



Forest Health VERMONT *highlights*

2020



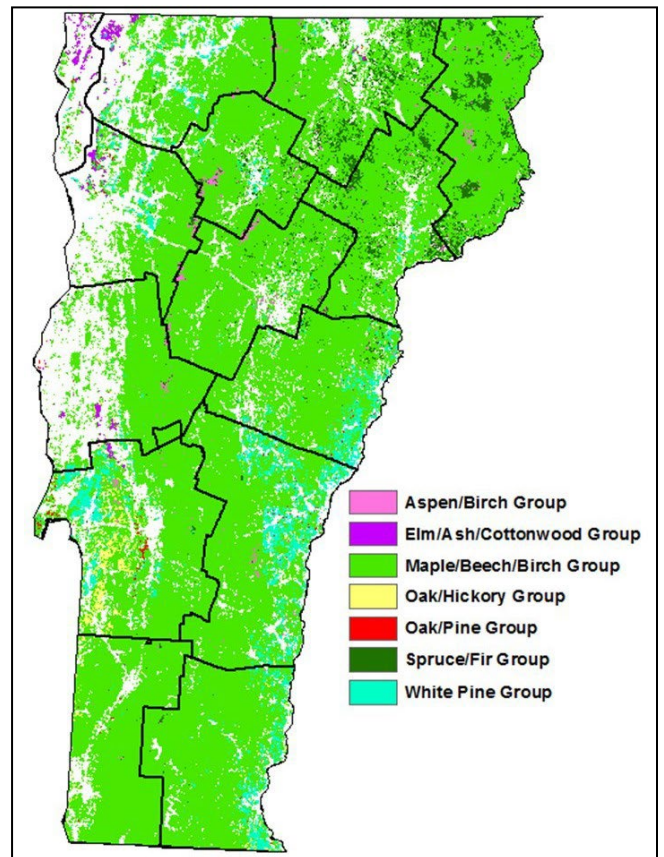
2020 Vermont Forest Health Highlights

These Forest Health Highlights summarize information from the annual report on Forest Insect and Disease Conditions in Vermont. They provide 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 established in the state, a section on exotic forest pests and any changes in status, a summary of activities related to non-native invasive plants, and forest health monitoring results. Vermont forest health information is available online at <https://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

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 can be found at <https://fpr.vermont.gov/forest-inventory-and-analysis-fia>.



Distribution of forest type-groups in Vermont. Source: US Forest Service Forest Inventory and Analysis 2008 NLCD 2006 (Fry et al. 2011). Credit: R. Morin; data available at: <http://www.fia.fs.fed.us/tools-data/>



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.

Forest Health Program Highlights

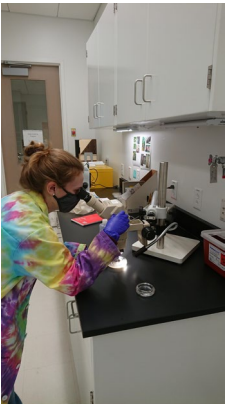
The Vermont Department of Forests, Parks and Recreation (FPR) conducts aerial and ground surveys to detect forest damage. In addition, long-term monitoring plots are inspected to evaluate forest health. FPR and the Agency of Agriculture, Food and Markets (AAFM) collaborate with USDA agencies to survey and manage **non-native forest pests**, and with the University of Vermont (UVM) Extension on education and outreach.

This year provided challenges and opportunities due to the global COVID-19 pandemic. As the country moved toward shutting down all but essential services, and workers in Vermont were instructed to stay at home, our field season appeared to have shut down even before it started. However, over the first few months of the stay at home order, the State of Vermont and the Agency of Natural Resources (ANR) developed guidelines to allow specific types of work if all safety protocols were followed. This allowed staff from the FPR to slowly start conducting fieldwork. Surprisingly there were only a few projects impacted and most of the forest health monitoring projects were implemented. This couldn't have been done without the dedication, flexibility, and preparedness of the staff conducting these projects.



View from the top of Camel's hump. Photo credit FPR Staff.

The Department conducts an annual **Aerial Detection Survey** identifying and mapping forest health issues and damages. This year, mapping forest disturbances by plane was not possible, so staff headed for the hills – quite literally. After identifying standing (and climbable) fire towers, as well as summits with sufficient views, Protection Foresters visited these locations to assess forest health. This year the forest looked quite healthy and there were limited areas exhibiting damage.



Forest Pathologist, Savannah Ferreira at the Forest Biology Lab.

The **Forest Biology Lab** is located in the Vermont Agricultural and Environmental Laboratory (VAEL) on the campus of Vermont Technical College in Randolph. This new facility houses FPR's insect collection that contains at least 1,884 different species of Vermont invertebrates, as well as a collection of semi-permanent mounts of plant material from animal, fungal, bacterial, and human-caused damages. By moving the collection to a secure space at VAEL and updating the collection's database, the preserved specimens and their records can now be easily accessed.

