

FOREST HEALTH REVIEW

2023 REPORT ON THE HEALTH OF VIRGINIA'S FORESTS



Spongy moth damage near the Shenandoah Valley



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FOREST HEALTH BY THE NUMBERS

WELCOME

The Forest Health program at the Virginia Department of Forestry (DOF) surveys and monitors Virginia for major forest pests, pathogens, non-native invasive plants and other forest disturbances. This data is shared with and used by partners, stakeholders and other interested parties to guide forest management activities. The Forest Health Review summarizes significant forest health issues and program activities each year in Virginia.

Contact the Forest Health Program Staff

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1,586,750 acres of aerial survey with digital mobile sketch mapping
37,042 acres with spongy moth defoliation mapped by DOF
26,645 acres with saltwater damage mapped along the coast
5,236 southern pine beetles (SPB) caught in funnel traps
3,000 parasitoids released for emerald ash borer (EAB) control
2,659 acres of pine thinned with SPB prevention funds
2,317 predator beetles released for hemlock woolly adelgid (HWA) control
1,046 attendees present during forest health presentations
261 ash trees treated via EAB Cost-Share Program
173 eastern hemlock trees treated for HWA
91 forest health ground observations reported by DOF staff
75 spotted lanternfly egg mass surveys
58 acres of wavyleaf grass treated
30 SPB traps placed in high-risk areas
12 beech leaf disease surveys completed

INVASIVE SPECIES OUTREACH

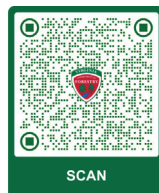
The battle against invasive plants requires constant vigilance, but many landowners may not know where to start. To assist their efforts, Forest Health staff have begun creating a new video series hosted on the DOF YouTube channel. Videos will cover a range of topics including invasive plant identification, different treatment methods and herbicide information, and will be posted to our YouTube channel (<https://www.youtube.com/playlist?list=PLIfcCRH17LbNuPF04ec-WV9aYK5AQDKoT>).

Another great resource to familiarize yourself with invasive species is the Wild Spotter app (<https://wildspotter.org/>). Best of all, you can learn about invasive species while assisting our management efforts! The Wild Spotter app is a citizen science tool that is loaded with photos and information about species we are most concerned with in our forests. Simply familiarize yourself with the species list before you head out to the forest and, if you recognize an invasive species on your hike, report it in the app. This data helps us make informed management decisions while also raising awareness for the public.

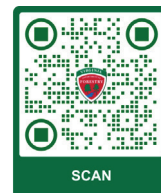


The DOF Forest Health program
(left to right)
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Plants Videos*



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HEMLOCK WOOLLY ADELGID

Protecting hemlock trees from the invasive hemlock woolly adelgid (HWA) continues to be a priority for the DOF Forest Health program. The Forest Health team is always looking for potential treatment sites where hemlock trees are healthy and in good condition despite having HWA infestations. One such site is Hungry Mother State Park in Smyth County. In May 2023, DOF staff worked with the Virginia Department of Conservation and Recreation (DCR) district resource specialists to treat 173 hemlock trees in a single day using the soil drench treatment method. This method protects hemlocks for up to 7 years against HWA feeding. It is a highly effective treatment method when used in appropriate locations and is often less expensive than other treatment options. Check out our new video that demonstrates this soil drench method: <https://www.youtube.com/watch?v=5Zke-QQ3Des>.

In addition to chemical treatments, biological control is part of the long-term plan to protect Virginia's hemlocks. Predator insects such as *Laricobius* beetles and *Leucotaraxis* flies are currently being reared and released to control HWA populations in eastern North America. In 2023, the Forest Health program coordinated releases of *Laricobius* beetles and *Leucotaraxis* flies on public land in Virginia. Beetles were released at Paul State Forest and First Mountain State Forest in Rockingham County, and Scotts Run Nature Preserve in Fairfax. The *Leucotaraxis* silver flies were also released at First Mountain State Forest. These predators will help control HWA in forested settings where chemical control is impractical or difficult. The beetles feed on HWA in the fall and winter while the flies feed on HWA in the spring. We are hopeful that these two complimentary biocontrol agents will control HWA populations and protect more hemlocks in our forests.

