Forest Health Review

January 2018

Variable Oakleaf Caterpillar. Photo credit: Amy Bigger.

In this issue...

Greetings

The forest health staff visited all Virginia Department of Forestry work areas throughout 2016 and 2017. During these visits, we gathered information regarding regional forest pests, answered forest health questions, solicited input for program improvement, and enjoyed the fellowship of our field staff. We would like to thank all work areas for hosting us – we'll be back! All foresters and technicians are a vital part of the forest health program since they have the most frequent and direct contact with landowners and come across forest health issues in their daily work. In many cases, we would not be aware of forest conditions if it were not for the reporting of field foresters, especially in more remote parts of the state. VDOF forest health liaisons were implemented last year to increase our forest health presence across the state and improve the flow of communication between headquarters and field staff. Our six forest health liaisons participated in multiple training events throughout the year and were a critical part of this year's forest pest surveys. You can read their annual reports on pages 6 and 7 of this publication. These individuals are a good resource for regional forest health queries.

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Pine Bark Beetle Prevention Program

Virginia has not seen a large-scale southern pine beetle (SPB), *Dendroctonus frontalis*, outbreak in more than a decade, but we continue monitoring activities and surveys. Twenty-one SPB pheromone traps were deployed in March 2017 across nine counties. The results indicate that SPB populations in Virginia persist at low, static levels. SPB spots were reported in two counties across the state, neither of which were large outbreaks. Black turpentine and Ips beetle activity was also limited with only 10 observations across seven counties. Chincoteague Island on the Eastern Shore has been the primary source of SPB activity in Virginia for the last five years. Mature dense stands of pines on the island continue to be stressed due to saltwater intrusion, which increases their likelihood of beetle attack. SPB traps placed in Chincoteague this spring caught a disproportionately higher number of clerid predator beetles than southern pine beetles, indicating the outbreak may be coming to an end.

The Virginia Pine Bark Beetle Prevention Program is composed of three cost-share programs: pre-commercial pine thinning for landowners, first commercial pine thinning for loggers, and longleaf restoration for landowners. This program continues to be supported by USDA Forest Service funds granted to the VDOF. At the time of this report, Virginia has thinned more than 56,000 acres of pine (mostly pre-commercial) through such cost-share programs.

Pine stands are thinned through VDOF's pine bark beetle prevention cost-share program.

Emerald Ash Borer

The emerald ash borer (EAB), *Agrilus planipennis*, continues its march across Virginia, now officially confirmed in 55 counties and tentatively confirmed in three others. EAB was discovered in the following counties in 2017: Highland, Albemarle, Nelson, Amherst, Buckingham, Orange, Nottoway, and Franklin. The three counties where EAB damage was found but an insect specimen is still needed to confirm presence are Fluvanna, Cumberland, and Essex. This non-native flat-headed borer wreaks havoc on all species and size of ash in Virginia. The larvae feed on the tree's vascular tissue under the bark, which eventually girdles and kills the tree. These invasive insects are originally from eastern Asia where they are a relatively innocuous pest of ash. Though the initial point of introduction of EAB into North America was in Michigan in the mid-1990s, the infestation in Virginia began in 2008 in Fairfax County.

Chemical control is effective for landscape and high-value trees, but is not practical in a large-scale forested setting. In these situations, biological control is a possible control strategy, and four species of parasitoid wasps have been approved for just this purpose. These biocontrol agents have been released in Virginia since 2011, mainly by researchers at Virginia Tech; however, VDOF conducted the first EAB biological control release on State Forest land in 2017. The VDOF forest health program received two types of parasitoid wasps, *Oobius agrili*, an egg parasitoid, and *Tetrastichus planipennisi*, a larval parasitoid, from the USDA APHIS EAB Parasitoid Rearing Facility and released them at Whitney State Forest and Cumberland State Forest. Both of these species are native to Asia where they keep native EAB populations under control. *Oobius* lays its eggs only in EAB eggs where the developing wasps feed on the developing EAB. Adults of the larval parasitoid *Tetrastichus* drill into the tree bark with ovipositors (organs used to lay eggs) and lay eggs in developing EAB larvae. As EAB larvae continue to feed and develop, the parasitoid larvae also feed and consume the EAB. APHIS tested these biological control agents in quarantine for years prior to approving their release. These tests include host specificity trials to ensure that other closely related species will not be impacted. During trials with *Tetrastichus*, none of the 17 non-target hosts were attacked and the wasp was deemed host specific. Testing on *Oobius* showed that these species of wasps could attack eggs of other *Agrilus* species if they were similar in size to EAB eggs, but given the choice between EAB eggs and other species, *Oobius* chose EAB eggs. Additionally, these wasps pose no threat to human health; they are both small and cannot sting or harm people! VDOF forest health staff will continue to monitor the establishment of these parasitoids over the next few years.

