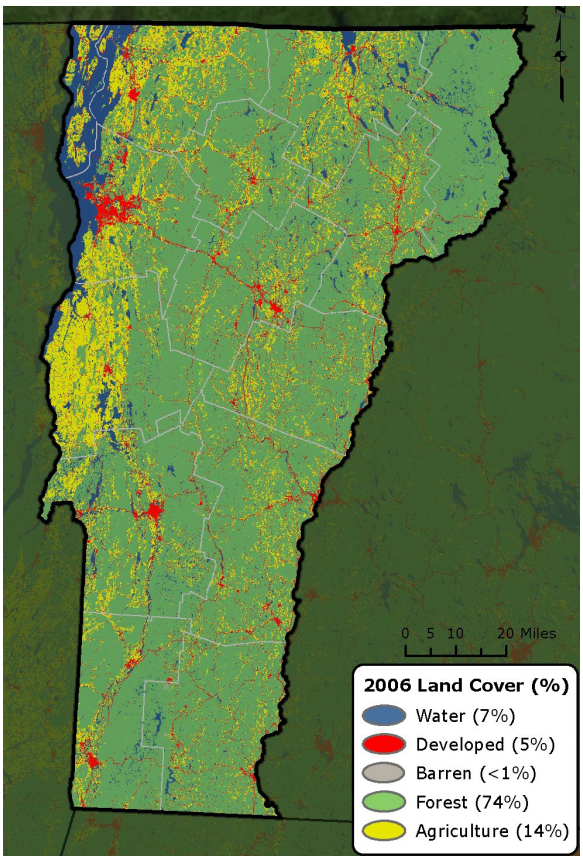
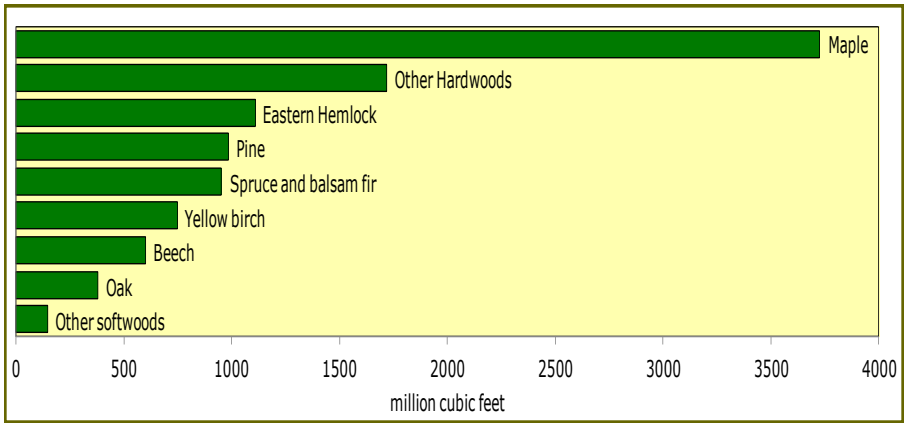
Forest Health VERMONT *highlights* 2012

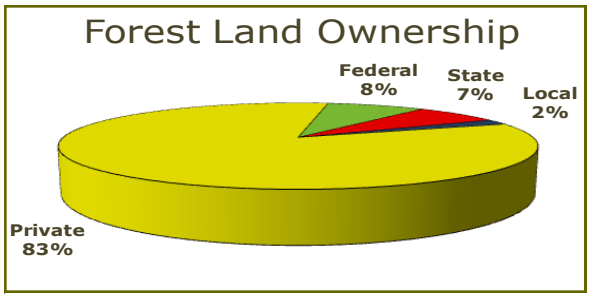
These highlights summarize information from the annual report on Forest Insect and Disease Conditions in Vermont. The complete annual reports, as well as other Vermont forest health information, are posted on-line at www.vtfpr.org/protection/idfrontpage.cfm. To receive a copy by mail, for assistance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



Forest Resource Summary

Forests cover 78% of Vermont. Over 83% of the state's forest land is privately owned with eight percent under federal management in the Green Mountain National Forest and 7% 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 Vermont's Forest Resources, 2011.



