Forest Health Review

February 2014

Mature oak forest in northern Caroline County stripped bare by the fall cankerworm in May 2013.

In this issue...

Greetings

If I had to sum up 2013, it was a year of repetition (as compared to 2012). A major fall cankerworm outbreak impacted eastern Virginia for the second year in a row. And, like the year before, Virginia witnessed a major outbreak of the 17-year (periodical) cicada, albeit a different brood population affecting a different region than the previous year's Brood I. Elevated southern pine beetle activity continued in the same area of western Hanover County, while gypsy defoliation remained virtually undetectable, as has been the case for the previous three years. While emerald ash borer and thousand cankers disease continued to spread into new areas across the U.S., there were no major changes to their known distribution within Virginia in 2013.

One thing that was markedly different this year, compared to recent history, was the weather. Cool, humid, wet, calm. It was actually quite pleasant most of the summer, although I did miss the sun at times, and leaf diseases were more abundant than usual. As I write this, the days are getting very short, and I am missing the sun more than ever. It looks like it's shaping up to be a long, cold winter. But that's okay – spring will be all the more welcome when it returns – and we"ll soon see what surprises await us in 2014. I hope you find this issue to be interesting and informative.

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Fall Cankerworm Outbreak, Again

As we saw in the spring of 2012, an extensive fall cankerworm outbreak once-again spanned a very large area covering much eastern Virginia. The worst-hit areas included Powhatan, Hanover, Henrico and Caroline counties and the City of Richmond. In total, more than 20 counties and a total area spanning almost **2.3 million acres** were variably impacted, although a majority of the defoliation was light and patchy in nature (Figure 1). Approximately **33,000 acres** were classified as having heavy, continuous defoliation and an additional **217,000 acres** were classified as heavy but patchy. Most of the severely defoliated trees were oaks, while maple and beech also saw some moderate to heavy defoliation. Due to a continuously wet spring and summer, most trees refoliated very quickly and are expected to live through the event. An outbreak of this duration and magnitude is unprecedented as far as Virginia records go, particularly for this part of the state. Typically, cankerworm outbreaks occur in the mountains at the higher elevations and crash on their own after one or two years of severe defoliation.

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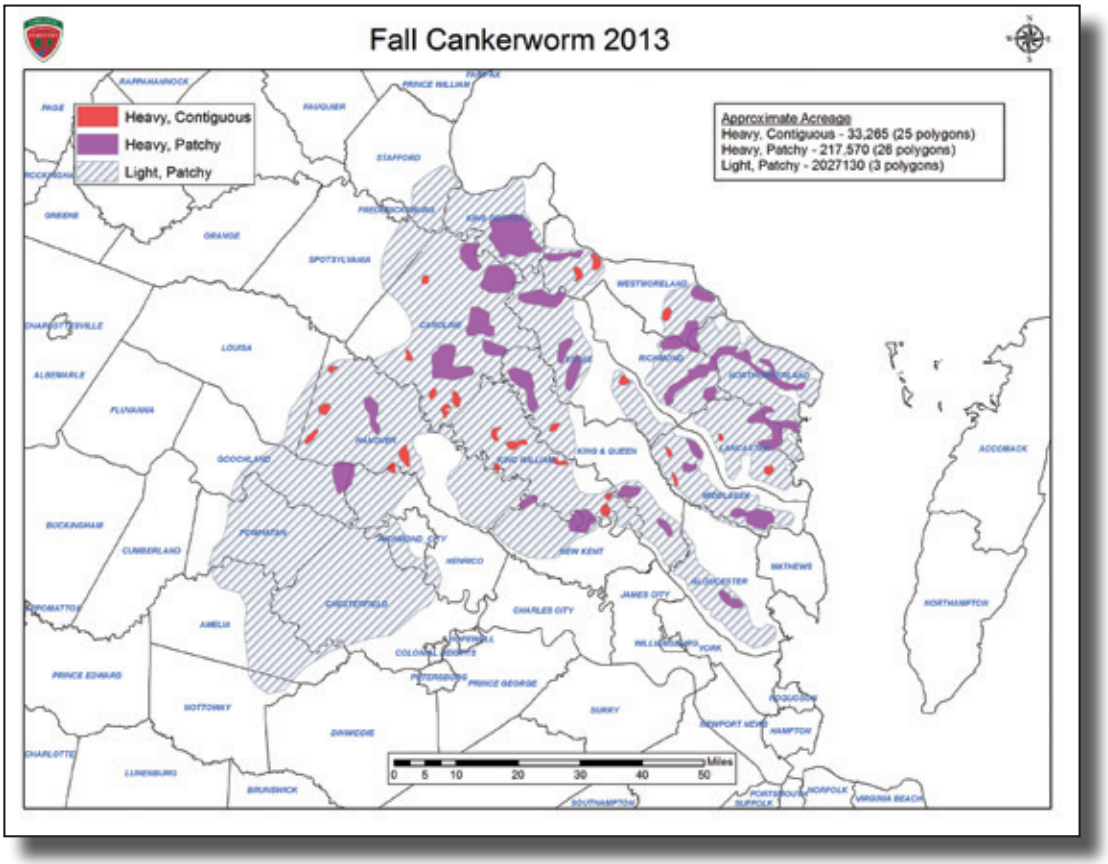
Fall Cankerworm Outbreak, Again, continued