Tetrastichus planipennisi, a larval parasitoid of the emerald ash borer. Photo credit: D. Cappaert

Releasing Tetrastichus planipennisi parasitoids at Cumberland State Forest for biological control of the emerald ash borer.

Left to right: Kendra Counts, forest health intern; Katlin Mooneyham, forest health specialist; and Lori Chamberlin, forest health manager

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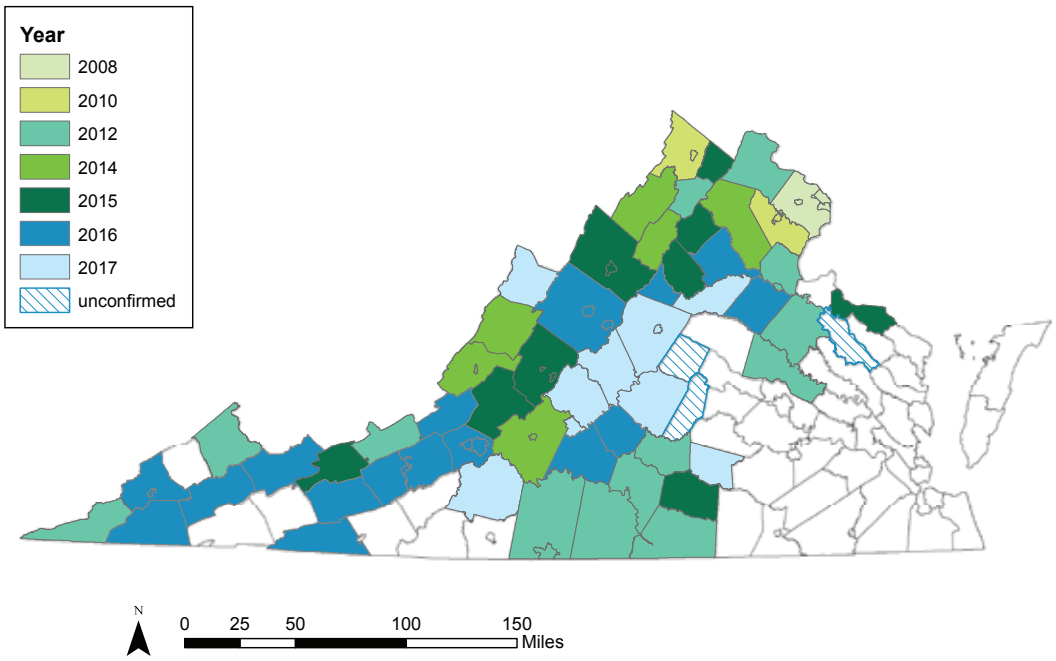
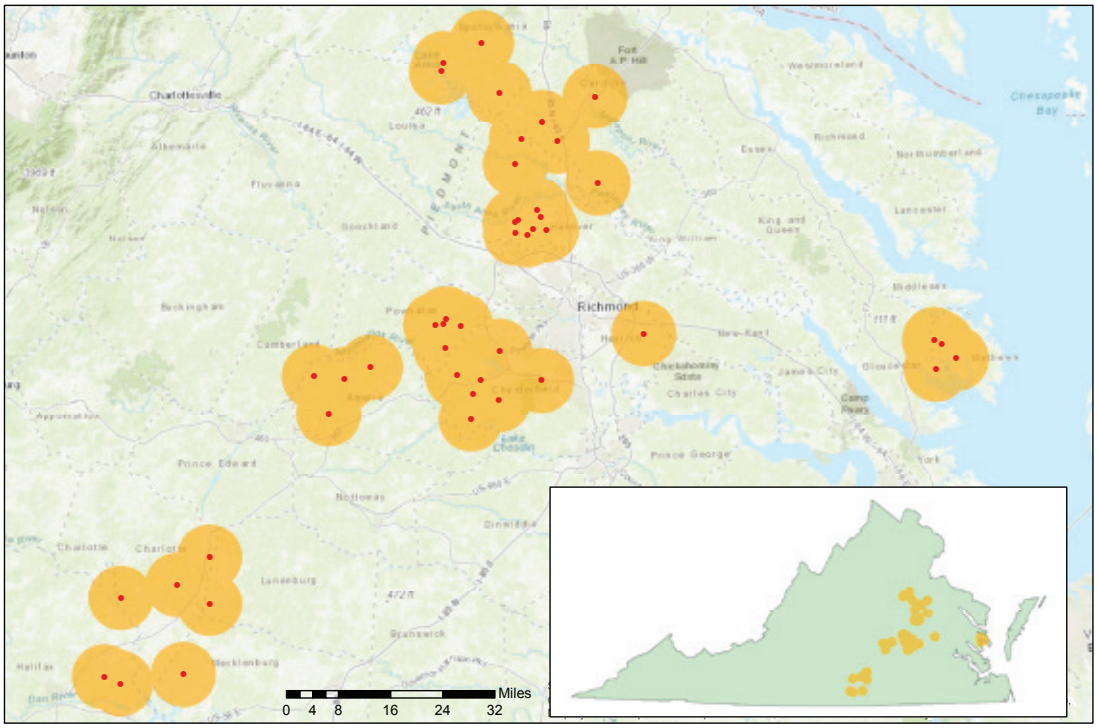
The Emerald Ash Borer in Virginia



