



FOREST HEALTH REVIEW

January 2021



Ips beetle spot within a pine stand.



Lightning strike that initiated an ips beetle spot.

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GREETINGS

What a year it has been! Much of the world changed, but forest pests and other disturbances continue on as normal. We are very fortunate that much of our fieldwork is already socially distanced and that we were able to carry out routine forest health monitoring and treatment work despite statewide restrictions. 2020 was another busy year for the Virginia Department of Forestry (VDOF) forest health staff – we treated more ash trees in all parts of the state (page 6), trapped for southern pine beetle and monitored Ips beetle activity (page 3), and surveyed tree-of-heaven (page 8). With people staying close to home and spending more time outside, forest health inquiries were constant. Forests and yard trees are appreciated as an escape from virtual Zoom meetings and the importance of maintaining healthy forests has become even more evident. Please continue to reach out to forest health staff with any questions and we hope that you have a safe and good 2021!



Lori Chamberlin, forest health program manager
(434) 220-9026
lori.chamberlin@dof.virginia.gov



Katlin DeWitt, forest health specialist
(434) 220-9060
katlin.mooneyham@dof.virginia.gov

FOREST HEALTH 2020 IN NUMBERS

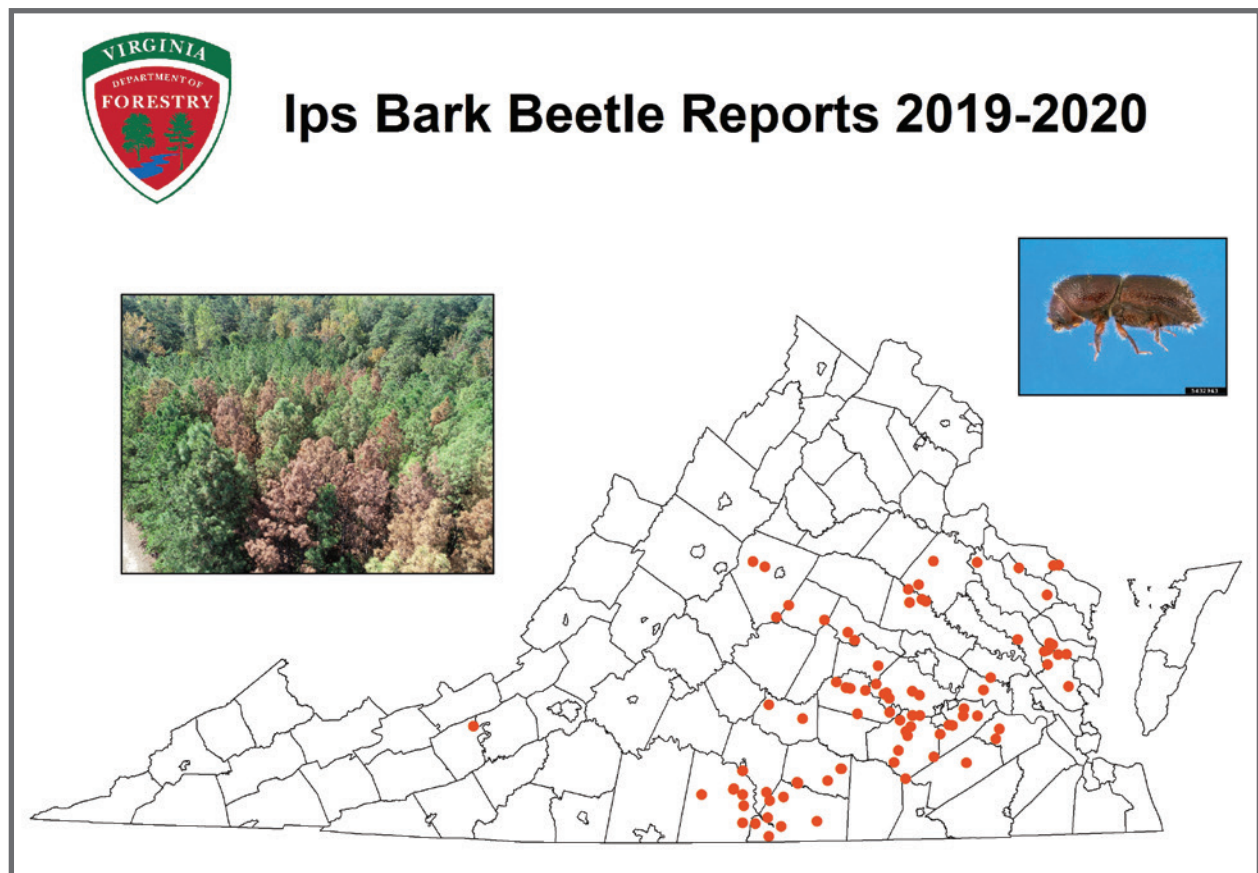
- 394,938 acres** of aerial survey
- 3,306 parasitoid wasps** released for emerald ash borer control
- 1,687 acres** thinned with southern pine beetle (SPB) prevention funds
- 510 predator beetles** released as biological control of hemlock woolly adelgid
- 478 ash trees** treated via VDOF ash treatment cost-share program
- 400 Virginia Tree and Forest Health Guides** produced for distribution
- 333 acres** of longleaf restoration funded with SPB prevention funds
- 164 forest health ground observations** reported by VDOF personnel
- 157 ash trees** treated on Virginia state lands
- 136 eastern hemlocks** treated with chemical soil drenches
- 100 goats** allowed to graze at Paul State Forest
- 25 southern pine beetle traps** deployed
- 16 forest health presentations** given
- 10 spotted lanternfly traps** monitored
- 7 emerald ash borer traps** deployed