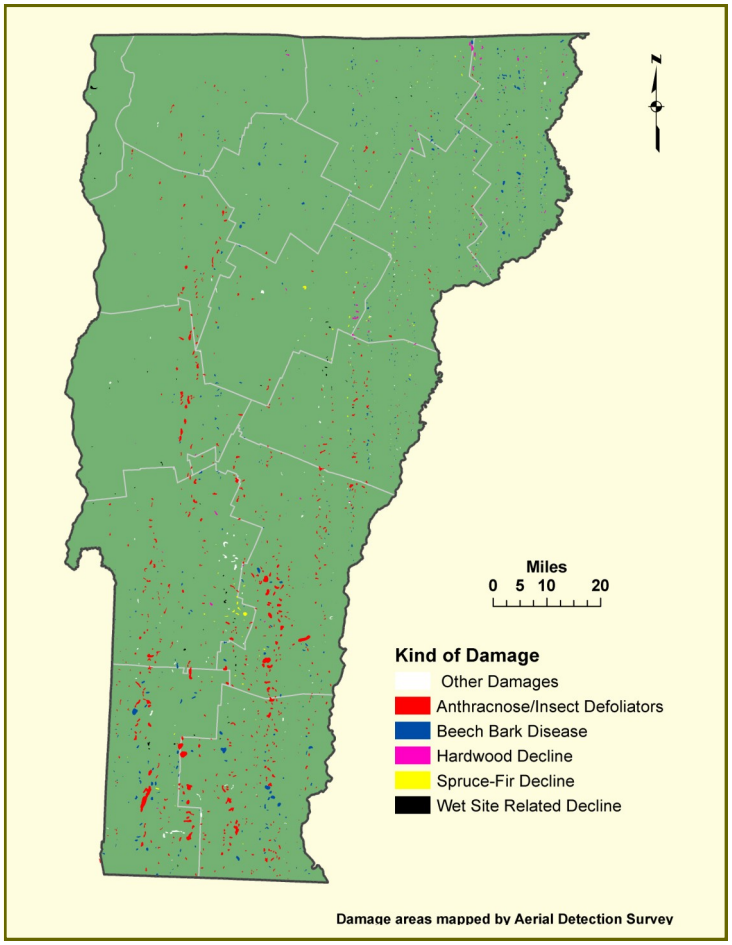


Forest Health Programs in the Northeast

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.

Aerial Surveys

In 2012, 88,286 acres of forest damage were mapped statewide. This represents 2% of Vermont's forestland, indicating that forest condition is generally healthy. Much of the acreage mapped was hardwood defoliation by leaf fungi, frost, and/or pear thrips. All of these damages are related to spring weather conditions. Nearly a quarter of the damage was due to the non-native pest complex, beech bark disease.



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 visited to evaluate forest health.

Invasive Pests and Plants continue to impact forest health in the region. The 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. An interagency Invasive Forest Pest Action Plan is updated every year. The website dedicated to invasives, vtinvasives.org, covers non-native plants and tree pests, and provides information on reporting suspects, spreading the word, and getting involved as a volunteer. A video, *Invasion Vermont*, was completed by Riverbank Media.

The vtinvasives website provides information on reporting invasive pest suspects, spreading the word, and getting involved as a volunteer.

To support these efforts, a Forest Pest First Detectors program has been initiated. Ninety-three volunteers have been trained to assist their communities with early detection and rapid response. They have spent 1500 hours on training, screening, outreach, surveying and community preparedness activities in 92 communities.

In 2013, invasive pest preparedness activities will continue, including mini-grants that will be offered to communities so they can prepare invasive forest pest response plans.

Ninety-three Forest Pest First Detectors have spent 1500 hours on training, screening, outreach, surveying and community preparedness activities in 92 communities.

Climate Change vulnerability assessments and adaptation strategies are being developed in collaboration with TetraTech and the Manoment Center for Conservation Sciences. Among the results will be an assessment of 30 Vermont tree species, climate factors most likely to affect their long-term health, and silvicultural techniques to address stresses and build more resilient forests. We are also establishing a demonstration area to model how climate vulnerability can be assessed at the parcel-scale, and how management options can be developed to build a more climate-resilient forest.

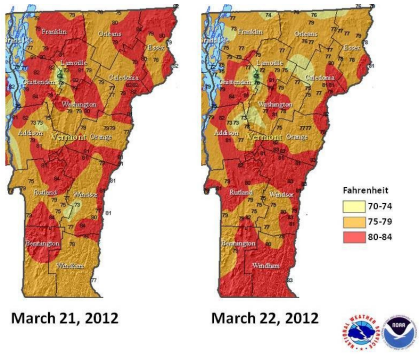
Other Forest Health Initiatives which continued in 2012 include the following:

- Efforts to discourage long-distance firewood movement
- A multi-state project to slow the spread of hemlock woolly adelgid
- An investigation into causes for tree mortality in Vermont and adjacent states
- An effort to build capacity for an invasive plant management program
- A project to conserve germplasm of disease resistant butternut
- With the University of Vermont, a study of forest carbon at recently harvested sites

We also continue to provide diagnostic services, assist the Vermont Department of Health in monitoring tick populations, and participate in programs with the Vermont Invasive Exotic Plant Committee and the Endangered Species Subcommittee.

