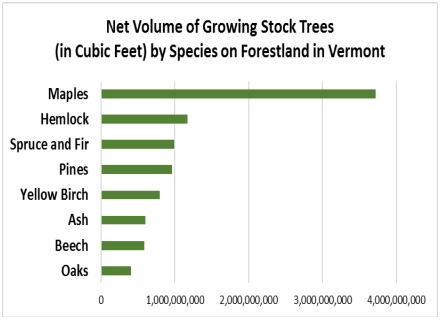
Forest Health VERMONT *highlights* 2017

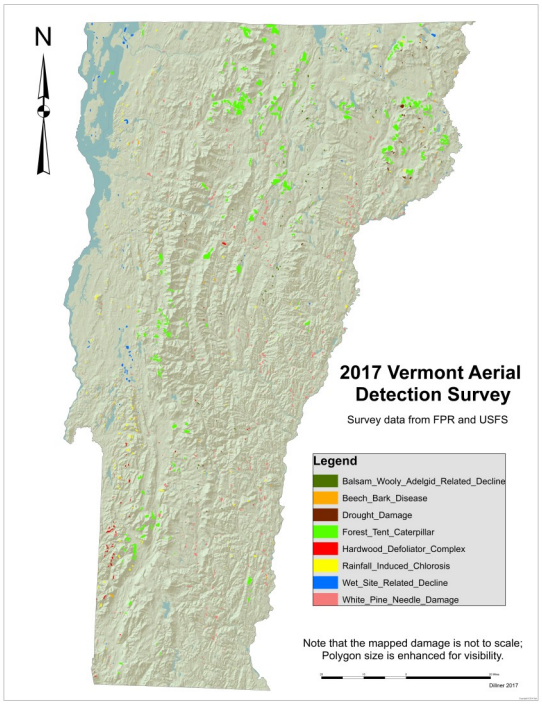
These Forest Health Highlights summarize information from the annual report on Forest Insect and Disease Conditions in Vermont. This summary provides an overview of the forest resource in Vermont, forest health program highlights, a weather summary, sections on hardwood and softwood insects and diseases which are native or well-established in the state, a section on exotic forest pests which are not known to occur in the state, a summary of activities related to non-native invasive plants, and forest health monitoring results.



Vermont forest health information is on-line at http://fpr.vermont.gov/forest/forest_health, or you can contact us:

- for assistance in identifying pests or diagnosing forest health problems
- to request on-site evaluations or management recommendations
- to obtain defoliation maps and hard-copy publications
- to participate in invasive pest citizen monitoring.

Data are from US Forest Service Forest Inventory and Analysis (FIA) plots. Estimates were calculated from FIA DataMart (FIADB_1.6.0.02), November 2017 https://apps.fs.usda.gov/fia/datamart/datamart_excel.html.



Forest Resource Summary

Vermont's forests cover about three-quarters of the state, and include billions of trees. 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 and eastern hemlock are the most common species by number and volume. More information on Vermont's forest inventory is at http://fpr.vermont.gov/forest/forest_business/forest_statistics/fia.

Forest Health Program Highlights

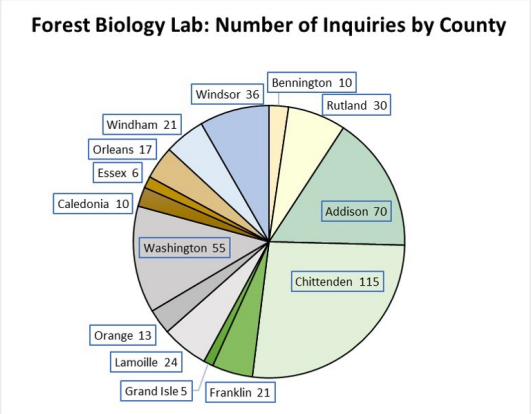
The Vermont Department of Forests, Parks and Recreation (FPR) conducts aerial and ground surveys to detect forest damage. In addition, long-term monitoring plots are inspected to evaluate forest health.

In 2017, 98,555 acres of forest damage were sketchmapped during statewide **Aerial Detection Surveys**. This represents just over 2% of Vermont's forestland, and is similar to the area mapped in 2016. Defoliation by forest tent caterpillar and white pine needle damage accounted for 61% and 17%, respectively, of the area mapped.

Healthy forests are ecologically functional and resilient to disturbance. They are valued by communities and have the capacity to produce economic benefits. The mission of the Vermont Division of Forests is to manage for and protect healthy forests. We work with Vermont citizens to promote forest health, supporting best management practices, sustainable use, and respect for the land.

At the **Forest Biology Lab**, we continue to provide invertebrate identifications, tree disease diagnoses and pest management recommendations, and support environmental education and outreach. In 2017, 38% of our inquiries came directly from the public; 30% from forest and tree care professionals; questions from other labs, researchers and commissions made up 17% of our inquiries; 9% came from other state or federal agencies; and 6% involved education and outreach. Forest health inquiries came from all 14 Vermont counties. Six percent of our inquiries were from out-of-state. Planning efforts continue for eventual relocation of the Vermont Agriculture and Environmental Laboratory to a new facility in Randolph.

The Forest Biology Lab responded to inquiries from throughout the state.



Climate Change remained a focus in 2017. Recommendations have been drafted on assisted migration for use on ANR lands, and State Park Interpretive Naturalists have begun including climate change information in their educational programming. In 2017, the Vermont Urban & Community Forestry Program partnered with the Vermont Climate & Health Program and the Arbor Day Foundation to provide 200 trees to residents in urbanized areas of Bennington and Newport. These communities were selected based on their relatively high risk for heat illnesses, in part due to lack of tree cover. For more information, visit our website on Climate Change and Forests.

The Vermont Monitoring Cooperative completed its 27th year of monitoring forest ecosystem health by broadening its focus to include neighboring states. Now called the **Forest Ecosystem Monitoring Cooperative**, survey and monitoring results are available at the new FEMC website.