IPS BARK BEETLE ACTIVITY AND SPB TRAPPING REPORT

Due to the threat of southern pine beetle (SPB) outbreaks in pine stands, Virginia participates in a southwide SPB survey, coordinated by the USDA Forest Service and the Texas A&M Forest Service. This program monitors populations of southern pine beetles and predator clerid beetles using pheromone traps that are deployed each spring. Each trap is baited with frontalin (SPB aggregation pheromone), a Sirex lure (primarily *alpha*-pinene), and the SPB pheromone *endo*-brevicomin to boost attractiveness to SPB adults. This year, 25 traps were placed in the following Virginia counties: Cumberland, Chesterfield, Amelia, Lunenburg, Halifax, Sussex, Hanover, Spotsylvania, Accomack, Henry, and Franklin. VDOF foresters helped collect samples for four weeks and forest health staff sorted and identified beetles.

Very few southern pine beetles were collected in our 2020 survey this past spring. The most beetles were found in Chesterfield, a few beetles were found in Amelia and Hanover counties, and one single beetle was found in Sussex. These results were entered into the Pine Beetle Prediction Portal which predicted the likelihood that Virginia would have a SPB outbreak this year was low. This continues to be good news for Virginia!

While SPB activity was minimal this year, another native bark beetle did receive a lot of attention. Ips bark beetles, of which there are three species common in Virginia, were very active in late 2019 and early 2020. This was primarily the result of drought conditions in late summer 2019. Ips beetles rarely attack healthy trees, but populations will increase when pine stands are stressed. Signs of an ips bark beetle infestation include sawdust around the base of pine trees, small pitch tubes on the main stem, and vertical galleries (tunnels) underneath bark. The beetles are small and identified by tiny “spines” on the back end of their bodies. Usually control is not warranted other than minimizing stress to trees. However, when stands are already stressed from conditions like drought, ips beetles overcome a tree’s defenses, build in population, and have a great impact on surrounding trees. In these cases, infested trees can be cut and removed to stop populations from building. This year, there were 91 reports of ips spots in 27 central and eastern Virginia counties. Beetle spots were, for the most part, small and patchy, but VDOF staff will continue to monitor them.



Ips beetle spots throughout Virginia from October 2019 through September 2020.

HEMLOCK WOOLLY ADELGID

The hemlock woolly adelgid (HWA) remains active on hemlock trees in Virginia. This sapsucking pest, native to Asia, has been feeding throughout the native range of eastern hemlocks for almost seven decades. The damage is extensive; mortality and decline of hemlocks is present all along the east coast. Hemlock trees are a foundation species that create habitat for other species, so protecting these trees is a priority. In spring 2020, forest health staff treated hemlocks at both First Mountain and Paul state forests with the help of Matt Wolanski, Shenandoah senior area forester. Both of these forests had active HWA populations, but trees were still in overall good health. In April 2020, 97 trees were treated at First Mountain State Forest and in May 2020, 39 trees were treated at Paul State Forest. At both locations, trees were treated by applying dinotefuran as a soil drench around the base of the trees. This product knocks back heavy HWA populations but does not have lasting efficacy within the tree. Follow-up treatments with imidacloprid will be applied this spring to give trees protection for 5-7 years. The hemlocks will be monitored annually to observe HWA populations and tree health. With reduced feeding from HWA, the trees should flourish! Forest health staff will continue to seek out other hemlock stands on state lands where chemical protection will benefit tree health.