24 Hour High Temperatures

Maps from the National Weather Service



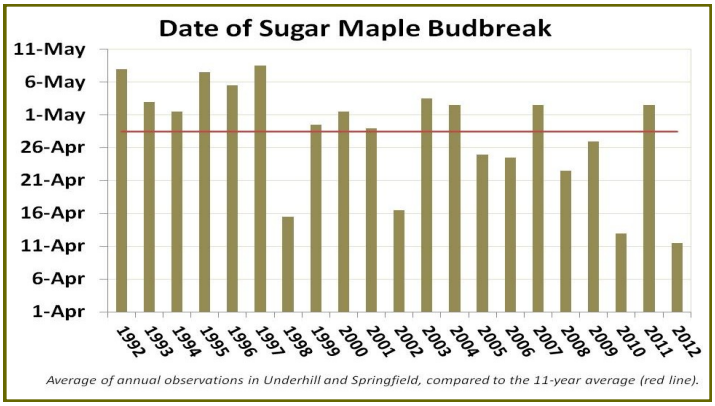
In most of the state, temperatures went above 80° in March. Sugar maple bud development was more than two weeks ahead of average. Desiccation symptoms appeared by spring on evergreens, especially fir Christmas trees.

2012 Weather Influences on Forest Health

Weather conditions, once again, drew the blueprint for tree health in 2012. Winter 2011-12 was referred to as "the winter that wasn't", with little snow and warmer than average temperatures. The open conditions froze shallow roots.

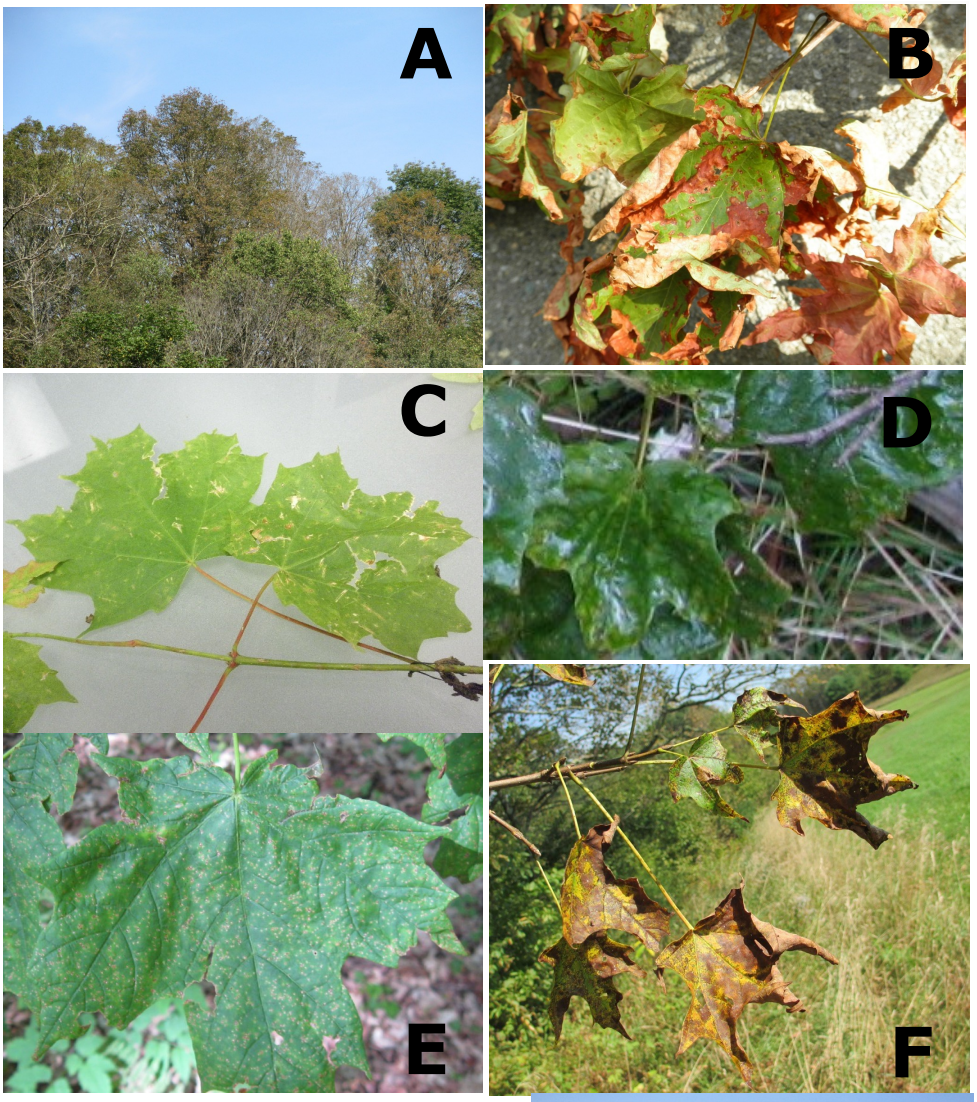
Winter also ended early and mud season was epic. Grass fire activity started in February, and many maple sugarmakers began boiling just after Valentine's Day. In March, record highs were observed for 5 consecutive days when temperatures topped out in the upper 70's and low 80's. Sugar maple flower buds were 30 days ahead of average at the Proctor Maple Research Center in Underhill. Vegetative buds on saplings and trees were also earlier, by 22 and 17 days respectively.