Variable Oakleaf Caterpillar 2017



Variable Oakleaf Caterpillar

The variable oakleaf caterpillar (VOLC), *Heterocampa manteo*, was a surprise pest this past summer. The VOLC is a native defoliator that is present in low numbers every summer and sometimes has population booms. Reports of raining frass (caterpillar excrement) began mid-July, mainly from the area surrounding the city of Richmond. Affected trees became completely defoliated over the following two weeks. Patchy defoliation occurred in Virginia's Piedmont and parts of the Coastal Plain totaling approximately 18,000 acres spread over 14 counties. In total, we had 37 variable oakleaf caterpillar entries in our field reporting system (IFRIS), representing a third of all insect forest health ground observations for the year.

As the name suggests, the color of these caterpillars can be variable, though typically they are yellow-greenish in color with a brown band on their back. This brown band has a yellow band on either side of it, along with a thin white line down the middle. This native defoliator feeds on all species of oaks, but tends to prefer white oaks. Younger caterpillars will skeletonize oak leaves while older larvae typically consume the entire leaf minus the veins and leaf stalk. Once feeding subsides, the VOLC pupates in the soil and adults emerge the next season to mate.

Outbreaks of VOLC occur periodically; the last one documented in Virginia was in 2006. A healthy tree can survive a year or two of defoliation, so no long-term tree damage is predicted. In fact, in some areas re-foliation was observed a few weeks after periods of heavy feeding activity. VOLC outbreaks are usually short lived since natural predators will cause caterpillar populations to plummet after one or two years of heavy activity. Indeed, as populations of caterpillars increased in 2017, so did reports of their predators, such as tiger beetles. While the defoliation due to VOLC was certainly alarming, we expect trees to recover in the spring and will monitor areas that experienced severe defoliation.

Severe defoliation of oaks in Southside Virginia

Leaf fed upon down to veins and leaf stalk

Variable oakleaf caterpillar

Oaks defoliated by the variable oakleaf caterpillar in Chesterfield County

Forest Health Liaison Reports

Lucas Kerns - Western Region

The newest and most significant forest health issue in our area is the emerald ash borer (EAB). In the Clinch work area, it was first discovered in Lee County in 2012 and has now been confirmed in most counties in Southwest Virginia. EAB kill has been very noticeable throughout Lee County and has become clearly visible in Scott County this past year. EAB kill will become more and more noticeable in affected areas throughout the region in coming years. Invasive species have continued to be a problem in our area, primarily in the coalfields of Wise, Dickenson, and Buchanan counties where autumn olive, lespedeza, and kudzu have become established. These invasive species as well as ailanthus, multiflora rose, Chinese privet, and Japanese knotweed are common throughout the area. Chinese silvergrass, *Miscanthus Sinesis* Anders, is an invasive plant that has been in Scott and Lee counties for years. Many landowners continue to buy and plant it for aesthetics. *Miscanthus* spp. is also moved unintentionally by farmers as they move hay that contains the seeds. Like most invasive species, it can spread rapidly over long distances and occupy open areas quickly.