FPR and the Agency of Agriculture, Food and Markets (AAFM) collaborate with USDA agencies to survey and manage **Non-Native Forest Pests**, and with University of Vermont (UVM) Extension on education and outreach. UVM Extension led an effort this year focusing on private campgrounds. Host tree maps were created and pest surveys were conducted for participating campgrounds, and they received educational materials to share with campers.

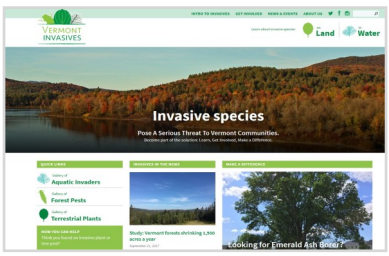
The Forest Pest Outreach program included host tree surveys on private campgrounds.

Photo: UVM Extension

To maintain our ability to respond to Invasive Pests, an Interagency ICS exercise was held in June. The tabletop exercise was facilitated by USDA APHIS, and included four other agencies, in a run-though of a simulated Asian longhorned beetle detection. Vermont continues to participate in the Northeastern Forest Fire Compact's Forest Health Working Team, which streamlines resource sharing among northeastern states and provinces in response to forest pest incidents. Vermont participated in a Compact mobilization to assist with brown spruce longhorned beetle detection in New Brunswick. An update to Vermont's Invasive Forest Pest Response plan is under review.

Two Forest Pest First Detector trainings were held in 2017 with 33 arborists, tree wardens, and concerned citizens attending. Volunteers assisted in detection surveys and community outreach.

The website vtinvasives.org has been re-launched with a new look. The expanded site continues to offer information on terrestrial plants, forest pests, and aquatics. To publicize the availability of this information, posters were distributed to 186 libraries in the state. On average, the website has approximately 400 online users per week.



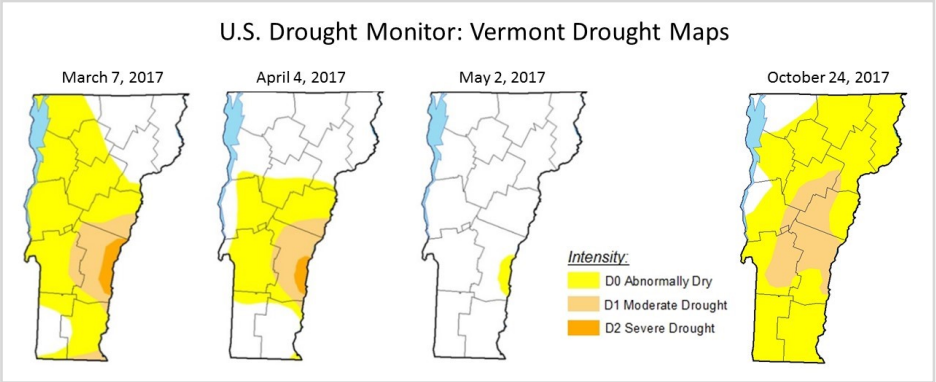
The vtinvasives.org website was updated. Posters announcing the website were distributed to 186 libraries.

Vermont's **Firewood Quarantine**, the Rule Governing the Importation of Untreated Firewood into the State of Vermont, went into effect in 2016. Untreated firewood, less than 48 inches in length, cannot be brought into Vermont, unless a waiver has been granted to the person moving the firewood. Several waivers have been approved for wood from adjacent counties in New Hampshire that are not under quarantine for emerald ash borer.

2017 Weather Influences on Forest Health

The winter of 2016-2017 lacked extremes, though it was somewhat warmer and drier than normal through February, and colder and wetter in March. Going into the winter, however, the entire state was abnormally dry or in moderate to severe drought. Dryness tapered off through the winter, finally ending by early May in eastern Windsor and Orange Counties.

Late spring and early summer 2017 were a different story, with May, most of June, and early July being cooler and wetter than normal. Cold temperatures May 8 and 9 resulted in snow at higher elevations and scattered frost damage.



Dry conditions from the 2016 drought persisted through early spring. Rainfall was plentiful in late spring and early summer. However, by late October most of the state was abnormally dry or in drought.

Map Authors: Anthony Artusa and Eric Luebehusen NOAA/USDA/NDMC http://droughtmonitor.unl.edu/

By mid-July, weather conditions changed again, with generally drier than normal weather through September. That period remained cooler than normal in most of the state through mid-September, when warmer temperatures arrived. There were record-breaking high temperatures in late September, frequently reaching the mid-80s and sometimes exceeding 90°, and October was the warmest on record. By late October, most of the state was abnormally dry or in moderate drought.

Severe tree-damaging storms punctuated the growing season. A partial list includes gravity wave storms on May 5th, microburst storms on May 18th, storms including hail on May 31st, July 18th, and August 12th, and multiple days of torrential rain June 29 through July 2 and October 24 to 30th.

With the see-saw between wet and dry, unusual cool and warm periods, and severe storms, weather conditions, as always, were a major driver of tree health. In addition to direct hail injury, tree breakage, or windthrow from severe storms, these included the following:

The drought of 2016 continued to affect tree health long after moisture conditions improved, including the following conditions observed in 2017:

- This was a **heavy seed year** for many tree species: notably maple, beech, oak, basswood, apple, and hop hornbeam (but not white ash) among hardwoods, and among conifers including white pine, balsam fir, red, white, and Norway spruce and northern white cedar. Heavy seed production, sometimes referred to as a "distress crop", is common following drought conditions. When trees put lots of resources into seed production, they may look sparser than normal. We should also expect an uptick in squirrel damage in the near future, with exploding populations from the recent glut of food.

Severe tree-damaging storms included a gravity wave storm that hit Rutland County on May 5th. (left).

Drought conditions in 2016 contributed to heavy seed production on multiple species, including white pine (center). It also led to dieback on maple (right) and ash, especially in eastern Vermont.