The lab continues to provide invertebrate identifications, tree disease diagnoses, pest management recommendations and supports education and outreach. In 2020, our inquiries came from 13 Vermont counties, with the highest numbers from Windsor, Washington, and Windham. Insect identification was our highest inquire, followed by fungal/ disease identification, forest health-related information requests, abiotic damage identification, and animal damage identification. Three percent of our inquiries were from out-of-state.

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. In 2020, twenty-two waivers were in effect for firewood from adjacent counties in New Hampshire, New York, or Massachusetts. Waivers for wood from counties known to have EAB do not allow the importation of untreated ash firewood.

To align with the firewood quarantine and slow the spread campaign, the protocol was modified regarding outside firewood entering **Vermont State Parks**. Campers were encouraged to bring no more than one night's worth of firewood regardless of the firewood's location of origin. Unless it was certified to have been heat-treated, outside firewood was confiscated, bagged, labeled, and exchanged for heat treated wood. In 2020, 210 bags of firewood were processed, compared to 8 bags of out-of-state wood in 2018. The wood originated from Connecticut, Massachusetts, New York, New Hampshire, and multiple towns across Vermont.



Truckload of firewood from Vermont State Parks. Photo: FPR staff

The **Vermont Forest Pest Outreach Program**, implemented by the Urban and Community Forestry Program and UVM Extension, reached 306 people at workshops, presentations and trainings and an estimated 452,385 people were exposed to forest pest educational material through exhibits, newsletters, radio, and social media messaging.

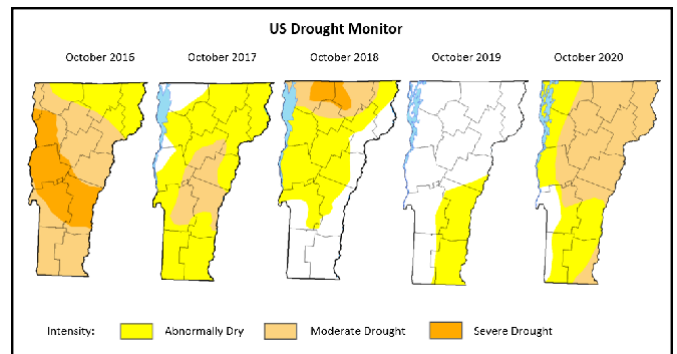


- Workshops included: Suspect Tree Workshops where Forest Pest First Detectors (FPFDs) were trained to take photographs of trees in their regions suspected of being infested with emerald ash borer; **Rural Right-of-Way Ash Inventory Workshops** which trained volunteers to conduct inventories and map ash trees in their communities using the ArcGIS Collector app.; and a **Hemlock Woolly Adelgid Monitoring** training in Bristol.
- Over **400 trailhead signs** about emerald ash borer were posted on the state's most trafficked hiking trails. With help from FPR; the Green Mountain Club; and the Green Mountain National Forest, laminated signs about the signs and symptoms of EAB infestation were posted on trailheads and kiosks on the state's most trafficked trails. Additional signs are posted at some of Vermont's natural history museums, and town forests.
- **EAB Awareness Week.** Despite COVID, Forest Pest First Detectors and other dedicated volunteers in 9 towns organized activities such as ash tree tagging events, ash tree walks, webinars, drawing contests, and local media coverage to raise awareness of emerald ash borer in their communities. We also partnered with the Vermont Land Trust to collect stories and pictures of notable ash trees statewide. The week received lots of media coverage, including WCAX, My Champlain Valley, UVM Extension's Across the Fence, Vermont Public Radio, the Vermont Journal, the Brattleboro Reformer, Vermont Business Magazine, and even a news channel in Boston.
- **Purple Trap Program.** Forty-four FPFD volunteers and FPR staff monitored 114 traps in 50 towns and 12 counties. This resulted in confirmed infestations in three new locations: West Swanton, Marshfield, and Shaftsbury.



2020 Weather Influences on Forest Health

Winter was milder and with less snow than average, but cool temperatures persisted through mid-May and delayed the start of the growing season. Indeed, many parts of the state experienced snowfall in early May, followed by higher than normal temperatures that facilitated rapid bud break. Following snowmelt, little precipitation was recorded through early June, at which point the state was classified as Abnormally Dry by the US Drought Monitor. Dry conditions continued throughout the state during the growing season, and by the end of September resulted in Severe Drought in northeastern VT (~30% of the state), with the rest of the state categorized as being in either Moderate Drought or Abnormally Dry. Despite the adverse growing conditions, little damage to foliage was observed. However, the dry weather likely contributed to slightly earlier peak foliage color in many places, as well as earlier leaf drop.