Desiccation symptoms appeared early in the year when planted evergreens, especially fir Christmas trees, were unable to keep up with transpiration demands. The geographic pattern of damage reported by NH-VT Christmas Tree Association growers roughly coincided with the footprint of extreme weather patterns. Shallow fir root systems are vulnerable to freezing, especially without the humus layer of their natural environment. Growers reported the worst damage on sites with poor drainage (41% of growers) and recent transplants (80%).



Leaf development stalled with cool weather in early April. Hard frosts occurred in late April and, on May 11th, nipped tender leaf margins. Add to these events a few localized hail storms or wind events. Many leaves were blown off completely, and the ones remaining looked worse for the wear. In addition, the long, moist period of bud development fostered fungal leaf diseases and pear thrips damage. Although summer precipitation averaged out to be fairly normal, every month had 10-day stretches without rain. Trees on shallow soils and, in some cases seedlings and ferns, were affected by drought.

The first widespread hard frost didn't occur until October 13th. Without cold nights, the fall foliage was slow to change color. Early leaf drop made for a short foliage season in the upper elevations. Once again, however, fears of a less than prime fall color display were quelled when reports of brilliant foliage started coming in. The season came to a dramatic end with winds from "Superstorm Sandy".



In August, 52,600 acres of brown hardwoods (A) were mapped during aerial surveys. Contributing to these symptoms were late spring frost (B), localized hail (C) or wind events, pear thrips feeding (D), fungus diseases such as leaf spot (E) and anthracnose (F), refoliation, and mid-summer drought. Leaf blight was common on Balsam Poplar (G).

Hardwood Insects and Diseases

Hardwood Browning, was mapped on 52,600 acres. A complex of sugar maple defoliators, pear thrips, anthracnose, *Septoria* and other leaf spots, drought, and frost, was widespread. Damage levels varied substantially. **Pear Thrips** damage was sometimes moderate, and even heavy in southern Vermont. Total number of adults trapped was up only slightly from 2011 in Underhill, but they emerged early, starting by March 23rd. Very little refoliation occurred, so trees went through the season with subnormal foliage.

Defoliation of white birch by **Septoria Leaf Spot** was unusually common at lower elevations. However, acres mapped were down substantially from 2011 due to less damage in birch-dominated montane forests. Birch skeletonizers and leaf folders were occasionally observed, but birch leaf miners were abnormally rare.

Poplar Leaf Blight, also attributed to a *Septoria* fungus, was common statewide on balsam poplar.

Dieback from **Beech Bark Disease** was mapped on 20,268 acres. This increase over 2011 may be due to drought-stress, which makes bark more vulnerable to canker diseases.

Most of the **Oak Defoliation** observed this year was damage was from oak anthracnose on lower branches. There was little defoliation by the oak leaf tier and leaf roller complex. However, some dieback and mortality occurred in locations that had noticeable defoliation from this complex between 2008-2011, including a conspicuous pocket of mortality on a shallow, exposed site in Middlesex.

Drooping dead branches caused by **Oak Twig Pruner** were common, with very noticeable damage in Bennington County. **Early Acorn Drop** on red oak was attributed to high grey squirrel populations. In a year with spotty mast production, this left even fewer acorns to mature on the trees.

Ash Decline continues to be reported from scattered locations, including Chittenden, Washington, and Windham Counties. Symptomatic trees from one site in Windham County tested negative for the ash yellows disease. The heavy anthracnose and copious seed production in 2011 may have been a stressor to some trees. However, much decline pre-dates those events. Since only the outer rings transport water in ash, it is particularly susceptible to fluctuations in water availability.

There was little damage by **Defoliating Caterpillars.** Nests of fall webworm and cherry scallop shell moth caterpillars were widely noticeable. There were also sporadic reports of noticeable feeding by gypsy moth, including in Sheldon and Hartford, but overall egg mass counts were very low. Hickory tussock moth caterpillars were even more common statewide than in 2011, and other tussock caterpillars were also observed. Saddled prominent, greenstriped mapleworm and bruce spanworm larvae were reported from northern Vermont. Trap catches of both spruce budworm and forest tent caterpillar moths remained very low.

There was little damage by defoliating caterpillars, although some, like hickory tussock moth caterpillars, were common statewide.

Some **Defoliating Beetles** were active. The work of locust leafminer gave affected trees a bronzy-brown appearance. Following heavy viburnum leaf beetle damage in scattered locations, egg niches could be seen chewed into twigs. Damage by the European snout beetle was seen on maples and yellow birch in several central and western Vermont locations.

Flagging branches from **Dutch Elm Disease** were quite noticeable. The fungus is supposed to move more readily in tree vessels when the weather is wet, and we've had a number of wet years in a row. If flagging is observed on a specimen tree, it may be possible to save it by proper sanitation pruning and fungicide injection.

Softwood Insects and Diseases

Studies are being conducted to clarify the roles of fungi and weather in causing needle damage to white pine. Plots have been established to monitor the impact of this damage on tree growth.

Consecutive wet springs also continue to leave behind a legacy of conifer diseases, most notably **Needle Damage to White Pine**. During the aerial survey conducted over the Green Mountain National Forest in June, the US Forest Service mapped 3,494 acres of white pine needle damage.

