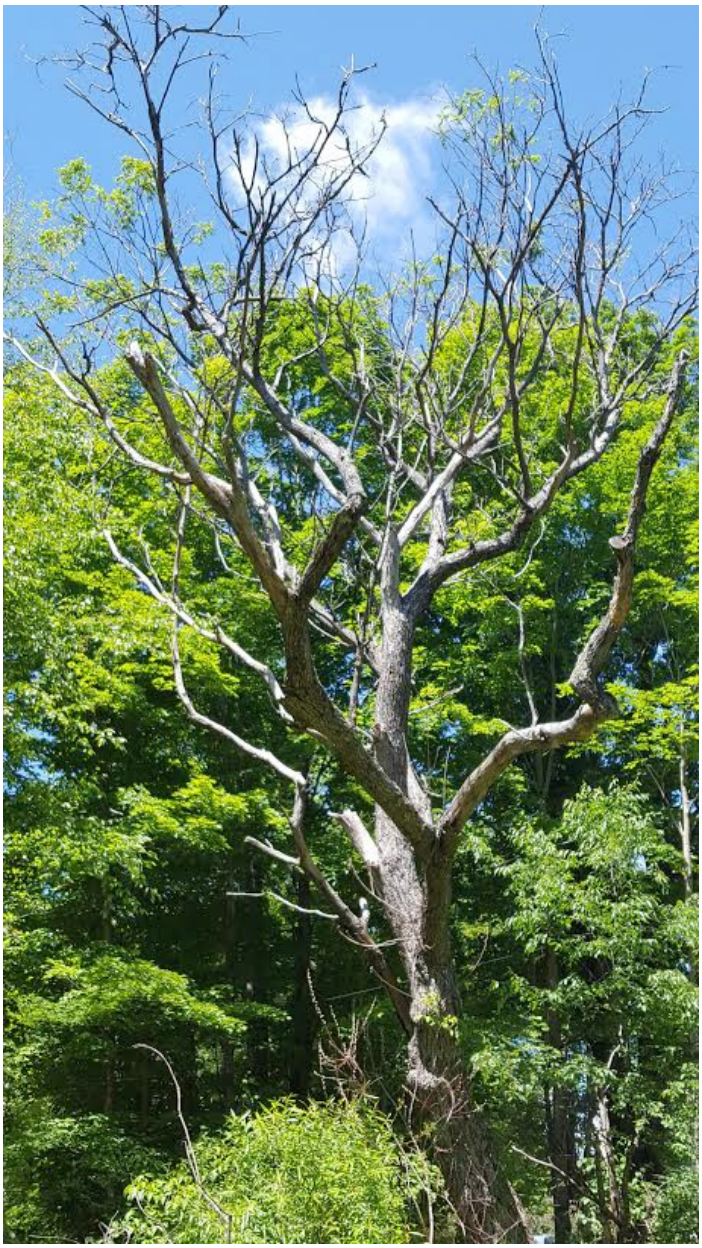
This realization prompted the need to visit each of the identified resistant trees and re-examine them to determine if they were truly native resistant butternut or butternut hybrids. Hybrids are much more resistant to the canker disease and technically not native. Identification of butternut and Japanese walnut x butternut hybrids is complicated by their ability to readily back cross with either parent species or other hybrids. Hybrids were first introduced into North America in the 1870s and were widely planted until the 1930s. Hybrids were more vigorous and produced more nuts than the native butternut. Morphological differences include pith color, lenticel shape, and difference in the leaf scar (Farlee and others 2010[1]). Back crosses to butternut in subsequent generations may minimize these differences.

This past summer we visited the 20 original sites with superior butternuts with two goals: 1) determine if superior trees continue to display canker resistance, and 2) determine if trees identified in the 1990s as possibly canker resistant are truly native butternuts (*J. cinerea*) or are hybrids with Japanese butternut (*J. ailantifolia*).

