



FOREST HEALTH REVIEW

November 2007



Due to extreme drought conditions, premature leaf browning and some tree mortality on rocky, mountain tops was a common sight in parts of Virginia this year.

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GREETINGS

The immediate future is grim from a forest health standpoint. We have had record-breaking drought, which is likely to continue into the winter months with current La Niña conditions in place across the Southeast. While Virginia has suffered, particularly southwest Virginia, other areas, like Georgia, Alabama and Tennessee, are much worse. As in past years, we have seen early leaf senescence in late summer, browning and some tree mortality – particularly on upper slopes and ridges – and all the associated tree decline problems that come with SUSTAINED drought. I emphasize the word “sustained” because we have been in a drought of one degree to another for the majority of the last 10 years. These impacts are cumulative, and trees that suddenly die one year may have been declining from weather-related events going back many years. Sustained drought has also contributed to a rise in gypsy moth populations, which are harder to keep in check without the benefits of a lethal fungus that thrives on gypsy moth caterpillars during moist spring weather. It is probable that only an unusually wet spring next year will prevent us from seeing gypsy moth defoliation levels reaching hundreds of thousands of acres. In addition, the southern pine beetle is beginning to return to some areas, and a number of counties could possibly reach outbreak status next year. Meanwhile, the emerald ash borer is right on our doorstep, and we face losing yet more tree species from our landscape. Besides job security for me, it’s difficult to put a positive spin on all of this. So, I won’t try. I hope you find this issue useful and informative, if not uplifting.

Chris Asaro, forest health specialist



THE GYPSY MOTH IN VIRGINIA: PAST, PRESENT AND FUTURE

The gypsy moth was back with a vengeance in Virginia and neighboring states, and this year may have been only a prelude to what lies ahead. Despite an increase from about 14,000 acres of heavy defoliation in 2006 to more than 73,000 acres this year throughout the Commonwealth (Figure 1), another dry spring in 2008 will likely lead to far greater impacts. One needs only to look at defoliation levels this year in Pennsylvania (800,000 acres) or New Jersey (320,000 acres) to recognize that this could easily happen to us.

In fact, it was not so long ago that Virginia witnessed such extreme levels of

defoliation. Beginning in the late '80s and proceeding through 1995, Virginia saw annual defoliation levels in the hundreds of thousands of acres – peaking in 1995 at more than 800,000 acres (Figure 2). Moist weather and the sudden and mysterious appearance of the fungal pathogen *Entomophaga maimaiga* triggered a dramatic collapse of gypsy moth populations. Since 1996, only the year 2001 has registered defoliation above 100,000 acres (Figure 2). Some have speculated that the presence of *Entomophaga maimaiga* in the environment will serve to keep gypsy moth populations from reaching the explosive levels of the past. Time will tell whether this holds true, but if annual drought conditions continue as they are, the fungus will not be as effective, and we are likely to see dramatic increases in defoliation compared to what we’ve seen since 1996.

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“I never give them [the public] hell. I just tell the truth, and they think it is hell.”

Harry S. Truman, 1956

THE GYPSY MOTH IN VIRGINIA, CONTINUED

Which areas in Virginia have been most affected by gypsy moth defoliation? Generally, it has been the mountainous regions in the northern and western part of the state (Figure 3). Gypsy moth first began moving through northern Virginia in 1984 and has gradually spread south and west. The head of this active front can be found along a line roughly running from Blacksburg to Danville to Virginia Beach. While gypsy moth defoliation does occur in Virginia's Piedmont and Coastal Plain, it rarely occurs over large contiguous areas that can be easily mapped from the air. Among the reasons why mountainous areas are more susceptible to gypsy moth defoliation are

the prevalence of preferred hosts (oaks), the relative stress on those host trees due to steep slopes and dry, rocky soils, and the amount of contiguous forest made up mostly of federal land. Figure 3 illustrates that between 1984 and 2007, approximately 2.3 million acres of forest in Virginia have been defoliated at least once by the gypsy moth. If one compares Figure 3 with a map of general forest cover, it becomes clear that a vast majority of the acreage of the George Washington National Forest and Shenandoah National Park has been defoliated at one time or another. Many trees that see multiple years of heavy defoliation die, and the ensuing ecological changes to these areas can be profound.