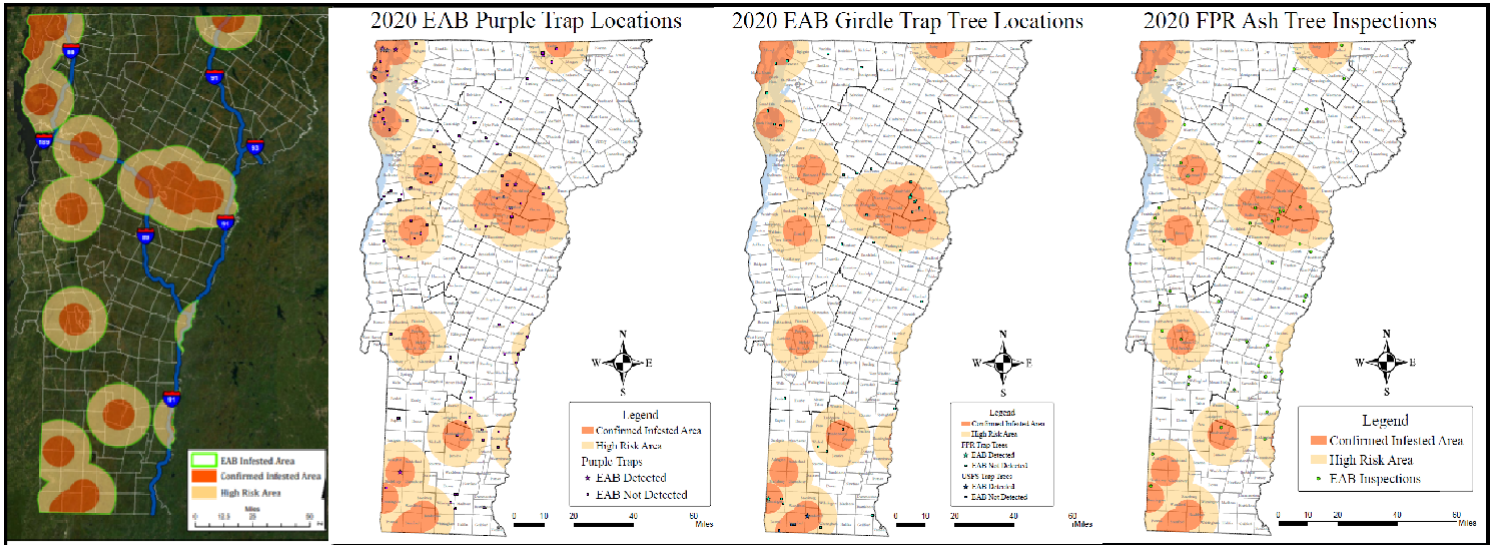
Periodic dry conditions since 2016 continue to impact tree health.
 Map: NOAA/USDA/NDMC
<http://droughtmonitor.unl.edu/>



Sugar maple phenology was monitored for the timing of bud break and leaf out in the spring at the Proctor Maple Research Center in Underhill as part of the Forest Ecosystem Monitoring Cooperative. Initial monitoring was late to begin due to restrictions put on fieldwork associated with COVID-19. Sugar maple bud expansion was delayed by 8 days compared to the long-term average, with bud break occurring on May 11. Full leaf-out was similarly delayed and occurred 7 days later than the long-term average. This was not a year of heavy flowering for sugar maple.

Hardwood Insects and Diseases

Emerald ash borer was detected in five significant new locations in 2020. New discoveries in Readsboro, Swanton, and Isle La Motte increased the size of existing EAB high-risk and confirmed infested areas in Bennington, Windham, Franklin, and Grand Isle Counties. A detection in Richmond was the first for Chittenden County. A detection in West Rutland, coupled with two in southwestern New Hampshire established entirely new infestation locations and high risk areas in southern Vermont in Rutland, Windham, and Windsor Counties. Several detections were found on purple prism traps, and trap trees.



The mapped EAB Infested Area extends ten miles from known EAB locations. The EAB Infested Area indicates where Slow the Spread Recommendations apply. Purple trap locations, girdled trap tree locations and ash tree inspection locations for 2020.

Maps detailing known EAB infested areas in Vermont are available at VTinvasives.org. The mapped areas indicate the likelihood of EAB based on where it has actually been observed; EAB is not necessarily present throughout the mapped infested areas. By the time an insect is detected, it has already dispersed, so any ash within ten miles of a known EAB location is considered to be at-risk. Including these high-risk areas, the mapped infested area now includes all or part of 130 towns in thirteen counties. The infested areas are also available for download on the ANR Atlas. <http://anrmaps.vermont.gov/websites/anra5/>.

Sign up for the **EAB Update Listserv** to receive notification of new detections, and please continue to look for signs and symptoms of the insect and report suspicious findings on VTinvasives.org. Resources are available to assist in slowing the spread of EAB and managing threatened resources.

Applying **Slow the Spread Recommendations** to the mapped Infested Area reduces the risk of spreading EAB and provides time to conduct management activities. Slow the Spread Recommendations can be found at <https://vtinvasives.org/land/emerald-ash-borer-vermont/slow-spread-of-eab>.