- New **ash mortality** and **maple dieback** was noticeable by mid-June in multiple locations in eastern Vermont where drought conditions had persisted into early spring. Ash trees are particularly sensitive to fluctuating water conditions. Affected maples often had foliage of good size and color on living branches, suggesting that plentiful moisture later in the spring is allowing trees to recover.

- Heavy production of **Armillaria** "honey mushrooms" suggests that this fungus successfully invaded drought-stressed roots.
- More attacks by **hemlock borer** were reported on wounded hemlocks.

Cool, wet weather in May and June slowed leaf development, saturated soil, and promoted the spread of fungi, resulting in the following conditions observed in 2017:

2016 drought conditions likely led to a heavy crop of honey mushrooms (left) and more frequent hemlock borer attacks (right).

Photos: K. Jones, R. Freeberg

- Light **frost damage** to sugar maple and beech was observed in widely scattered locations, including northeastern and southwestern Vermont, and the central mountains.
- Conditions were ideal for leaf infection by **fungal pathogens**, and for caterpillar infection by fungal and viral diseases.
- Delayed leaf development led to increased damage by **pear thrips** on sugar maple.
- Stands of **chlorotic sugar maples**, were observed in scattered locations statewide, with 6,494 acres mapped from the air. This is frequently observed in unusually rainy summers.
- Saturated soil made trees more vulnerable to **windthrow** in stormy weather.

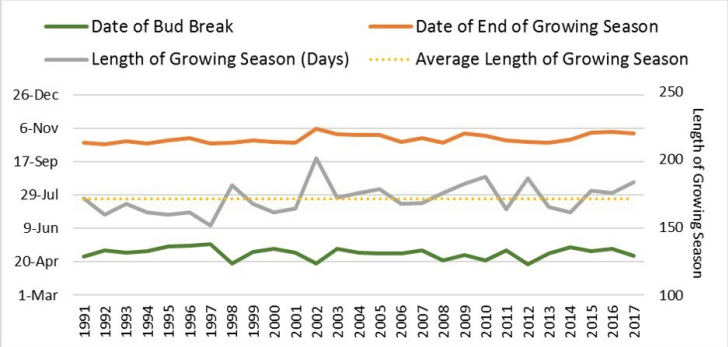
Warm dry conditions in late summer into fall led to:

- **Refoliation failures** from forest tent caterpillar and other defoliators, along with infection by leaf fungi and other factors.
- A general **delay in fall foliage**, with the exception of swamps and other stressed areas that start to turn color early.
- **Early leaf drop** of sugar maple and ash, especially on roadsides, openings, river corridors, and edges. Once leaves are compromised by disease infection they are more likely to brown and drop early under dry conditions.

Cool wet spring conditions resulted in scattered frost damage to sugar maple and beech (bottom left), stands of chlorotic sugar maple (top left) and made trees more vulnerable to windthrow in stormy weather (top center). Warm dry late summer and early fall contributed to early leaf drop of ash (right) and refoliation failures (bottom center).

Frost Photo: E. Crumley

We continue to monitor **phenology** for the timing of budbreak, leaf out, and fall leaf color and drop. Sugar maple budbreak on April 29th was 4 days earlier than the long-term average, but the timing of full leaf-out was nearly indistinguishable from the long-term average. In general, peak color was later than usual in 2017. Double-peaks in sugar maple color were likely due to initial color change that stalled, followed by some leaf drop due to dry conditions of early fall. Growing season length in 2017 was the longest since 2012, and exceeded the long-term average by 12 days.



Based on sugar maple phenology monitoring, the 2017 growing season was the longest since 2012, and exceeded the long-term average by 12 days.

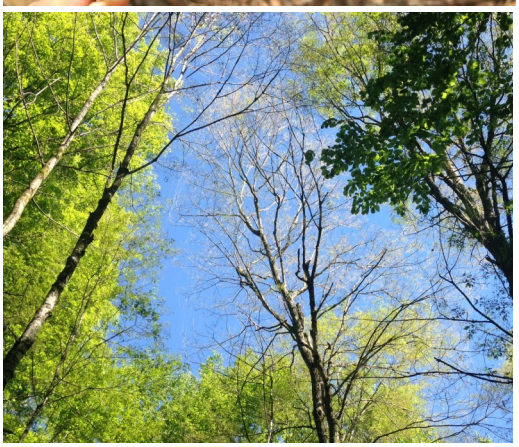
Hardwood Insects and Diseases

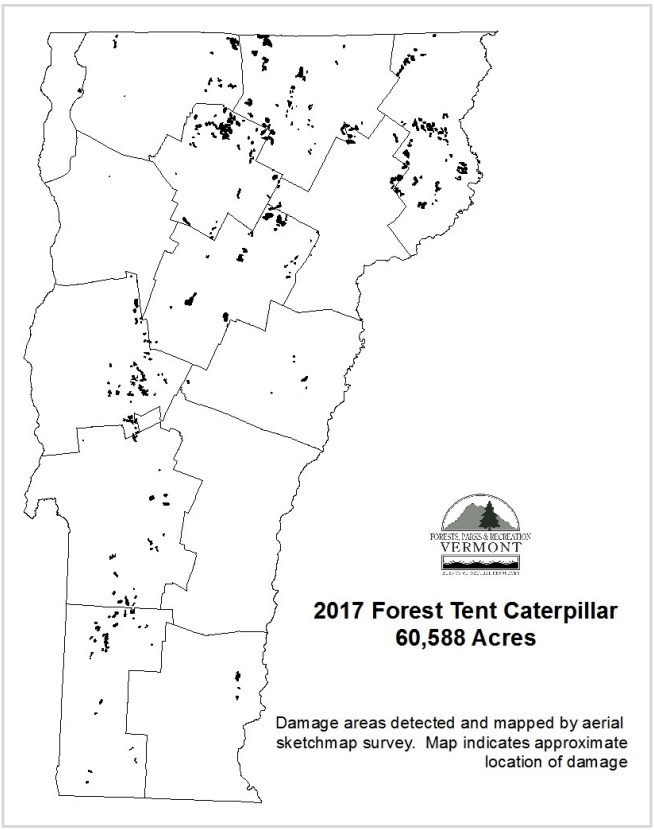
Forest Tent Caterpillar (FTC) populations increased statewide in 2017, with 60,588 acres of defoliation mapped during statewide aerial surveys. This accounts for roughly 2% of the northern hardwood forest in Vermont. Defoliation was mapped in every county and total acres more than doubled compared to 2016. Defoliation data are available on the ANR Natural Resources Atlas.