Bill Sweeney - Western Region

Forest health issues have been pretty diverse this year in the far southwest Piedmont. We fielded calls ranging from oak decline and bark beetles to autumn-olive, kudzu, and voles in pine plantations. Unfortunately, the seemingly juggernaut-like spread of EAB has taken its toll in many work areas, with new confirmed reports in several counties including Franklin. Education of the public has been key in dealing with many of these issues, whether that is directly through mitigation efforts or simply in giving advice during stewardship plan consultations. Western Region VDOF team members have made an effort to be visible in this facet of forestry, being sure to be present at events such as the "Alien Invaders: Invasive Species" event held at Explore Park this fall. Many of our team members continued to build or refresh their forest health knowledge by attending many of the trainings offered. We shall endeavor to continue these efforts into 2018 and beyond.

Rick Butler - Central Region

When asked if I was interested in this position, I was eager to accept the challenge. I have always been into CSI and mysteries, and figured this would be as close as I would get to a crime scene other than fire investigation. The year started out with a landowner wondering why his three-year-old loblolly stand had trees dying. My immediate thoughts were vole damage. I went out to the tract and did not find any meadow vole damage. A call to Lori Chamberlin and Katlin Mooneyham and we made a trip to investigate. We collected soil samples along with wood and root samples, and it turned out to be a *Fomes Annosus*, a root-destroying fungus problem. This is very rare in Appomattox County especially near the James River; one case had been found in the Red House area years ago.

My next big challenge was to set up southern pine beetle (SPB) traps on the State Forest and monitor the traps for an eight-week period. The opportunity allowed me to play the part of a mountain man and trapper. It was exciting to see what we caught each week and to see the changing seasons from winter to spring. Steven Jasenak and I collected samples in temperatures ranging from 20 degrees to 93 degrees. Seeing frozen antifreeze in the collection cup made me wonder what I was doing out there. Watching the seasonal changes in this area, especially the green-up, was exciting for an old-time wildland firefighter.

Other activities included going to two excellent training sessions in Richmond and Amherst to gain more knowledge in the forest health area. Highlights of my new responsibility included being able to confirm EAB in Appomattox county and daily calls about pine trees dying. Causes were Ips and black turpentine beetle. I also had a fungus called dog vomit, bagworms on bald cypress, and dogwood sawfly in red kousa dogwoods. Thank goodness no SPB outbreaks have been spotted in the county. The reason for this could be that we don't allow them to grow very long before we harvest them.

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Jim McGlone - Central Region

In May 2017, the NOVA work area received several calls about partial to complete defoliation of oaks up to 30 feet tall. Examination of defoliated trees found damage to all parts of the leaves, including the petioles and twigs, indicating a strong-jawed feeder. There were no signs of the insect involved. A second call from a citizen who observed the trees at night pointed to may beetles. May beetle and June bug are common names for small, brown, nocturnal scarab beetles generally in the genus *Phyllophaga*. These insects are more commonly encountered as white grub pests of turf grass. The adults of the genus generally emerge in spring and fly for a few weeks. The adults feed on foliage, mate, and lay eggs in the ground. Larva take one to four years to mature, while feeding on roots. Generally, feeding by the adults goes unnoticed, however, in some cases, defoliation can be severe. Most of the control literature focuses on treating grubs, but the University of Florida extension service suggests putting a white bucket with a few inches of water and a few drops of liquid soap under the tree overnight. The adults are attracted to light and the soap breaks surface tension in the water so the beetle will sink and drown.

Trevor Simmons - Central Region

This year in the Dan River work area, I observed just a few pests that were impacting our forests. We were hit in some areas with the variable oak leaf caterpillar (VOLC), EAB, and isolated trees with pine bark beetle. Many landowners confused the VOLC for gypsy moth as they had never heard of this pest. So even though it was causing problems in our forests, it did bring about the opportunity to teach landowners the difference so they could help keep an eye out in the future. The damage from this pest was not overwhelming in our area but was felt even harder in counties to our east. EAB is a continuing problem in our area just as it is across the state. Most landowners are aware of EAB now and have taken trees out that were affected or were going to be. We did not have many cases of pine bark beetles this year and what did arise was caught at one or two trees, which were taken down and spreading was stopped. Loggers in this area are really helping with the prevention of bark beetle as many are starting to thin smaller blocks of timber. Overall, the forests in our area were able to grow and maintain their health with little disease or pest problems.