HWA Cost-Share Program

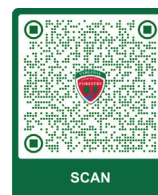
While the DOF Forest Health program has worked to safeguard hemlock trees on public land for many years, threatened stands of hemlock also occur on privately owned land. To encourage and assist landowners with HWA treatments on their property, DOF expanded the Forest Pest Treatment Cost-Share Program to include treatment practices of HWA. The response to DOF's Emerald Ash Border (EAB) Cost-Share Program has been overwhelmingly positive since its establishment in 2018. Much like the EAB Cost-Share Program, our new HWA



DOF and DCR staff treated hemlocks at Hungry Mother State Park.

Cost-Share Program will provide financial assistance to organizations and landowners for treatment of eastern or Carolina hemlock trees using approved treatment practices. These practices include trunk injection, soil drench, soil injection or basal bark spray of either imidacloprid or dinotefuran products. Any applications not conducted by landowners on their property must be conducted by a certified pesticide applicator in good standing with Virginia Department of Agriculture and Consumer Services (VDACS). All treatment applications must be conducted in accordance with the directions for use as appear on the product label that has been approved by the Environmental Protection Agency (EPA). A complete application consists of application [Form 6.7](#) which can be found on the DOF website, a treatment quote or estimation of costs, and a site visit from a DOF forester. To discuss management options for your at-risk trees, contact your local forester or Forest Health staff. We hope that this cost-share program will enable more landowners to protect hemlock trees on their property and contribute to the overall preservation of hemlocks across the Virginia landscape.

View Invasive Insects Videos



Treating hemlocks with soil drench application of insecticide

December 2023

SPONGY MOTH, CONTINUED

But there is some good news! In late June, Forest Health staff observed a number of spongy moth caterpillars impacted by natural population control factors, mainly the *Entomophaga maimaiga* fungus and *Nucleopolyhedrosis* virus (NPV). *E. maimaiga* is an introduced fungus that only targets the spongy moth and leaves caterpillars desiccated. NPV is a naturally occurring virus that impacts the caterpillars' internal organs and typically only is seen

when populations are elevated. If *E. maimaiga* and NPV attack enough caterpillars, the spongy moth population will be lower next year. Shenandoah National Park and the USDA Forest Service will perform spongy moth egg mass surveys to predict next year's population levels and determine what, if any, control efforts are needed. Hopefully, next year, there will be significantly fewer of these very hungry caterpillars!



Spongy moth caterpillar



Spongy moth females lay egg masses on an oak tree.



Spongy moth caterpillar feeding on oak foliage



Spongy moth damage observed over Shenandoah National Park

ASH TREATMENT PARTNERSHIPS

Since the establishment of DOF's emerald ash borer (EAB) program in 2018, the Forest Health program has collaborated with partners around the state working to protect Virginia's ash trees threatened by the invasive EAB. While DOF manages approximately 74,969 acres of state forest land, other state and federal partners have similar land with valuable ash populations. By collaboratively managing ash trees on each respective property, DOF's Forest Health program and its partners can better protect the ash resource of the Commonwealth.

For the past several years, DOF has worked with the Virginia Department of Conservation and Recreation (DCR) to treat ash in Southeast Virginia. Recently, a survey by DCR's Natural Heritage division identified an undiscovered pocket of green ash in Machicomoco State Park in Gloucester County. DCR reached out to DOF to discuss treatment options and management strategies for this untreated stand totaling around 6.4 acres. This past summer, the Forest Health team, along with other DOF and DCR staff members, visited the site to implement an integrated pest management (IPM) strategy by performing chemical injection treatments and biological control. Insecticides provide short-term protection (2-3 years), while parasitoid wasps of EAB could provide long-term biological control. Through the collaborative effort at Machicomoco State Park, 30 ash trees were directly treated for EAB and 200 acres are now part of DCR's EAB biological control management area. After working with DOF at Machicomoco State Park, DCR staff borrowed injection equipment to treat additional ash trees at Chippokes State Park. The protection of natural areas is a team effort!