In the spring, leaf development, caterpillar hatch, and defoliation were monitored at four sites. Hatching was first observed during the last week of April. By the last week of May, some trees were 90% defoliated.

In late 2016 and early 2017, FPR staff assisted landowners with FTC egg mass surveys to determine the likelihood of defoliation on their property. Of the 64 sugarbushes surveyed, 32 were identified as at risk of defoliation. Eighteen landowners made arrangements with an aerial applicator to have their sugarbushes treated with Foray 48B, a *Btk* product that is registered for use in certified organic production. In total, these accounted for 3,434 acres. At the time of treatment, defoliation averaged 18%. This increased to just 24% after FTC feeding had ended, suggesting that treatment was highly effective. Several additional landowners also had their forestland treated.

Forest tent caterpillar (left) populations increased statewide in 2017. Hatching began in April (above right). By late May, some trees were completely defoliated (below right). Defoliation was mapped in every county.



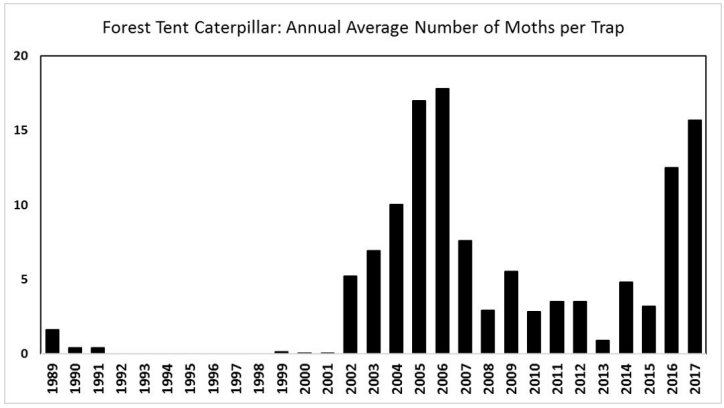


FTC parasitoids known as friendly flies were reported throughout the defoliated areas, and there was some early caterpillar mortality likely due to viral and/or fungal infection. However, moth capture in pheromone traps increased from 2016 levels, suggesting that we can expect more defoliation from FTC in 2018. By request, FPR is conducting egg mass surveys in late 2017 and early 2018 for landowners who might use the results to adjust management practices.

Parasitic friendly flies were common.

Photo: R. Kelley

Some FTC mortality occurred which was likely due to fungal or viral disease.



The number of FTC moths trapped in 2017 increased from 2016, indicating that the outbreak will continue next year.

Trees typically respond to the relatively early-season feeding by FTC by sending out a new flush of leaves. However, in both 2016 and 2017, some defoliated areas remained noticeable all summer because of a lack of refoliation. Factors that may have contributed to this include the lingering effects of 2016 drought, heavy seed, a late start of feeding in 2017, infection by leaf fungi and dry mid-summer conditions. In late October, after a burst of rainfall and continued warm temperatures, some defoliated sugar maples attempted another refoliation.

Dieback and off-color leaves have been observed in some locations where defoliation was heavy in 2016 and trees were under stress from other factors. The second year of defoliation, and lack of refoliation, will almost certainly affect wood production, the amount of foliage and shoot growth next year.

More details on FTC biology and management are in the most recent Forest Tent Caterpillar Update.

Some defoliated trees failed to refoliate all summer (top right) while others attempted to refoliate in late October (left). Dieback has been observed in some locations where defoliation was heavy in 2016 (below right).

Pear thrips damage was noticeable, and numbers in our only monitoring plot are up compared to the last 2 years. Damage was still mostly light, and mixed with frost, fungus disease and other defoliators. Pollen increases thrips fecundity, so the heavy flower production may produce a lot more thrips next spring.

Other maple insects observed in 2017, included persistent populations of maple webworm, maple leafcutter and maple trumpet skeletonizer. New this year were frequent observations of orange humped mapleworm.

Pear thrips damage may be more common next spring, since pollen increases thrips fecundity.

Photo: R. Kelley

Vermont continued to dodge the **gypsy moth** outbreak occurring elsewhere in New England, with no significant defoliation, and infrequent caterpillar reports. Egg mass monitoring plots indicate populations will remain low in 2018.

Beech bark disease remains a chronic cause of dieback and mortality, with damage mapped on 2,807 acres.

Other hardwood insects observed in 2017 included birch leaf folder which increased noticeably statewide, although no significant defoliation was observed. Poplar and willow defoliation by non-native satin moth caterpillars was more widespread than in 2017. Locust leafminer damage was particularly heavy on many roadside locusts. A large variety of tussock moth caterpillar species were reported from throughout the state, but only light feeding was observed. New this year were noticeable feeding by the red humped oakworm and scattered observations of oystershell scale, which can cause dieback when populations are heavy.