Dave Terwilliger - Eastern Region

The big news in our area this past summer was a widespread VOLC outbreak. If populations were building prior to this event, they succeeded undetected. Once the larvae started munching, concerned citizens called daily. Kudos to coworker Rich Reuse for his metro Richmond TV news interview, which hopefully abated some viewers' worries. While most of the forestland impacted may suffer no long-term consequences, some tracts of predominately upland oaks were totally defoliated. This coincided with weeks of dry weather in July, so we'll see how these trees fare next May.

EAB continues to spread. Most of the damage is observed in or near the floodplains of our waterways where we find green ash. In late June, I noticed dieback in some young ash trees near the Town of Ashland. Upon closer examination, I discovered active EAB larvae under the bark. Not sure how or when they got there since it's a long flight from any other confirmed EAB location.

In the Capital work area, we respond to plenty of sick-tree calls. Most noteworthy observations include: stem dieback in crepe myrtle from early spring freezing temps; Seiridium canker and bagworms on Leyland cypress; landscape white pine death from whatever causes it to wilt, turn yellow, turn red, die; red tip photinia's being hammered by entomosporium leaf spot; oaks that have succumbed (from pre-existing factors?) and are now covered with hypoxylon canker and granulate ambrosia beetle, and, most recently, fall webworm occupying the canopies of multiple tree species.

Gypsy Moth

Gypsy moth, *Lymantria dispar*, continues to be an issue in the western part of the state where it has been building in population since 2015. The first signs of gypsy moth in 2017, at the end of April, were observed in Bland County on National Forest land. Winter surveys revealed high numbers of egg masses and caterpillars emerged and began feeding by the beginning of May. The unusual weather patterns this spring contributed to the initial rise and subsequent crash of gypsy moth populations. Initial warm, dry weather triggered early caterpillar emergence and defoliation; but the following cooler, wet conditions allowed the fungus *Entomophaga maimaiga* to proliferate and attack gypsy moth larvae. This fungus persists in the soil, is activated by humidity and rain, and has become a major player in controlling gypsy moth populations.

Gypsy moth damage in Bland County observed during an aerial survey

Originally from Europe, the gypsy moth was an accidental introduction to the U.S. from a silk worm breeder in the mid-1800s. The caterpillars are fairly conspicuous, with tufts of hair on each body segment, and a double row of five pairs of blue spots and then six pairs of red spots on the top of their back. The egg masses can be cryptic and tannish in color, except in times of outbreak when they are noticeable on the surface of the bark on the entirety of the tree. Winter is a good time to scout for these egg masses, as they are easier to spot after leaf drop. The outbreak this year was concentrated primarily in Giles and Bland counties, with approximately 33,000 acres with moderate to severe defoliation. The VDOF forest health staff conducted an aerial survey in June using the Digital Mobile Sketch Mapping (DMSM) technology created by the USDA Forest Service. Damage was primarily concentrated along a ridgetop bordering the Virginia/West Virginia state line. In Bland County, the majority of defoliation was near Round Mountain off Route 52. This is National Forest land that will be logged in the future, so gypsy moth suppression was conducted to prevent tree mortality. *Bacillus thuringiensis*, a naturally occurring soil bacteria that is toxic when consumed by gypsy moth larvae, was sprayed over the area by the USDA Forest Service. This type of control is meant to limit the damage from high-density populations of gypsy moth. Healthy trees can generally withstand a year or two of defoliation, but oak mortality may become more prevalent in southwest Virginia after this second consecutive year of heavy gypsy moth activity. It will be interesting to see how populations change next summer and the long-term impact on our forests.