While the overall area of infestation in 2013 was similar to that in 2012, the areas of heaviest defoliation shifted somewhat between years. This is to be expected because severe cankerworm populations attract predators like birds and ground beetles, while other insects parasitize cankerworm eggs and larvae. Thus, areas that see heavy defoliation one year tend to be less severely impacted the following year, and vice versa.

While these boom and bust cycles are a hallmark of cankerworm population dynamics, outbreaks tend to recur in the same areas over time since the adult female moths are wingless and flightless and don't disperse very far from where they fed as caterpillars. In fact, the City of Charlotte, North Carolina, has been dealing with recurring cankerworm populations for more than 20 years and even has an organized spray program for the city and surrounding counties because the of the level of public nuisance generated by this pest. Will Richmond and surrounding counties experience the same fate? I do have my concerns that this will be a recurring issue for this heavily-populated area of the state.



Map by T. Edgerton

Figure 1

Continued on page 4

Fall Cankerworm Outbreak, Again, continued

While cankerworms are native insects and are not normally destructive to forests, they certainly can cause a lot of distress to the public, and can kill trees under the right circumstances (in particular, back to back years of greater than 60 percent defoliation on top of drought stress). What can be done about cankerworms, or should we do anything? One important management tool involves "tree banding." This involves placing a plastic band around the base of the tree (breast height) during the winter and covering it with sticky Tanglefoot. Adult moths are active in the winter and begin emerging from the ground in late November to mate and lay eggs. With female moths being wingless and flightless, they must climb up to the tops of trees to lay their eggs following mating. A tree that is banded captures these moths on the way up as they get stuck on the sticky band. Banding thus can protect individual trees from later defoliation because pregnant female moths are unable to get past the banding and lay eggs. Larvae can travel from tree to tree on silken threads, so it's a good idea to band multiple trees that are close together.

Tree banding can also serve a second purpose. If enough trees are banded over a large area, the number of female moths captured in the bands over the winter can give an indication of what degree of defoliation we can expect in that area later in the spring. For example, an average catch of less than 45 moths per band usually means relatively low defoliation levels generally; 45 to 90 moths suggests moderate defoliation; greater than 90 moths per band suggests heavy to severe defoliation. While many variables can influence defoliation (predator and parasitism rates, weather, host distribution, etc.), banding gives us a lot more information about what to expect than we would otherwise have. Being able to forecast outbreaks and share that information with the public will allow people time to react and plan accordingly. For example, if caterpillars are sprayed with B.t. early and shortly after egg hatch, defoliation can be controlled before it gets too severe. Unfortunately, without banding, most people have no idea what amount of damage they can expect year to year, and by the time they notice anything going on, it's usually too late to spray and the damage is done.

Therefore, our goal this winter is to establish reliable monitoring sites that are forested or contain enough trees to band 10 to 20 oaks in areas that have seen fall cankerworm activity in the past. Preferably we would return to these same sites each year, or at least regularly, to repeat the process. We would start by obtaining coordinates and placing flagging around each tree we intend to band in the fall. Once this is done, a contractor will come out in December to apply the sticky bands. Moth counts will be obtained by VDOF personnel in January and February, and the contractor will return to remove the sticky bands in April. If we do this in enough places over multiple counties, we will hopefully have enough data to obtain a general idea of what defoliation levels we can expect regionally. In addition, specimen oak trees that are banded will be protected from cankerworm defoliation even if localized populations end up being significant. We will use government (state, county and city) lands that are relatively out of the way and are reliable sites to return to year after year. While banding is proven to be somewhat effective for this purpose locally, it's not been widely tested for population monitoring on the scale of five counties, so this is an experiment. Stay tuned for further updates and results.

