



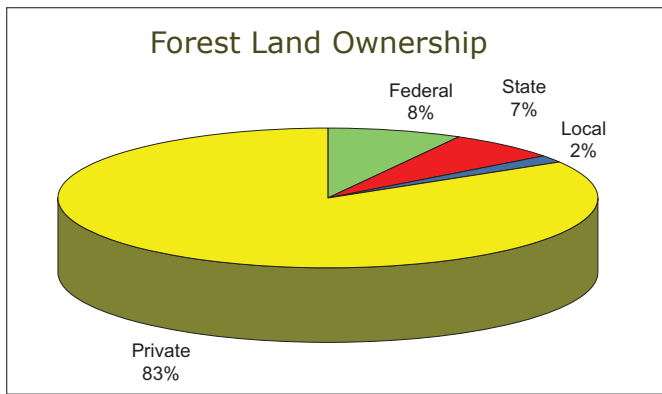
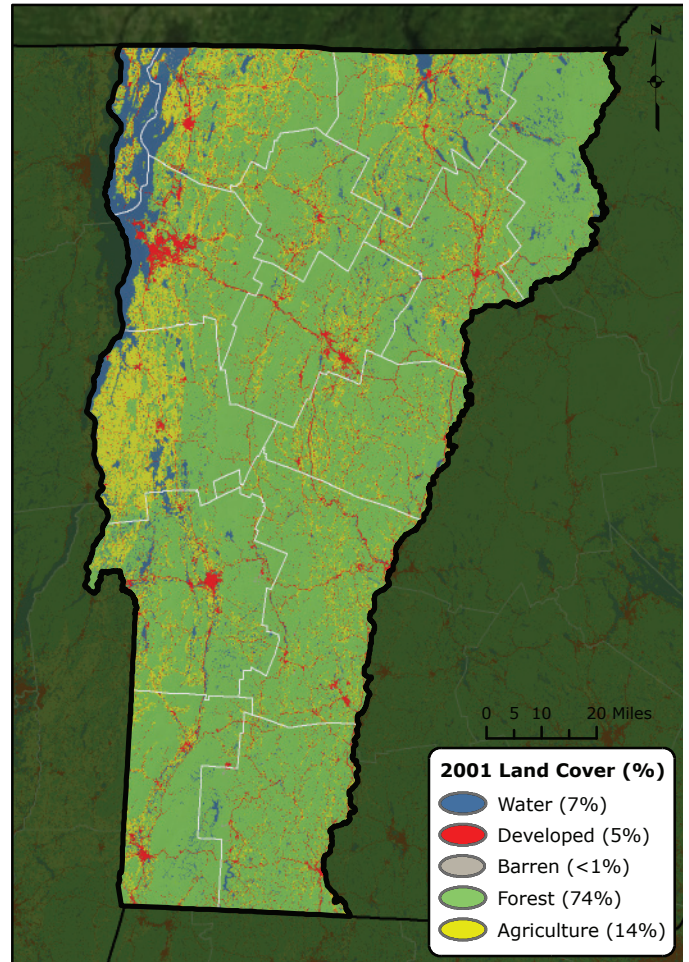
Forest Health VERMONT *highlights*



These highlights summarize information from the Forest Insect and Disease Conditions in Vermont 2010 report. The complete annual report, as well as other Vermont forest health information, is posted online at <http://www.vtfpr.org/protection/idfrontpage.cfm>. Contact Forest Resource Protection personnel or your County Forester to receive a copy by mail. This report provides information about identifying pests, diagnosing forest health problems, making on-site evaluations, sampling insect populations, and obtaining defoliation maps. It also includes management recommendations and additional literature as well as options for citizens to participate in invasive pest monitoring.