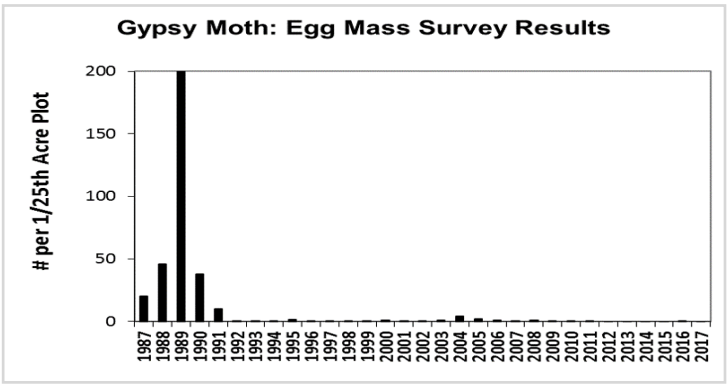
Hardwood insects which were more common in 2017 included (clockwise from top left): orange-humped mapleworm, birch leaf folder, locust leafminer, and oystershell scale.

Photos: R. Kelley

Certain **foliage diseases** were common due to the wet weather in late spring. Sycamore anthracnose kept sycamores bare into early June, wherever they grow, but foliage emerging later was unaffected, and trees were green all summer. Apple scab was heavy throughout the state, and cedar apple rust was also common. Giant tarspot caused substantial early leaf drop of Norway maple in southwestern Vermont.

Common foliage diseases included sycamore anthracnose (left) and giant tar spot on Norway maple (right).

Tar spot photo: R. Kelley



Egg mass survey plots indicate gypsy moth populations will remain low in 2018.

There's no simple answer to the **early leaf drop** of sugar maple and white ash, but a number of fungi appear to have contributed. The UVM Plant Diagnostic Lab identified the Anthracnose fungi *Discula* and *Aureobasidium* and the leafspot fungi *Phyllosticta* and *Septoria* on symptomatic sugar maple leaves, and the Anthracnose fungi *Gloeosporium* and *Aureobasidium* and the leafspot fungi *Mycosphaerella*, *Marssonina*, *Cercospora*, and *Phyllosticta* on symptomatic white ash leaves.

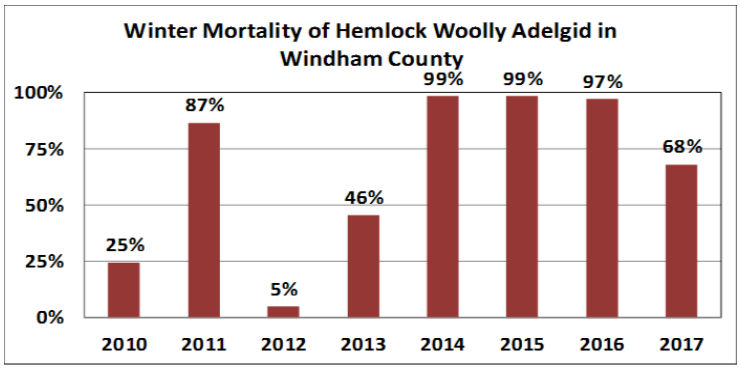
A variety of anthracnose and leafspot fungi have been identified on sugar maple leaves that dropped in late summer.

Softwood Insects and Diseases

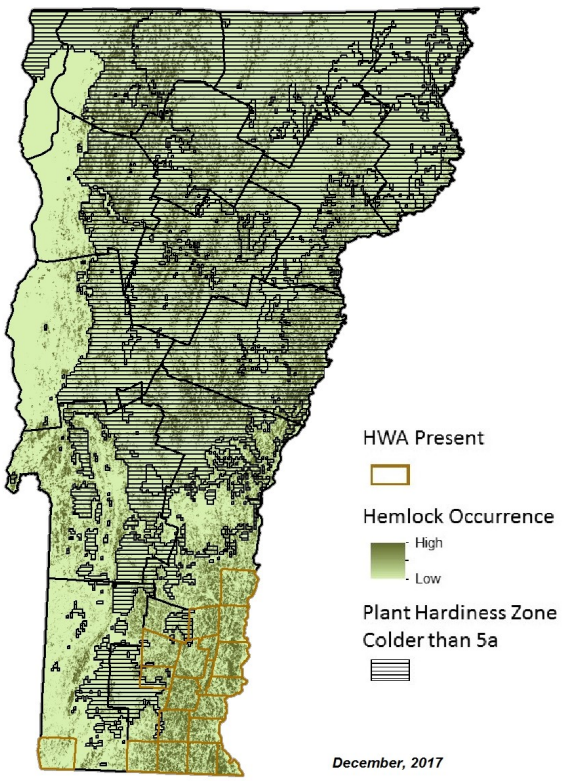
Vermont's **hemlock woolly adelgid** (HWA) infestation remains centered primarily in Windham County, with small spots in Springfield and Pownal. In 2017, hemlock woolly adelgid was detected just south of Lake George in New York, posing an additional threat to western Vermont.

Thirty sites were surveyed in 2017, with significant assistance from volunteers, to delineate Vermont's HWA infestation. No newly infested towns were reported. This limited spread is due in large part to three successive years with high winter mortality. However, the mortality rate for winter 2016-2017 was approximately 65%, well below the threshold that seems to slow new invasions. Consequently, we expect to see more HWA over the coming winter. Spread is most likely to occur into warmer regions of the state.

In spite of high adelgid mortality rates, some stands of hemlock are in noticeable decline. Compounding the situation are the spread of elongate hemlock scale into Windham County and the 2016 drought.



HWA mortality in winter 2016-17 was well below the threshold that seems to slow new invasions.



Hemlock woolly adelgid spread has been limited, due to three successive years with high overwintering mortality. No newly infested towns were detected in 2017. Spread is most likely within zones 5a and 5b.

No predatory beetles, *Laricobius nigrinus,* were recovered during fall sampling of the three sites where they had been released in 2009 and 2012, so the status of this introduction remains unknown. To augment the population at the Brattleboro site, 468 beetle adults that had been field collected in North Carolina were released in late November.

