



Forest Health VERMONT *highlights*

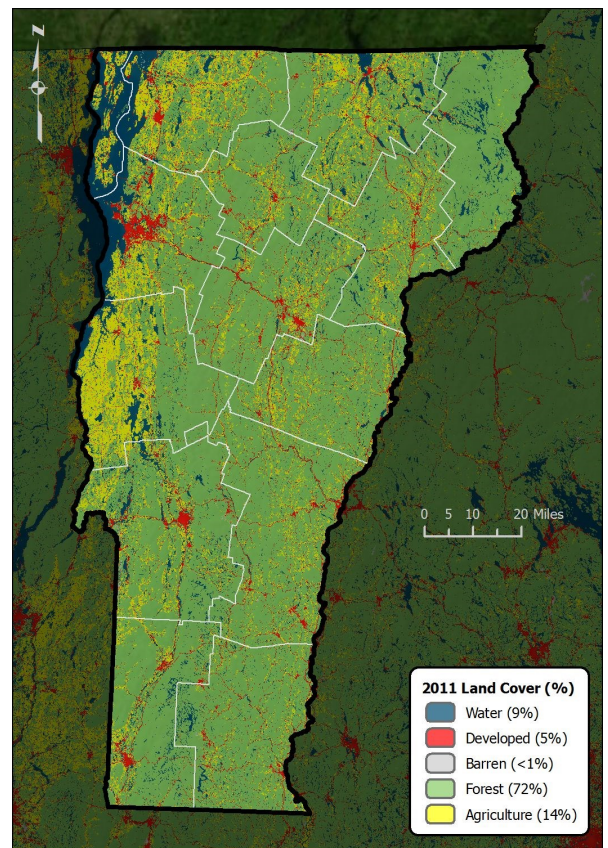
2014



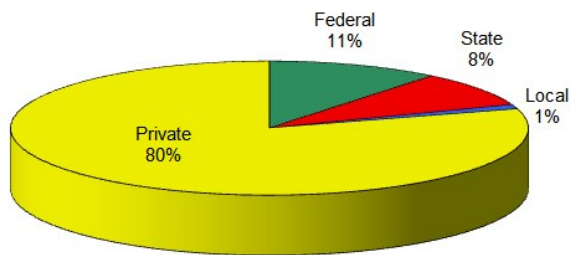
These highlights summarize information from the annual report on Forest Insect and Disease Conditions in Vermont. The complete annual report, as well as other Vermont forest health information, is posted online at www.vtfpr.org/protection/idfrontpage.cfm. Contact [Forest Resource Protection Personnel](#) or your [County Forester](#) to receive a copy by mail or for assistance in identifying pests and diagnosing forest health problems, on-site evaluations, and insect population sampling; to find defoliation maps, management recommendations, and other literature; or to participate in invasive pest citizen monitoring.

Forest Resource Summary

Forests cover 72% of Vermont. Eighty percent of the State's forest land is privately owned with 11% under Federal management in the Green Mountain National Forest and 8% managed by the State of Vermont. Sugar and red maple, eastern hemlock, and white pine are the most common species by number and volume. More information on Vermont's forest inventory is at <http://www.nrs.fs.fed.us/fia/>.



Forest Land Ownership in Vermont, 2012



Land Cover Map:

Jin, S.; Yang, L.; Danielson, P.; Homer, C.; Fry, J.; Xian, G. 2013. A comprehensive change detection method for updating the National Land Cover Database to circa 2011. *Remote Sensing of Environment*. 132: 159-175.

Forest Land Area by Ownership:

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. Table 2.

Net Volume of Growing Stock on Timberland by Species (next page):

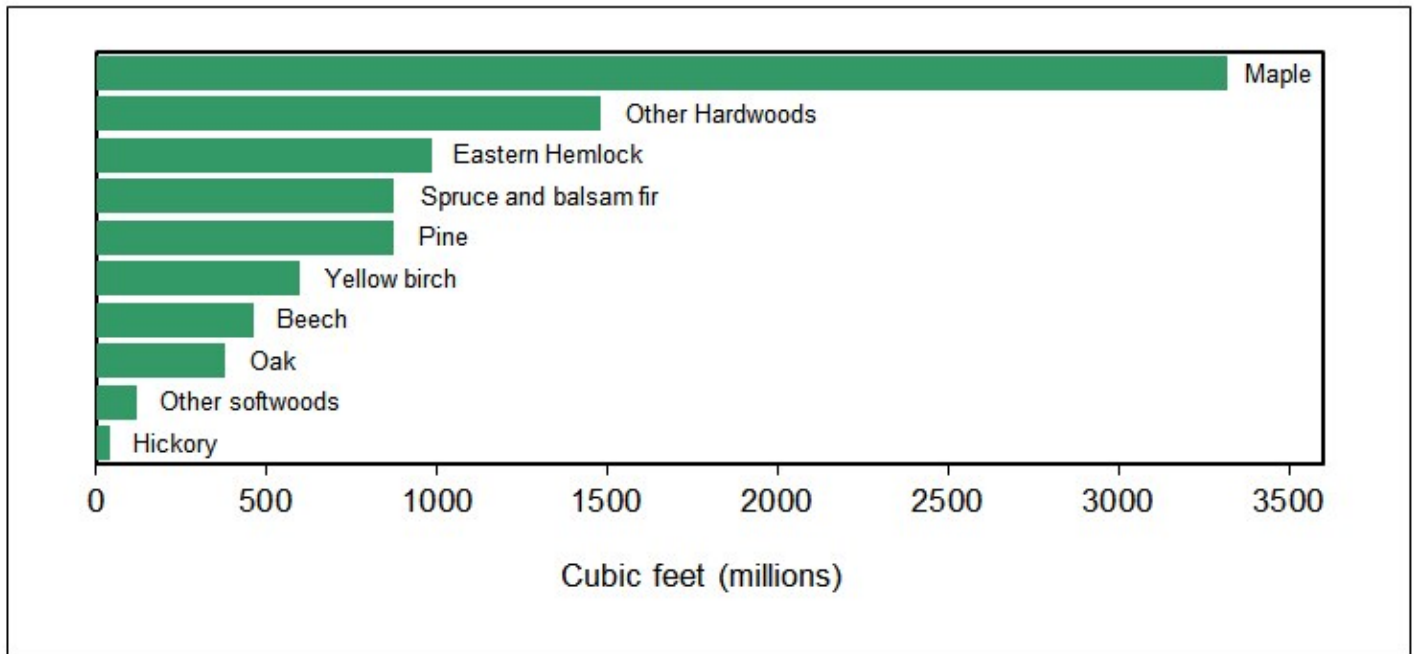
Oswalt, Sonja N.; Smith, W. Brad; Miles, Patrick D.; Pugh, Scott A. 2014. Forest resources of the United States, 2012: a technical document supporting the Forest Service 2015 update of the RPA Assessment. Gen. Tech. Rep. WO-91. Washington, DC: U.S. Department of Agriculture, Forest Service, Washington Office. Table 23 & 24.