Biocontrol Release

EAB biological control agents were released in two locations this year. One release site was located on LR Jones State Forest in Plainfield, the first State Forest in Vermont, as well as the first State Forest to become infested with EAB. The second site was located in the town of South Hero. The biocontrol agents, *Tetrastichus planipennisi*, are tiny stingless wasps that parasitize EAB by laying eggs in EAB larvae, where they eventually hatch and grow, and ultimately kill the EAB larvae. They are known to target EAB exclusively, and do not parasitize other insects or pose a human health risk. These biocontrol releases involve securing small pieces of ash logs that contain the parasitic wasps to visibly infested trees and allowing the insects to emerge for a minimum of two weeks before the pieces of ash logs are removed. These particular parasitic wasps (or parasitoids) are effective on smaller trees and saplings, and have been shown to reduce the number of EAB larvae in young trees by as much as 50%. The goal of these releases is not to eradicate EAB (which is considered impossible in the US at this point), but to establish a self-sustaining population of the parasitic wasps that will improve ash regeneration and lessen the impact of EAB in infested areas in Vermont.

EAB Biocontrol release involves securing small pieces of ash logs containing the parasitic wasps to infested trees. Photo: FPR staff

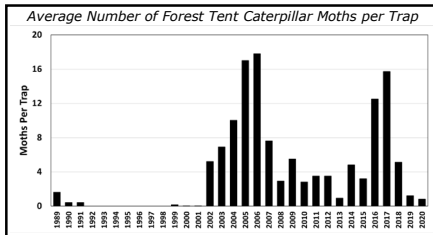
Vermont is the 30th state participating in the national EAB biocontrol program. The parasitoids were produced and supplied from the United States Department of Agriculture’s Animal and Plant Health Inspection Service (APHIS), Plant Protection and Quarantine (PPQ) EAB Parasitoid Rearing Facility in Brighton, MI.

Fall webworm (*Hyphantria cunea*), a native hardwood defoliator, was reported across the state at higher than normal levels. The nests of these caterpillars are formed in late summer/early fall and towards the tips of branches. Although the nests and feeding can be unsightly, because the defoliation is happening later in the growing season, it does not have a huge impact on overall tree health. Multiple years of heavy defoliation can lead to dieback.

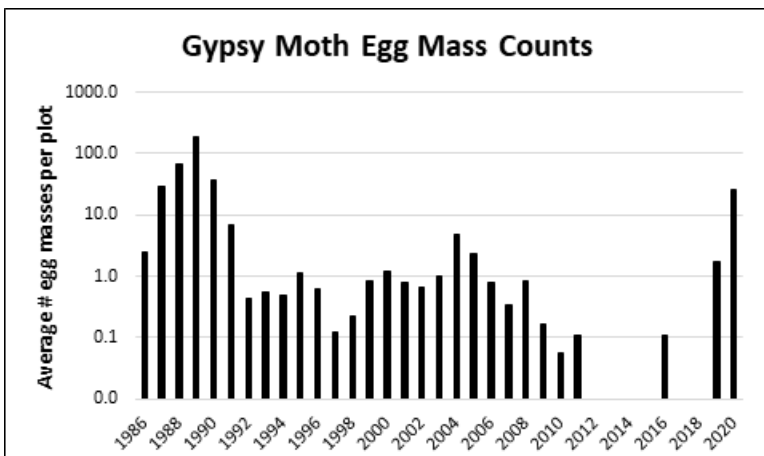


Fall webworm damage was seen across the state; close up of larva. Photo: FPR staff

Forest Tent Caterpillar defoliation was not observed this year. The number of moths caught in pheromone traps confirm that the outbreak that started in 2016 has ended.



Gypsy Moth (*Limantria dispar*) many reports of gypsy moth caterpillars were received throughout the state in June and July, although no defoliation was reported or observed. The increase in their numbers is likely due to a drier than normal spring, where *Entomophaga maimaiga* was less effective than is typical. This resulted in similarly numerous reports of gypsy moth egg masses in late summer and fall. Indeed, from our long-term gypsy moth monitoring plots we documented the highest number of egg masses in recent memory. Based on these data, some level of defoliation can be expected in 2021 through areas of the Champlain valley. The severity of defoliation will likely be influenced by spring moisture levels and the success of fungal and viral pathogens on the caterpillars.



Gypsy moth egg mass counts from long-term monitoring plots in Vermont. The average counts were the highest we've seen since 1990, and we anticipate some defoliation occurring in the state in 2021.

Multiple reports were received of hardwood defoliation due to **saddled prominent** (*Heterocampa guttivitta*) throughout the state in July, though severity was light. Heavy frass rain and scattered leaf fragments on the forest floor were the most notable effects from their feeding. Despite the number of reports, no landscape-scale damage was observed.



Saddled prominent larva. Photo: FPR staff

Maple leaf cutter (*Paraclemensia acerifoliella*) damage is predominately found on sugar maples, although this insect also feeds on other hardwoods such as red maple, beech and birch species. Larvae excise circular holes in the leaf, which is then bound together with silk, and used as protection from predators and environmental conditions.