Weather

2013 was the first year I can remember in a long time where we saw no extreme weather events. Other than a couple of late frosts in May that may have had an impact on this year's mast crop, there were few, if any, tornadoes or hail storms; no hurricanes or tropical systems; no micro-bursts or derecho's, and no drought or excessive flooding. We did see an unusual amount of rain, however, for much of the growing season. In fact, it rained so much between May and August, that clear sunny days were few and far between. But most of the time, it was a gentle, steady rain instead of the usual downbursts that often come with flooding and violent weather. Humidity levels stayed high all summer long. Temperatures were moderate to even a little bit on the cool side. July felt like June, August like September and September like October. All in all, except for the scarcity of the sun, it was rather pleasant! Things started to dry out a bit during autumn, but it also got cold early and we saw enough rain here and there that there were no major fire emergencies.

The table presents the percent of average monthly precipitation and average degrees above (+) or below (-) monthly average temperature for each of nine geographic regions in Virginia (defined below). For monthly temperatures, a "0" indicates average.

	SW	CW	NW	NP	CP	SP	NCP	SCP	ES
DEC Precip	90 to 110%	70 to 90%	70 to 130%	70 to 130%	70 to 100%	70 to 130%	70 to 130%	70 to 150%	90 to 110%
DEC Temp	+4 to +6	+4 to +6	+4 to +6	+4 to +6	+4 to +6	+4 to +6	+4 to +6	+4 to +6	+4 to +6
JAN Precip	150 to 250%	130 to 250%	130 to 200%	110 to 200%	130 to 250%	200 to 250%	90 to 150%	70 to 200%	110 to 130%
JAN Temp	+2 to +6	+2 to +6	+4 to +6	+2 to +4	0 to +4	0 to +6	+2 to +6	0 to +4	0 to +2
FEB Precip	90 to 150%	110 to 150%	130 to 200%	90 to 200%	70 to 150%	70 to 200%	70 to 150%	70 to 200%	130 to 200%
FEB Temp	-1 to +1	-2 t o+1	-1 to +1	0 to +1	-1 to +1	-1 to +2	0 to +2	-1 to 0	0 to +2
MAR Precip	75 to 125%	75 to 125%	75 to 400%	75 to 125%	100 to 150%	75 to 125%	75 to 125%	50 to 125%	100 to 125%
MAR Temp	-8 to -6	-8 to -4	-6 to -4	-6 t o-4	-8 to -4	-8 to -2	-6 to -4	-8 to -4	-6 to -4
APR Precip	100 to 130%	60 to 90%	50 to 70%	50 to 80%	70 to 110%	70 to 110%	90 to 130%	50 to 150%	110 to 130%
APR Temp	-2 to +2	0 to +2	0 to +2	0 to +2	0 to +4	0 to +4	0 to +2	0 to +2	-2 to +2
MAY Precip	70 to 130%	100 to 150%	90 to 150%	70 to 130%	70 to 150%	70 to 150%	70 to 130%	50 to 110%	50 to 70%
MAY Temp	-1 to 0	-2 to 0	-2 to 0	-2 to 0	-2 to 0	-2 to +1	-1 to 0	-1 to 0	-1 to +1
JUNE Precip	110 to 200%	130 to 200%	110 to 200%	110 to 200%	150 to 250%	150 to 200%	110 to 250%	50 to 300%	110 to 130%
JUNE Temp	-1 to +1	-1 to +1	0 to +1	0 to +1	0 to +1	0 to +2	0 to +1	-1 to +1	0 to +2
JULY Precip	70 to 250%	110 to 200%	90 to 200%	110 to 150%	70 to 150%	70 to 200%	70 to 100%	90 to 130%	70 to 130%
JULY Temp	-2 to 0	-1 to 0	0 to +1	0 to +1	-1 to 0	-2 to +2	0 to +1	-1 to +1	0 to +2
AUG Precip	90 to 150%	70 to 130%	90 to 200%	50 to 150%	90 to 200%	50 to 150%	90 to 150%	70 to 150%	70 to 90%
AUG Temp	-4 to -2	-4 to -2	-4 to -2	-4 to -2	-4 to -2	-4 to -2	-4 to -2	-4 to -2	-4 to -2
SEPT Precip	50 to 150%	25 to 70%	25 to 50%	25 to 50%	25 to 50%	25 to 50%	25 to 50%	25 to 50%	25 to 50%
SEPT Temp	-1 to 0	-1 to 0	-2 to -1	-2 to -1	-2 to -1	-1 to +1	-2 to -1	-2 to -1	-1 to +1
OCT Precip	25 to 70%	50 to 100%	70 to 200%	50 to 200%	70 to 200%	50 to 110%	70 to 150%	70 to 200%	110 to 130%
OCT Temp	0 to +2	0 to +2	0 to +2	0 to +2	0 to +2	0 to +3	0 to +2	0 to +2	+1 to +3
NOV Precip	90 to 130%	70 to 90%	50 to 70%	50 to 70%	70 to 90%	70 to 100%	70 to 100%	70 to 90%	70 to 90%
NOV Temp	-6 to -4	-6 to -4	-6 to -4	-6 to -4	-6 to -4	-6 to -4	-6 to -4	-6 to -4	-6 to -4

