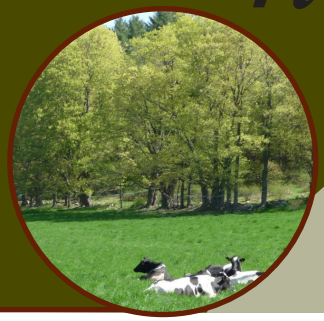
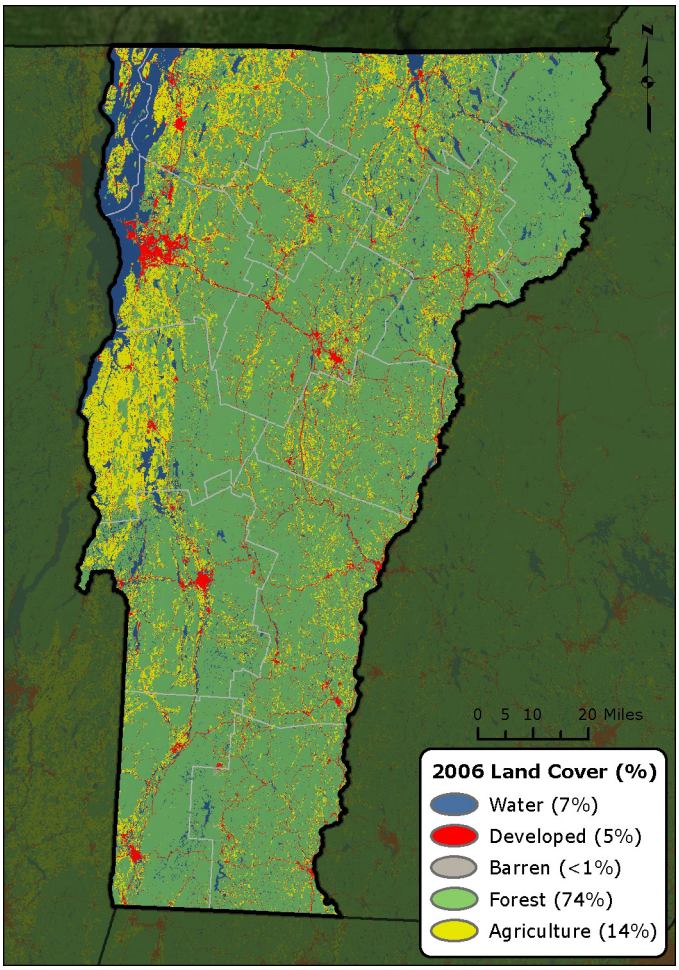
2011 Forest Health highlights

VERMONT

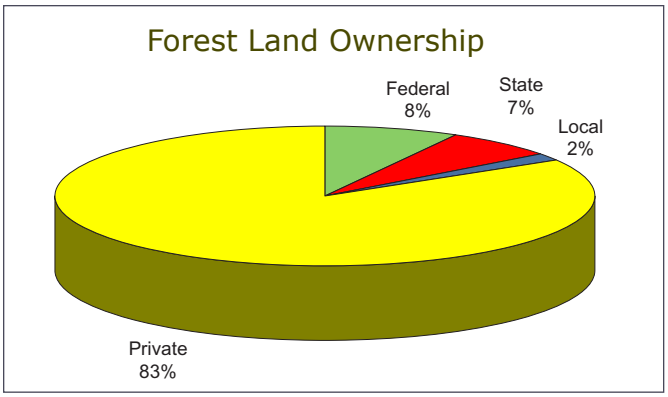


These highlights summarize information from the report on Forest Insect and Disease Conditions in Vermont 2011. The complete annual report, as well as other Vermont forest health information, is posted online at www.vtfpr.org/protection/idfrontpage.cfm. Contact Forest Resource Protection personnel or your County Forester to receive a copy of this report by mail or for help with identifying pests, diagnosing forest health problems, on-site evaluations, and insect population sampling; for management recommendations and additional literature; to obtain defoliation maps; or to participate in invasive pest citizen monitoring.