At the original 20 sites, we examined 74 butternut trees; using Farlee's key, we estimated that 39 of those 74 were hybrids. Just two of those 39 trees were considered "healthy" with less than 20 percent crown dieback. All the suspected hybrid trees had at least a few cankers of the disease on the root flare or bole. The remaining 35 trees were determined to be native and all were moderately or heavily infected; dieback ranged from 20 to 80 percent. The healthiest native butternut was at the Rocks Estate owned by the Society for the Protection of New Hampshire Forests in Bethlehem, and the nicest hybrid butternut was an incredible specimen at the Rundlet-May House in Portsmouth.

Apparently native butternut showing severe crown dieback caused by canker in Enfield, NH. (Photo: NH DRED Division of Forests & Lands)

[1] Farlee, L.; Woeste, K.; Ostry, M.; McKenna, J.; Weeks, S. 2010. Identification of butternuts and butternut hybrids. Purdue Extension FNR-420-W. 11 p.



Apparently native butternut showing severe crown dieback caused by canker in Center Harbor, NH. (Photo: NH DRED Division of Forests & Lands)

Samples from 15 of the native and hybrid trees have been sent to Purdue University for DNA testing to verify our visual assessments. In the coming years we'll continue to look at potentially resistant trees as people report them. There are research organizations with breeding programs to back cross the resistance gene into native butternut. Maybe somebody in New Hampshire will stumble across a healthy native butternut that could be helpful.