HWA populations in 2020 were higher than usual because of mild winter conditions. Adelgid populations are highly dependent on winter temperatures; harsh winters can be of detriment to populations while mild temperatures allow them to thrive. According to National Weather Service data, winter 2019/2020 lacked sustained cold winter temperatures and average temperatures were 4-7 degrees above the 1981-2010 means. This means that HWA had more time feeding since they were not exposed to temperatures that would put them at their supercooling point (fancy bug term for the lethal limit of low temperatures).

Be diligent this fall and winter while in the woods

– if you see the white woolly “cotton balls” of HWA on hemlock branches, it is time to consider treating the trees!



Soil drenching a hemlock at First Mountain State Forest.



Infested hemlock branch.



Measuring a hemlock tree for treatment.

FREEZE DAMAGE

Temperature fluctuations affected Virginia forests last spring. March was unseasonably warm for Virginia and some tree species leafed out earlier than normal. Then temperatures cooled down significantly in April and Virginia experienced a frost in mid-April that caused damage to certain species just as delicate new leaves were emerging. In areas where trees had not yet broken bud, this April frost delayed green-up. Another significant frost event occurred in May, which caused freeze damage to many plants, most noticeably yellow-poplar and sycamore trees. Effects of this late May freeze were reported to forest health staff from all regions of the state. Symptoms of freeze damage include wilting, curling, and browning of foliage.

ForWarn is a vegetation change recognition and tracking system that uses high-frequency, moderate resolution satellite data. It provides near real-time change maps that show the effects of disturbances such as wildfires, insects, diseases, and departures from normal seasonal greenness caused by weather. The map below shows departure from normal greenness over April 22nd to May 15th. The areas showing up as red in the western region experienced a combination of freeze damage and late spring phenology due to cool spring temperatures, especially at higher elevations. Forest health staff met Mountain Valley work area staff to look at damaged trees in Bath County. In early July, Clint Folks, VDOF forester, reported that trees in these high elevation areas were still only about 50% leafed out. It was determined that the area was hit hard by the late freeze in May, even getting some snow. The oaks looked especially impacted with thin canopies and browning and curling leaves with shotholes. No egg masses or other insect activity were observed, so gypsy moth was ruled out. Most mature trees recover from spring freeze damage; however, there may be some growth reduction and sustained damage in younger trees.



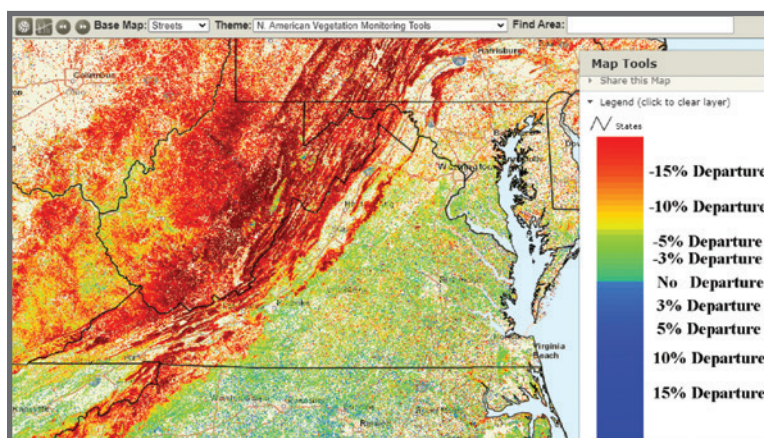
Seedling damage at VDOF Augusta Forestry Center.



Frost damage from Bath County.



Freeze damage to plants on a Dinwiddie County cutover.