SW = Southwest (Cumberland Gap to Abingdon to Blacksburg & Galax)
CW = Central West (Roanoke to Staunton)
NW = Northwest (Staunton to Winchester)
NP = Northern Piedmont (Loudoun/DC to Greene/Spotsylvania)
CP = Central Piedmont (Albemarle/Goochland to Bedford/Nottoway)
SP = Southern Piedmont (Campbell/Lunenburg to Henry/Mecklenburg)
NCP = North Coastal Plain (King George/Northumberland to Chesterfield/ Newport News)
SCP = South Coastal Plain (Dinwiddie/Brunswick to Virginia Beach)
ES = Eastern Shore

17-year (Periodical) Cicada, Brood II

Brood II of the periodical or 17-year cicada emerged throughout the Piedmont and western Coastal Plain this May. Many locations within these regions showed extensive "flagging" of vegetation, particularly on oak trees, due to oviposition damage by the cicadas. The worst flagging was on trees along roadsides and the edges of fields, making these trees highly visible to the public. Damage was sometimes quite extensive, but very spotty in nature across the outbreak area. Most trees are expected to recover just fine, but some already weakened may be further impacted due to foliage loss and dead branches leading to secondary infections from invading fungi. Small trees that were hit hard will likely be heavily impacted by dieback, but most will re-sprout vigorously.

Because the range of Brood II extends from northern Georgia all the way up to the Hudson Valley of New York, including the Piedmont and the most populated region of the country (DC-Baltimore-Philadelphia-New York City), this story got a lot of media attention. We did a press release in March to warn folks that this was coming, and, in fact, most major and national news outlets covered the story as well. Our Department did newspaper, radio and TV interviews before, during and after the outbreak. Many calls from concerned landowners came in after the event was over to inquire as to "whether the oaks would be ok" or "why the oaks are dying." Therefore, we did a second press release in June to address this concern, which brought on another suite of interviews. While the interest in this bug story was positive for the most part, by mid-June, I was getting a little tired of it all and was happy to move on.

Branch flagging caused by the periodical cicada's egg-laying habits.

Southern Pine Beetle

The southern pine beetle has been relatively quiet during the last 10 years. In general, the southern pine resource in central and southeast Virginia remains healthy and productive. Federal funds from the USDA Forest Service Forest Health Protection support our Southern Pine Beetle Prevention cost-share program with landowners and loggers for thinning of pine stands. To date, Virginia has thinned about 45,000 acres of loblolly pine out of approximately 130,000 acres estimated to be overstocked. Overstocked pine stands are more vulnerable to bark beetle outbreaks, and thinning is the best method of reducing this threat.

Numbers remain low in most places based on the spring trapping survey results and relatively few reports, and there has been a decrease in activity since 2012. In total, 19 spots amounting to 134 acres of dead loblolly pine across five counties were detected in 2013. An additional 458 infested trees were reported among 12 separate reports. A large majority of the acreage came from one area in western Hanover County where, in 2011, a spot within an unthinned pine stand that was converted into subdivisions had gone undetected for years, expanded and was never reported or dealt with. About 400 acres of this area were ultimately clearcut and managed, but due to the complex ownerships and insufficient, untimely cutting and removals, SPB has since spread to other adjacent and nearby properties. No counties were in outbreak status, although, on top of the 300+ additional infested acres in western Hanover in 2012, there continues to be spillover from these past outbreaks and this remains an active area. The other area where several spots were concentrated was central Cumberland County within the Cumberland State Forest. However, most of these spots were inactive and quite small.