The US 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. Plots have been established to monitor impacts on tree growth. In the plot established a year ago, pines that had the most disease symptoms in 2011 were also those with the most severe browning in 2012.

Damage from **White Spotted Sawyer** maturation feeding on the bark of conifer twigs and small branches was been more common than normal.

Rust diseases were commonly observed, including Fir-Fern Rust (left) and Hemlock-Blueberry Rust (right).

Many **Rust Diseases** are foliage diseases on at least one of their hosts, and some were commonly observed in 2012. Fir-fern rust was widespread on balsam fir. Needles are infected shortly after budbreak by spores from diseased ferns. Branch flagging from white pine blister rust was common, and there has been an increase in mortality of occasional white pines. Numerous observations of blister rust infection on "resistant" currant cultivars have been made in other states, raising concern about expanding currant production. Yellow witches' broom on fir was also widely reported, and hemlock-blueberry rust was observed in several locations.

During a regional survey for **Hemlock Shoot Blight**, the US Forest Service examined hemlock regeneration in FIA plots. Seedlings from plots in Washington and Orange Counties had very little if any symptoms. In contrast, seedlings from plots in Rutland and Lamoille Counties had up to 50% of shoots affected.

Other **Shoot and Needle Diseases** that remain common are Diplodia shoot blight on red pine, Rhizosphaera needlecast on blue spruce and Swiss needlecast on Douglas fir. Fungus diseases are more severe on lower branches, and in stand openings or other protected pockets where moist air accumulates.

We're not completely sure what caused the occasional **Yellow Branches on Hemlock** reported from scattered locations in 2012. This symptom has been observed previously in years that were dry.

Occasional stands with **Larch Decline** and mortality remain active. Browning from **Larch Casebearer** defoliation was widely observed in the Northeast Kingdom, and could initiate a new episode of decline. This exotic caterpillar has been in New England since the 1880's.

Larch Casebearer defoliation can initiate episodes of larch decline.

Exotic Pest Update

We continue to address the invasion of **Non-Native Plants** into forest ecosystems. A new invasive plant category will be available for pesticide applicator certification in the coming months, and we are working with the Agency of Agriculture to finalize a manual.

The Nature Conservancy (TNC) has supported iMap-Invasives, a web based system used to report sightings and map infestations of invasive plants in Vermont. Trainings can be done online at: http://vtinvasives.org/plants/report-it/volunteer. TNC is also working on a project to conduct invasive plant management on three nature reserves.

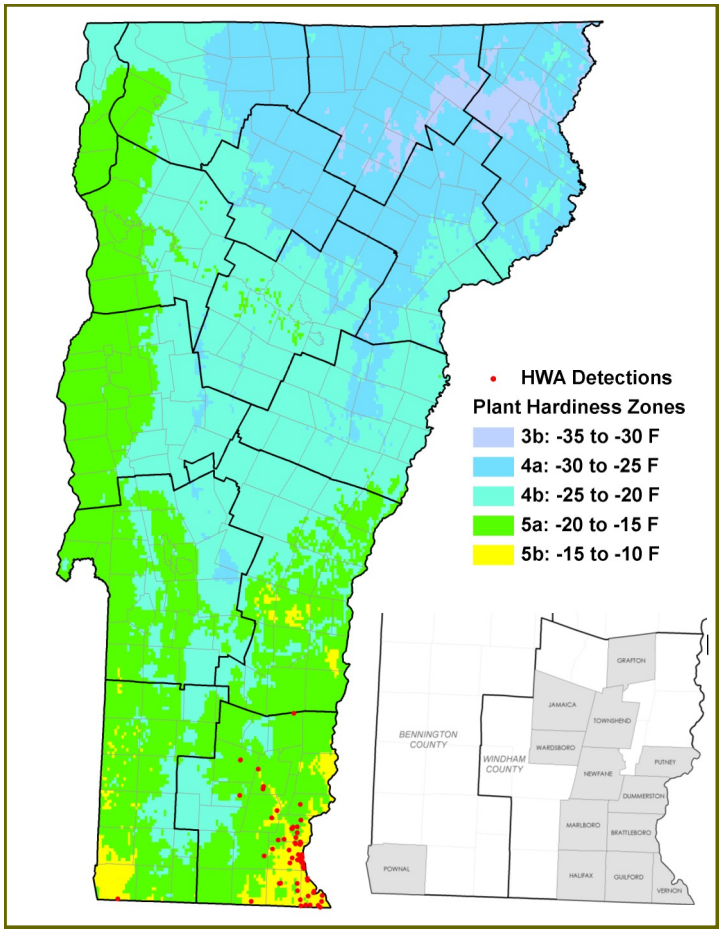
To help locate and remove infestations of Japanese knotweed initiated by Hurricane Irene, the Agency of Natural Resources hired a Japanese knotweed program coordinator, who has worked with a wide range of volunteers, including conservation commissions and students. Thousands of plants have been removed through this effort.