EMERALD ASH BORER

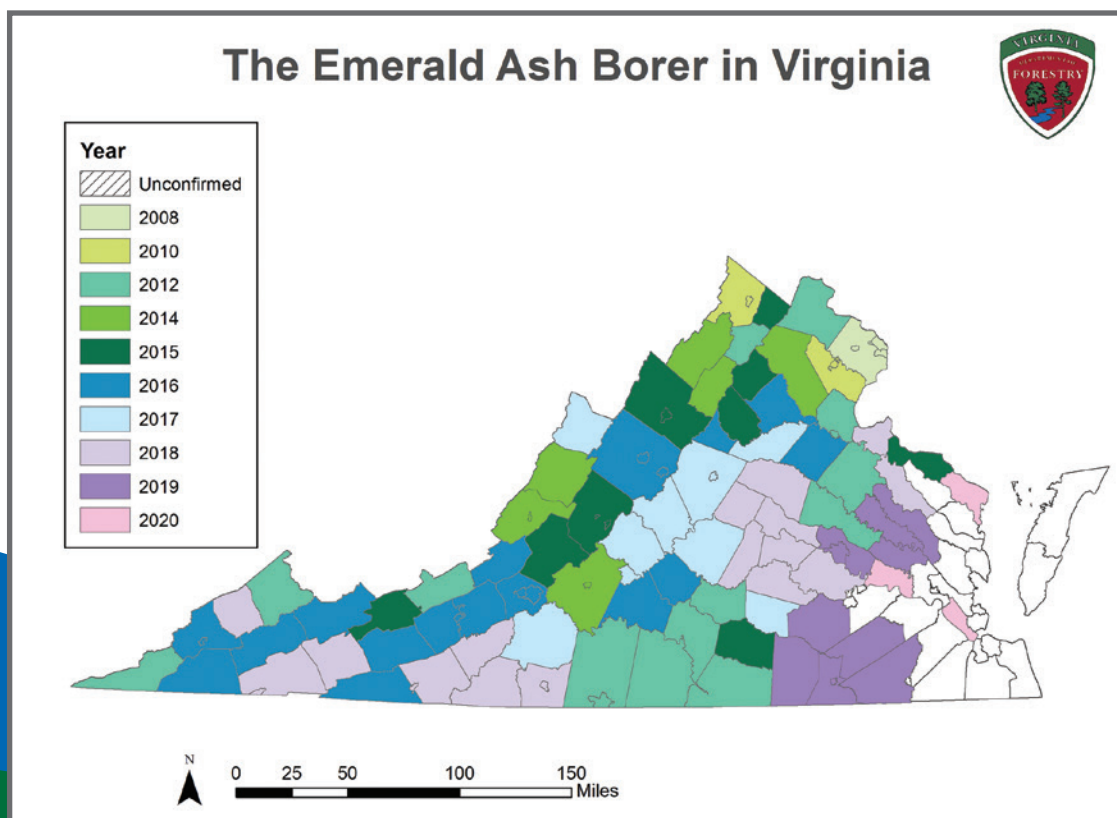
The emerald ash borer (EAB) continues to devastate ash species in Virginia. Now officially detected in 81 counties, EAB impacts ash trees across the state. Standing dead ash are commonly found along many traffic corridors, and in urban and forest areas. This pest has officially been in Virginia since 2008 and impacts all six of the native ash species found in the Commonwealth (green, white, black, blue, Carolina and pumpkin). Treatment continues to be the best available option for high value, rare, or landscape trees, and stem injections can provide effective control against EAB for up to three years. In 2020, along with offering the EAB ash treatment cost-share program, VDOF forest health staff worked to treat as many ash trees on state lands as possible. The National Association of State Foresters put out a centennial challenge to all state forestry agencies in honor of the Association's 100-year anniversary. VDOF decided to participate by pledging to treat 100 ash trees across Virginia and protect them against the emerald ash borer. The treatment team surpassed this goal, treating 157 trees across 16 sites in Virginia. Of the trees treated, 20 were black ash, eight were blue ash, and 24 were pumpkin ash. Black, blue, and pumpkin ash are all rare species with limited geographic distribution in Virginia. Black ash is present at GR Thompson Wildlife Management Area in Fauquier County, blue ash is located at Natural Tunnels State Park in Scott County, and pumpkin ash was found at Langley Air Force Base in Hampton as well as Stumpy Lake Natural Area in Virginia Beach. Because these rare ash species are only found in a few isolated locations throughout the state, treating and protecting a few specimen trees is necessary to ensure a future seed source in Virginia. Other state lands where

treatment efforts were focused in 2020 include Paul D. Camp Community College in Franklin, Pocahontas State Park in Chesterfield, Cumberland State Forest in Cumberland County, and many other state-owned locations.