Forest Health Programs in the Northeast



Vermont Department of Forests, Parks and Recreation (FPR) works in partnership with the U.S. Forest Service to monitor forest conditions and trends in Vermont and respond to pest outbreaks to protect the forest resource.

Net Volume of Growing Stock on Timberland by Species in Vermont, 2012



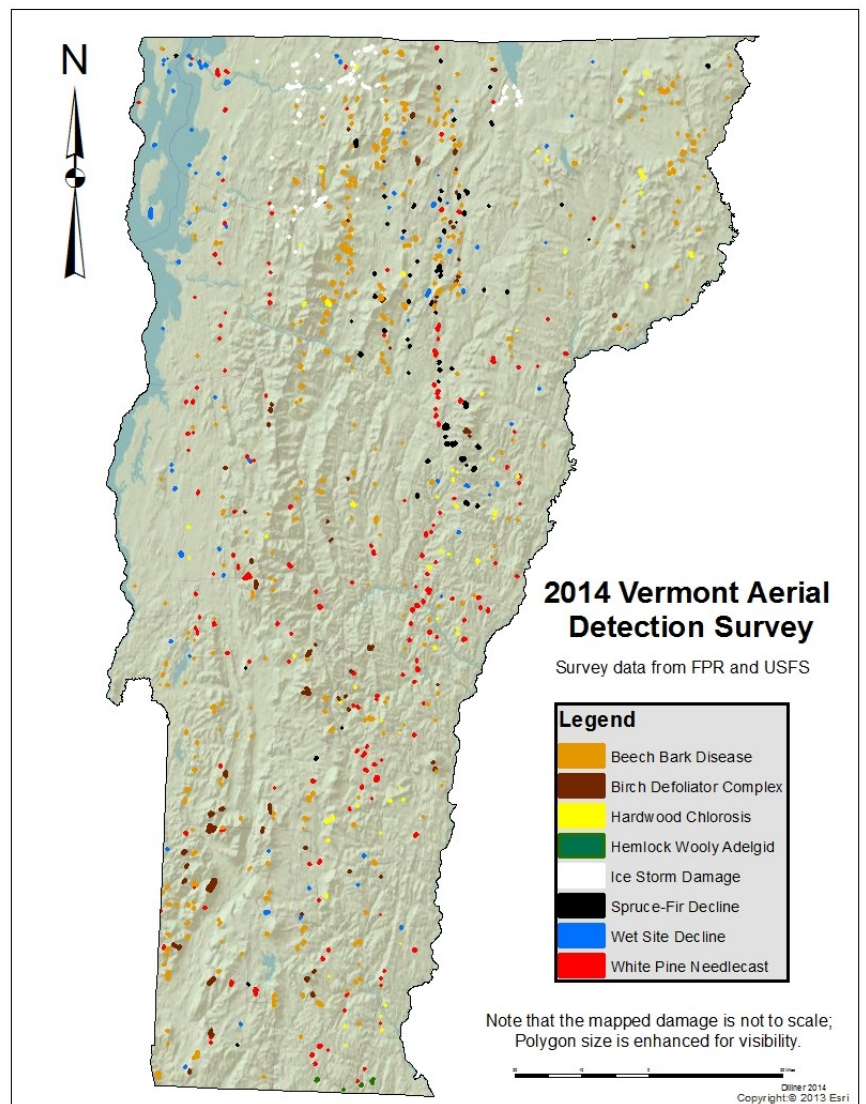
Aerial Surveys

In 2014, 38,235 acres of forest damage were mapped statewide. This represents less than 1 percent of Vermont’s forest land and an 80 percent decrease from 2013. Beech bark disease, a non-native pest complex, accounted for 36 percent of the damage area mapped.

Forest Health Program Highlights

The Vermont Department of Forests, Parks and Recreation conducts aerial and ground surveys to detect forest damage. In addition, long-term monitoring plots are inspected to evaluate forest health.

Invasive pests and plants are a key threat to forest health in the region. The Vermont Department of Forests, Parks and Recreation and the Agency of Agriculture, Food and Markets collaborate with USDA agencies to survey and manage non-native forest pests, and with University of Vermont Extension on education and outreach. An interagency [Invasive Forest Pest Action Plan](#) is updated every year.