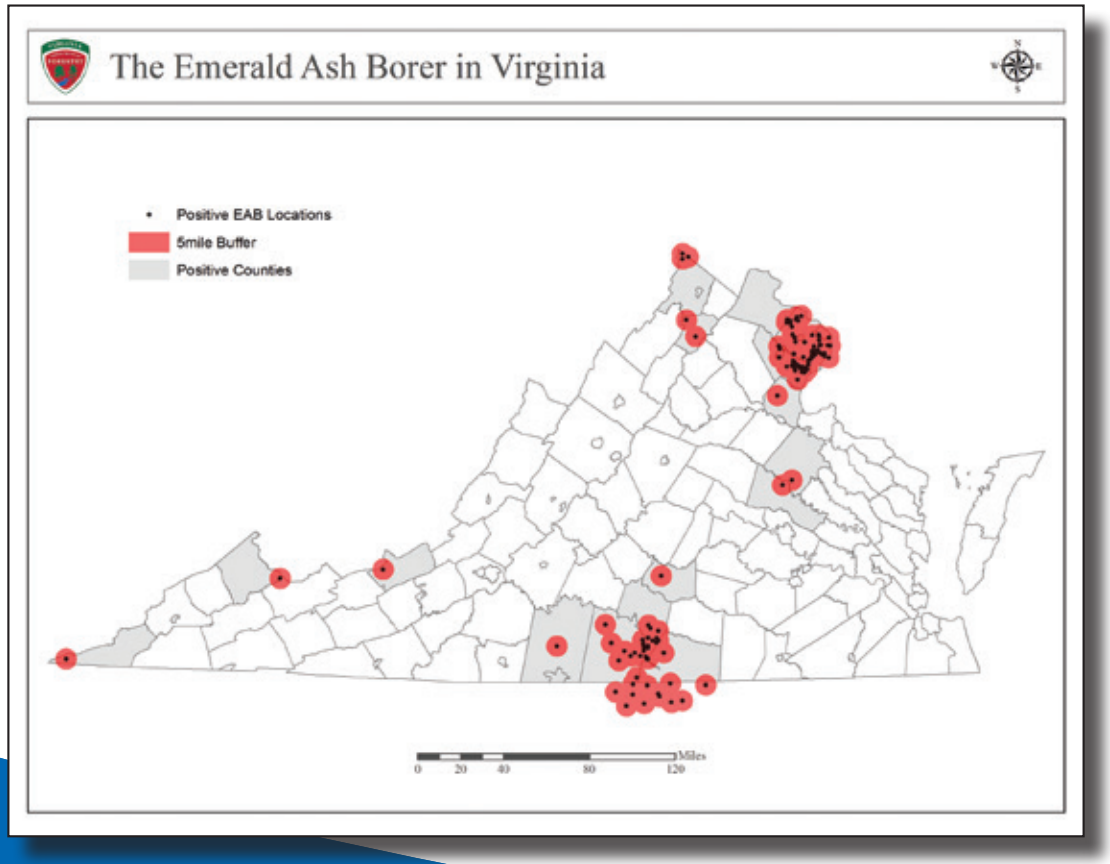
Gypsy Moth

For the fourth year in a row, we have reported virtually zero defoliated acres from gypsy moth from aerial survey, although one acre of light defoliation was reported from a ground observation by a VDOF forester. This occurred in Tazewell County (Southwest Virginia) just to the west of Burkes Garden, an area that has seen elevated STS trap catches during the last couple of years and bears keeping a close eye on for next spring. Since 2009, continued wet spring weather and the resultant impact of *Entomophaga maimaiga* have likely contributed to low gypsy moth levels during this time period. However, the next dry spring will likely portend populations gradually building up to damaging levels again.

Dave Terwilliger, area forester for Hanover County, speaks with a landowner about options for managing his property after considerable damage from the southern pine beetle.

Emerald Ash Borer (EAB)

While 2012 was a breakout year for EAB in Virginia, with 13 additional counties reporting new records due to the trapping survey by APHIS, such was not the case in 2013. First discovered in Virginia during 2003 in Fairfax County, EAB has since spread to at least 17 counties across the Commonwealth and was also found to be causing widespread ash mortality in several forested areas throughout the state. Virginia and the nation face the prospect of losing all ash species from natural and urban landscapes in the forthcoming decades. In Virginia, the impact may include the loss of approximately 187 million ash trees in her forests and could eventually cost the Commonwealth many millions of dollars. This year, no new counties were added to the list, but new infestations were discovered in and around the extensive area of infestation in Southside Virginia along with four new counties in adjacent North Carolina (Figure 2). In addition, Shenandoah National Park reported their first adult EAB from their own trapping effort on the northern end of the Park near milepost five of Skyline Drive. In many counties where EAB was reported in 2012 from positive traps, no EAB-infested trees could be confirmed this year where searches took place near trap locations. I visited counties across Virginia (Tazewell, Giles, Warren, Hanover, Prince Edward) and searched near the precise GPS location where these positive traps were located. In most cases, I was able to find many declining and even dead ash trees nearby. However, if I found any emergence holes they were always round rather than D-shaped, and either too big or too small. If I found galleries in the cambium, they were indicative of other native wood borers and not the characteristic zigzagging or sinuous shape of EAB galleries. It's well known that EAB is not easily detected early in an infestation. Part of this is that adults spend most of their time near the top of the crowns, and only gradually work their way down to the base when they run out of cambium to feed up top. This can take years. It's also likely that one beetle caught in a trap represents a very recent and young population, and it will take time to build up numbers to detectable levels. Research suggests it typically takes three to five years of infestation for EAB populations to build up to levels where ash trees begin to decline seriously or to die. Without the benefit of traps, that is typically the time when they are first discovered.