Additionally, the VDOF Ash Treatment Cost-Share program had another successful year with many landowners applying to receive funds to help protect their ash trees. In total, there were 141 completed applications and almost \$84,000 in cost-share funds distributed. Recipients include private landowners, historical organizations, communities, and non-profit organizations across 39 different counties. More than 450 trees were treated and protected from the emerald ash borer via this cost-share program.



Treatment of pumpkin ash at Langley Air Force Base.



PERIODICAL CICADA DAMAGE IN SOUTHWEST VIRGINIA

Brood IX of the periodical cicadas emerged in parts of southwest Virginia in 2020. They were everywhere, and singing their love songs to the masses. Immature cicada nymphs live underground for 17 years, feeding on plant roots and waiting for the right time and conditions to emerge. Once they come out, nymphs molt and adults emerge, and the party begins. Singing and mating occurs, and then females use long ovipositors (a reproductive structure) to slice into branches and lay eggs. This damages the tree and causes flagging on branches. Virginia is set to witness another periodical cicada emergence in 2021, Brood X, this time in Northern Virginia (Arlington, Clarke, Fairfax, Fauquier, Frederick, Shenandoah, Warren, Winchester counties)! Bill Sweeney, a VDOF forest health liaison in the western region, observed the Brood IX emergence in 2020. Here is what he saw (and heard) during that time:



Recently molted periodical cicada next to its exoskeleton.



Cicadas mating on a young maple tree.



Bill Sweeney, forester in the Piedmont Work Area, and forest health liaison.

- ◆ When did the cicadas start emerging in your work area?
The cicadas began emerging toward the beginning of May and increased in abundance through the month, persisting into June.
- ◆ Were they everywhere or was their activity spotty?
The activity that I observed seemed to be concentrated in areas that either currently or historically had a large oak component, this meant that the damage was pretty much everywhere in Franklin County. In researching the insect, I read that oak, hickory, apples, and dogwoods are all preferred host species for cicada oviposition. Having all of these species either on or around my property, I was able to confirm this through my own observations.
- ◆ Did you receive a lot of calls and reports from landowners? Was there concern and/or interest from the public?
I didn't receive that many calls, actually, but it was something that regularly came up during conversations with landowners and loggers during my normal duties. Most folks talked more about the noise than observed damage.
- ◆ Did you ever notice damage to trees from the females laying eggs on branches?
Yes. Having both young oaks, apples, and dogwoods around my house, I became very aware of the damage caused by the cicadas. As mentioned before, these trees are favored for oviposition by cicada females. Because their ovipositor is so large and they lay so many eggs, severe structural damage was done to many branches, up to ½ inch in diameter. This damage led to the need for intense pruning to remove the eggs. Removal is recommended because as the eggs hatch, the young insects will drop and burrow into the ground around each affected tree. The young cicadas will feed on the tree's roots for another 17 years before emerging again to restart the cycle. Large trees can withstand this kind of feeding, but for young trees, this can lead to mortality – especially if they lost a lot of foliage due to branch damage.
- ◆ Were they very loud?
Yes, and it occurred to me that cicadas may have been the impetus behind the addition of the word "keening" to our lexicon.
- ◆ What was the coolest thing about their emergence?
Probably just the sheer abundance of them was the "coolest" thing. On some logging jobs, they were seemingly everywhere you looked! One funny story I can share involved a drone mapping trip with Andrew Vinson, one of our water quality specialists. The cicadas were so thick on the first site we visited, that they were landing on us. These cicadas were large enough, that you knew when one landed on you even if it was on the bill of your cap. I can tell you that these things were especially loud when they're only a couple of inches from your ear!