The Web site dedicated to invasives, vtinvasives.org, covers non-native plants and tree pests. It also provides information on reporting suspects, spreading the word, and getting involved as a volunteer. In 2014, 29 new volunteers attended Vermont's [Forest Pest First Detector Program](#) training, bringing the statewide total of trained volunteers to 147.

Don't Move Firewood outreach continues. To reduce risk, State Park campgrounds exchanged out-of-state firewood with local wood. Act 112 was signed in spring 2014, which requires regulations on importing untreated firewood by summer 2015.

The **Forest Biology Laboratory** continues to provide invertebrate identifications, tree disease diagnoses, and pest management recommendations. It also maintains an invertebrate collection and historical records that serve as an invaluable resource in evaluating forest health changes. With the assistance of volunteers and interns, we continue to make remedial progress in recovering this collection from losses due to tropical storm Irene.

Climate change adaptation remained a focus in 2014. A number of demonstration projects have been initiated on public and private lands. These are management units that provide on-the-ground examples of how people can work toward the goal of creating resilient forests, along with other objectives. More details about these projects are available at <http://forestadaptation.org/new-england/vt>. The publication *Creating and Maintaining Resilient Forests in Vermont: Adapting Forests to Climate Change* is another resource that will be available in 2015.

Resources for urban and community forest storm preparedness were compiled for tree stewards and are available at <http://www.vtcommunityforestry.org/resources/community-preparedness/storms>.

The Department of Forests, Parks and Recreation is working with partners to develop **voluntary harvesting guidelines** in support of forest health and sustainability, as directed by Act 24. The draft guidelines address a number of forest health concerns, including protecting soil health and productivity; maintaining biodiversity; and planning for uncertainty in the face of factors such as climate change, disturbance, non-native pests, and invasive plants. The initial guidelines will be adopted by January 15, 2015.



The vtinvasives.org Web site provides information on invasive pests and suggests ways to take action.



A network of Forest Pest First Detectors, serving 122 communities, has conducted training, screening, outreach, surveys, and community preparedness activities.

2014 Weather Influences on Forest Health

The "old-fashioned" winter of 2013–2014 included cold temperatures and a substantial snowpack, and ended with a shorter than normal sugaring season. The deep, persistent snow cover over the winter gave rodents an opportunity to girdle apples and other hardwoods. Winter injury to ornamental cedar, yew, and other conifers started to show up in the spring, as did desiccation of young conifer transplants.



Winter injury to conifers began to show up in the spring.

Spring leaf expansion was slow, but temperatures were generally moderate through the summer. There was nothing moderate about the storm activity, however, which included hailstorms on May 27 and on July 3, 23, and 27. These and other storms included strong, tree-damaging winds.

Precipitation in August and September was well below normal. In some areas, this led to rapid browning and premature leaf drop of ash, which is very sensitive to water availability. After widespread frost in mid-September, foliage season was spectacular.

Red oak acorns, a major food source for many wildlife species, were abundant. Early-fall visits to some oak stands practically required hardhats to avoid injury.

Hardwood Insects and Diseases

The most striking highlight regarding hardwood insects and diseases is what *didn't* happen. It was a year with remarkably few hardwood foliage problems.

Anthracnose on maple, ash, and oak and **Septoria** on birch plummeted from recent years, with 6,150 acres of damage by these diseases mapped, compared to 127,628 acres in 2013. Only balsam poplar and black willow, species that grow mostly in riparian areas, had notable defoliation by leaf fungi.

Major defoliating insects did not reach outbreak levels. **Saddled prominent** pheromone traps were deployed statewide due to concern about building populations of this northern hardwood defoliator. Trap catches varied widely throughout the State (see graphic lower right), but subsequent defoliation was limited. There were many reports of saddled prominent caterpillars and their "frass rain", indicating that there may still be a threat of defoliation by these insects in 2015.



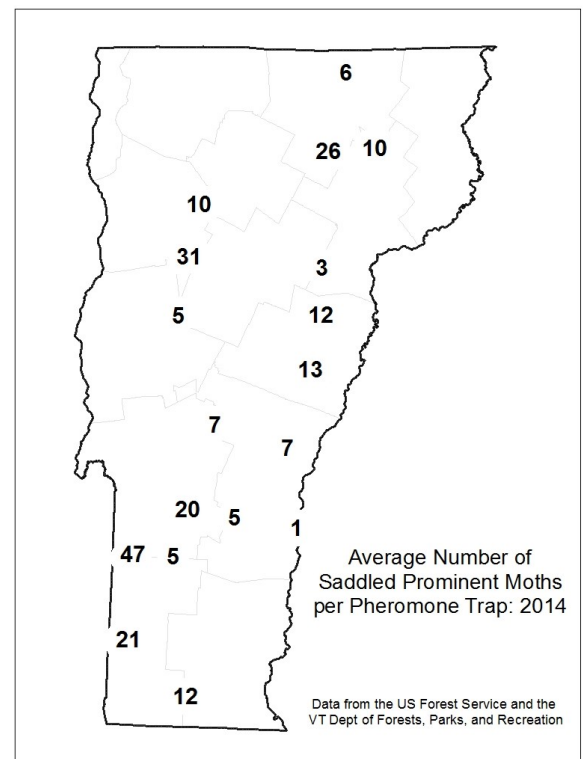
Saddled prominent caterpillar.



Several hail storms included strong, tree-damaging winds.



After a mid-September frost, foliage season was spectacular.