Forest Resource Summary

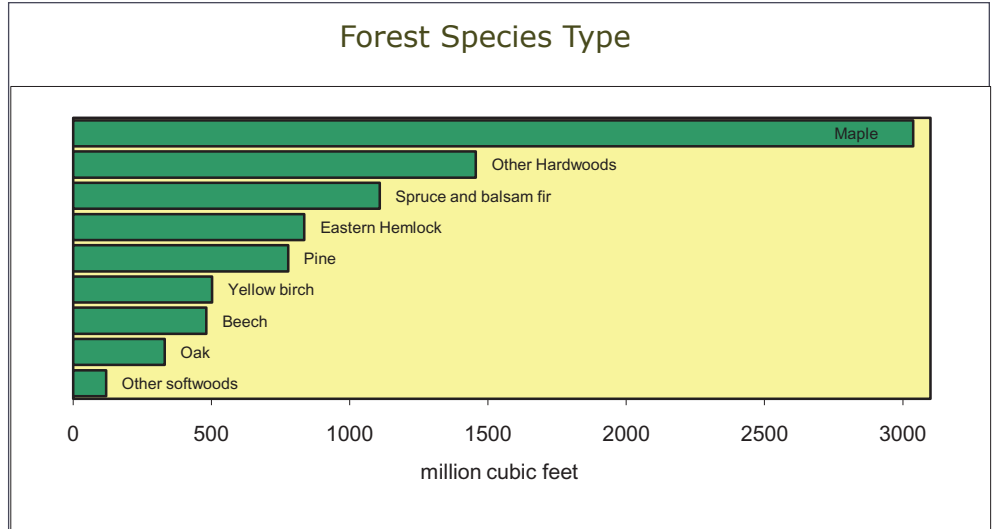
Forests cover 76 percent of Vermont. Over 83 percent of the State's forest land is privately owned with 8 percent under Federal



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.

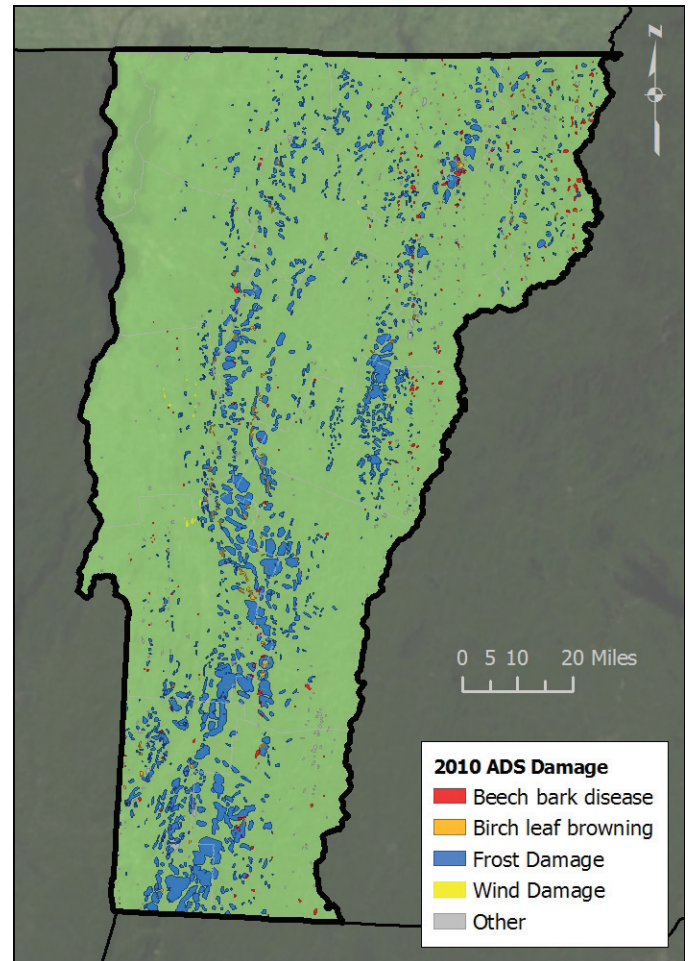
management in the Green Mountain National Forest. The major forest types contain maples and other hardwoods, along with spruce, balsam fir, pine, and hemlock.



Aerial Surveys

In Vermont, more than 480,000 acres of damage were mapped. Most of the damage was defoliation from the widespread frost that occurred in May, including areas on the Green Mountain National Forest. There were also about 65,000 acres of dieback, discoloration, and mortality due to a variety of forest damage factors, including beech bark disease and birch leaf spot.