A similar opportunity for cooperative EAB management presented itself when both the Virginia Department of Wildlife Resources (DWR) and the U.S. Air Force (USAF)



Photo credit: DCR, Virginia State Parks

Forest Health staff teach DCR staff how to trunk inject for EAB.

contacted the DOF Forest Health program about protecting their own respective ash resources. Both DWR and USAF own tracts of land with ash populations that are well suited to an IPM strategy of both chemical and biological control treatments. DWR's G. Richard Thompson Wildlife Management Area in Fauquier County has black ash scattered around the expansive 4,000 acre property, the majority of which exist in a 15-acre

area. DOF has treated ash and released biocontrol agents on this wildlife management area in previous years and continued chemical treatments in 2023 while the previously released biocontrol parasitoids establish in the area. In the Bethel Reservoir property of the USAF Joint Base Langley-Eustis, Forest Health staff helped to release a second year of biocontrol agents to supplement the rotation of chemical injection treatments. Environmental Biologist Cecilia Boyd for Joint Base Langley-Eustis spoke about their long-term ash management plan for the approximately 40-acre property:

"Langley hosts the three state-champion pumpkin ash trees near our Bethel Reservoir site that characterize our natural heritage amidst the cultural heritage sites of Big Bethel. Although we cannot protect all our ash, we intend to maintain a viable population of 35 pumpkin ash from the emerald ash borer through systemic pesticide injections in partnership with the Department of Forestry. We expect to lose most of our ash to EAB but will seize best practices as they are available – like predator biocontrol – to give the trees a chance to survive."

While the Forest Health team realizes that not all ash trees in the Commonwealth can ultimately be saved, collaborative treatments and landscape management practices can greatly increase the scope of DOF's ash treatment program to protect more ash trees statewide.

WAVYLEAF GRASS

One of the most concerning emerging invasive plant species in Virginia is wavyleaf grass (*Oplismenus undulatifolius*). This species, originally from Eurasia, was first located in Maryland state parks in 1996. We still aren't sure exactly how the grass ended up there, but it established itself across Maryland very quickly. This rapid spread continued and the first Virginia sighting was discovered in Shenandoah National Park less than 10 years later. Wavyleaf grass can be identified by its wavy leaves and hairy stem, and thrives under a thick forest canopy with little to no sunlight.

The plant is of particular concern because of its ability to create monocultures on the forest floor, outcompete other vegetation such as forbs and grasses, and prevent forest regeneration. One of the most frightening characteristics of this plant is its reproduction. In late summer, wavyleaf grass begins producing a large quantity of very sticky seeds. The glue-like substance ensures that seeds get stuck to whatever passes the plant. Shoes, bike tires, pets and wildlife are all potential vectors. If these things aren't properly cleaned after coming across a wavyleaf infestation, they will move seeds into different areas. This means that places with high visitation and recreation such as state and national parks, state and national forests, and recreational trails such as the Appalachian Trail are all at high risk since they see so many visitors traveling from other areas.

This year, the DOF Forest Health program launched a new initiative focused on education, surveillance and treatment of wavyleaf grass. As a relatively new species of concern, raising awareness about wavyleaf grass and its invasive potential is paramount to slowing the spread. This year, we designed informational signage and created content on wavyleaf identification for our social media channels. In the field, we focused surveillance efforts on our state forests and additional state-owned lands, and surveyed more than 255 acres. Multiple new infestations were identified and valuable data was gathered on the size and density of previously reported locations. This data is critical in determining our treatment efforts for next year.