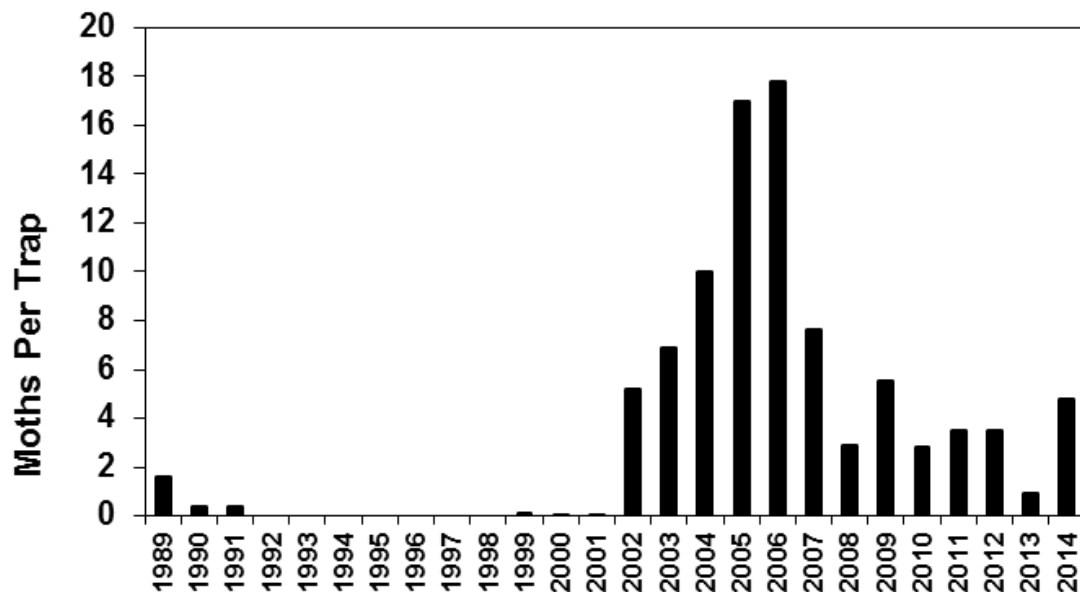


Saddled prominent moth trap catches varied throughout the State.

Individual larvae of **forest tent caterpillar** were reported. Later in the season, moth catches in pheromone traps increased from previous years (see bar chart below), making this another defoliator to watch for next year.

Other defoliators that were noticeable in 2014 included **maple trumpet skeletonizer**, **cherry scallop-shell moth**, and **locust leafminer**.

Dieback from **beech bark disease** was mapped on 14,479 acres, a drop from the 25,150 acres mapped in 2013. We also received reports of **beech blight aphid** from multiple locations. These aphids sway from side to side when disturbed and, for that reason, have received the common name "Boogie-Woogie Aphid."



Forest tent caterpillar moth catches increased from previous years.



Forest tent caterpillar.

Maple trumpet skeletonizer (left) and cherry scallop-shell caterpillar (right) feed within protective shelters.



Softwood Insects and Diseases

White pine needle damage was widespread this year throughout Vermont. Brown foliage continued to be obvious late in the season, and 4,972 acres were mapped during aerial surveys. This damage has been widespread since 2010, and the current epidemic has been building since at least 2005. Although causes may vary, widespread episodes of white pine needle blights have been reported throughout the past century, including in 1908, in the mid-1950s into the 1960s, and between 1983–89.

The discoloration and defoliation of last year's needles are most severe in the lower crown and are attributed to fungi, which have been thriving due to consecutive wet springs. The primary causal agent is thought to be brown spot needle blight, *Mycosphaerella dearnessii*, but two needlecast fungi (*Canavirgella banfieldii* and *Bifusella linearis*) have also been identified.

The repeated damage to white pine needles is causing concern about its impact because the heaviest damage occurs on the same trees from year to year. While most trees will be able to meet their needs for respiration (staying alive), shoot elongation and new wood production will be limited. Severely defoliated lower branches are likely to dry out and die, reducing crown length and live crown ratio.

Decline and mortality of white pine have been observed in stands that have had multiple years of needle damage where other stress factors are also present, such as wet site conditions, wind impact, or wounding. Weak pests and pathogens, such as turpentine beetles, *Caliciopsis canker*, and *Armillaria* root rot, have been observed in some stressed stands.

Where white pine needle damage is a concern:

- Evaluate individual trees; trees within a stand vary hugely in susceptibility. Check out the topmost branches; if they're okay, the tree probably will be too. Focus on disease-prone sites—low-lying or riparian areas and narrow valleys, and where trees are already stressed.
- Avoid disturbance that results in wounding. Red rot thrives in slow growing pines.
- Look for bark beetles. Turpentine beetles often show up first, making pitch tubes at the base of the tree. Trees may recover from light attacks by this insect. The presence of other bark beetle species is more likely to indicate a tree near death.

The U.S. Forest Service, in cooperation with UNH and affected States, continues to investigate this malady, including studies to clarify the roles of needlecast fungi and weather.



White pine branches with severe needle damage are likely to dry out, reducing crown length and capacity for tree growth.

Unexplained **red pine decline** has been observed in multiple locations in Vermont. In some stands, the rapid progression and pattern of mortality suggest that a pest or pathogen may be involved. Similar symptoms have been reported elsewhere in New England. Through a research project being conducted out of UNH, we hope to clarify the causes of the decline. Sites will be examined for insects, pathogens, soil conditions, and other factors to determine if there is a pattern across the region.



Red pine decline has been observed in multiple locations within Vermont and elsewhere in New England.

Levels of several disease-causing fungi, including **Diplodia tip blight** and **brown spot needle blight**, continue to be unusually heavy on both red and Scots pines.