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



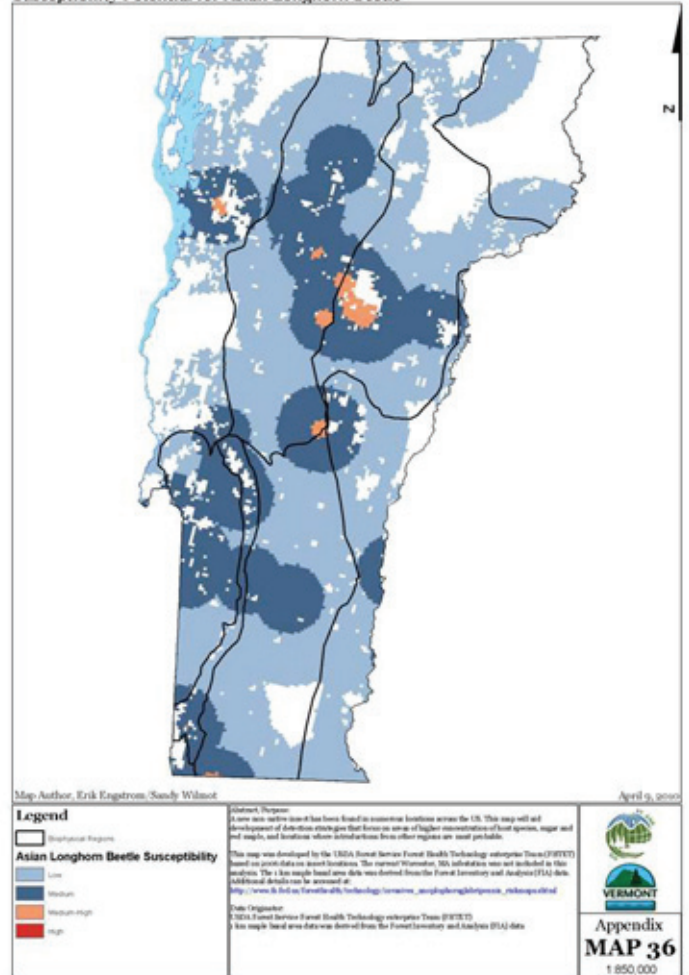
Forest Health Program Highlights

The Forestry Division has published the 2010 **Vermont Forest Resources Plan – State Assessment and Resource Strategies** to guide work over the next 5 years. The plan recognizes that sustainable forests begin with healthy forests. It identifies priority issues and landscapes to focus resources, guided by the vision that “*the forests of Vermont will consist of healthy and sustainable ecosystems; a prosperous and sustainable forest products industry; abundant recreational opportunities; and a combination of ownership patterns supporting a working forest landscape and large, unbroken forest tracts. Citizens, government, and businesses understand their proper roles, responsibilities, and rights, and work together to support the values of forests for this and future generations.*” The plan can be accessed at http://www.vtfpr.org/htm/for_resourcesplan.cfm.

Vermont State government, academic institutions, businesses, and nongovernment organizations are working together on **climate change** issues through the Vermont Climate Collaborative. In 2010, the State greenhouse gas inventory was updated by the Agency of Natural Resources. Forest sequestration of carbon dioxide continues to increase although the rate has slowed. The agency also formed a team to plan for climate change impacts on infrastructure and natural resources. An initial assessment of potential impacts will be available in January 2011. This and other forest-related information can be found at http://www.vtfpr.org/htm/for_climatechange.cfm.

The **Vermont Monitoring Cooperative** (VMC) continued forest ecosystem monitoring and research for the twentieth year. Long-term study results and data are accessible through the new Web site (<http://sal.snr.uvm.edu/vmc/>). An annotated bibliography of forest health indicators and benchmarks has been

2010 Vermont Forest Resource Plan Department of Forests, Parks, and Recreation. Division of Forestry. Susceptibility Potential for Asian Longhorn Beetle



The State Assessment includes maps of susceptibility to exotic pests and acid deposition, occurrence of invasive plants and stored carbon, and decline history.

developed that will be available in 2011. A new VMC-sponsored project will use research findings to develop recommendations for managing forest soil carbon and nutrition.