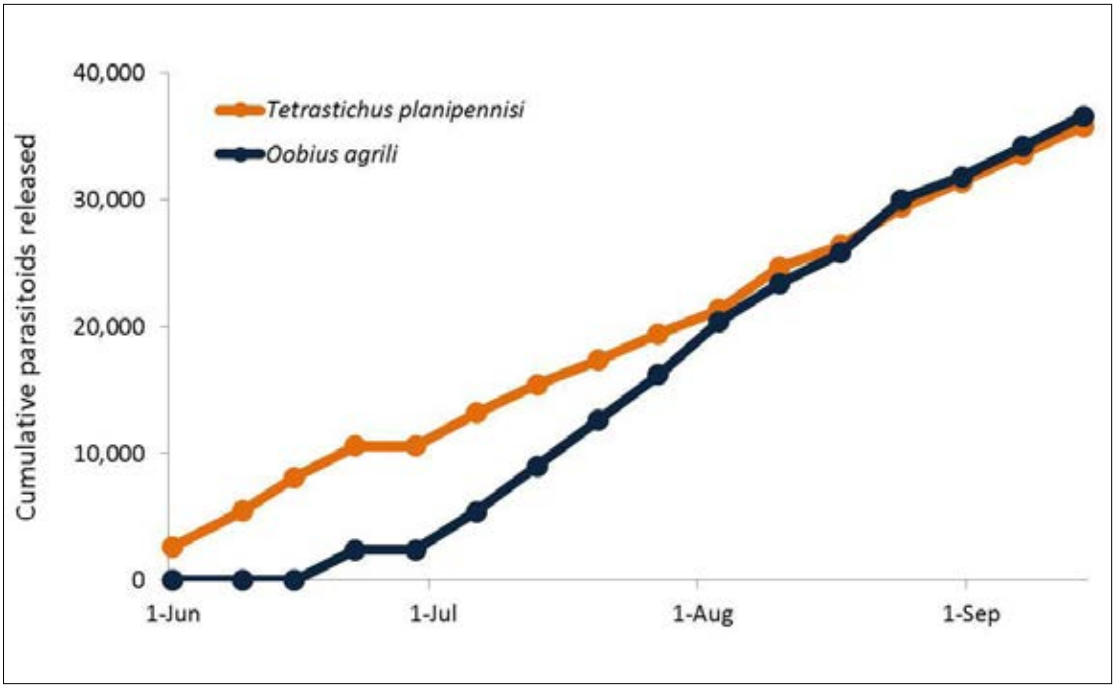
Emerald Ash Borer Update

The New Hampshire Division of Forests and Lands has concluded its 2016 trapping for emerald ash borer. Forty prism traps were deployed throughout a roughly 2- to 5-mile-wide buffer around known infested areas along with nine green funnel traps located at high-risk sites in Cheshire and Sullivan Counties. Five of the prism traps captured emerald ash borer representing the first detections of the pest in Goffstown and Pittsfield, bringing the total number of New Hampshire towns with known infestations to 20. The other three detections were made in Dunbarton, Gilmanton, and Mont Vernon, which had previously known infestations. The detection in Pittsfield is now the closest to the boundary of the Federal Quarantine (Belknap, Hillsboro, Merrimack, and