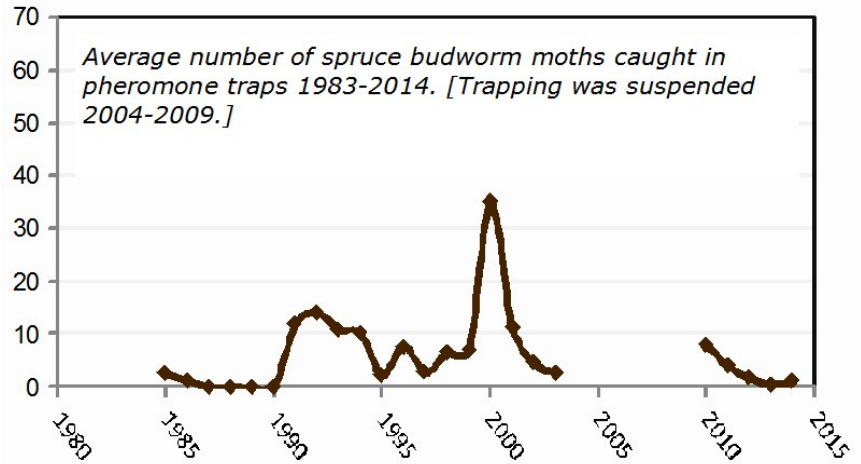
Spruce budworm is causing widespread defoliation in Quebec, including south of the St. Lawrence River, and populations are building in Maine and New Brunswick. However, the moth trap catch in Vermont remains low.

We have received an unusually large number of diagnostic calls about balsam fir symptoms this year that included landscape and forest as well as Christmas trees. Every year, **fir mortality** is captured during aerial surveys, but this year the percentage of dying trees within affected areas was often higher than normal. Some balsam fir decline is the result of stress caused by **balsam woolly adelgid** making trees vulnerable to **Armillaria** root rot. **Rhizosphaera needle blight** has been confirmed in scattered locations.

Areas in the Northeast Kingdom continue to experience **larch decline**, often initiated by heavy larch casebearer and eastern larch beetle populations.

Exotic Forest Pests

Sirex woodwasp has been trapped in several Vermont counties over the past few years, but had never been seen in trees. In 2014, an infested red and Scots pine plantation in Jericho was brought to our attention. *Sirex* is quite destructive in Southern Hemisphere locations where it has been introduced, but has been less damaging in the Northeastern U.S. where it mostly attacks suppressed trees.



Balsam fir symptoms were more common this year, including decline initiated by balsam woolly adelgid (left) and needle browning caused by Rhizosphaera needle blight (above).



Round Sirex woodwasp exit holes are evident in this infested red pine in Jericho.

Elongate hemlock scale has moved into southeastern Windham County. It has been observed in several sites in Brattleboro and Guilford on both forest and ornamental hemlocks. Elongate hemlock scale has a reputation of teaming up with hemlock woolly adelgid to cause more severe damage to hemlocks. It also infests balsam fir and other conifers.



Elongate hemlock scale is established in several locations in southeastern Windham County. Scales are found on the underside of needles (top). In heavily infested trees, yellow spots may be apparent on the upper surfaces of the needles (bottom).



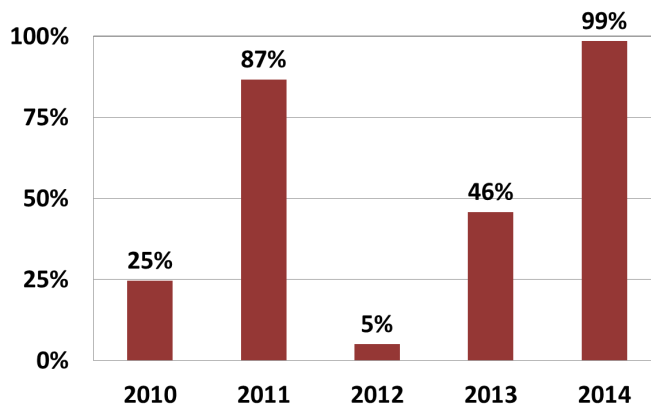
Maine Forest Service

Hemlock woolly adelgid (HWA) has now been detected in 17 towns in Vermont, including 15 towns in Windham County and one in Bennington County (Pownal). It was found in a Windsor County town (Springfield) by volunteers in February 2014. This was close to a previous find in Rockingham.

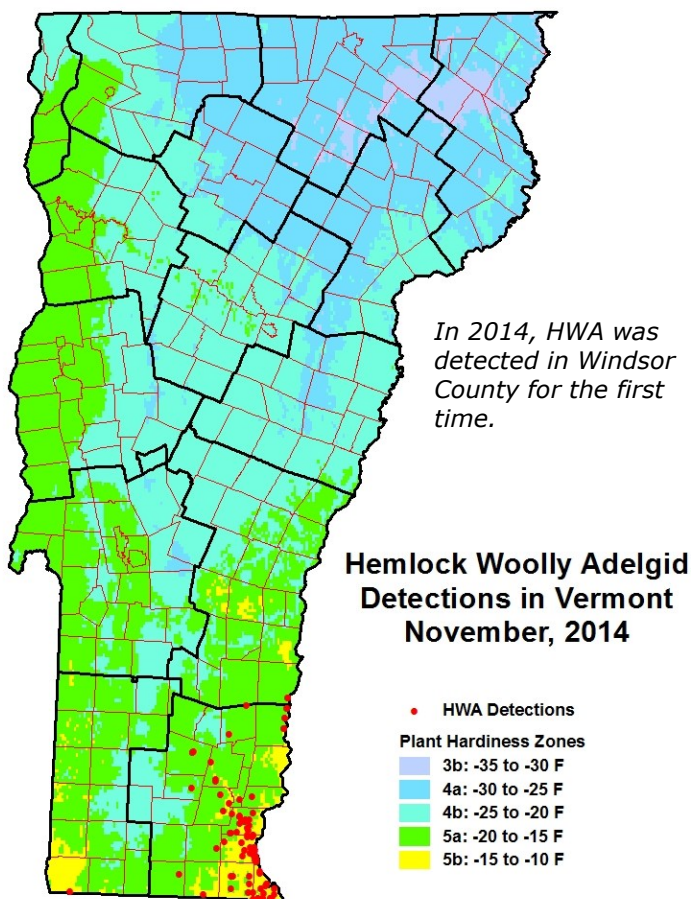
In 2014, a total of 65 sites in 18 towns were surveyed to detect spread of HWA. There were 34 volunteers assisting in this effort.