Forest Resource Summary

The latest Vermont forest inventory estimates that there are approximately 4.6 million acres in the State that are forested. Over 83 percent of the State's forest land is privately

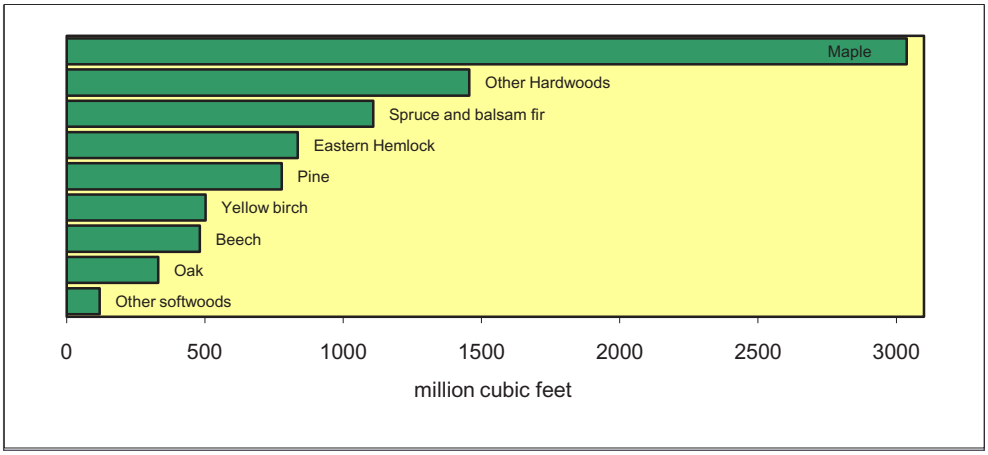


Forest Health Programs in the Northeast

Vermont Department of Forests, Parks and Recreation 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.

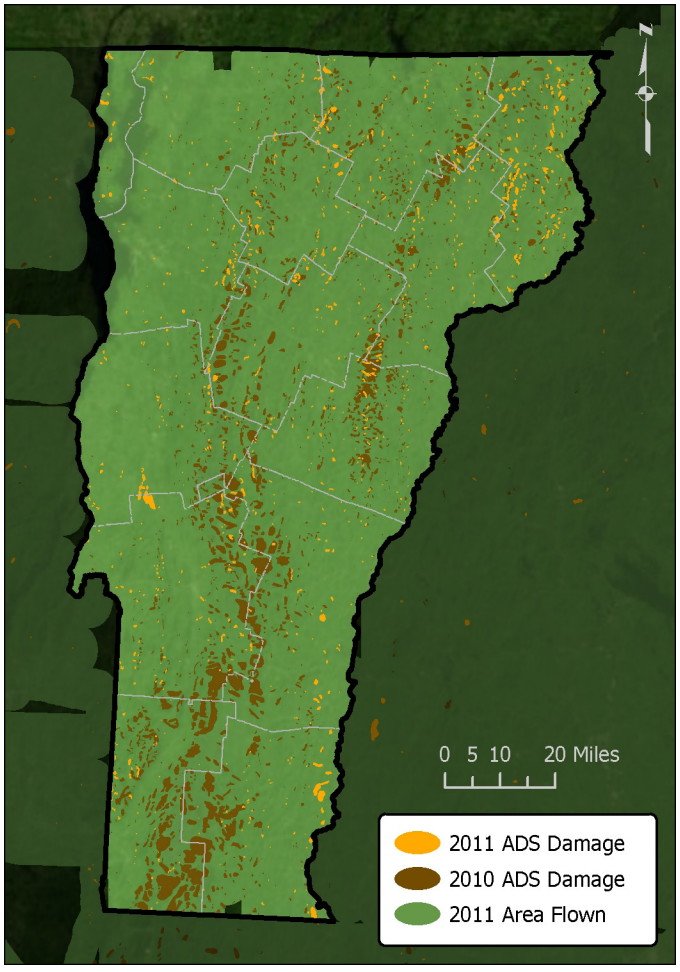
owned with 8 percent under Federal management in the Green Mountain National Forest. Sugar and red maple, eastern hemlock, and American beech account for over half of Vermont's trees. More information on Vermont's forest inventory can be found at Vermont's Forest Resources, 2010.

Forest Species Type



Aerial Surveys

In 2011, only 57,000 acres of forest damage were mapped statewide. This represents just 1 percent of Vermont's forest land, indicating that Vermont's forests are generally healthy. Half the acreage mapped was hardwood and softwood defoliation caused by leaf fungi due to wet growing season conditions. Twenty percent of the damage was due to the non-native beech bark disease.



This map delineates aerial detection survey (ADS) results for Vermont in 2011and 2010.