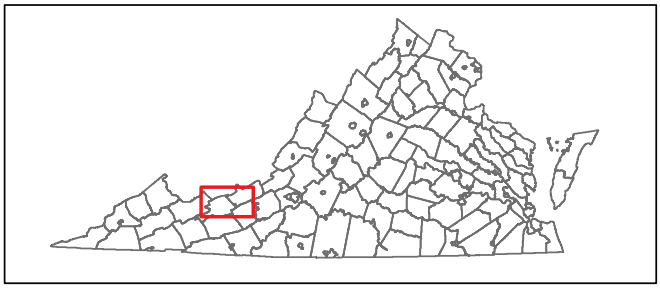
High numbers of gypsy moth egg masses on chestnut oaks in Bland County

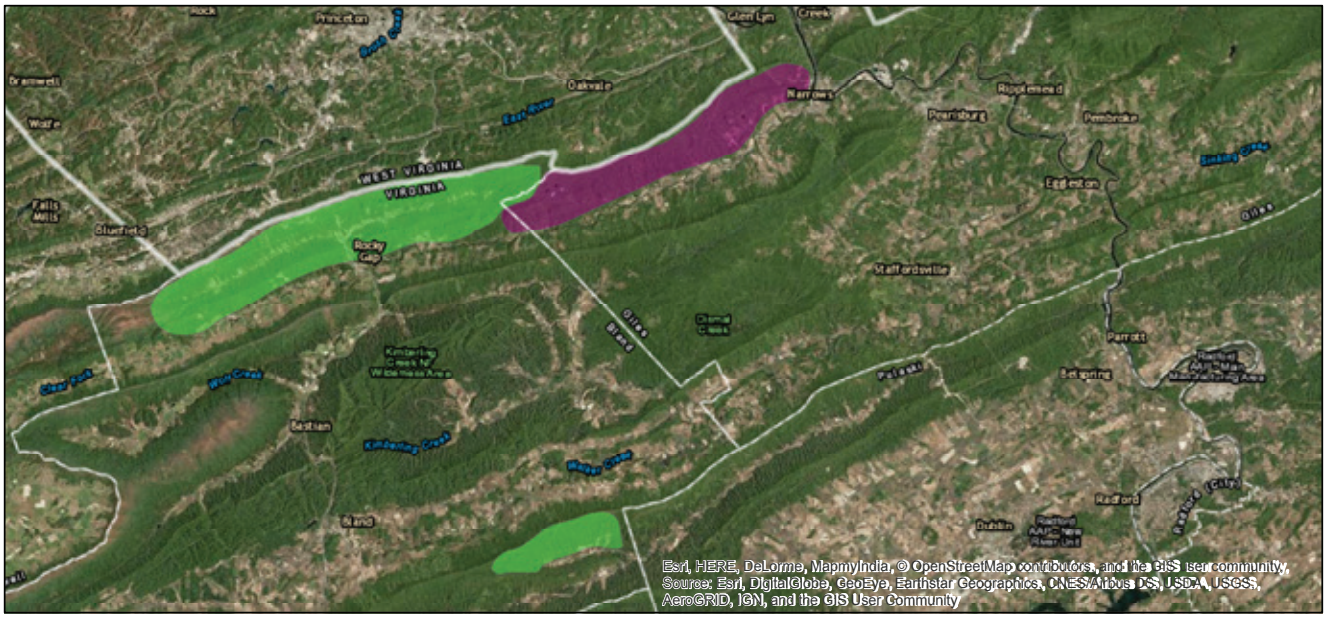
Gypsy moth larva

Virginia Gypsy Moth Defoliation 2017

approx. 11,000 acres with **heavy** defoliation

approx. 22,000 acres with **moderate** defoliation





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White Pine Update

Decline in white pines has been observed in western Virginia since 2005. Flagging and branch cankers are observed initially, followed by tree mortality. While tree death has been observed in white pines across all age classes, seedlings and saplings appear to be dying off at a higher rate. This decline phenomenon has been observed from New Hampshire down to Georgia, affecting white pines in the Appalachian Mountains. Research conducted by pathologists and entomologists have led to the hypothesis that the cause of this white pine decline is a scale and pathogen complex. A scale insect, *Matsucoccus macrocicatrices* (Canadian pine scale), has been found in association with one or more secondary pathogens, most commonly *Caliciopsis pinea*. In 2012, the VDOF established monitoring sites to document white pine health in western Virginia. Each site is visited annually to monitor decline and mortality among different white pine size classes. Sites are located in the following counties where the scale/pathogen complex has been identified: Bath, Highland, Augusta, and Grayson. Analysis of five years' worth of data shows an overall increase in observed mortality among the smaller diameter classes, which is greater than baseline mortality associated with natural stand self-thinning. Results from this study have been included in a manuscript submitted for publication in a special edition of the *Journal of Forest Ecology and Management*.