Map by T. Edgerton

Figure 2

Emerald ash borer damage

Anthracnose Diseases and Fire Blight

Due to the cool, wet spring and continued humid, wet summer – anthracnose diseases were very widespread across most of the state, particularly sycamore anthracnose (*Discula platani*). In many severe instances, spring leaves were decimated but quickly replaced. This may deplete starch reserves and lead to decline or mortality in some trees, particularly if the winter season is severe. In addition, the bacteria that causes fire blight in pears, apple, crabapple, hawthorn and other species of Rosaceae, was very widespread among ornamentals of these species. Generally, leaf diseases can be controlled by applying a fungicide to emergent foliage in the spring, although multiple applications throughout the summer may be necessary to prevent infections from developing later in the year. Fire blight, on the other hand, cannot be controlled with traditional fungicides since it is caused by a bacterium instead of a fungus. Antibiotics must be used to control fire blight – but the treatment is expensive and not well tested. Pruning fire-blight infected branches and using resistant tree varieties are the best method for avoiding this disease.

Hemlock Woolly Adelgid

Significant decline continues in many areas, although trees in some areas that have supported infestations for many years are still hanging on. The adelgid continues to spread and has more-or-less permeated the entire range of hemlock within Virginia, minus a few pockets here and there. Hemlock mortality levels average about 22 percent in the southwest portion of the Commonwealth from Bath and Rockbridge counties southwest to Lee County. This is a 2 percent increase from last year's mortality level estimate.

Oak Decline

Oak decline likely represents the largest mortality factor within Virginia's forests right now and continues to be widespread throughout the Commonwealth due to past drought, storm events and insect defoliation. Gypsy moth defoliation has affected a number of areas along the Blue Ridge and Appalachian mountains from 2005 to 2009. Many oak trees that were not killed outright were subject to severe stress. Oaks in the mountains and in eastern Virginia have been widely impacted by fall cankerworm outbreaks in 2012 to 2013. These widespread stress factors lead to tree mortality precipitated by numerous other biotic agents, including Armillaria root rot, Hypoxylon canker, ambrosia beetles, two-lined chestnut borer, oak carpenter worm, red-oak borer, white oak borer and oak carpenter worms among other pests. This mortality is likely exacerbated in some areas by localized and periodic drought on top of intense heat waves such as what was experienced for several weeks in 2012. Last year's wet, humid weather pattern from May through August likely led to a more moderate rate of decline than in past years. Although this was not quantified or measured, there were no new reports of severe, widespread decline reported in 2013 FIA Inventory data suggests that other tree species, such as maple, beech, birch, tulip poplar and pine, will gradually replace much of the mature oak that is lost.

Wavy Leaf Basket Grass

Wavy leaf basket grass (WLBG) is a relatively recent emerging weed problem that has been documented in several areas of northern Virginia and is widespread in central Maryland, but nowhere else in the U.S. to date. It's a shade-loving grass that often grows with Japanese stiltgrass, which it eventually dominates. It thickly carpets the forest floor and outcompetes and inhibits native flora. Sticky seed-heads promote spread by animal and human movement of seeds stuck to shoes, clothing and fur and can be transported potentially long distances. While most of the major non-native invasive plants in Virginia have had hundreds of years to establish and become very widespread, WLBG is still in the relatively early phase of