SPOTTED LANTERNFLY

Frederick and Clarke counties, and the City of Winchester continue to bug out. The spotted lanternfly (SLF) continues to feed on trees and other plants within the quarantine zone enacted by Virginia Department of Agriculture and Consumer Services (VDACS). Since this invasive pest feeds on some of our native trees such as black walnut and maples, VDOF supports VDACS and other agencies in their efforts to control and minimize impacts from SLF in Virginia. In 2020, VDOF conducted an aerial survey for tree-of-heaven, *Ailanthus altissima* (referred to as *Ailanthus*), which is an invasive tree that is widely distributed in Virginia. Additionally, *Ailanthus* is a preferred host of SLF since both the tree and pest are from Asia. Based on a survey method described by Rebbeck et al (2015)¹, VDOF forest health staff utilized Digital Mobile Sketch Mapping (DMSM) software already available from the USDA Forest Service, Forest Health Assessment and Applied Science Team to create a map of female *Ailanthus* populations.

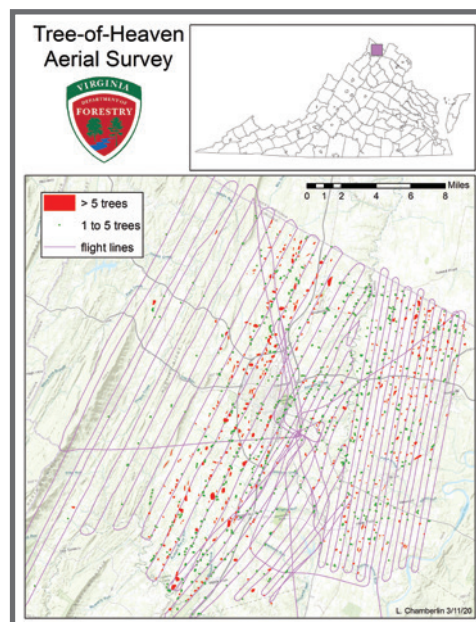
The aerial surveys took place in January 2020 so that tree-of-heaven could be identified by the seed pods that female trees retain during winter months. The survey followed pre-determined flight lines spaced 2,000 feet (1,000 feet of visibility from either side of the helicopter) in Frederick and Clarke counties. The survey took place over three days and was scheduled around weather, and pilot and sketch mapper availability. In total, 937 miles were flown. Tree-of-heaven was easily identified from above due to the seed pods on female trees. Points were used to map clusters of one to five trees, and polygons were drawn when there was a

cluster of more than five trees. In total, 921 data points and 493 polygons were collected; the area within the polygons equaled approximately 3,700 acres. The location of tree-of-heaven was consistent with our knowledge of the invasive species. It was most common along disturbed sites and the highest number of trees were observed along train tracks, roadsides, field edges, and a quarry in the southern end of Frederick County. While this survey method only gives us data for half of the population (male trees were not mapped), it is an effective way to identify tree-of-heaven clusters and obtain a better geographic understanding of the tree's overall distribution. This information should help focus treatment efforts and slow the spread of SLF.

Additionally, VDOF forest health staff assisted the Urban and Community Forestry Program in the deployment of an Urban Forest Strike Team in Frederick County. The goal was to identify and map as many tree-of-heaven trees as possible using an ArcGIS Collector application. Trees were marked with paint color based on their size; if trees were under 6 inches in diameter, they were marked red to be treated with herbicide. If they were more than 6 inches in diameter, they were marked yellow to be treated with insecticide. In total, after three days of field work in some of the gnarliest sites found in Frederick County (along I-81, top of a local quarry, etc), 12,891 trees were marked and recorded. This strike team was a massive undertaking and was a successful collaboration between state and federal agencies with involvement from neighboring states. In total, 13 VDOF staff participated, along with four VDOT staff, seven VDACS staff, two USDA-APHIS staff, two NC Forest Service staff, one staff from Washington DC, and two USDA Forest Service staff from West Virginia.



Female tree-of-heaven from aerial survey.



Map of female tree-of-heaven trees from aerial survey.



Joe Rossetti, area forester, measuring tree-of-heaven for the strike team.

¹ Rebbeck, Joanne; Kloss, Aaron; Bowden, Michael; Coon, Cheryl; Hutchinson, Todd F.; Iverson, Louis; Guess, Greg. 2015. Aerial detection of *Ailanthus altissima*: a cost-effective method to map an invasive tree in forested landscapes. *Forest Science*. 61(6): 1068-1078.

ASIAN LONGHORNED BEETLE



Dr. David Jenkins, forest health specialist, South Carolina Forestry Commission.



Niches where females deposit eggs.