HWA-infested twigs were collected in mid-March from four Vermont sites for winter mortality assessments. Mortality averaged 99%, the highest recorded over the past five winters (see bar chart).

Winter Mortality of Hemlock Woolly Adelgid in Windham County



Infested twigs collected during winter 2013–2014 had the highest percentage of dead HWA we have observed over the past 5 years.



In 2014, we had a sharp increase in reports of HWA-related tree decline. Thin crowns due to this insect were mapped for the first time during aerial surveys, with 175 acres delineated. We have known about hemlock woolly adelgid in Vermont since 2007, which means it has probably been in the State for about a decade. A similar lag time has been observed in other States between first detection and the onset of decline. In addition, hot, dry spells through the summer may have increased stress to trees on droughty sites.

Five impact plots were established to monitor the effects of HWA infestation. These will complement similar plots elsewhere in New England and help clarify the risk to trees as the insect spreads north. Feeding by hemlock woolly adelgid results in premature needle loss, and new shoots fail to develop. Once tree health declines, so do populations of HWA. When trees recover, HWA populations rebound in a cycle that can repeat itself. Although many hemlocks have survived in other Northeastern States, trees have been less likely to recover on dry slopes and shallow sites.

A pictorial guide for *Managing Hemlock in Northern New England Forests Threatened by Hemlock Woolly Adelgid and Elongate Hemlock Scale* will be available in 2015.

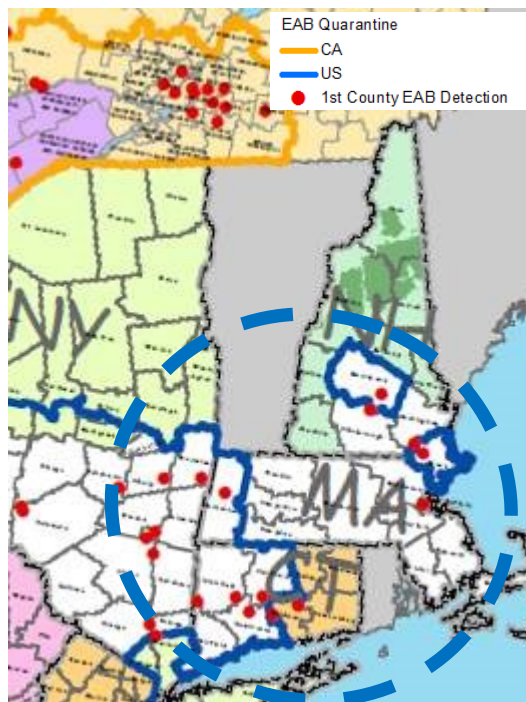
We continue to monitor the three sites where the predatory beetle *Laricobius nigrinus* has been released. Potential new sites are being evaluated for future releases and possible establishment of a beetle-rearing insectary.

There was a sharp increase in reports of HWA-related tree decline with thin crowns mapped on 175 acres during aerial surveys.



Emerald ash borer (EAB) is not known to occur in Vermont and was not detected by survey. However, new counties were found to be infested in New Hampshire, New York, Connecticut, and eastern Massachusetts in 2014.

Regulated areas in the Northeastern U.S. and Canada have expanded as well. As of early December, the quarantine includes three counties in New Hampshire and all of Connecticut and Massachusetts. Anyone using hardwood firewood, ash sawlogs, or other ash products from infested States should be aware of current regulations. Information is available by contacting USDA APHIS; the Vermont Agency of Agriculture, Food and Markets; or an FPR office listed on page 11.

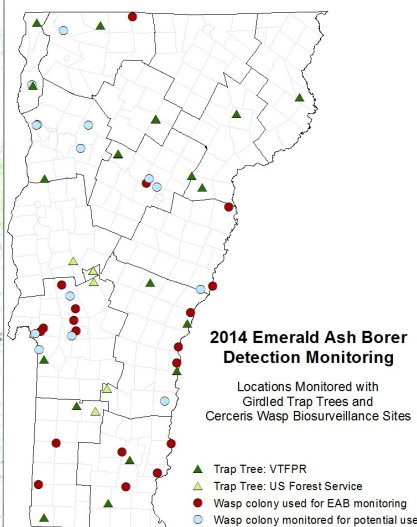
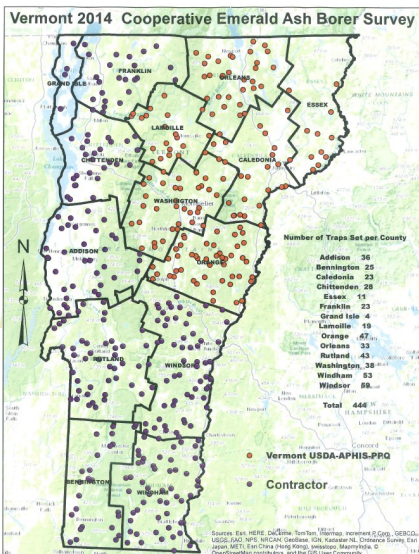
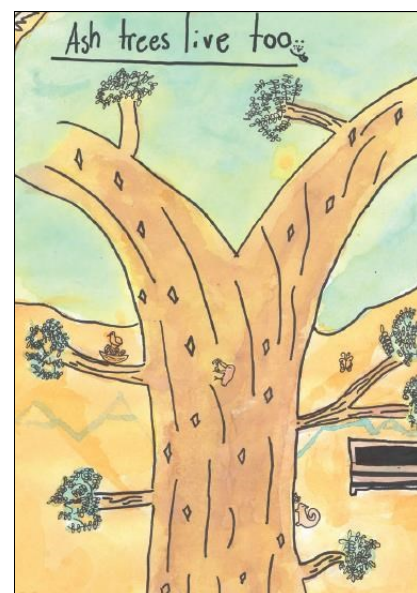


As of early December 2014, three counties in New Hampshire and all of Connecticut and Massachusetts are included in the emerald ash borer quarantine area.