Forest Health Program Highlights

Invasive pests and plants continue to be a major focus of the forest health program. 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. A new Web site dedicated to invasives, vtinvasives.org, covers non-native plants and tree pests, and provides information on reporting suspects, spreading the word, and getting involved in volunteer efforts (figure 1). To support these efforts, a Forest Pest First Detectors program is being initiated, modeled on a similar program in Minnesota. Volunteers will be trained to help their communities with early detection and rapid response. Online course materials are now available and training sessions are being conducted. We continue to conduct numerous outreach activities to increase invasive pest awareness and improve early detection. In 2011, these reached thousands of people through fairs and festivals, and hundreds more through training sessions and hands-on workshops. In 2012, invasive pest preparedness activities will continue, including mini grants that will be offered to communities to prepare invasive forest pest response plans.

A Climate Cabinet was established by Vermont's governor to coordinate **climate change** efforts across State agencies and departments. An adaptation white paper, Climate Change and Vermont's Forests, provides an overview of the challenges facing forestry, what programs are already in place to address those challenges, and what steps need to be taken next to continue adapting to the impacts of climate change. To follow up, a project was initiated to develop Vermont-appropriate adaptation strategies for managing forests in a changing climate. Objectives include identifying vulnerable species and landscapes, developing decisionmaking tools, establishing demonstration areas, and developing a monitoring system.

Figure 1.—Information about becoming a Forest Pest First Detector is on the Vermont invasives Web site (vtinvasives.org).

The **flooding of the State Office Complex** in downtown Waterbury had a major impact on forest health programs (figure 2). Staff members were displaced and forestry records accumulated over the last century were destroyed, including historical reports and photos. The Forest Biology Lab was inundated with 3 feet of water and silt, ruining much of the insect collection. Collection data for the specimens that are beyond recovery are being entered into the Vermont Invertebrate Data Alliance database.

Figure 2.—Flooding of State offices and the Forest Biology Lab destroyed historical forest pest records and ruined much of the insect collection.

Other Forest Health Initiatives that continued in 2011 include the following:

- A campground invasive plant control project with the Green Mountain National Forest
- Efforts to discourage long-distance firewood movement
- A multistate project to slow the spread of hemlock woolly adelgid
- An investigation into causes of 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
- A study of forest carbon at recently harvested sites with the University of Vermont

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

2011 Forest Damage

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.

Water was a particularly important driver of forest health in 2011. The growing season was bookended by record-breaking floods. Wet weather was also responsible for widespread foliage diseases. Where it did not cause damage, all the moisture had its upside. Tree health and growth were generally good and dense tree crowns ensured that the fall foliage season, once again, would not disappoint.

Flood damage started in the spring. Precipitation levels were at a record high in Burlington, which received nearly 20 inches from March through May. The shoreline of Lake Champlain remained under water from April through early June. Trees in flooded areas were submerged for weeks, and those species not well adapted to flood conditions succumbed. Coming on the heels of a wet season, the rain event on May 26-28 caused river flooding throughout northern Vermont.

On August 28, Tropical Storm Irene tracked up the Connecticut River Valley. Rainfall totals ranged from 3.2 to 8.15 inches, shattering records dating back to the summers of 1949, 1950, and 1971. The widespread heavy rainfall and river flooding were accompanied by wind, with gusts up to 85 mph reported on Mount Mansfield. The combination of wind and saturated soil uprooted trees and took down power lines (figure 3). Flash flooding was common across central and southern Vermont. For example, the Otter Creek in Rutland crested at nearly 10 feet above flood stage. At least 260 roads and 18 State highway bridges were washed out or closed.

Figure 3.—The force of flood waters from Tropical Storm Irene uprooted trees, undermined root systems, and wounded stems with floating debris.

Thousands of acres of forest land along lakes and streams were inundated. The force of flood waters uprooted trees, undermined root systems, and wounded stems with floating debris. Many flooded areas were left with a thick layer of sediment, which buried roots.

We expect substantial non-native plant invasions on disturbed sites. Some trees were swept away for good, but most were left standing and are expected to survive the short duration of standing water. More information is available in the leaflet How Does Late Summer Flooding Affect Trees?

Moist spring conditions set the stage for foliage diseases. Throughout the State, **white pine needlecast** led to premature casting of last year's needles. Fungi on diseased needles were identified by U.S. Forest Service personnel as *Mycosphaerella dearnessii,* the causal agent of brown spot needle blight, and the needlecast fungi *Bifusella linearis* and *Canavirgella banfieldii*. Most current shoots developed normally and top branches were rarely affected, so we don't expect severe impacts. Because of wet spring conditions in 2011 and high fungus levels, white pine needle diseases are likely to be common again next year.