Volunteers are assisting with an effort to remove Japanese knotweed infestations initiated by Hurricane Irene.

On-the-ground management groups have been increasingly active. The Upper White River Cooperative Weed Management Area hired a part time coordinator, did a series of Garlic Mustard pull events, and conducted town road and trail surveys. The National Fish and Wildlife Foundation supported two interns with the Upper Connecticut River Watershed CISMA who mapped invasive plants to target control work. It also supported two interns for the Ottauquechee CISMA, who mapped and removed invasives on conserved lands in the Woodstock area.

Don't Move Firewood outreach continued. The 2012 camping season was the fourth year the State Parks collected firewood brought from over 50 miles away, and exchanged it with local wood. The amount of firewood being exchanged continues to decline, but 136 bundles of wood were still collected, including wood from as far away as North Carolina, and from areas under quarantine, including Virginia, Pennsylvania, the ALB regulated area in New York and Quebec. More information on firewood, including a downloadable Don't Move Firewood poster, is available on the website, firewood.vt.gov.

Due to the mild winter, **Hemlock Woolly Adelgid** (HWA) survival was high, with only 5% mortality in our monitoring plots, compared to 87% in the winter of 2010-2011. HWA was detected in seven new towns in 2012, including a new county (Bennington). A Forest Pest First Detector found infested trees on municipal land in Pownal. The insect is thought to have spread naturally from nearby Massachusetts. To reduce its potential impact, 379 adults of the predatory beetle, *Laricobius nigrinus*, were released at this site. (Sixty-five additional beetles were added to a previous release site in Brattleboro.) Amendments to the hemlock woolly adelgid quarantine will be necessary in 2013.



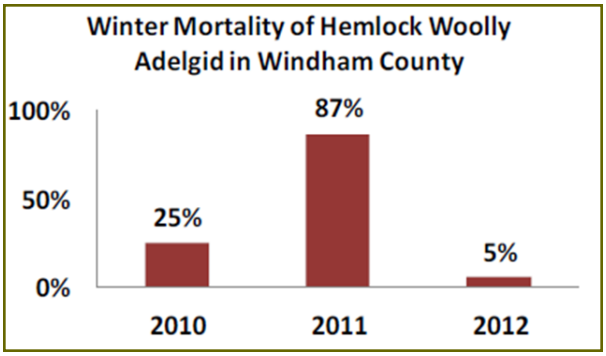
Hemlock woolly adelgid was detected in Bennington County. The predatory beetle, Laricobius nigrinus, was released at this site in Pownal.

We are seeing some symptomatic trees in infested areas. These have a gray/green look from a distance, some yellow needles, and little-to-no new growth. Updated hemlock woolly adelgid recommendations for landowner response can be found at http://www.vtfpr.org/protection/idfrontpage.cfm.

We continue to track the spread of HWA by surveying five sites in each town adjacent to infested towns, with assistance from citizen volunteers, and collaborate with other New England states to manage this insect as it spreads north. A University of Vermont project is studying a native fungus that may have potential as a biocontrol.

A single **European Wood Wasp** (*Sirex noctilio*) was captured in a trap in Brattleboro. This insect has been recovered from traps twice before: in Stowe (2007) and Burlington (2010). No infested trees have been seen in Vermont.

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.



Hemlock woolly adelgid was detected in 7 new towns in 2012. Due to mild temperatures, winter mortality was only 5%. Thirteen towns are now known to have active infestations.

Emerald Ash Borer (EAB) is not known to occur in Vermont and was not detected by public outreach or survey. However, it continues to advance. In 2012, there were several Initial County Detections nearby. Well-established infestations were discovered in Connecticut's New Haven County, and there have been several detections east of the Hudson River in New York. A beetle was trapped in the western Massachusetts town of Dalton, where an infested tree was detected by follow-up survey. There are also new Areas Regulated for Emerald Ash Borer in Canada, but none are closer to Vermont than infestations already known to exist.

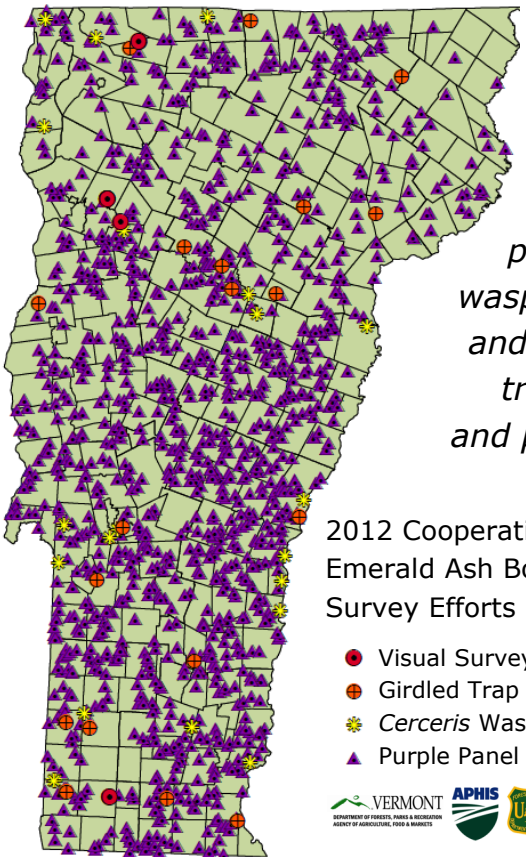
Anyone using firewood, ash sawlogs, or other ash products from infested states should be aware of the USDA quarantine regulations and compliance agreement conditions. You can start by contacting USDA APHIS, the VT Agency of Agriculture, Food, & Markets, or an FPR office below.