Rockingham Counties) at just under 5 miles west of the Strafford County line. The closest known infestations to Carroll, Cheshire, and Sullivan Counties are roughly 15 miles away, and the closest to Grafton County is 9 miles. Other State cooperators deployed an additional 55 traps throughout the State, all of which were negative for the ash borer. This upcoming fall and winter, detection efforts will continue through visual survey inspection of previously established trap trees.

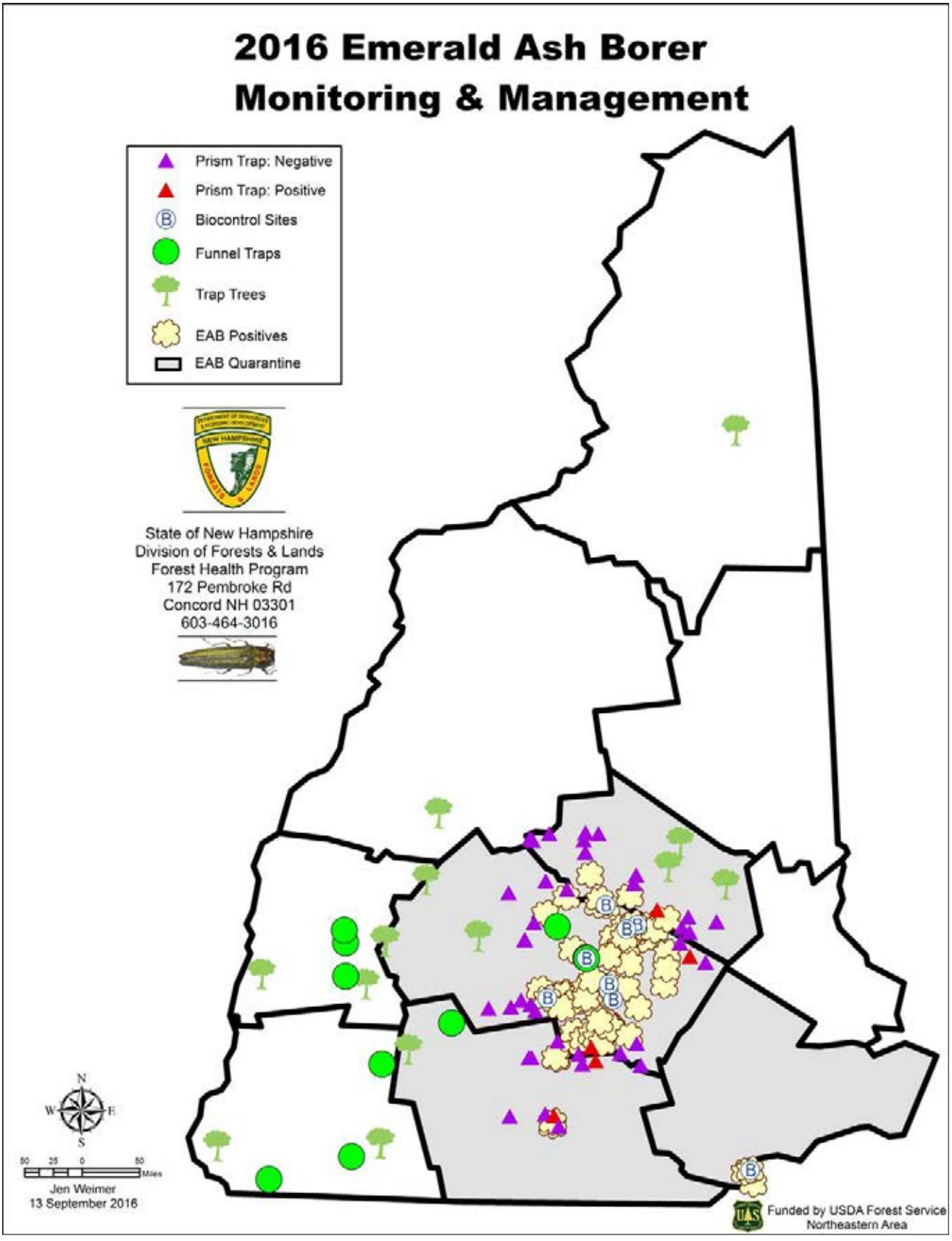
Yellow pan traps attached to the trunks of infested ash trees are used to catch parasitic wasps at retired release locations. The wasps, which feed on flower nectar as adults, are attracted to the bright bowls, which resemble flowers. (Photo: NH DRED Division of Forests & Lands)