Hardwood foliage diseases were also common. **Septoria leafspot on birch** continued to be widespread at high elevations, with 24,976 acres of damage mapped during aerial surveys. Due in large part to this disease, white birches dropped their leaves about 10 days ahead of normal in monitoring plots on Mount Mansfield. **Anthracnose** became noticeable by late spring on sugar maple, ash, and red oak (figure 4a). Browning continued to show up through the growing season as leaves infected in the spring dried out (figure 4b). Many ash trees dropped leaves prematurely. More information is available in the leaflet Anthracnose Disease. Leaf and/or shoot diseases were also common on elms, poplars, willows, and sycamores.

Beech bark disease was the primary cause of dieback and mortality on 11,042 acres. The VT ANR Management Guidelines for Optimizing Mast Yields in Beech Mast Production Areas have been completed, incorporating beech bark disease considerations as well as wildlife needs.

Figure 4a.—By late spring, anthracnose became noticeable on sugar maple.

Figure 4b.—Browning from anthracnose and Septoria developed through the growing season and was widespread by late summer.

Oak defoliation by oak leaf tier and leaf rollers reappeared. This complex has been causing noticeable defoliation since 2008, with the same locations affected. Leaves are chewed, skeletonized, and occasionally rolled, but rarely enough to cause refoliation. New Hampshire has reported scattered mortality from similar damage.

Very little **pear thrips** damage was observed, and spring counts of thrips on sticky traps were low. With this year's heavy sugar maple flower production, thrips numbers in 2012 may be much higher. When they feed on flower buds, thrips produce more offspring.

Other insect defoliator populations remain low. Although there is a big increase in spruce budworm defoliation north of the Saint Lawrence River in Quebec, moth trap catches are down from 2010 in northern Vermont. Hickory tussock moth caterpillars were commonly observed, but no defoliation was reported. Saddled prominent, gypsy moth, and forest tent caterpillars were all observed in 2011, but the reports were isolated, and any defoliation was very light. Bruce spanworm was observed causing light defoliation in several stands. Moths were commonly observed in the fall, indicating that damage may increase in spring of 2012.

Ash decline was reported from several locations, including Addison, Rutland, and Windsor Counties. Symptomatic trees in Addison and Rutland Counties tested negative for the ash yellows disease. Research in New England has identified sensitivity to water table changes as another common cause of ash decline. This may occur on sites that are clearly wet or droughty, as well as mesic sites that are merely shallow. Since only the outer rings transport water in ash, it is particularly susceptible to fluctuations in water availability.

Wind damage from several events resulted in 800 acres of mortality, mostly in northern Vermont. **Ice damage** occurred following a March storm, breaking branches and scattering fir and hemlock shoots on the forest floor.

Seed production was unusually heavy on a variety of species, including sugar and red maple, white ash, birch, red oak, willow, hickory, and apple (figure 5). While it's normal to have occasional bumper seed crops, the widespread synchrony of flowering led to concern that stress might be involved. Northern Woodlands magazine, among others, addressed the question: Do Stressed Trees Produce More Seeds?

Figure 5.—Seed production was unusually heavy on many species, including sugar maple.

Exotic Pest Update

A number of projects are taking place regarding **non-native invasive plants**. We collaborated with The Nature Conservancy to produce a field guide, *Best Management Practices for the Prevention and Treatment of Terrestrial Invasive Plants in Vermont Woodlands*, and a pocket guide, *Invasive Terrestrial Plants of Vermont*. Tools were developed to help landowners and managers assess infestations, create management plans, use cost-share programs, and hire contractors. These tools are available through the Vermont invasives Tools and Resources Web page. This Web site also provides access to iMapInvasives, which tracks the spread of invasive plants. Workshops on managing invasive plants were held in the fall, which will be repeated in May 2012 (figure 6).

Figure 6.—Workshops on managing terrestrial invasive plants in Vermont woodlands will be held again in spring 2012.

Crews funded by the American Recovery and Reinvestment Act were hired to conduct non-native invasive plant control work in campgrounds, dispersed camping sites, and roadside recreation sites in the Green Mountain National Forest, in State Parks, and on the Long and Appalachian Trails. Work was completed at 62 sites. Targeted plants included Japanese knotweed, goutweed, garlic mustard, wild chervil, wild parsnip, burning bush, honeysuckle, multiflora rose, and buckthorn.