Emerald Ash Borer continues to advance. In 2012, it was detected in Connecticut, Massachusetts, and east of the Hudson River in New York.

(Map: USDA Cooperative Emerald Ash Borer Project)

An aggressive emerald ash borer detection effort continues in Vermont. Purple panel traps were deployed at 1,195 sites, in an effort led by USDA-APHIS. About 45 wasp watchers searched for and monitored nest sites of the predatory wasp *Cerceris fumipennis* in biosurveillance surveys. Although no emerald ash borer beetles were found, 996 buprestids were collected at 18 *Cerceris* nest sites in eight Vermont counties. We are also using girdled trap trees as a detection tool. In 2012, 20 trap trees were girdled in nine counties in the spring, then harvested in December and peeled to look for EAB.

A variety of other preparedness activities are ongoing. A one-day drill to simulate a delimiting survey was conducted to ensure coordination between responsible agencies before an actual occurrence of EAB. A technical publication providing Ash Management Guidance for Forest Managers was completed.



Emerald Ash Borer has not been detected in Vermont in spite of intensive survey efforts.

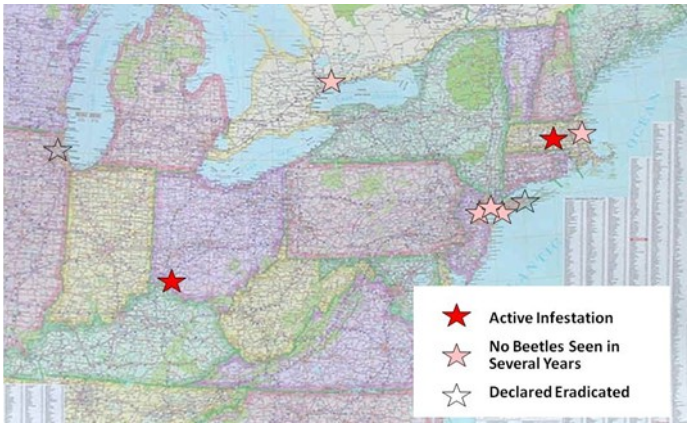
In 2012, there were 1,195 purple panel traps, 18 Cerceris wasp colony survey sites (above), and 20 trap tree locations, where trees were girdled in the spring and peeled to look for EAB (right).

A drill was conducted to ensure coordination before an actual occurrence of EAB.

Butternut Canker levels remain stable, with most butternuts showing symptoms of the disease. Sixty-seven trees, grafted from 30 different Vermont butternuts which seemed to have some disease resistance, are being maintained by the University of Missouri. In 2013, we will be outplanting these trees in Vermont seed orchards in an effort to conserve butternut germplasm. The Green Mountain National Forest is leading a parallel effort.

Butternuts grafted from trees which seem to have resistance to Butternut Canker are being outplanted in Vermont seed orchards.

Asian Longhorned Beetle is not known to occur in Vermont. We don't recommend any management adjustments in anticipation of this insect. However, early detection is especially important for Asian longhorned beetle. In Worcester County, MA, where the infestation is about twenty years old, delineation and eradication efforts continue. Improved efficacy of traps deployed in the area suggests that we may have a better detection tool in the future.



Asian longhorned beetle was not detected in any new locations in 2012. Eradication efforts are continuing in infested areas.

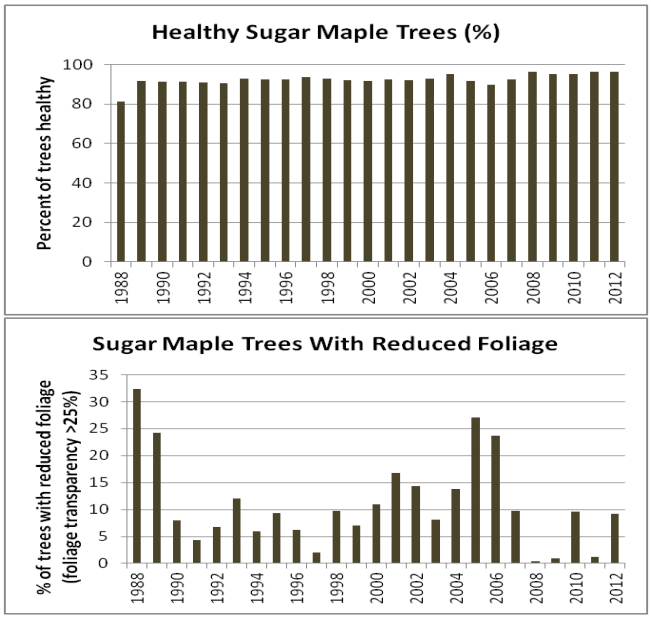
Brown Spruce Longhorn Beetle has been established in Nova Scotia since at least 1990. In 2011, it was detected in New Brunswick. This insect has not been seen in Vermont, including in pheromone traps deployed in 2012. A trap in Brunswick did attract 85 specimens of an indigenous *Picea*-feeding species in the same genus, *Tetropium cinnamopterum*.