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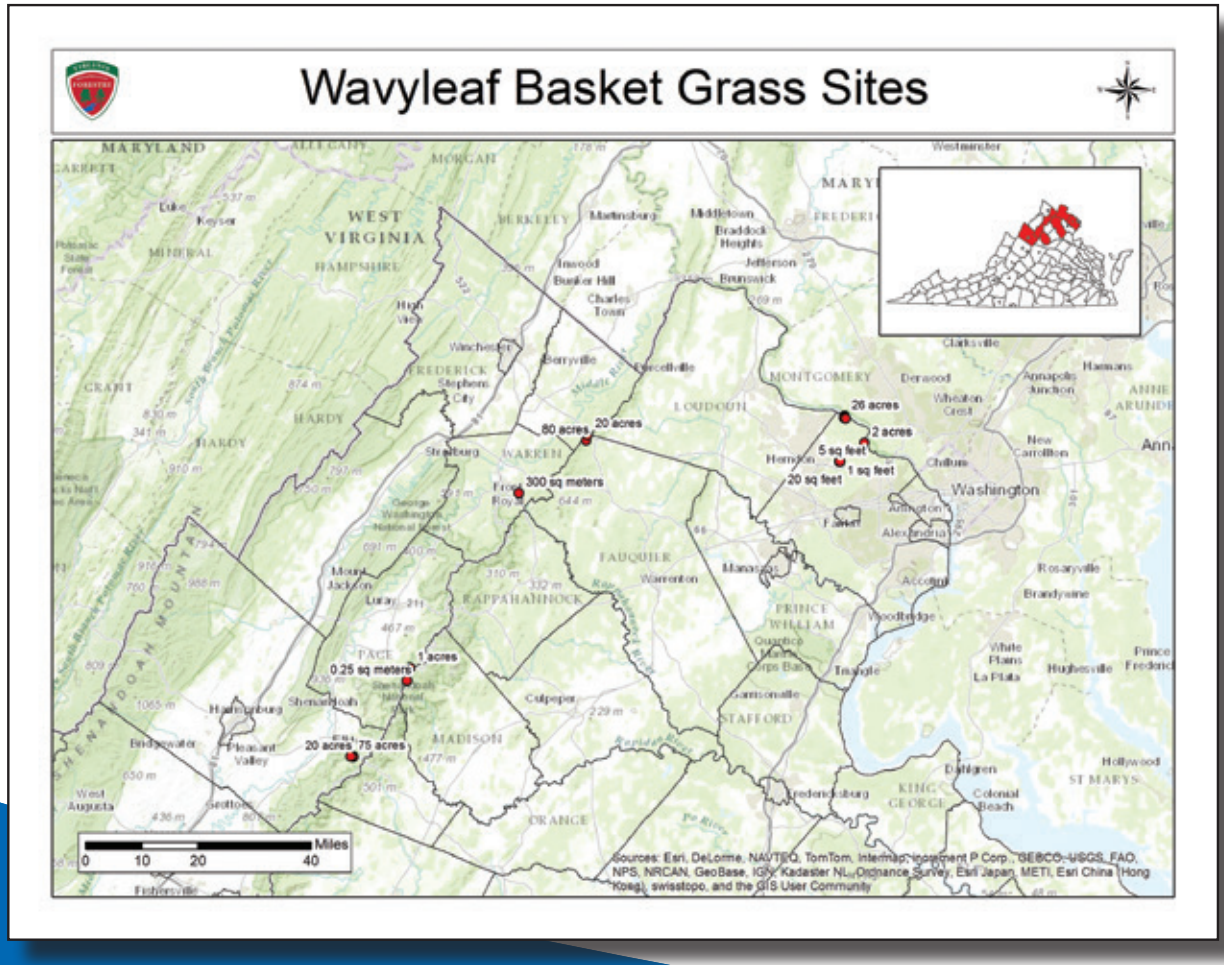
Wavy leaf Basket Grass continued

invasion. Currently, only 15 distinct populations have been identified among seven counties, totaling approximately 220 acres (Figure 3). These populations range in size from one square foot to 80 acres. Therefore, with sufficient funding and effort, Virginia has a real chance to eradicate this species if it acts quickly. Previous control efforts at several sites have been ongoing for years but have stalled out due to lack of funding. New USDA Forest Service Forest Health Protection funding will help revitalize efforts to control this species and survey Virginia for additional infested sites, which no doubt

exist. This federal grant funding is being passed through from VDOF to Virginia Department of Conservation Division of Natural Heritage, who shall spearhead these efforts.



Map by T. Edgerton

Figure 3

Yellow-Poplar Decline and the Poplar Weevil in Southwest Virginia

Recent declines in yellow-poplar in Lee, Wise and Scott counties have landowners concerned over the health of one of the most abundant and resilient hardwood trees in Virginia's forests. While I am not entirely certain about the reason for the declines, I suspect they may stem from past insect infestations that previously went unnoticed.

Yellow-poplar, or tulip poplar, is the most common hardwood tree in Virginia and one of the most important timber species in far southwest Virginia. Its rapid growth, straight trunk and wood properties, along with its abundance, make it an excellent tree for loggers to harvest in bulk and bring to the mills. Generally speaking, yellow-poplar is a resilient tree that does particularly well in moist cove habitats and fertile soils common to the lower slopes and valleys of the southern Appalachians. It also has very few insect and disease problems due to the fact that the leaves, bark and wood contain a host of chemicals that deter them. Even an invasive species like the gypsy moth, which can feed on more than 200 species of trees and shrubs, will completely avoid feeding on yellow-poplar.