Adult ALB.

The Asian longhorned beetle (ALB) is a beautiful but problematic beetle. Originally from China and the Korean peninsula, this beetle has become invasive in North America. Infestations were previously limited to New York, Ohio, and Massachusetts, but in 2020, ALB was confirmed in South Carolina, a major move south. This beetle has a large host list, including many of our forest species, such as maple, sycamore, poplar, ash, elm, and birch. Female beetles chew small niches on bark to lay eggs. Eggs hatch and larvae tunnel into the phloem to feed, then pupate in the wood. Adults chew their way out in the spring and the cycle begins again. ALB has not been found in Virginia, but it is a serious threat to our forests. To learn more about the ALB population in South Carolina, we asked Dr. David Jenkins, forest health specialist with the South Carolina Forestry Commission (SCFC), some questions about ALB in his state:

- ◆ When and where was ALB first detected in South Carolina?
ALB was first detected in Hollywood (Charleston County) on May 28, 2020 by an alert homeowner who contacted Clemson.
- ◆ What is the SCFC's response to this new pest and what is the agency's role in control and/or eradication?
In South Carolina, Clemson's Department of Plant Industry (DPI) is in charge of all regulatory action and so they contacted USDA-APHIS and APHIS sent a team down the second week of June. This team was composed entirely of USDA APHIS employees working in ALB eradication, mostly in Bethel, Ohio, but also from New York and Massachusetts. APHIS and Clemson DPI work together, but APHIS has the knowledge and skills and are the quiet leaders in the outfit. I help with the surveys one or two days a week, as time and work permit.
- ◆ What other players are involved with control of this pest and what are their roles?
It is entirely APHIS and Clemson DPI but we all work closely together. We have mills in the area and loggers and we shared that information with them.
- ◆ Are landowners and other forestry professionals in South Carolina concerned?
Yes. For the most part, landowners have been very happy to let people on their property to inspect. Having done this for years, APHIS knows some of the pitfalls of having a massive public presence suddenly so they and Clemson have worked hard to engage the public and let them know what is going on. APHIS also tends to let Clemson or myself reach to the public first as a local.
- ◆ Are you seeing any damage or mortality from ALB at this time?
In the epicenter, there are some dead trees, but mostly it is heavily-infested trees. On the edges of the infestation, it is harder to detect infested trees since they tend to start at the top.
- ◆ Anything else we should know or prepare for regarding this beetle?
It is a slow mover. It was estimated to have been in the area for at least seven years.
- ◆ Is there anything crazy or cool that you've seen so far in the woods with these beetles?
SC is the lowest latitude the beast has been recorded at and it appears to be able to go from egg to adult in a year or less. Anecdotally, the beetles are bigger here, too. And identifying the damage on higher branches takes skill. I still haven't mastered it. Invest in a good pair of binoculars, a green laser pointer (useful for pointing at potential damage on the tree; green shows up best in the daylight), and potentially a spotting scope. APHIS relies heavily on climbers to confirm suspicious trees.

FALL CANKERWORM AT MOUNTAIN LAKE

Fall cankerworm is a native defoliator that periodically pops up in high populations and can cause large areas of damage from its feeding. Contrary to its name, this pest is active in the spring – the larvae feed on trees that have recently leafed out with tender, new foliage. Female moths lay eggs in the fall, giving this insect the name fall cankerworm. Natural enemies normally keep cankerworm populations below damaging levels, but outbreaks can cause considerable damage to trees.

Defoliation around Mountain Lake in Giles County was reported to VDOF in June 2020. Forest health staff met with Johnny Vest, area forester, and Virginia Tech forest entomology lab staff to document the defoliation using the Digital Mobile Sketch Mapper app developed by the USDA Forest Service. Although gypsy moth has been documented at this location in the past, fall cankerworm was confirmed to be the casual agent of damage in 2020. Defoliation was patchy and noticable from the road up the mountain and some spots resembled a winter forest even though trees should have been leafed out. This type of damage would normally be mapped via aerial survey, but due to COVID-19 restrictions, damage was mapped with ground points only.

After surveying the area, it was clear that some tree mortality was present in addition to the expected defoliation damage. It was noted that fall cankerworm had been active in this area for a few years, and multiple consecutive years of defoliation can lead to tree mortality.