Other 2010 Forest Health Initiatives include:

- A new project to build capacity for an on-the-ground invasive plant management program
- Projects to detect emerald ash borer and Asian longhorned beetle through public awareness, biosurveillance, trapping, and targeting high-risk sites

- A public campground invasive species survey, control, and outreach project in collaboration with the Green Mountain National Forest
- An ongoing effort to discourage long-distance firewood movement
- Development of a model citizen monitoring program for forest invasives
- A multistate project to slow the spread of hemlock woolly adelgid
- An investigation into causes of tree mortality in Vermont and adjacent States
- A project to conserve germplasm of disease-resistant butternut
- A survey for new exotic pests of oak



Hemlock woolly adelgid

We continue to provide diagnostic services at the Forest Biology Lab; help the Vermont Department of Health monitor tick populations; and participate in programs with the Vermont Invasive Exotic Plant Committee, the Climate Change Collaborative, and the Endangered Species Subcommittee.

2010 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.

Weather was a particularly important driver of forest health in 2010. Heavy wind, spring frost, and several abnormally dry periods resulted in substantial areas of forest damage.

The most significant event of the year was **spring frost damage** due to below-freezing temperatures that occurred statewide during the week of May 9. With an early spring that included sugar maples leafing out several weeks earlier than normal, many trees were vulnerable. As a result, 414,901 acres of damage were recorded. Sugar maple was widely affected; there was substantial damage to birch, poplar, red maple, beech, and oak as well. Although most trees refoliated



Frost injury to sugar maple and other species occurred in late May.

shortly after the freeze event, new growth did not fully expand. Some trees did not refoliate at all, and retained damaged leaves all summer. Intermittent dry periods may have been responsible for the incomplete refoilation. Tree health is at risk when foliage is compromised for an entire growing season. Additional stress in 2011 could easily initiate decline and mortality. Recommendations for sugarbush evaluation are at http://www.vtfpr.org/protection/documents/VTFPR_EvaluatingSugarbushRecoveryfromFrost_Sept2010.pdf.

Hardwood **drought** symptoms were mapped on 5,970 acres in southern Vermont. Because drought conditions developed late in the growing season, the impact on tree health should be minimal. The weather was also abnormally dry throughout the State in May.

Widespread **white pine needle damage** developed suddenly in late May. One-year-old needles changed color, especially on lower branches. The symptoms were attributed to a combination of spring weather and disease fungi. Brown spot needle blight and *Canavirgella* needlecast were both commonly associated with the damage. Because topmost branches were rarely affected, most trees are expected to recover. However, the damage may accelerate white pine decline in marginal, wet sites because the damage was often severe in these low-lying areas.

Birch defoliation decreased with only 13,280 acres mapped during aerial surveys. While much of this was a result of *Septoria* leaf spot on paper birch at higher elevations, birch leafmining sawflies were more commonly seen than in recent years.

Beech bark disease was the primary cause of dieback and mortality on 14,738 acres. A spike in the disease continues due to dry fall conditions early in the decade, which allowed beech scale populations to increase. Smooth-barked healthy trees may be genetically resistant. Leaving these trees, while removing



Fungal diseases were associated with widespread white pine needle damage.

susceptible beech, will increase the proportion of seedlings resistant to beech bark disease. The Agency of Natural Resources is finalizing management guidelines to optimize yields in beech mast production areas. These guidelines will incorporate beech bark disease symptoms as well as wildlife needs.

Oak defoliation by leaf rollers was also less noticeable than in 2008-2009, and gypsy moth egg mass counts indicate continued low populations for 2011. Forest tent caterpillar populations continued to decline, and no defoliation was observed. Average moth catch in pheromone traps dropped in 11 of 13 survey locations. However, areas of red oak and sugar maple mortality, caused by forest tent caterpillar, are still noticeable in the Taconic range. Don't forget to consider **hardwood defoliators** if you encounter dieback or mortality. You can request defoliation records to determine whether damage was recently mapped in the area.