Don't Move Firewood efforts continued, which included publicity aimed at winter tourists through the [Vermont] Winter Vacation Guide and mentoring a UVM class conducting a student-oriented campaign (figures 7 and 8). Although Vermont does not have a statewide rule, its State Parks and the Green Mountain National Forest continue to have firewood restrictions. Exporting firewood from Vermont is limited by other quarantines. Under a new rule, New Hampshire will only accept untreated firewood if there is a compliance agreement. Untreated firewood cannot be exported to Maine, New York, or Canada. More information on firewood, including a downloadable Don't Move Firewood poster, is available on the Web site firewood.vt.gov.

Figure 7 & 8.—Don't Move Firewood outreach included an ad in the [Vermont] Winter Vacation Guide and collaboration with a UVM Forest Health class.

Emerald ash borer is not known to occur in Vermont and was not detected by public outreach or survey. However, it continues to be detected nearby. In 2011, an infestation was discovered on the island of Montreal, and a beetle was trapped in the Albany County town of Selkirk. To date, no beetles have been detected east of the Hudson River in New York.

Due to the increasing threat of emerald ash borer, survey efforts have intensified. Purple panel traps were deployed at 2,200 sites on a 2- by 2-mile grid over most of the State in an effort led by USDA APHIS. Surveys of the predatory wasp, *Cerceris fumipennis*, were conducted in most Vermont counties, with volunteers making significant contributions. Several new nest locations were identified. We are also beginning to use girdled trap trees as a detection tool. For 2012, we will be looking for landowners interested in participating in a statewide trap tree network (figure 9).

Figure 9.—We will be looking for landowners interested in participating in a girdled trap tree network to detect emerald ash borer.

Figure 10.—Vermont contributed ash seeds to the National Ash Seed Collection Initiative.

Current information is being assembled to help landowners and managers make decisions about ash management, including Emerald Ash Borer: Information for Vermont Landowners and more technical information for land managers. A Policy on Forest Management Plans and Amendments for Land Enrolled in Vermont's Use Value Appraisal Program (UVA) Related to Emerald Ash Borer has been developed. Plans to treat ash in response to emerald ash borer will be approved for UVA lands as long as they adhere to the program's minimum standards.

To prepare for the worst possible outcome, we participated in the National Ash Seed Collection Initiative. Seeds from 50 ash trees were collected for storage at the National Center for Genetic Resources Preservation in Colorado (figure 10). A variety of other preparedness activities are planned for 2012 including preplanning for biocontrol, pesticide use, and quarantine compliance agreements.

Asian longhorned beetle is not known to occur in Vermont. We don't recommend any management adjustments in anticipation of this insect. Its infestations expand gradually and mortality is not rapid. However, early detection is especially important for Asian longhorned beetle. Although several small infestations have been successfully eradicated, in Worcester County, MA, where the infestation is about 20 years old, the quarantine zone now covers over 100 square miles. Eradication efforts there are far from complete.

In 2009, 96 of the 198 Vermont property owners whose primary residence is in the vicinity of the infestation in Worcester County

responded to a questionnaire to determine if firewood may have been moved into Vermont. In 2011, the nonrespondents from that survey were contacted. Thirty-three were reached by telephone; letters were mailed to the others. Nineteen surveys were returned, for a total 2009-2011 response rate of 76 percent. Followup was conducted for the three 2011 responses indicating that firewood or live plants had been transported.

Hemlock woolly adelgid was not observed in any new towns, and the infestation remains confined to Windham County (figure 11). The drop in detections is attributed to colder temperatures in the winter of 2010-2011 than the previous year. Average overwintering mortality in monitoring sites increased to 87 percent from 25 percent in the winter of 2009-2010. This insect has now been detected in 38 locations in seven towns. Annual surveys are conducted, with assistance from citizen volunteers, at five sites in each town adjacent to infested towns.

Vermont is collaborating with the States of New Hampshire and Maine and the U.S. Forest Service to manage hemlock woolly adelgid on a regional basis. Recommendations for Landowner Response is available to help landowners manage this insect in the forest and the home landscape.

Hemlock products from Windham County are subject to quarantines. Vermont facilities may freely receive hemlock logs, pulpwood, or chips as long as the site has a compliance agreement. See Hemlock Wood Products Considerations for more information. The Vermont Agency of Agriculture, Food and Markets monitors nurseries for possible introductions of hemlock woolly adelgid.