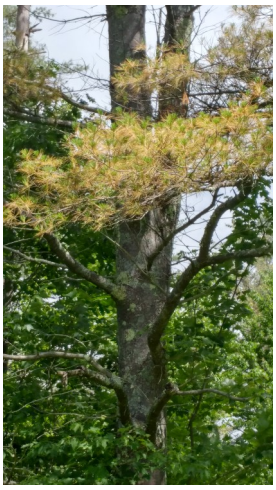
Laricobius nigrinus beetles from North Carolina were released to augment a biocontrol site in Brattleboro.

Fir mortality is continuing, although, in some areas, the balsam woolly adelgid infestation has collapsed.

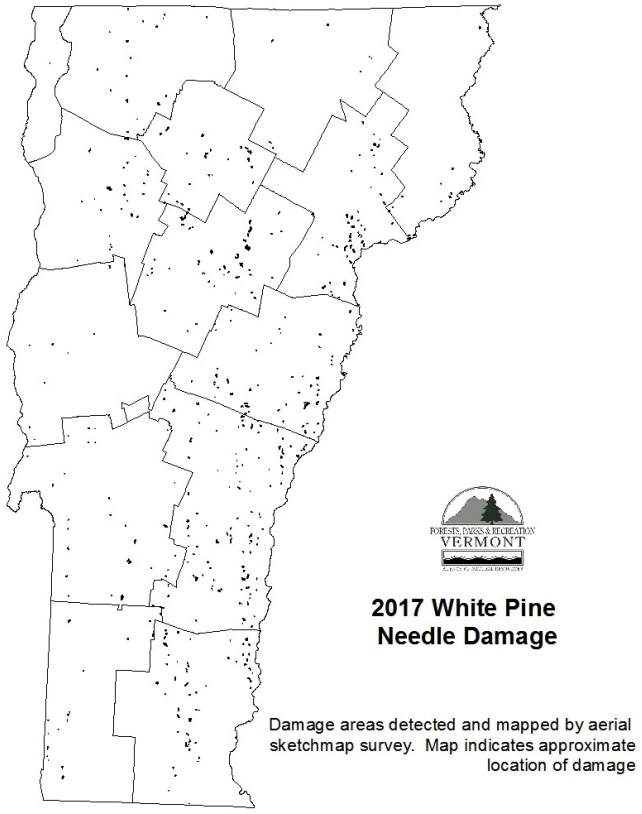
Fir mortality caused by **balsam woolly adelgid** is continuing but only 1,641 acres were mapped compared to 5,616 acres in 2016. Active populations are widely scattered, and the infestation has collapsed in some areas.

Although **white pine needle damage** was widespread again this year, with 16,413 acres mapped, this was about half of the acreage mapped in 2016. This likely underestimates the area affected since damage is mapped from above, while much of the damage is in lower crowns. This damage has been attributed to a complex of fungal pathogens. Since symptoms appear the year following infection, the dry conditions in spring 2016 may have reduced disease severity in 2017. Symptoms didn't develop until the second week of June, and with heavy winds and rains, many brown needles were already cast by late June.

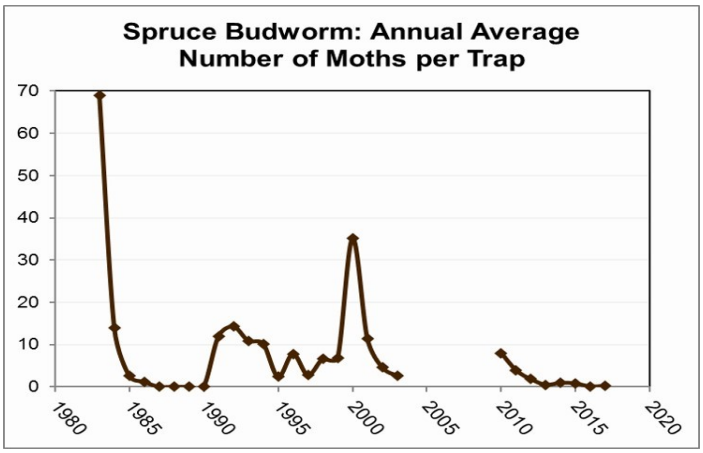
The damage has been widespread since 2010, and the current epidemic has been building at least since 2005. Needle damage continues to affect the same trees each year, and some are now exceedingly thin. Decline and mortality of white pine have been observed where other stress factors are also present.



White pine needle damage has been widespread since 2010. The disease was less severe in 2017, with only half as many acres mapped compared to 2016.



While **spruce budworm** continues to cause widespread defoliation in eastern Canada, the number of moths captured in our Vermont pheromone traps this summer remains low.



The number of spruce budworm moths caught in our traps remains low.

Reports of **red pine mortality** continued in 2016, with 516 acres mapped, scattered in seven counties. The exotic insect, red pine scale, detected in 2015 in Rutland and Orange Counties, continues to be a suspect, although it remains premature to say that red pine scale is the sole "cause" of this red pine mortality. In 2017, we were not able to detect scale insects in any stands that were visited. It's possible that cold winters have knocked populations back. It's also possible that the decline in these stands is not related to red pine scale. Pests that were observed included Diplodia shoot blight and pine gall weevil.

In 2017 we did not detect red pine scale in stands with shoot dieback. Diplodia shoot blight and pine gall weevil were commonly observed.

Exotic Forest Pests Threatening Vermont

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 Massachusetts, eastern New York, and New Hampshire in 2017. The insect is now reported from thirty-one states. Anyone using ash products from infested states should be aware of current regulations. Information is available by contacting USDA APHIS, AAFM, or an FPR office below.

The emerald ash borer detection effort continues in Vermont. USDA APHIS continued its statewide survey by deploying 214 purple traps throughout Vermont. We follow-up on all suspects, and conducted on-site inspections at ten locations where dying ash were observed or reported.

Asian longhorned beetle (ALB), is not known to occur in Vermont and no forest management changes are recommended in anticipation of the insect. Nonetheless, education and outreach that can promote early detection remain a priority. Early detection is particularly important with the Asian longhorned beetle, since small, newly-discovered populations can be successfully eradicated.