Coneworm Trapping

The southern pine coneworm, *Dioryctria amatella*, and the webbing coneworm, *Dioryctria disclusa*, are two of the most common and destructive pests in pine seed orchards. Coneworm larvae damage the reproductive structures of pines by tunneling and feeding on cones. Some larvae might also feed in buds, shoots, flowers, and conelets. Ones Bitoki, VDOF tree improvement forester at our New Kent seed orchard, reached out to the forest health team in 2016 about setting up a pheromone trapping program to monitor for *Dioryctria* populations in the loblolly seed orchard. The seed orchard is sprayed routinely to prevent pests from damaging the valuable commodity. A coneworm monitoring program could improve our knowledge about the insect's life cycle and population dynamics in Virginia so that sprays are better timed and more effective.

Traps baited with synthetic pheromones were placed at the top of loblolly seed orchard trees in April of 2017. The pheromones in these traps mimic the volatile chemical released by females to attract mates, so traps were designed to catch flying adult males. We chose two individual loblolly pines from each of six parent genotypes within the orchard and placed one trap on each tree. Half of the trees contained a *D. amatella* lure and the other half contained a *D. disclusa* lure. Traps were checked every two weeks and pheromone lures were changed every month until the end of August. Ideally, this trapping would have taken place where no pesticides were being sprayed. However, due to the high value of our seed orchard trees and the severity of coneworm damage, spraying continued during this study. Because of this, our results are certainly skewed and really only show us data during a typical spray schedule. We plan to repeat this study next year, and will add a control site that will not receive spray treatment so that we can compare coneworm populations in areas with and without chemical control. It will take many years of repeated data collection to fully understand this system.

Placing coneworm traps in select loblolly pines at the VDOF New Kent seed orchard

Coneworm trap

Early Detection Rapid Response Survey

The USDA Forest Service set up an Early Detection and Rapid Response (EDRR) team comprised of federal, university, and state cooperators in 2007 to implement a national detection, monitoring, and response system for non-native bark and ambrosia beetles. These insects frequently enter our forests by way of packaging material and shipping freight. The goal of EDRR is to detect these beetles at high-risk areas and respond to new detections quickly before they have a chance to establish. Virginia was asked to participate in this survey in 2017 and identify 12 high-risk sites that import, store, or recycle wood packing material that could be infested with these beetles of concern. Sites included the Virginia Inland Port in Front Royal, county land near Dulles International Airport, large home improvement stores in the Richmond area, and rest stops along high-traffic highways. VDOF, in partnership with the Virginia Department of Agriculture and Consumer Services, selected these 12 sites and placed three 12-unit funnel traps within each site. Each of the three traps had a different pheromone lure or lure combination that targeted a specific set of bark or ambrosia beetle species. Traps went out in April and were checked every two weeks over a 12-week period. Each trap was checked and the contents were poured into a filter and labeled. Specimens collected from traps were then sent to taxonomists trained in the identification of these little beetles. Three potential "new" species were found this year: *Anisandrus maiche*, *Cyclorhapidion bodoanum*, and *Xyleborus pfeili*. All are nonnative ambrosia beetles, but we are not aware of any instances in which they have caused forest health problems. It's actually likely that these species have been in Virginia a while (they've been collected in Maryland and other nearby states), but now we know to monitor their presence and impact on our forests.

Forest Health Calendar

Forest Health Concerns Throughout the Year

January

- Continue to survey for gypsy moth egg masses
- Begin to survey for fall cankerworm egg masses

February

- Remove fall cankerworm bands from tree trunks
- Survey for eastern and forest tent caterpillar egg masses
- Spring Fire Season: Feb. 15 – Apr. 30

March

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

April

- Fusiform rust fruiting bodies are evident
- Adult locust leafminers begin feeding
- Place southern pine beetle (SPB) pheromone traps

May

- Treatment for gypsy moth should be underway
- Anthracnose symptoms may appear on sycamore
- Defoliation by fall cankerworm should be evident