Biological control continues to be utilized as the most promising method for providing large-scale and long-term control of emerald ash borer. From June through September, releases of two species of parasitic wasps were carried out at six release locations throughout the infested area of the State. At each of these locations about 350 individuals of each species were released weekly for 4 months totaling over 70,000 parasitoids released in New Hampshire in 2016. An additional three release locations had received parasitoids in previous years and have since been retired; they are now being evaluated for successful parasitoid establishment. The larval parasitoid *Tetrastichus planipennisi* has been recovered from all three sites through a combination of on-site trapping and rearing from infested ash material. Recovery indicates that this species has successfully established self-sustaining populations that will naturally grow in size, apply pressure to local ash borer populations, and migrate to newly infested areas. We have not yet seen evidence of the establishment of the egg parasitoid *Oobius agrili*, though at less than 1 mm, this tiny insect is exceedingly difficult to detect even when present. Next year two of the six locations that were in use in 2016 will be retired at which point we will evaluate them for successful parasitoid establishment. New locations are being sought along the periphery of the emerald ash borer infestation to expand biological control coverage in the State, which will increase the efficacy of the program.

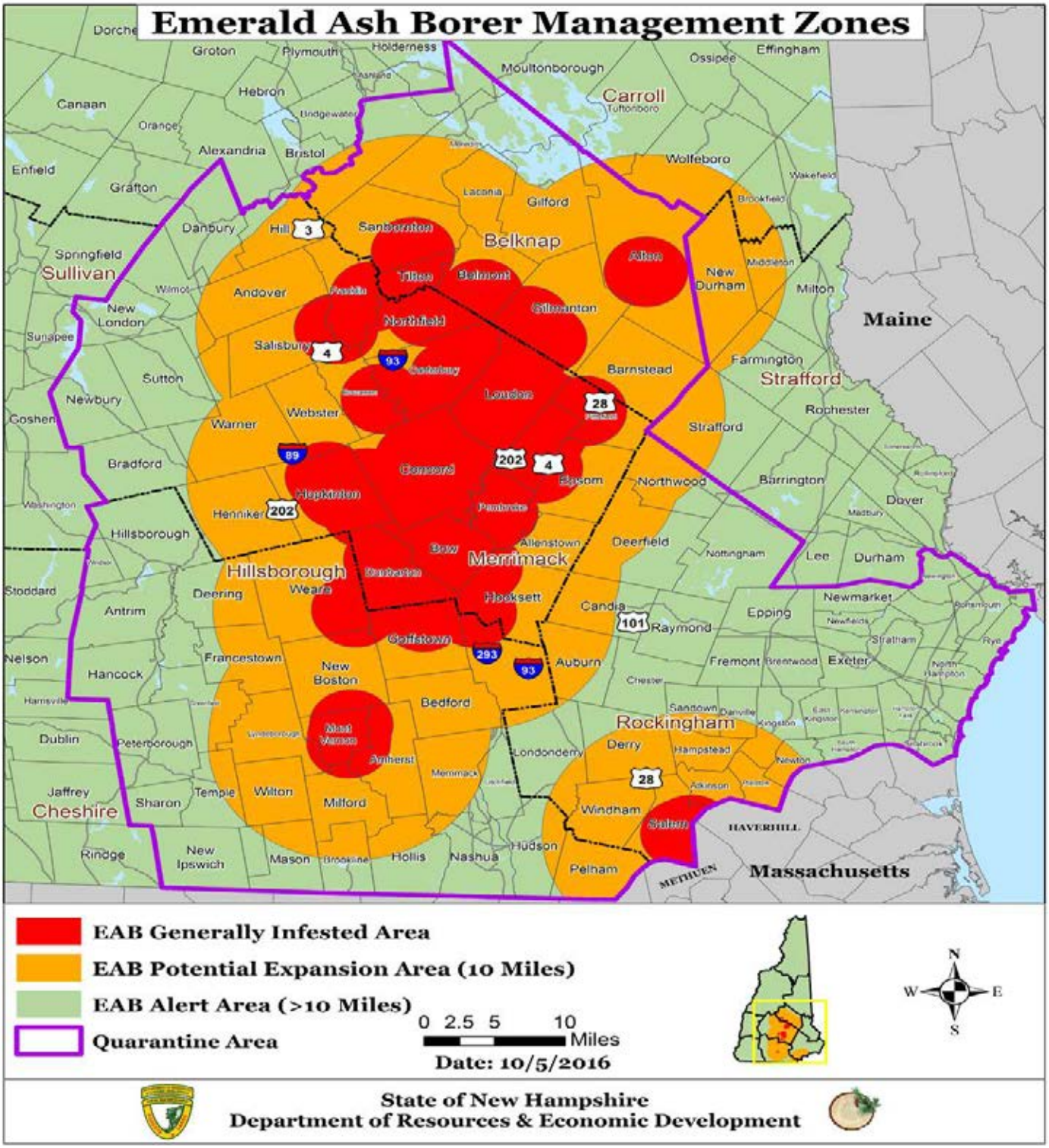
Rearing barrels are used to evaluate parasitoid establishment. Ash trees infested by emerald ash borer are felled from parasitoid release locations and cut into sections, which are stored in large barrels. When parasitoids within the wood finish their development, they will emerge from the logs and fly into glass collection jars affixed to the ends of the barrels. (Photo: NH DRED Division of Forests & Lands)



Through mid-September roughly 35,000 of each of the two parasitoid species had been released across six locations. That is about 700 parasitoids released at each location every week for 4 months. (Graph: NH DRED Division of Forests & Lands)



(Map: NH DRED Division of Forests & Lands)



(Map: NH DRED Division of Forests & Lands)

References

Land Cover Map

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Forest Land Ownership

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Net Volume of Growing Stock on Timberland Species

Oswalt, Sonja N.; Smith, W. Brad; Miles, Patrick D.; Pugh, Scott A. 2014. Forest resources of the United States, 2012: a technical document supporting the Forest Service 2015 update of the RPA Assessment. Gen. Tech. Rep. WO-91. Washington, DC: U.S. Department of Agriculture, Forest Service, Washington Office. Tables 23 & 24. http://www.fs.fed.us/sites/default/files/media/types/publication/field_pdf/GTR-WO-91.pdf. (1 March 2016).

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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.

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