Vermont has hosted several biocontrol research projects. An adult of the predatory beetle, *Larcicobius nigrinus*, which was released by UMass in Brattleboro in 2009, was recovered in 2010, but none were found

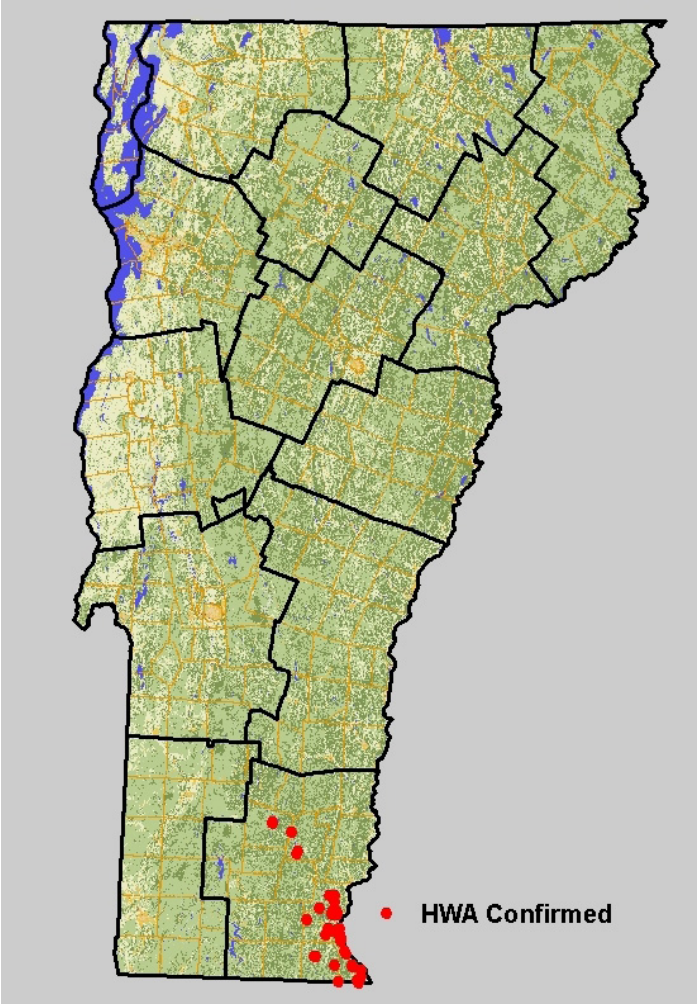


Figure 11.—Hemlock woolly adelgid was not detected in any new towns in 2011.

in 2011. A UVM report on the 2010 trial application of the fungal insecticide, Mycotal, with a whey-based "forest fungus factory" indicates that adelgid population growth was suppressed in treated trees. A new UVM project, Dynamics of a Naturally-Occurring Fungus-Caused Disease of Hemlock Woolly Adelgid, has been initiated. Biotests of the native entomopathogen, *Myriangium* sp., are being conducted to determine its virulence and persistence.

Butternut canker levels remain stable, with most butternuts showing symptoms of the disease. We have been participating in a multistate project with Plant Technologies LLC to conserve butternut germplasm. In the

winter of 2010-2011, scions for grafting were also collected from 48 trees known to be pure butternut that seemed to have some disease resistance. Trees grafted from 33 different Vermont butternuts are being maintained by the University of Missouri. There are plans to plant these trees or their progeny in Vermont seed orchards.

The **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 pheromone traps deployed in 2011 in two Caledonia County locations.

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

There were no new **European wood wasp** (*Sirex noctilio*) detections in 2011. A few other non-native species of concern that have not been observed in Vermont include elongate hemlock scale as well as the agents that cause oak wilt, thousand cankers disease, and sudden oak death.

Monitoring Forest Health

Now in its 21st year, the **Vermont Monitoring Cooperative** continued to support forest ecosystem monitoring and research. Long-term study results and data are accessible at sal.snr.uvm.edu/vmc. A new urban forest health initiative began in 2011. University of Vermont students evaluated trees in Burlington to establish baseline health data. Nearly 200 plots will be used for long-term monitoring and to evaluate ecosystem services.

In Vermont's **North American Maple Project** (NAMP) plots, tree condition improved from 2010 (figure 12). Only 2 percent of the sugar maples had thin foliage. Eight percent had symptoms of moderate or heavy decline, and dieback averaged less than 7 percent of dead fine twigs.