For the past several years, **spruce budworm** populations have been increasing in Eastern Canada. Nova Scotia reported its highest moth counts since 1994. In Quebec, the acres defoliated doubled between 2009 and 2010, to approximately 1.7 million acres. To date, all of the mapped damage is north of

the St. Lawrence River. In Vermont, we had discontinued our pheromone trap program after 20 years (1983-2003). However, with recent regional increases, we decided to deploy traps in Orleans, Caledonia, Essex, and Chittenden Counties. Counts for 2010 were generally low.

Lacebugs were commonly observed on basswood, elm, and other hardwoods. These delicate, highly ornamented insects feed on a variety of species, usually on the undersides of leaves.

Ozone damage to foliage was light. A small amount of injury was observed on 3 of the 10 monitoring sites.

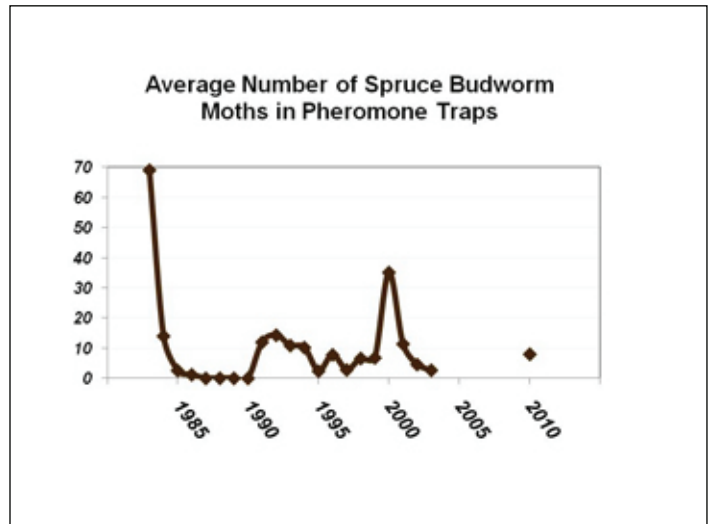
Norway spruce shoot drop was reported late in the season from scattered locations. Although squirrels clipped their share to feed on buds, drought conditions may also have played a role.

Scattered locations of **red pine decline** continue to be reported. No single causal agent has been identified, and site conditions don't appear to play a primary role. We are interested in hearing of stands where recent mortality has occurred.

Exotic Pest Update

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. We participated in the Forest Pest Outreach and Survey Project to help detect Asian longhorned beetle and emerald ash borer through public awareness and surveys. Targeted surveys for both insects were conducted in large areas of Rutland and St Albans.

We welcome volunteers to participate in our surveys. Volunteers do much of the hemlock woolly adelgid monitoring, survey for emerald ash borer and Asian longhorned beetle, and



With a spruce budworm outbreak building in Eastern Canada, trapping was resumed. Counts in 2010 were low.



Scattered locations of red pine decline continue to be reported.

assist in our don't-move-firewood efforts. With University of Vermont Extension and the Nature Conservancy, we are participating in a project to develop best practices and tools for a Citizen Monitoring Program for invasives in urban forests. We expect to launch a citizen monitoring Web site in late spring.

State Park **firewood** restrictions to prevent introductions of non-native pests continued for the second year. About 400 bags of firewood (five cords) were exchanged, up from 200 in 2009. The increase may be due to higher camper visitation. We have developed a

firewood marketing program, including an updated Web site and an increased effort to partner with other natural resource organizations. We continued to work with the Vermont Campground Association and reached out to private campgrounds through handout materials, a newsletter article, and the Vermont Campground Guide. Details are available at <http://www.firewood.vt.gov>.

Invasive insect campground surveys were conducted at over 100 camping areas as part of our regional outreach and survey project, University of Vermont student efforts, and an ARRA (American Recovery and Reinvestment Act)-funded survey. No target insects were found. Invasive species were highlighted by State Park interpretive programs in 22 parks and several Green Mountain National Forest campgrounds that reached more than 14,000 people.