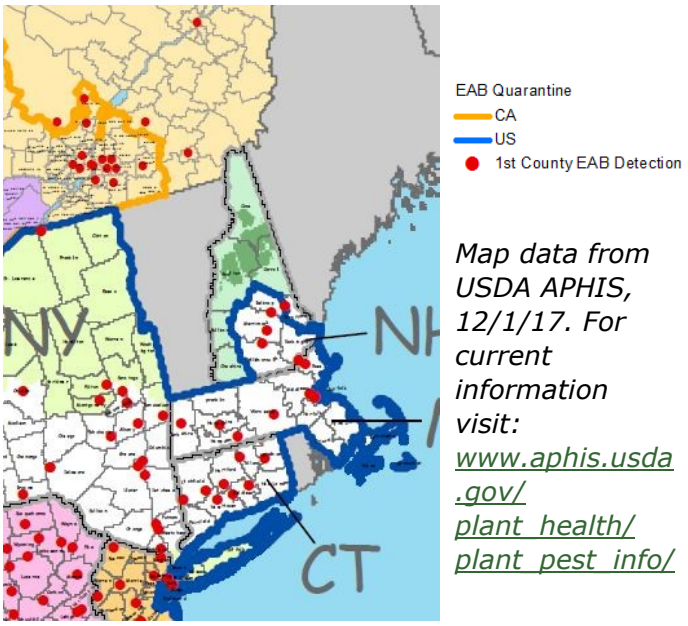
Outreach remains a priority for detecting exotic forest pests.

Photo: E. Schadler

AAFM and USDA APHIS continue efforts to trap non-native forest insects. **Sirex woodwasp** has been trapped in eight Vermont counties since 2007. In 2017, it was trapped in Chittenden and Rutland Counties. No new observations of Sirex infesting trees were reported, with the only known location in Jericho.

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.

The **brown marmorated stinkbug** has been found in Addison, Bennington, Chittenden, Lamoille, Washington, Windham, and Windsor Counties, but may occur statewide.



Map data from USDA APHIS, 12/1/17. For current information visit: www.aphis.usda.gov/plant_health/plant_pest_info/

As of December 2017, five counties in New Hampshire, and all of New York, Connecticut and Massachusetts are included in the emerald ash borer quarantine area. EAB is not known to occur in Vermont.

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.

Non-Native Invasive Plants

Non-native invasive plant (NNIP) management efforts continued in 2017, with progress on mapping, control, outreach and education. FPR's invasive plant coordinator led over 22 workshops for a variety of stakeholders, and worked with multiple state departments and agencies to unify Vermont's approach to NNIPs. Management activities are being conducted on state lands, including efforts to reclaim invaded meadows, to prevent invasions from becoming established, and to improve conditions to regenerate native species. A tool loan program loans out weed wrenches to local organizations, municipalities, and private landowners.

Non-native invasive plant efforts included over 22 workshops and other outreach events.

The Vermont Invasive Exotic Plant Committee updated its Watch List of NNIP. Two early detection species of recent concern are species of *Petasites*, butterbur sweet coltsfoot (first documented in Vermont 2009) and Japanese sweet coltsfoot (first documented in 2016). Populations have been detected in 18 towns scattered throughout the state, and appear to be increasing rapidly.

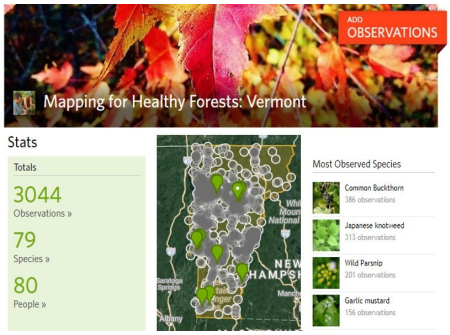
Several targeted NNIP efforts are made possible through US Forest Service grant funding:

- The Mapping for Healthy Forests project continued efforts to provide a resource for tracking NNIP, with a focus on private and municipal lands. This citizen science project trains volunteers to conduct assessments and prioritize treatment areas. The information from this project is stored on the iNaturalist website; by mid-October the project exceeded 3,000 observations.
- A Habitat Restoration Crew was hired to lead a project focused on Education, Volunteer Outreach, & Capacity Building in southwestern Vermont. Management activities were conducted on over 20 state-owned properties. One example of the benefit of early detection and response was the crew's effort to control a population of *Phragmites australis* threatening 300 acres of wetland in the Coolidge Management Unit. In 2016, the crew conducted drip application of herbicide to 1,000 Phragmites stems. By 2017, only five stems survived, which were treated. Elsewhere, management efforts included volunteers, with 348 assisting in 2017. Since 2014, this program has worked with 1,791 volunteers contributing 7,408 volunteer hours. Additionally, the crew worked on curriculum development for schools and creating interpretive materials for State Parks.

Local volunteer efforts contribute significantly to NNIP management.

Local efforts contribute significantly to NNIP management. Highlights in 2017 included projects like South Burlington's Weed Warriors, the Great Richmond Root-Out!, and NNIP management work completed by the Battenkill Watershed Comprehensive Invasive Species Management Association, Moving Towards Sustainability students at CCV-Winooski, and the Winooski Valley Park District.

The Mapping for Healthy Forests project trains volunteers to conduct assessments. The website contains over 3,000 observations.



A Habitat Restoration Crew conducted NNIP management activities on over 20 state-owned properties (above). In the Plymsbury Basin, 1000 Phragmites stems were treated in 2016 (below left). Only five had survived when the site was revisited in 2017 (below right).