Map data from USDA APHIS, 11/20/14. For current information visit www.aphis.usda.gov/plant_health/plant_pest_info/.

An aggressive emerald ash borer detection effort continues in Vermont. Purple panel traps were deployed at 444 sites in an effort led by USDA APHIS. Wasp watchers helped monitor 34 colonies of the predatory wasp *Cerceris fumipennis* in biosurveillance surveys. Although no emerald ash borer beetles were found, over 40 buprestids were collected at 13 of these sites. We are also using girdled trap trees as a detection tool. In 2014, trap trees were girdled in 11 counties in the spring, then harvested in November and peeled to look for signs of EAB.

A poster contest was conducted as part of Ash Awareness Week. This submission was from 4th grader Payton Kingsbury.



Emerald ash borer has not been detected in Vermont despite intensive surveys. In 2014, USDA APHIS led the deployment of 444 purple traps (left). Volunteers helped monitor 34 *Cerceris* colony sites and peel 20 girdled trap trees. An additional 15 trap trees were located on the Green Mountain National Forest (right).

In cooperation with UVM Extension, we continue to work with Vermont towns in developing Community Preparedness Plans. Twenty-seven communities are working on, or have completed, EAB plans, either as stand-alone documents or by completing street tree inventories and developing urban forest management plans that address EAB and other pests.

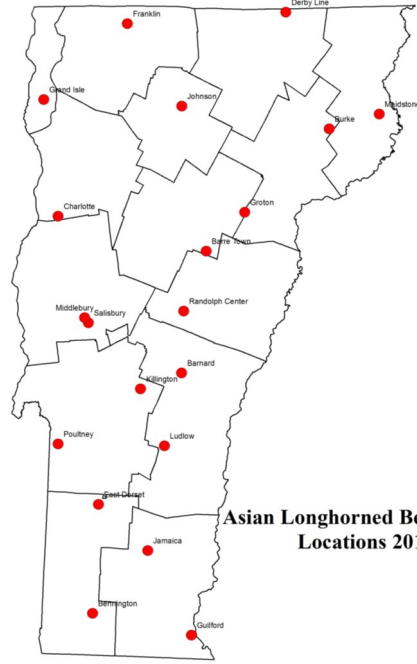
Emerald ash borer was featured during Ash Awareness Week April 27–May 3 to draw attention to the importance of our ash resource. Activities included tree taggings, ash tree walks hosted around the State, news coverage, and other events that involved 130 volunteers and staff.

The **common pine shoot beetle** has been found in many Vermont counties since it was detected in 1999. By Federal quarantine, pine material is free to move within Vermont and through most of the region. See [Pine Shoot Beetle Quarantine Considerations](#) for more information.

Asian longhorned beetle (ALB) is not known to occur in Vermont and was not found in the panel traps deployed in 20 locations throughout Vermont and checked biweekly (map right). We don't recommend any management adjustments in anticipation of this insect. However, early detection is especially important for Asian longhorned beetle; small populations in other States have been successfully eradicated.

Other **non-native insects and diseases that have not been observed** in Vermont include winter moth and the agents that cause oak wilt, thousand cankers disease, and sudden oak death.

We continue to address the invasion of **non-native plants** into forest ecosystems.

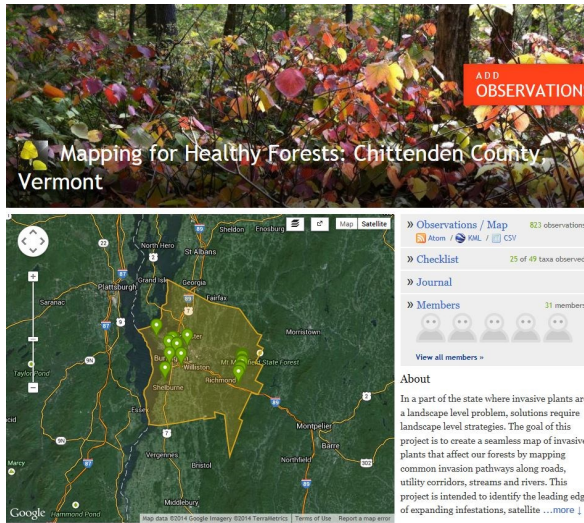


Asian Longhorned Beetle Trap Locations 2014

Asian longhorned beetle is not known to occur in Vermont and was not found in any of the 20 traps deployed in 2014.



E. Mitchell



Mapping for Healthy Forests: Chittenden County Vermont

In southwestern Vermont, special funding has been supporting a project that 1) combines invasive plant control with hands-on education and community service and 2) creates demonstration areas on State land to exhibit long-term management. This season 451 people were involved through a combination of invasive education and projects on State land and contributed about 2,000 volunteer hours. A habitat restoration crew also controlled populations of invasive plants in critical areas.