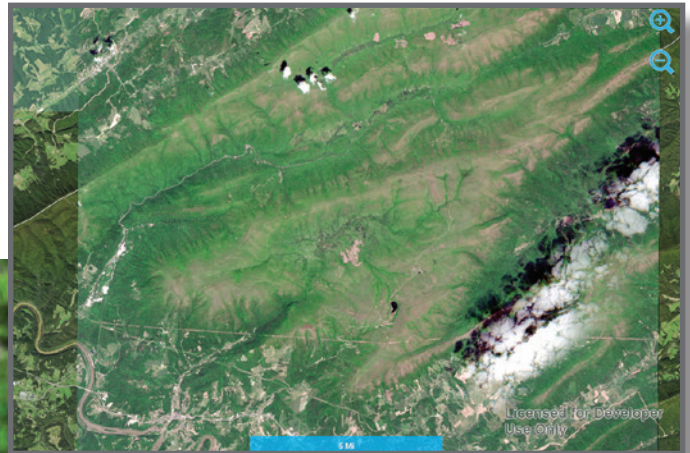
Fall cankerworm was documented in 2018 and 2019 at Mountain Lake but the damage was never mapped. VDOF forest health staff is now working with the USDA Forest Service to map damage from this multi-year fall cankerworm outbreak. Dr. Chris Asaro and Anthony Elledge (USDA Forest Service) have obtained old WorldView, Sentinel-2, and NAIP satellite imagery, which will allow us to retroactively map defoliation from 2018.



Fall cankerworm caterpillar.



Defoliation driving up to Mountain Lake.



Defoliation visible from Sentinel-2 imagery in 2018.

WHAT'S THIS?

One of the best parts of being in the forest health program is the amazing photos that the field staff shares with us! Going out in the woods allows for sightings of many cool creatures in addition to spending time in the company of the trees. Here are some of the favorites that were shared over the course of the year:



Hognose snake – courtesy of Doug Audley.



Wheelbug eggs – courtesy of Joe Rossetti.



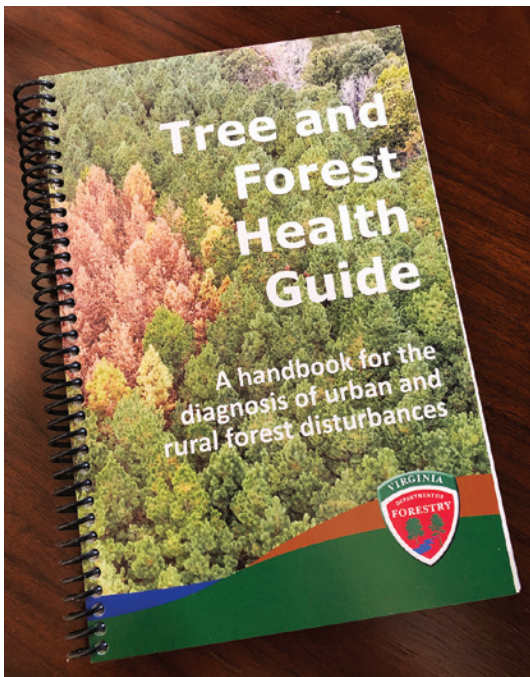
Swallowtail butterfly chrysalis – Katlin DeWitt.



Pandora sphinx caterpillar being parasitized – courtesy of Ellen Powell.



Longtailed Skipper – courtesy of David Terwilliger.



TREE AND FOREST HEALTH GUIDE

Stuck at home in the middle of a pandemic? What a great time to write a Tree and Forest Health Guide! VDOF's Urban and Community Forestry Program and Forest Health Program, along with help from Clemson University Forest Health Extension and design and edits from VDOF Integrated Media Manager, Janet Muncy, wrote and produced an easy-to-use field guide to help identify and learn about common tree and forest health issues. Hard copies have been distributed to all VDOF field staff and this guide can also be found on the VDOF Website: https://dof.virginia.gov/infopubs/Tree-and-Forest-Health-Guide_2020.pdf

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Virginia Department of Forestry
900 Natural Resources Drive, Suite 800
Charlottesville, Virginia 22903
Phone: (434) 977-6555
www.dof.virginia.gov

01/2021

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Virginia Department of Forestry
900 Natural Resources Drive, Suite 800
Charlottesville, VA 22903