Extensive late season damage from maple leaf cutter. Larva revealed between layers of leaf tissue. Photo: FPR staff

Pear thrips, (*Taeniothrips inconsequens*) have been observed affecting beech and maple trees in central and southern Vermont this growing season. These insects feed on opening vegetation and flower buds, causing infested branches to appear tattered and stunted. High infestation levels can cause thinned crowns and premature leaf drop. For more information visit VTinvasives.org.



Moderate damage from pear thrips feeding. Photo: R. Kelley



Gypsy moth egg masses at long term monitoring plots. Photo: FPR staff

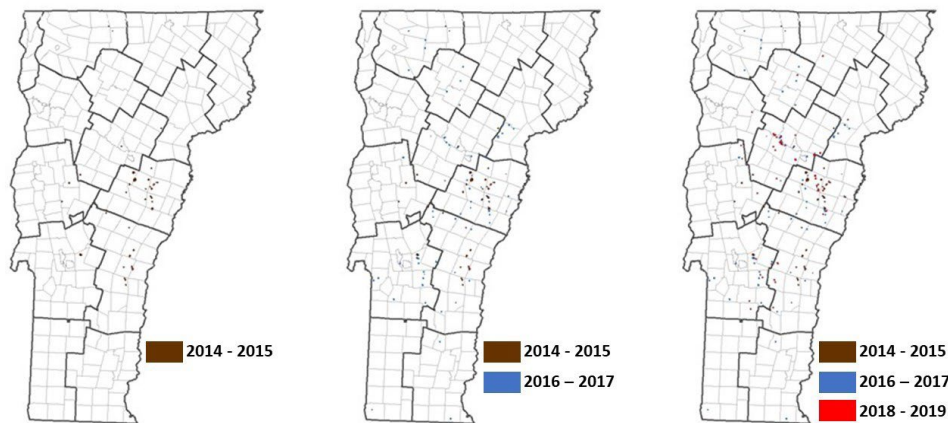
Softwood Insects and Diseases

Red pine (*Pinus resinosa*) has been in a state of decline across Vermont. This year 12 red pine health monitoring plots were established throughout the state to track crown changes and sample for suspected causes. Previously, foliar shoot blight pathogens such as *Diplodia pinea*, *Sirococcus conigenus*, and *Pestalotiopsis* spp. have been found to contribute to this decline in central Vermont in 2019. The exotic insect, red pine scale, has not been detected in Vermont since 2015, when it was only found in two locations. Pine gall weevil has also been found extensively associated with declining red pine. Plots will try and determine if this declining pattern and fungal complex is homogenous across the state and what role if any, the insects play in this decline.

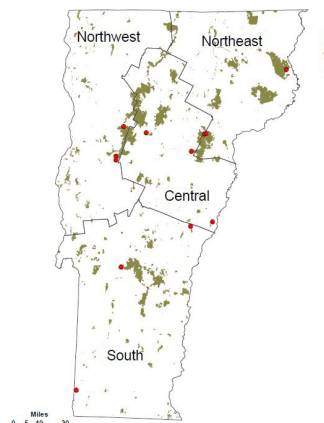


Left to right: *Diplodia* tip blight (*Diplodia sapinea*), Pine gall weevil damage caused by *Podapion gallicola* and stand level decline of red pine.

Mapped Red Pine Mortality 2014 - 2019

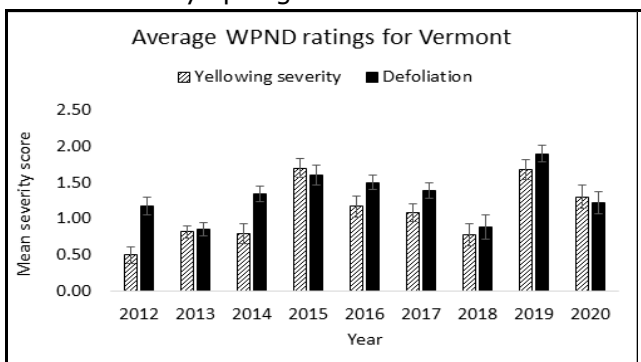
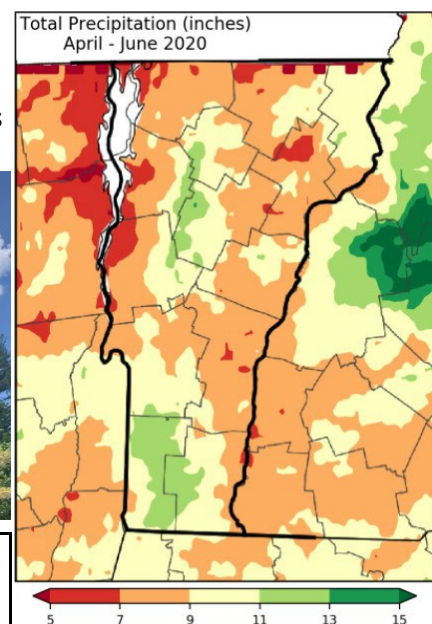