In Chittenden County, we initiated a new project to map and manage invasive plants. Students from UVM and a few volunteer enthusiasts systematically mapped terrestrial invasive plants on 40 miles of roads in Richmond, Jericho, Hinesburg, Huntington, and Bolton. These included 25 species and 823 observations with information stored on the [iNaturalist Web site](#). In addition, students have been refining a mapping protocol for volunteers.



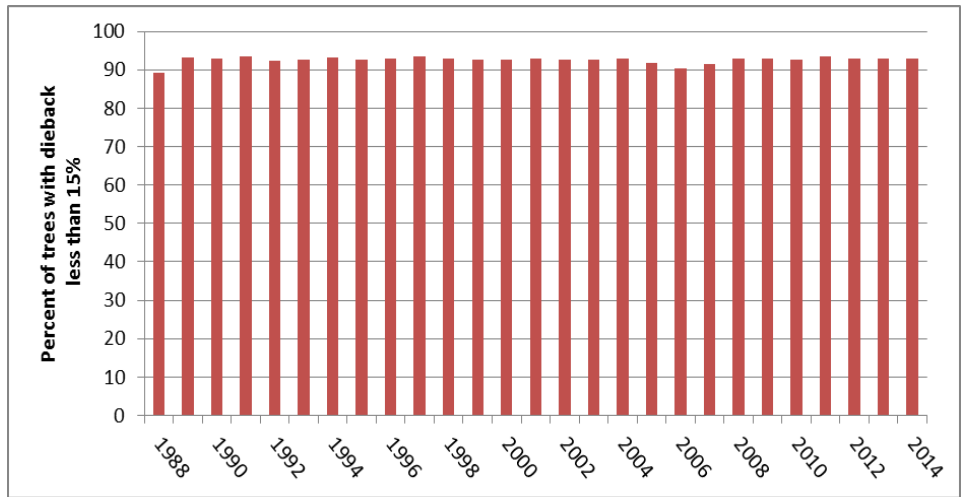
C. Balch

In southwestern Vermont, 451 volunteers were involved with invasive plant control on State lands (left) and supported efforts by a habitat restoration crew (above left).

In Chittenden County, a new project has been initiated to map invasive plants. Information is stored on the [iNaturalist Web site](#) (screen shot above).

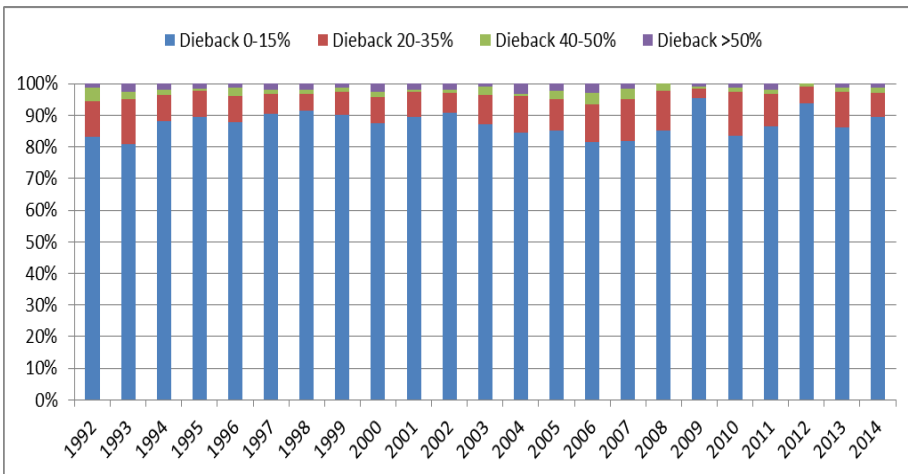
Monitoring Forest Health

In **North American Maple Project** plots, over 90 percent of sugar maples were rated as having low dieback (<15 percent) (bar chart to the right). Foliage continued to be particularly dense this year.



The **Vermont Monitoring Cooperative (VMC)**, Vermont’s forest ecosystem monitoring and research collaborative, continued activities to collect and archive forest-related data and information. In 2014, VMC completed a study of forest growth on Mount Mansfield. The fourth year of data was collected as part of a long-term urban tree health monitoring project being conducted in collaboration with UVM staff. VMC also initiated a statewide expansion of forest health monitoring plots to better represent Vermont’s forests.

Data storage and easy access has been a major focus for VMC. Access to graphing features for plot data and to spatial data such as aerial surveys of forest damages is being improved on the user interface.



Facilitating use of science in decisionmaking was part of a VMC workshop “Science to Policy: Benefitting from Actionable Science.”

VMC has been monitoring tree condition in the Green Mountain biophysical region since 1992 (left). In 2014, a statewide expansion of forest health monitoring plots was initiated.

<p>For more information, contact the Forest Biology Laboratory at 802-879-5687.</p> <p>To contact Forest Resource Protection or County Foresters:</p>	<p>Windsor & Windham Counties.....</p> <p>Bennington & Rutland Counties.....</p> <p>Addison, Chittenden, Franklin & Grand Isle Counties.....</p> <p>Lamoille, Orange & Washington Counties</p> <p>Caledonia, Orleans & Essex Counties.....</p>	<p>Springfield (802) 885-8845</p> <p>Rutland (802) 786-0060</p> <p>Essex Junction (802) 879-6565</p> <p>Barre (802) 476-0170</p> <p>St. Johnsbury (802) 751-0110</p>
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 Northeastern Area State and Private Forestry
 271 Mast Rd.
 Durham, NH 03824
 603-868-7708
<http://www.na.fs.fed.us>



Vermont Department of Forests,
 Parks and Recreation
 1 National Life Drive, Davis 2
 Montpelier, VT 05620-3801
 802-828-1531
<http://www.vtfpr.org>

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