Many of our partners at other state agencies are also battling wavyleaf infestations and we were able to assist their treatment efforts. Through our partnership with Virginia State Parks, we treated 37 acres at Powhatan



An advanced wavyleaf infestation crowds out native species.



The namesake hairy leaves and a wavy stem are key identification features.

State Park. We partnered with the Virginia Department of Wildlife Resources to assist with treating an infestation at Lake Shenandoah. We also treated wavyleaf on a few of our own properties. All together, we treated approximately 58 acres this year. Current treatment methods are limited to either hand pulling or herbicide spraying with either glyphosate or clethodim, and there is a relatively short window in the summer where treatment can occur before seeding begins. All treatment was either completed through hand pulling, bagging and removing specimens, or through use of backpack sprayers. Not easy work in the dense forests where wavyleaf thrives! We will continue our survey and treatment methods next year and work to slow the spread.

SOUTHERN PINE BEETLE



Pine bark beetle damage in a neighborhood

The southern pine beetle (SPB) is the most destructive native pest in the Southeastern United States. It is not uncommon to see SPB, or similar pine bark beetles such as *Ips* and black turpentine, attacking stressed trees. Old, injured or densely growing pines are most vulnerable to attack by bark beetles. When populations of beetles build to outbreak levels, they are capable of infesting healthy pine trees as well and this can lead to significant forest damage. In addition to causing mortality in planted and natural pine stands, pine bark beetles may also attack pines in urban/suburban settings. Neighborhoods, campgrounds and golf courses are often situated amidst unthinned pines that may be overmature and susceptible to beetle damage. Bark beetle infestations in these residential areas can be particularly difficult to manage, so prevention is key. Keep trees healthy by reducing environmental stress (e.g., soil compaction and mechanical damage), mulching around the base of yard trees and irrigating during drought conditions, and removing injured or diseased trees. Some insecticides are effective at preventing bark beetle attack, but the entire tree must be sprayed so this is usually only recommended for high-value yard trees.

DOF's Forest Health program participates in a southwide SPB survey, coordinated by the USDA Forest Service, to monitor populations in Virginia. Pheromone traps are deployed each spring in high-risk areas, and DOF foresters and partner agency staff collect samples over 4 weeks. Thirty traps were deployed in 2023 in which a total of 5,236 SPB and 7,049 clerid beetles (predators of the SPB) were caught. All results were entered into an online database, and data was sent to a Pine Beetle Prediction Portal (<https://www.spbpredict.com/>), which models the potential for an SPB outbreak within certain counties. These predictions are summarized in the table below. We will continue to monitor the entire state for pine bark beetle activity, but will pay close attention to Chesterfield, Cumberland and Hanover counties where the most SPB activity is expected, as well as Gloucester, and King and Queen counties that also had elevated SPB counts.

Table 1: 2023 Southern Pine Beetle Predictions*

County	Probability of any Spots	Probability of an Outbreak
Accomack	8.1%	1.1%
Charlotte	3.7%	0.4%
Chesterfield	18.0%	3.2%
Cumberland	44.5%	15.3%
Dinwiddie	8.3%	1.2%
Franklin	7.6%	1.1%
Gloucester	13.9%	2.3%
Hanover	14.7%	2.7%
King and Queen	13.4%	2.1%
Pittsylvania	3.7%	0.4%
Sussex	3.9%	0.4%

*Predictions are based on a zero-inflated Poisson model fit to historical data from 1988-2009 (Aoki 2017). The most important drivers of the model predictions are SPB trap captures in the current spring and SPB spots the previous year. The SPB prediction project is supported by the USDA Forest Service: Science and Technology Development Program (STDP).

VASCULAR STREAK DIEBACK

Nurseries in Virginia have become concerned about dieback observed on redbud and other woody ornamentals. Symptoms include stunting, yellowing, marginal scorching and wilting of leaves followed by branch dieback. The wilting typically starts at the top of the plant and progresses downward. Streaking of the vascular tissue may be evident when a symptomatic branch or stem is cut. These symptoms have been observed on several woody ornamental species in Virginia, but most commonly on redbud, maple and dogwood. The problem is being called “vascular streak dieback”; however, a single causal agent has not been scientifically confirmed in the United States. The fungus *Ceratobasidium theobromae* (synonym: *Rhizoctonia theobromae*) has been consistently associated with vascular tissue of nursery stock exhibiting these symptoms, but proof that *C. theobromae* is the causal agent has not been established.