Red Pine Monitoring Plots



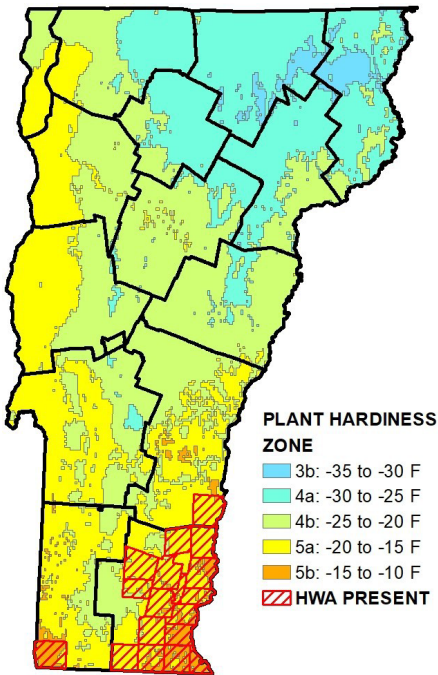
White pine needle damage: **white pine needle diseases** (WPND) have affected pine foliage in Vermont for the last decade, and this year was no different. While damage was lower than in 2019, significant yellowing and early needle-drop were present throughout the state. The expression of WPND is worse in years following wet springs (e.g., 2020 damage is influenced by 2019 weather). We expect to see the severity lessen in 2021 following the dry spring this year.

The expression of WPND is linked to the amount of humidity and moisture from the previous spring (e.g., 2020 damage is influenced by 2019 weather). Spore production typically peaks in June during shoot elongation. We expect WPND to be present again in 2021, but to be less severe than in recent years due to the dry spring in 2020.

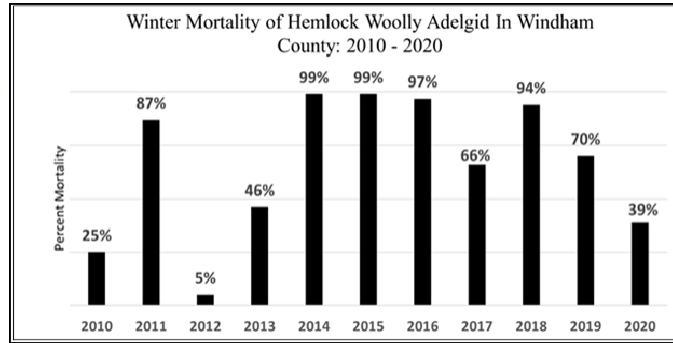


Yellowing severity and defoliation ratings on White Pine Plots, 2012-2020. Mean severity and defoliation were less in 2020 than 2019.

Needle yellowing on symptomatic white pine. Photo: FPR staff



Vermont's **hemlock woolly adelgid** (HWA) infestation remains primarily in Windham County, with small spots in Windsor and Bennington Counties. Much like last year, no large spread of the infested area was observed this year. Winter mortality of the insect was fairly low and the recovery rate of the summer generation was high resulting in higher than normal population counts. A new project to monitor summer mortality was initiated this season; the data will not be ready in time for this publication. The average winter mortality was only 39%, well below the threshold of 91-92% mortality which restricts expansion of the population.



To augment biocontrol efforts that began in 2009, 510 *Laricobius nigrinus* predatory beetles were released in November at a site in Brattleboro (Windham Co.). Beetles have also been released in Guilford (Windham Co.) and Pownal (Bennington Co.)

Vermont's HWA infestation remains centered in Windham County, with no expansion to new towns detected in 2020 despite a low HWA mortality rate in winter 2019-20, which dropped to 39%.

Compounding the risk to hemlock, the incidence of **elongate hemlock scale** (EHS) seems to be on the rise in southern Windham County due to natural spread. In addition to EHS populations present in southern Vermont, a property in northwestern Vermont was found to have EHS on planted fir stock in 2019. Treatments followed on this property and EHS was eradicated from the site. However, in August 2020, a report was received from another northwestern town (Shelburne) and EHS was confirmed. The extent of this population is being monitored and its severity will be evaluated in early 2021. Landowners affected by the new detection plan on treating their respective properties to control the insect.



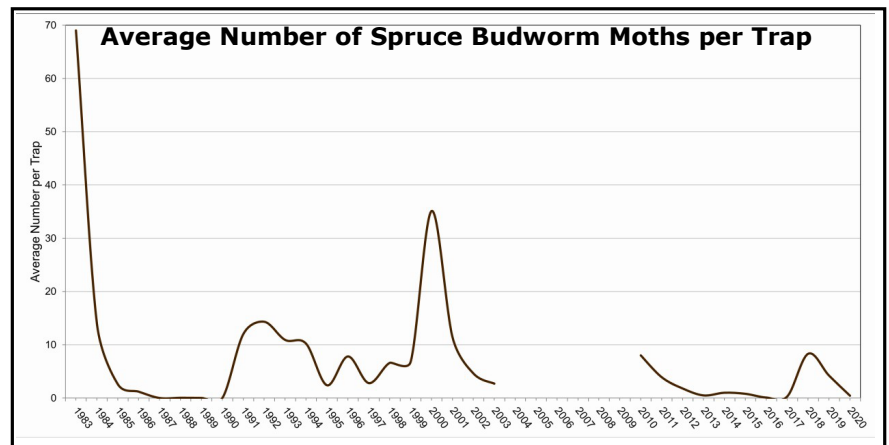
Elongate Hemlock Scale observed in Shelburne Vermont.