June

- Defoliation by gypsy moth larvae should be reaching a peak
- Peak adult emerald ash borer (EAB) activity
- Locust leafminer larvae start feeding

July

- Adult yellow poplar weevil present and active
- Native defoliators, such as variable oak leaf caterpillar (VOLC) larvae, begin feeding
- Gypsy moth adults present- females begin to lay eggs
- Be on the lookout for pine sawflies

August

- Late season native defoliators, such as orange-striped oakworm, walnut caterpillar and oak skeletonizer, are present
- Fall webworm nests become evident on trees
- Symptoms of bacterial leaf scorch present on leaves

September

- Migration time for monarch butterflies
- EAB larvae feed under the bark through the fall and stay here over winter

October

- This is a good time to survey for gypsy moth egg masses
- Rake fallen leaves to prevent the spread of anthracnose
- Start looking for hemlock woolly adelgid (HWA) egg masses
- Fall fire season Oct. 15 – Nov. 30

November

- HWA should be evident

December

- Place fall cankerworm bands
- Vole activity/damage may increase under the protection of snow

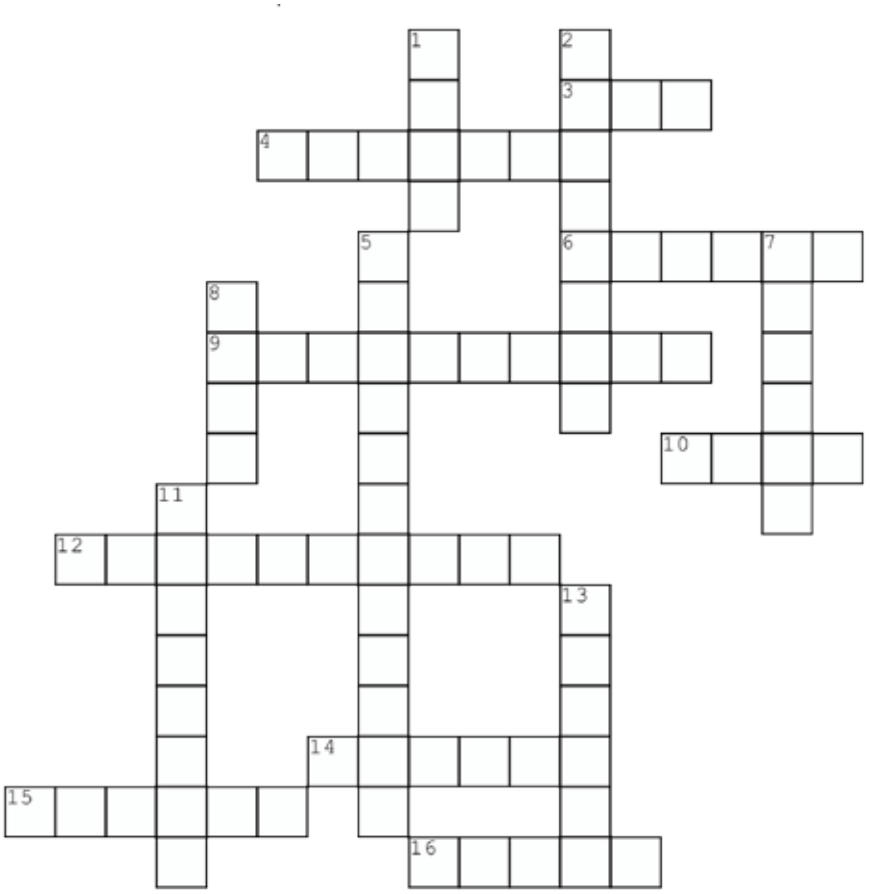
Forest Health Crossword

Across

3. Lori's undergraduate alma mater
4. EAB genus
6. Tent caterpillars found on bottomland hardwoods
9. Honey mushrooms are a sign of this root rot
10. Spores of Annosum Root Rot produced by this structure
12. Genus of insects monitored at New Kent with Ones
14. Traps for beetle collection
15. SPB main predator
16. This weevil lays eggs in fresh cut stumps and debris

Down

1. HWA place of origin
2. This disease requires oaks as alternate host
5. Active SPB outbreak site
7. Fall cankerworm is most destructive during this season
8. Adult sawflies are this type of insect
11. Katlin's favorite type of beetle
13. Number of sites with EDRR traps



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