A number of projects are taking place regarding **non-native invasive plants**. A Web site dedicated to invasive plant and pest issues will be launched in the coming year. This will be accessible to a variety of user groups from citizen scientists to professional foresters. The Web site will also allow users to report invasive plant occurrences, which allows a landscape approach to management, and will include information on training, volunteer opportunities, demonstration sites, and Best Management Practices. Several Cooperative Invasive Species Management Areas (CISMAs) are unfolding. This will allow limited resources to be used more effectively.

ARRA crews conducted invasive plant surveys in 37 State Parks, 41 Green Mountain National Forest (GMNF) recreation sites, and along 160 miles of hiking trail. Fourteen State Parks and only one of the GMNF sites were highly infested. This may be due to higher elevation



In an effort to prevent introductions of non-native pests, 400 bags of firewood were exchanged in State Parks.



ARRA crews surveyed public campgrounds and hiking trails for exotic insects and plants.

and less intensive human use on the National Forest. Honeysuckle and common buckthorn were the most pervasive plants. Honeysuckle, buckthorn, multiflora rose, and dame's rocket were found along the Appalachian and Long Trails.

Emerald ash borer is not known to occur in Vermont and was not detected by public outreach or survey. Purple traps were deployed at 480 high-risk sites in an effort led by the Vermont Agency of Agriculture Food and Markets. As part of our monitoring effort, we searched for nests of the predatory wasp, *Cerceris fumipennis*, with the assistance of 20 volunteers. Of the 177 sites visited, 38 had at least one *Cerceris* nest, and 6 had 50 or more. Approximately 200 buprestids were collected.

Elsewhere in North America, emerald ash borer continues to show up in new locations, including an infestation in the Hudson Valley of New York about 50 miles from Vermont. It is currently known to occur in 15 States and 2 Canadian Provinces. The leaflet, "Preparing for Emerald Ash Borer: Recommendations to Reduce the Impact in Vermont," has been updated. In stands with a high percentage of ash, particularly if it exceeds 20 percent of the basal area, consider treatments to enhance other species. The Vermont Department of Forests, Parks, and Recreation is not recommending that all ash be harvested in anticipation of an outbreak.

Asian longhorned beetle is not known to occur in Vermont and was not detected by public outreach or survey. In 2009, 96 of the 198 Massachusetts residents from Asian longhorned beetle-infested areas who own property in Vermont responded to a questionnaire to determine if firewood may have been moved into Vermont. In 2010, we are following up with those who have not yet responded.

We don't recommend any management adjustments in anticipation of this insect. Its infestations expand gradually, and mortality



*Volunteer assistance with emerald ash borer surveys included searching for nests of the wasp, *Cerceris fumipennis*.*

is not rapid. However, early detection is especially important for the Asian longhorned beetle. If an infestation is found when it's still small, there's a realistic chance it can be eradicated. This has already happened in Chicago and New Jersey, and looks promising for New York and Boston.

Hemlock woolly adelgid detections increased in Windham County. Winter mortality of hemlock woolly adelgid was low, with over 85 percent survival in four of the five monitoring sites. This insect has now been detected in 38 locations in seven towns. In all, 74 sites were surveyed, including a minimum of 5 sites in each of the 12 towns adjoining infested towns. Volunteers continue to assist with detection surveys.

Recommendations for landowner response to hemlock woolly adelgid in Vermont are available at http://www.vtfpr.org/protection/documents/VTFPR_August2010HWAinVermont.pdf. Vermont is collaborating with the States of New Hampshire and Maine as well as the U.S. Forest Service to develop a regional approach to managing this insect. Mycotal, the fungal insecticide, was applied to trees in Townshend in cooperation with Dr. Scott Costa. Dr. Dave Mausel from the University of Massachusetts continues to monitor the survival of the