Treatment of hemlock for managing elongate hemlock scale.

Photo: FPR staff



Spruce budworm trap catches declined again this year. There were an average of 0.44 moths per trap in 2020 compared to 4.2 moths per trap in 2019. Traps are deployed in Caledonia, Chittenden, Essex and Orleans Counties. Defoliation by spruce budworm is not anticipated for 2021.



Spruce budworm moth catches remain low

Exotic Forest Pests Threatening Vermont

Established Pests:

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

The USDA is deregulating two insects of importance to the forest health community, the tree-killing emerald ash borer and the less known velvet longhorn beetle, *Trichoferus campestris*. The velvet longhorn beetle stows away in furniture and has been found in 9 states in the U.S. It primarily attacks fruit trees but has been found on many other hardwoods. It is not clear whether it can attack healthy trees. The USDA will no longer alert states that it has been found in imported material.

Please note that the state law prohibiting the movement of pests is still in place, as are the state recommendations for the movement of ash.

Pests not known to occur in Vermont:

Beech leaf disease (BLD) is of increasing concern. This disease is known to occur in Ohio, Pennsylvania, New York, and Connecticut with recent detections in Massachusetts in the towns of Plymouth, Worcester, and Blandford. Several states have established long-term monitoring plots utilizing protocols developed with the BLD Survey and Monitoring Team, a partnership between the USDA Forest Service, Cleveland Metroparks, the Ohio Division of Forestry, and the Ontario Ministry of Forestry. Vermont will be establishing plots in asymptomatic stands in 2021.



Symptoms of beech leaf disease include dark stripes and yellowing between the veins. Photo: DEC NY

Vermont has been participating in a regional **oak wilt** survey. This year we investigated a suspect tree in Rutland County. Samples were taken and sent off for identification. Fortunately, oak wilt was not detected. We will continue to investigate suspects as they become known. If you have seen a tree with symptoms that match oak wilt, please visit [VTinvasives.org](https://www.vtinvasives.org)'s Report it so we can follow up on your observation. For more information: <https://www.vtinvasives.org/invasive/oak-wilt>.

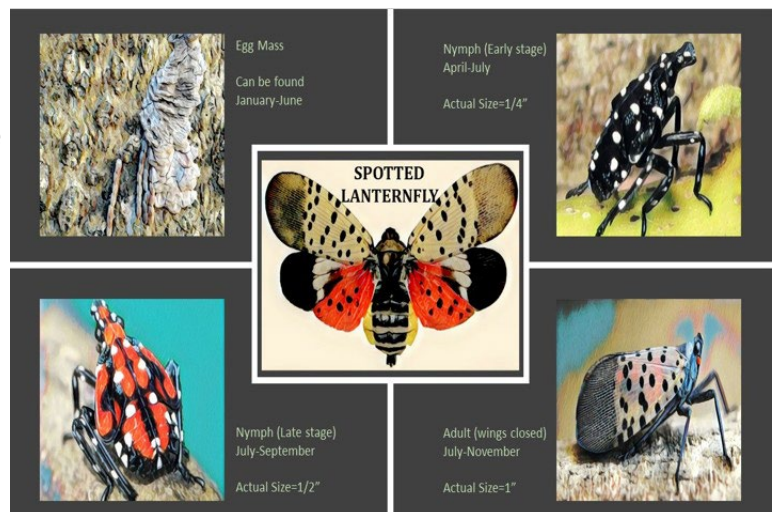
Asian longhorned beetle is not known to occur in Vermont, however education and outreach that can promote early detection remains a priority. In 2019, the insect was declared eradicated from New York City.

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

Spotted Lanternfly: In April of 2020 a nursery from an infested state shipped trees that had spotted lanternfly (*Lycorma delicatula*) egg masses on their upper branches. The company was operating under a compliance agreement but the staff only removed the egg masses from the tree trunks, not the upper limbs. These trees were shipped to all the New England states. Many went to a nursery in NH, which then distributed the trees to clients elsewhere.

NH found 14 live SLF at the nursery, and ME reported finding egg masses. VT nursery owners and landscapers received some trees from this nursery but all inspections conducted so far have been negative for SLF. CT has 4 towns with SLF, though not from this nursery incident.

Spotted lanternflies are planthoppers that consume some agricultural commodities like grapes and hops and can feed on trees such as red and silver maples, willows and walnuts. They feed on more than 70 host plant species. In addition to harming food plants, they create a public nuisance by exuding honeydew, a sticky substance, on all surfaces, which then attracts sticky mold. If you see or think you see SLF, please contact the state entomologist or a forest health specialist.