Two notable exceptions to this rule, however, are native insects known as the tulip tree scale and the poplar weevil. The scale is a tiny sap-sucking insect that produces a brown, waxy covering that looks something like a tortoise shell. Populations of these insects can occasionally reach such high levels in the forest that they can damage and even kill poplar trees, although this is rarely seen in southwest Virginia.

On the other hand, the poplar weevil is a defoliating insect that is particularly common in southwest Virginia, especially in Lee, Scott, Wise, Dickenson, Buchanan, Russell and Washington counties, along with adjacent counties in Kentucky and Tennessee. In most of these counties, as many as six to eight poplar weevil outbreaks have been documented over the last 25 years by forest health personnel with the Virginia Department of Forestry (Figure 4). Feeding by individual weevils in spring causes little damage to newly emerged leaves, other than a small brown patch. During outbreaks, however, millions of weevils can result in poplar trees being heavily defoliated. These outbreaks are often patchy in nature but can span large areas.

While the word "outbreak" can sound very dramatic, the truth is that these defoliation events are often not noticed from the ground for several reasons: they are very patchy across the landscape and often occur in remote areas that are not easily visible. In addition, poplar trees are generally quite tall and most people driving by don't have the tendency to look up. Furthermore, while complete defoliation of poplar can occasionally occur, trees

with adequate moisture often leaf out again pretty quickly, erasing any evidence of past damage. Outbreaks typically don't last very long in any one area either because poplar weevil has a host of other insects that prey on them, which usually causes outbreak populations to crash after a year or two.

While one defoliation event by itself is probably not going to cause poplars to decline or die, several defoliation events over successive years can weaken trees and, combined with other stressors such as drought, lead to some localized dieback,

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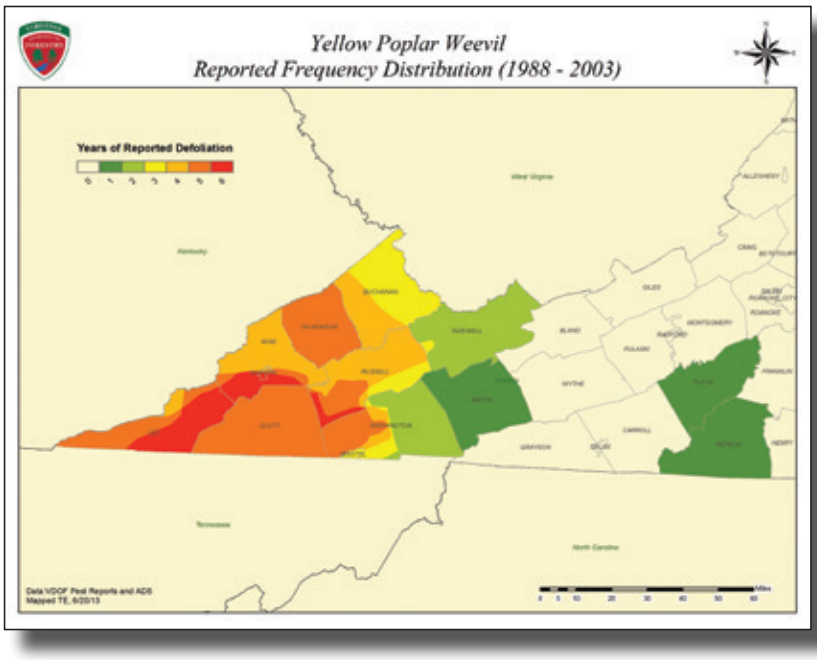
decline or even death. Recently, some landowners across Lee, Wise and Scott counties have seen such poplar decline over the last few years and have expressed concerns to local foresters. In most cases, these areas of decline are small – generally from ½ acre to several acres in size – although several locations have exhibited decline spanning 50 acres to 100 acres.

There appears to be no obvious reason why these declines show up where they do, other than the fact that these areas were known to have several weevil outbreaks during past years. Because tree decline is a gradual process that can take many years and be caused by multiple agents, it's always difficult to pinpoint exact causes. But knowing that the weevil is a major presence in the region and one of the few insects that can feed on poplar, it seems very possible that it is playing a prominent role in these decline events. The good news is that the affected areas are quite small, and most of the poplar trees were weakened but not dead. That means the wood is probably still sound and can be salvaged, so most landowners can still profit from forests with some poplar decline.



Map by T. Edgerton

Figure 4. The areas of yellow poplar decline coincide with the red area across Lee and Wise Counties that indicate six documented poplar weevil outbreaks since 1988.

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