Other **Non-Native Species that Have Not Been Observed** in Vermont include elongate hemlock scale and winter moth, as well as the agents that cause oak wilt, thousand cankers disease, and sudden oak death.

Monitoring Forest Health

In **North American Maple Project** (NAMP) plots, over 90% of sugar maples were rated healthy (low dieback). Foliage problems reduced the size or abundance of leaves (high foliage transparency). This was due to a variety of causes, including frost, pear thrips, and anthracnose. Defoliation was noticeable on most of the 30 plots, but only 7% of trees had moderate (30-60%) or heavy (>60%) defoliation.

There were 14 new dead overstory sugar maples, representing an annual mortality rate of 1.4%. Mortality was evenly distributed across plots. Of the trees which died, 8 trees were considered healthy in 2011.



Over 90% of sugar maples were healthy (low dieback) in North American Maple Project plots. Foliage problems reduced leaf size or abundance, but only 7% of trees had > 30% defoliation.

A poster about the ongoing **Investigation into Increased Mortality,** measured in the 2006-2008 FIA forest inventory, showed the value of using multiple datasets to investigate forest health. Preliminary results show the 1998 ice storm, balsam woolly adelgid, beech bark disease, past logging injury, and age as factors in tree declines. The poster is online at http://www.fs.fed.us/foresthealth/fhm/posters/posters12/Wilmot_Poster.pdf.

The **Vermont Monitoring Cooperative**, Vermont's forest ecosystem monitoring and research collaborative, continued activities to collect and archive forest-related data and information. New for 2012:

- Sampling was completed on the five long term soil monitoring study plots during the summer of 2012. This collaborative effort monitors trends in soil nutrients (e.g., calcium) and soil toxins (e.g., mercury). Regeneration data associated with soil pits is showing correlations between soil calcium levels and sugar maple (high calcium) vs. beech (low calcium) .

The Vermont Monitoring Cooperative's long term soil plots are sampled to monitor trends in soil nutrients and toxins.

- VMC supported a new study of forest growth on Mount Mansfield, which will allow comparison between environmental trends (climate, air quality, soil productivity) and tree response.
- VMC, in collaboration with university staff, successfully completed the second year of a long-term urban tree health monitoring project. University of Vermont natural resources students infiltrated the Burlington community to take data on tree health, vegetation, invasive plants, and exotic pests as part of a community service learning initiative.
- Several long-term air quality monitoring stations were discontinued or substantially reduced due to lack of federal support.

According to the most recent **Greenhouse Gas Inventory**, Vermont forests continue to play an important role in removing carbon dioxide from the atmosphere. Over the past 5 years, tree growth rate and average age have increased. This follows a period when both carbon storage and uptake were adversely affected by the 1998 ice storm and by reduced acres of forestland. Because of these changes, our forests are once again functioning as a carbon sink.

Wind-Disturbed-Site Beetle Surveys are being conducted in a mixed forest in Hinesburg that was damaged by a December 2010 windstorm. These will document the diversity of woodboring beetles, and also focus on ambrosia beetles in the genus *Trypodendron*.

Beetle trap surveys at a wind-disturbed site will document the diversity of wood-boring beetles and of ambrosia beetles in the genus Trypodendron (bottom right).

For more information, contact the Forest Biology Laboratory at 802-879-5687 or:	Windsor & Windham Counties…….. Bennington & Rutland Counties…… Addison, Chittenden, Franklin & Grand Isle Counties…….. Lamoille, Orange & Washington Counties …… Caledonia, Orleans & Essex Counties……	Springfield (802) 885-8845 Rutland (802) 786-0040 Essex Junction 802) 879-6565 Barre (802) 476-0170 St. Johnsbury (802) 751-0110

Forest Health Protection
USDA Forest Service
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
103 South Main Street
Waterbury, VT 05671-0601
802–241-3678
http://www.vtfpr.org

Forest health programs in the Vermont Department of Forests, Parks, and Recreation are supported, in part, by the US Forest Service, State and Private Forestry, and conducted in partnership with the Vermont Agency of Agriculture, Food, and Markets, USDA-APHIS, the University of Vermont, cooperating landowners, resource managers, and citizen volunteers. Photo contributors include R. Acciavatti, W. Boccio, C. Casey, C. Cusack, R. Kelley, and T. Sienkiewycz.