As a followup to the widespread **foliage injury from frost in 2010**, evaluations were conducted of Tree Recovery from Frost Damage in Maple Sugaring Sites on State Lands. Transparency readings improved substantially at all six maple sugaring sites (figures 13 a, b). Dieback and crown vigor generally improved as well, indicating that most trees have recovered from the frost event. Crown health also improved substantially in frost-damaged NAMP plot trees.

As part of a project to investigate potential causes of the **increased tree mortality recorded in Vermont's 2008 FIA data**, 24 field visits were made and 15 sampling locations were evaluated. Tree cores and soil samples will be evaluated to establish the timing of mortality and stress factors involved. Additional projects conducted by local scientists have examined other species, including paper birch (*Halman and others*: *Potential role of soil calcium in recovery of paper birch following ice storm injury in Vermont, USA*) and red spruce (*Schaberg and others*: *Assessment of weather-associated causes of red spruce winter injury and consequences to aboveground carbon sequestration*).

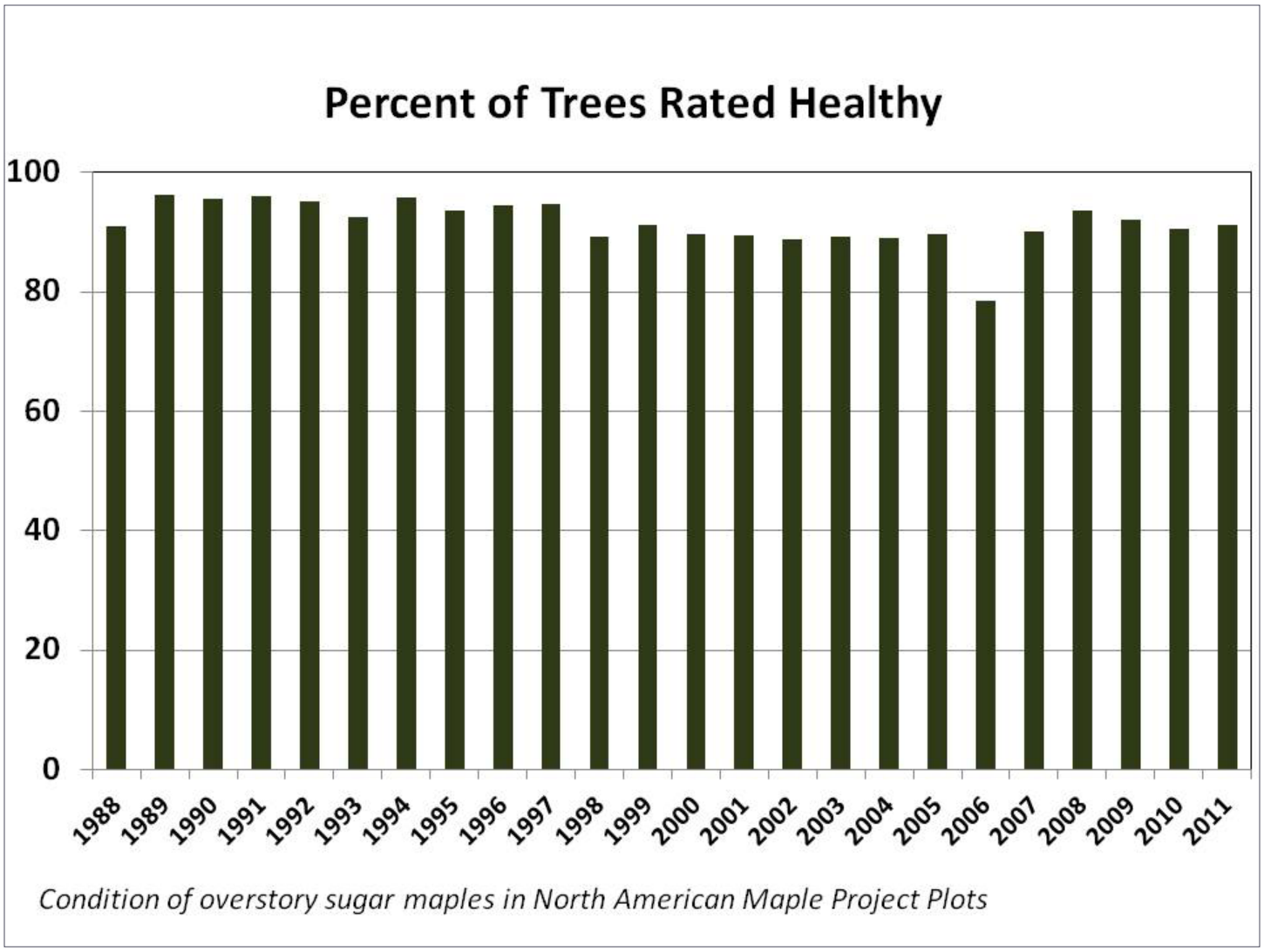


Figure 12.—Only 8 percent of sugar maples in North American Maple Project plots had symptoms of moderate or heavy decline.

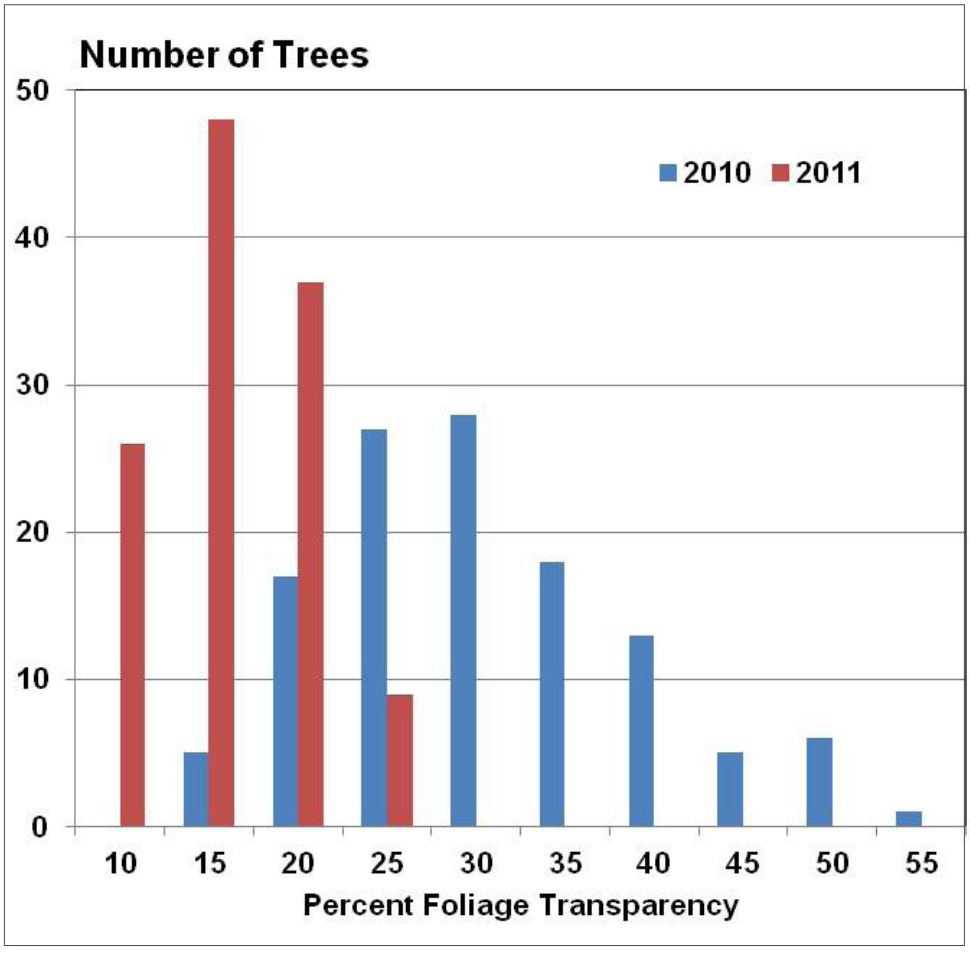


Figure 13a, b.—Foliage transparency readings improved at sugaring sites that were damaged by frost in 2010.

References

Land Cover Map:
U.S. Geological Survey. 2011. 2006 National land cover dataset. Sioux Falls, SD.

Forest Land Ownership, Forest Species Type:
U.S. Department of Agriculture, Forest Service. 2009. Forest resources of the United States, 2007. Gen. Tech. Rep. WO–78. Washington, DC. 336 p.

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

Forest Health programs in the Vermont Department of Forests, Parks and Recreation are supported, in part, by the U.S. Forest Service, Northeastern Area 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.

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