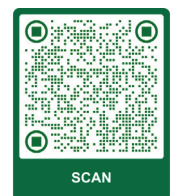
There are currently no official recommendations for management of vascular streak dieback, but using best cultural practices to minimize plant stress may decrease the chance of infection. Plants should be planted in the appropriate site, at the appropriate depth, and properly spaced in sites with adequate drainage and sufficient irrigation. When pruning woody ornamentals, the pruners should be disinfected between plants and the pruned wood removed. It is recommended that growers regularly monitor plants for signs of disease. If vascular streak dieback is suspected, samples may be submitted to the Virginia Tech Plant Disease Clinic through a local Virginia Cooperative Extension office. The following link has more information and describes how to properly collect a sample: <https://www.pubs.ext.vt.edu/SPES/spes-483/spes-483.html>.



Photo credit: Devin Bily, VDACS

Vascular streak dieback on redbud: branch dieback, stunted leaves and streaking in the vascular tissue.

View VCE
Vascular Streak
Dieback Factsheet



HETEROBASIDIUM ROOT DISEASE



Resin-soaked roots with soil attached



Photo credit: Devin Bily, VDACS

HRD conks at the base of an infected pine tree

Another new disease? Hardly! *Heterobasidium* root disease (HRD), formerly known as fomes, annosus or annosum root rot, has been part of the landscape for some time. It impacts loblolly, longleaf, shortleaf, Virginia and eastern white pine in the Southeastern states, and is most commonly identified after thinning operations in stands with well-drained sandy soils, or stands planted on abandoned farmland or pastures.

HRD is difficult to diagnose without sending root samples to a pathologist for confirmation, but there are a few signs and symptoms to look for. Conks under duff around the base of infected trees (live or dead) have been documented as a means of field diagnosis primarily during periods of high moisture and cooler temperatures, but Forest Health staff have found these conks to be elusive during our site visits. Another noted means of field diagnosis is resin-soaked roots or woody material that decays to white stringy rot. Resin-soaked roots are becoming easier to locate and sample thanks to guidance from pathologists in Virginia. The easiest symptoms of heterobasidium root disease to observe above-ground at stand-level are poor growth patterns, thin and/or fading crowns, and increased susceptibility to windthrow.

The disease is endemic in the southern U.S. Once *Heterobasidium irregulare* spores have infected a tree, often through tree wounds, the fungus grows through the root system and can even spread to neighboring trees via root contact. As the fungus spreads, it decreases the ability of the root system to effectively transport water and nutrients throughout the tree, leading to tree decline and eventual mortality. Cut stumps after thinning are perfect vessels for spores to infect; symptoms appear 2 to 3 years following thinning operations with the most severe symptoms showing in years 4 to 6. HRD can persist in roots until they completely decay, so adjacent live trees may continue to become infected even after diseased trees are removed.

In 2023, Forest Health staff met with DOF area foresters in New Kent and King William counties to visit declining pine stands that were alarming the landowners. Samples were collected from each location and sent to a pathology lab where HRD was confirmed. What does this mean for these stands? No management activities were recommended – it is often best to let infected trees grow until harvest even if some loss will occur. However, there are a number of considerations if a landowner is planning to thin or re-plant on a stand where HRD has been confirmed. It may be advisable to plant trees with wider spacing to reduce the need for thinning or plan thinning operations during the summer months when hot, dry conditions are not favorable for fungal growth. A preventative treatment of liquid borate can be applied to cut stumps after thinning. Clearcut harvests usually stop the progression of the disease and there is no concern for replanting on these sites. Remaining proactive by scouting stands and assessing forest health will help you determine if HRD is present and the best course of action to take.