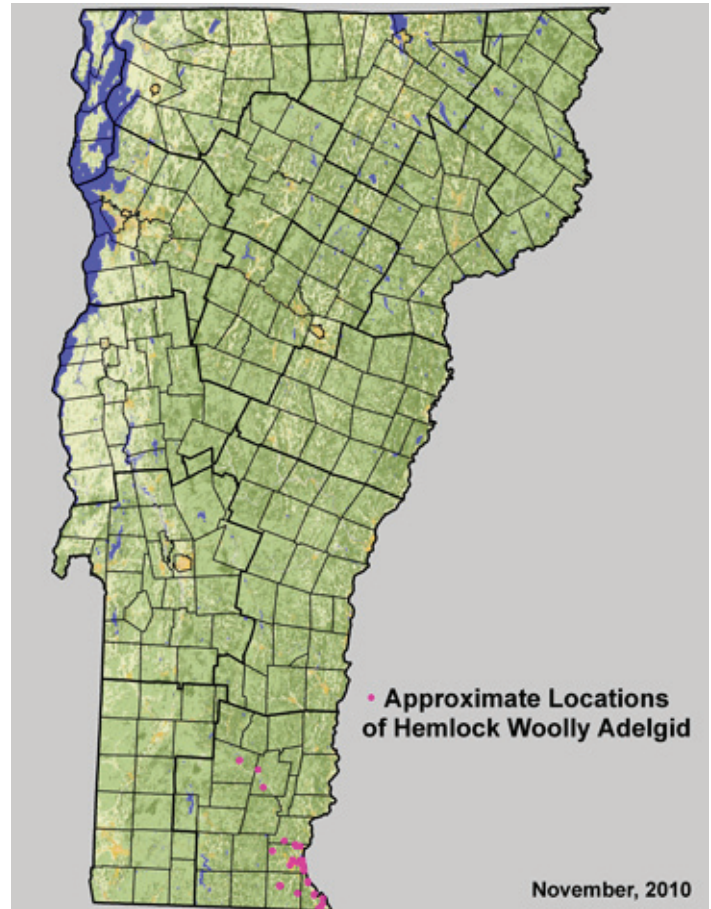
predatory beetle (*Laricobius nigrinus*) that was released in fall 2010.

Hemlock products from Windham County are subject to existing hemlock woolly adelgid quarantines. These vary from State to State. Vermont facilities may freely receive hemlock logs, pulpwood, or chips that may contain hemlock as long as the site has a compliance agreement with the Vermont Department of Forests, Parks, and Recreation. More information is available at <http://www.vtfpr.org/protection/hwawoodproductconsiderations.cfm>. The Vermont Agency of Agriculture Food and Markets continues to monitor nurseries for possible introductions of hemlock woolly adelgid on imported trees.

After 3 years of negative surveys, a single **European wood wasp** was collected in a bark beetle trap in Burlington. The wasp was likely transported to the site on logs slated for chipping. The only previous detection of this insect in Vermont was in 2007, in Lamoille County. No European wood wasps were caught in any of the 135 traps deployed statewide by USDA-PPQ. There are no Federal or State quarantines on this pest.

Butternut canker levels remain stable, with most butternuts showing symptoms of the disease. We have been participating in a multistate project, coordinated in Vermont by Dr. Dale Berghahl of Plant Technologies LLC, to conserve butternut germplasm. Collections were made from 43 butternuts that seemed to have some disease resistance. Scions from each tree were genetically checked to ensure that all trees sent for grafting were pure butternut. Scions from 33 trees were sent for grafting. Plans are to continue collections and to establish orchards for planting grafted trees.

The **common pine shoot beetle** has been found in many counties since it was first detected in Vermont in 1999. A Federal quarantine is in place to limit the spread



All known Vermont locations of hemlock woolly adelgid are in Windham County.



A fungal insecticide was applied experimentally to trees infested with hemlock woolly adelgid.

of this exotic insect, but pine material is free to move within Vermont and to most of the surrounding region. Details can be found at <http://www.vtfpr.org/protection/PSBConsiderations.cfm>.



To preserve butternut genes threatened by butternut canker, scions were collected from healthy trees for grafting.