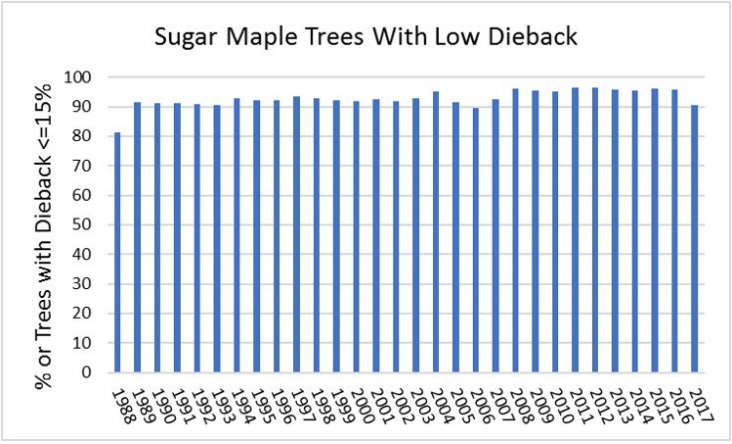
Monitoring Forest Health

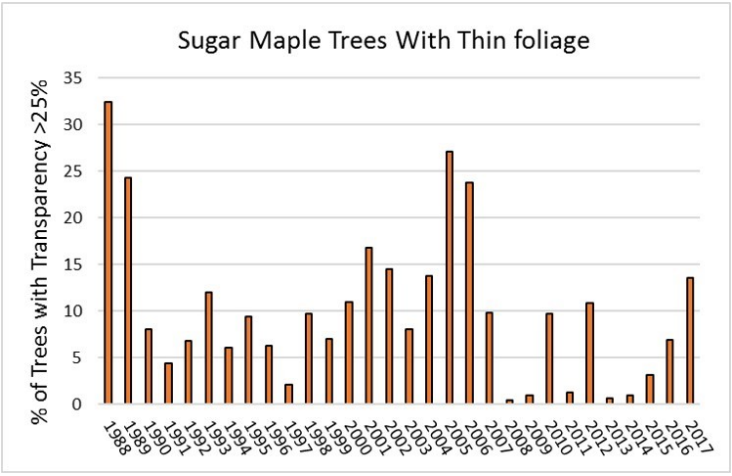
UrbanFIA work continued for the second year in Vermont. This US Forest Service program parallels traditional Forest Inventory and Analysis (FIA), measuring changes to forest demography and health through a network of long-term plots. Vermont was the first state to commit to a full UrbanFIA program, targeting urban areas statewide rather than focusing on a single metropolitan area. In 2017, all plots were completed by the end of June through the combined efforts of the USDA Forest Service, Vermont Department of Forests, Parks and Recreation, and the Forest Ecosystem Monitoring Cooperative. Data are collected on a seven year cycle, after which a statewide report will be published.

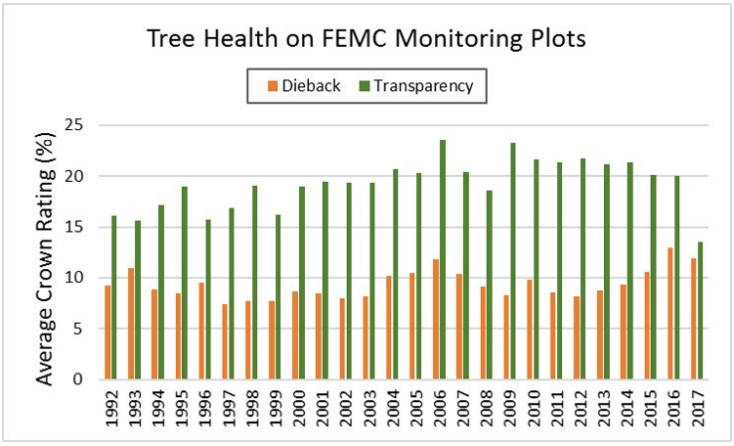
Vermont has continued to monitor sugar maple health in sugarbushes and in maple stands since 1988. In these **North American Maple Project** (NAMP) plots, 90% of trees were rated as having low dieback (less than 15%), compared to 95% in 2016. Dry conditions in 2016 may have been a factor in reduced tree health in 2017.

Thin foliage due to forest tent caterpillar defoliation was measured 9 of the 36 monitoring plots (25%). Seven had moderate-heavy defoliation (20%) and 2 had light defoliation (6%). Tree recovery through refoliation was minimal at most sites. Two additional sites were affected by pear thrips and frost. Statewide, there was an increase in trees with thin foliage from 7% in 2016 to 14% in 2017. Foliage transparency is sensitive to current stress factors. Other spikes in transparency were due to frost injury (2010, 2012, 2015), forest tent caterpillar defoliation (2004-2007, 2016), and pear thrips (1988-1989).

Fewer sugar maples had low dieback in 2017 than in 2016 in the North American Maple Project plots (above). Dry conditions and defoliation in 2016 may have been a factor. Thin foliage in 2017 was mostly due to forest tent caterpillar defoliation.







In addition, 48 forest health monitoring plots were sampled across Vermont in 2017 as part of the **Forest Ecosystem Monitoring Cooperative** (FEMC). Results from the original 23 sites on Mount Mansfield and Lye Brook Wilderness Area showed a decrease in both average dieback and foliage transparency, indicators of tree stress. An improvement in tree health in 2017 at these sites follows dry summer conditions in 2016.

FEMC monitoring sites include Mount Mansfield (right) and Lye Brook Wilderness Area. Tree health generally improved in these sites in 2017.

FORESTS, PARKS & RECREATION VERMONT
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Forest health programs in the Vermont Department of Forests, Parks and Recreation (FPR) are supported, in part, by the US Forest Service, State and Private Forestry. FPR works in partnership with the US Forest Service to monitor forest conditions and trends in Vermont and respond to pest outbreaks to protect the forest resource. Jointly operated pest survey, detection, and management projects are conducted in cooperation with the Vermont Agency of Agriculture, Food and Markets. We gratefully acknowledge additional contributions by the University of Vermont, USDA-APHIS, cooperating landowners, resource managers, and citizen volunteers.