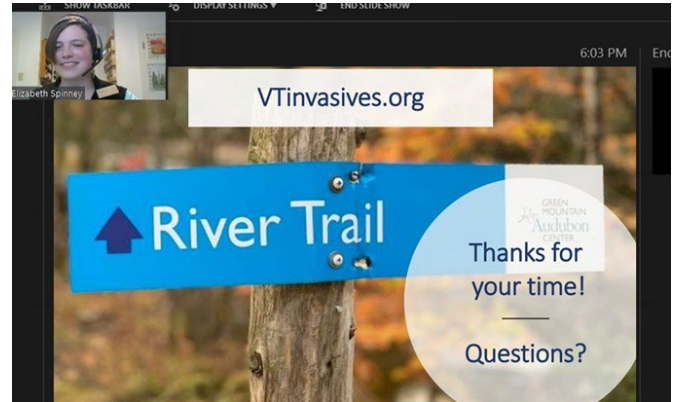
Vermont Agency of Agriculture spotted lanternfly informational post card sent to resource professionals.

Non-Native Invasive Plant Programs

Faced with unprecedented challenges, **non-native invasive plant (NNIP)** management efforts by the Forest Health Invasive Plant program continued in 2020, but with creative solutions to limited capacity due to hiring freezes and safety guidelines. Progress was made on control, outreach, and education made possible through several grant-funded opportunities. FPR's Invasive Plant Coordinator fielded hundreds of inquiries about invasive plants – a fantastic uptick that we hope to attribute to more people spending time in the forests and on the trails. While we could not involve volunteers directly with our efforts, it is worth noting that since 2014, 3,810 volunteers have assisted the program with direct management of NNIP in Vermont.

The Forest Hero! Network was established in late 2018, with four trainings conducted between October 2018 and October 2019. Without being able to provide in-person experiences for existing or new volunteers, the program is looking into making this training virtual, and offer a training in the spring of 2021. The Network provides training for local leadership in communities, to motivate citizens to engage in non-native invasive plant management, and is a collaboration between Vermont Coverts: Woodlands for Wildlife, Vermont Department of Forests, Parks & Recreation, and VTinvasives.org. Thirty people have completed the training.

The Invasive Plant program did offer **virtual workshops** this year, with local municipal road crews, State Parks staff, and with trail volunteers, and created a training video that was published on the ANR YouTube site as part of a collaboration with ECHO Aquarium and Science Center.

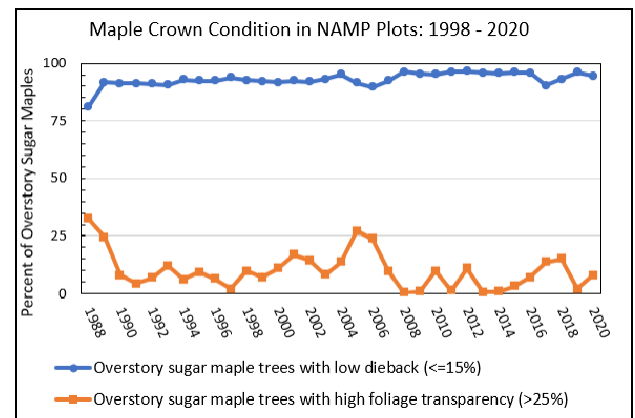


Sign of the times – Invasive Plant Coordinator, Elizabeth Spinney, presenting a virtual workshop to Audubon Vermont trail volunteers, teaching about invasive plant ID and control.

Monitoring Forest Health

Vermont has continued to monitor sugar maple health in sugarbushes and forest stands since 1988. In these **North American Maple Project (NAMP)** plots, 94% of overstory sugar maples were rated as healthy in 2020 (less than 15% dieback), which is slightly lower than in 2019 which was 96%. There was an increase in trees with thin foliage which was 8% in 2020 compared to 2% in 2019.

Urban FIA work continued for the fifth year in Vermont, despite the COVID-19 pandemic. 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 Urban-FIA program, targeting urban areas statewide rather than focusing on a single metropolitan area. Although all field operations were put on hold in early summer, conditions allowed for data collection to begin in early fall. In 2020, all plots (17) were completed by mid-November thanks to efforts of the US Forest Service. Data are collected on a seven-year cycle, after which a statewide report will be published. The first full cycle will be complete for Vermont in 2022.



Sugar maple crown condition showed a slight decline in maple health monitoring plots. The dry conditions this year most likely contributed to this.



For more information, contact the Forest Biology Laboratory at 802-505-8259 or:

Windsor & Windham Counties.....
 Bennington & Rutland Counties.....
 Addison, Chittenden, Franklin & Grand Isle Counties.....
 Lamoille, Orange & Washington Counties
 Caledonia, Orleans & Essex Counties.....

Springfield (802) 289-0613
 Rutland (802) 786-0060
 Essex Junction (802) 879-6565
 Barre (802) 476-0170
 St. Johnsbury (802) 751-0110