January



Photo: Robert L. Anderson, USDA Forest Service, Bugwood.org

- ◆ Vole activity/damage may increase under the protection of snow
- ◆ Begin to survey for fall cankerworm egg masses

February



Photo: Richard Gardner, Bugwood.org

- ◆ Survey for spotted lanternfly egg masses in winter
- ◆ Survey for eastern and forest tent caterpillar egg masses
- ◆ Spring Fire Season: Feb. 15 – Apr. 30

March



Photo: David Cappaert, Bugwood.org

- ◆ Eastern tent caterpillar eggs hatch around bud break
- ◆ Fall cankerworm eggs hatch in spring

April



Photo: USDA Forest Service - Region 8 - Southern, Bugwood.org

- ◆ Fusiform rust fruiting bodies are evident
- ◆ Place southern pine beetle pheromone traps

May

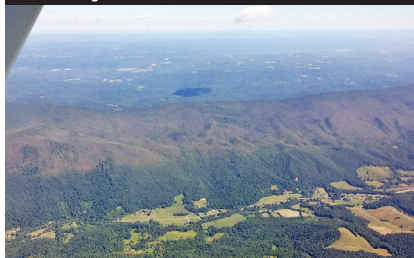


Photo: VDOF

- ◆ Defoliation by fall cankerworm and spongy moth evident
- ◆ Spotted lanternfly eggs hatch
- ◆ Anthracnose symptoms may appear on sycamore
- ◆ Ideal time for spongy moth treatment

June



Photo: VDOF

- ◆ Peak adult emerald ash borer activity, ideal month for treatment
- ◆ Locust leafminer larvae start feeding
- ◆ Monitor sassafras and redbay for laurel wilt disease

July



Photo: VDOF

- ◆ Spongy moth adults present, females begin to lay eggs
- ◆ Adult yellow-poplar weevil present and active
- ◆ Bacterial leaf scorch symptoms present on leaves

August



Photo: Linda Haugen, USDA Forest Service, Bugwood.org

- ◆ Fall webworm visible on trees
- ◆ Late season native defoliators, such as orange-striped oakworm, walnut caterpillar, and oak skeletonizer are present

September



Photo: VDOF

- ◆ Survey underside of beech canopy for beech leaf disease
- ◆ Emerald ash borer larvae feed under ash bark through fall and winter

October



Photo: VDOF

- ◆ Spotted lanternfly adults lay egg masses
- ◆ Fall fire season Oct. 15 - Nov. 30
- ◆ Survey for spongy moth egg masses through January

November



Photo: VDOF

- ◆ Hemlock woolly adelgid evident
- ◆ Rake fallen leaves to prevent the spread of anthracnose and other foliar diseases

December



Photo: William A. Carothers, USDA Forest Service, Bugwood.org

- ◆ Place fall cankerworm bands-remove in February
- ◆ Scout for heterobasidion conks in fall and winter

BEECH LEAF DISEASE

Beech leaf disease (BLD) is a foliar condition impacting beech trees. The most obvious symptom is interveinal banding where tissues between leaf veins darken. As the disease progresses, leaf curling and discoloration become more evident. Over time, beech bud production decreases, the canopy thins, and tree mortality may occur in 2 to 7 years. These symptoms appear to be associated with a foliar nematode that overwinters in leaf buds. First detected in Ohio in 2012, BLD has now been observed in many New England states and Ontario, Canada. Prince William County was the first detection in Virginia (2021), and BLD has since been found in Fairfax, Stafford and Loudoun counties. DOF Forest Health staff continue to survey locations with high concentration of American beech. If you find symptomatic beech leaves, snap a photo and send it to the Forest Health program!



Photo credit: Val Huelsman, VCE

Interveinal banding on a beech leaf caused by beech leaf disease

For more information about services or programs in your area, contact your local DOF office:

www.DOF.Virginia.gov



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