Exotic oak pests, including summer fruit tortrix (*Adoxophyes orana*), variegated golden tortrix (*Archips xylosteanus*), light brown apple moth (*Epiphyas postvittana*), and Ramorum blight caused by *Phytophthora ramorum* were not detected in a Cooperative Agricultural Pest Survey of four sites. Surveys for European oak bark beetle (*Scolytus intricatus*) at three sites were also negative.

Efforts to eradicate the **oak wilt** detected near Albany, NY, appear to have been successful. Although this is not known to occur in Vermont, we have increased our vigilance in

looking for this disease. Key symptoms include rapid leaf discoloration and wilting that start in the upper crown in early summer. Leaves turn brown and are rapidly cast. Affected trees occur in groups because the disease is spread through roots.

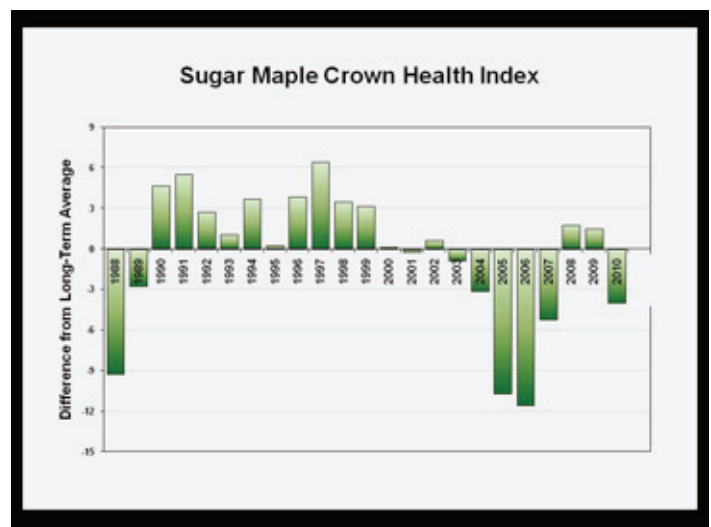
Mimosa webworm was detected for the first time in Vermont defoliating thornless honeylocusts in Springfield.

Monitoring Forest Health

In Vermont's **North American Maple Project** (NAMP) plots, only 5 percent of the sugar maples had more than 15 percent dieback in 2010. This is an improvement from recent years. However, the damage from late-spring frost, combined with pear thrips, resulted in lower than normal overall crown health. The crown health index was 4 percent below the long-term average.

NAMP data from 1988-2007 are being analyzed to assess long-term trends. Findings to date include:

- Sugar maple health was the same in both tapped and untapped stands.



Although dieback improved from recent years, sugar maple crowns were thinner than normal in North American Maple Project plots.

- Most trees with 20-35 percent dieback recover; most trees with more than 35 percent dieback do not.
- Annual mortality of canopy trees was 0.9 percent. This rose to 2.3 percent following the 1998 ice storm.
- Forest tent caterpillar defoliation in 2003-2006 increased tree mortality to 1.6 percent, and was more significant in stands with less tree diversity.
- Good soil nutrition improved recovery following defoliation. After pear thrips defoliation, no radial growth occurred for several years on sites with low soil calcium.
- Long-term health effects of the 1999 and 2001 droughts were evident through 2007.
- Non-native invasive plants have been found at 25 percent of the NAMP sites.

The crown condition of trees on the **Vermont Monitoring Cooperative's monitoring plots** on Mt. Mansfield (elevations of 1,400 to 3,800 feet) has recovered following a period of reduced health from 1997 to 2004. Trees on summit plots were less healthy than those at lower elevations.

We continue to pursue potential causes for **increased mortality** in our 2008 Vermont FIA data. Since the last inventory, the mortality of growing stock volume increased by 28 percent, which was distributed statewide. The increase is greatest for red maple, but increases were also identified for red oak, beech, sugar maple, white pine, and spruce. Smaller diameter trees may be affected to a greater degree. To date, no one cause explains the decline, including elevation, stocking, or ice damage.

Photos: Vermont Department of Forests, Parks, and Recreation



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