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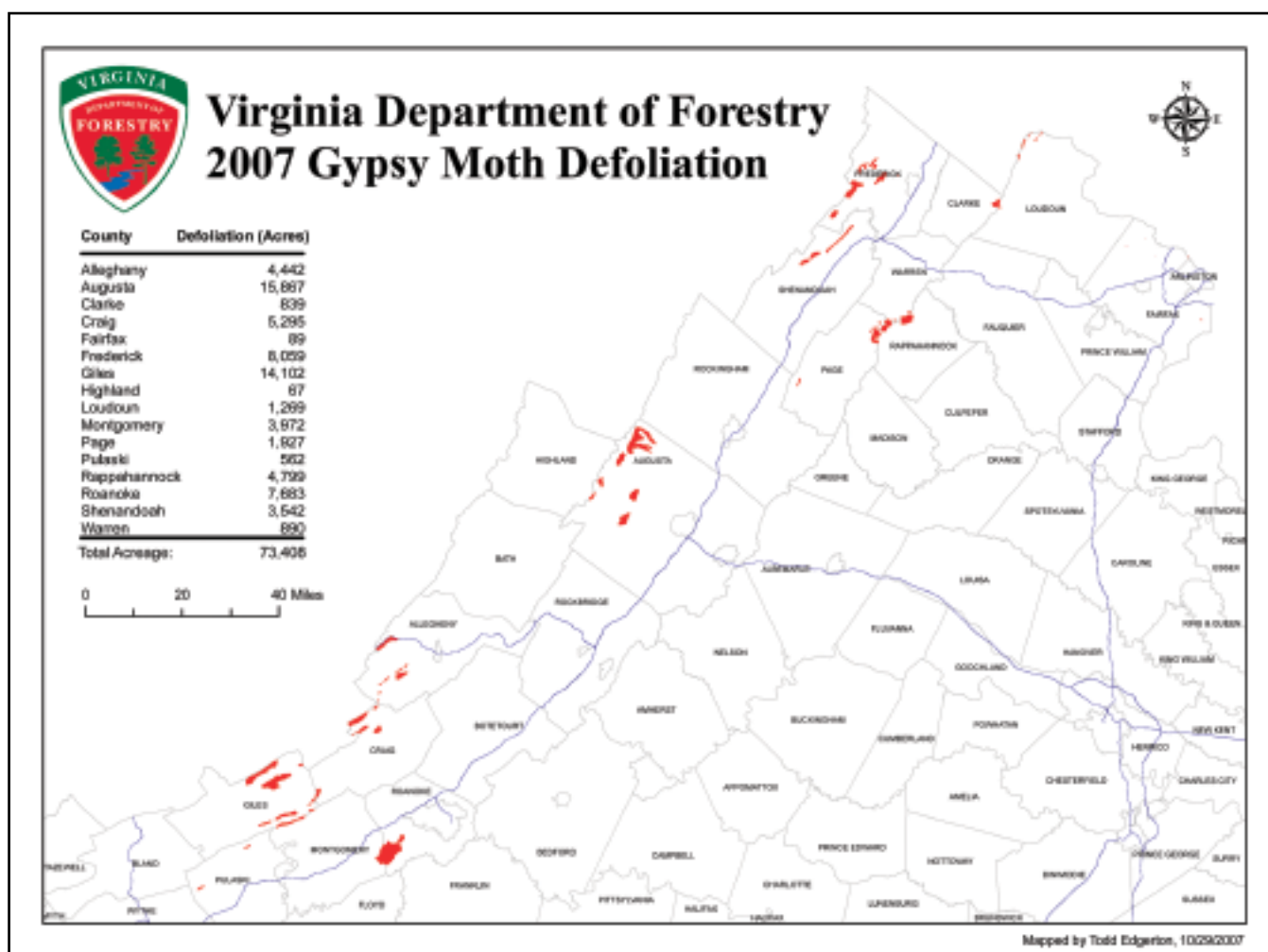


Figure 1

"He that will not apply new remedies must expect new evils; for time is the greatest innovator.

Francis Bacon, 1625

THE GYPSY MOTH IN VIRGINIA, CONTINUED

The effects of all this past defoliation can still be easily seen from the air as a patchwork mosaic of different age classes and species composition. Stark white 'ghost forests,' which contain the skeletons of long dead oaks that remain standing, still dot the landscape in many places. Where oak regeneration is poor, forest composition will change and be more heavily influenced by tulip poplar, red maple and sweet birch.

Mountainous areas to the south and west of Roanoke will begin to see gypsy moth defoliation for the first time in the coming years as the pest inexorably moves in that direction. The USDA Forest Service gypsy moth Slow-the-Spread program has been very successful at doing just that, but ultimately the gypsy moth will make its way across the United States and will become a major force for change in many forested environments.

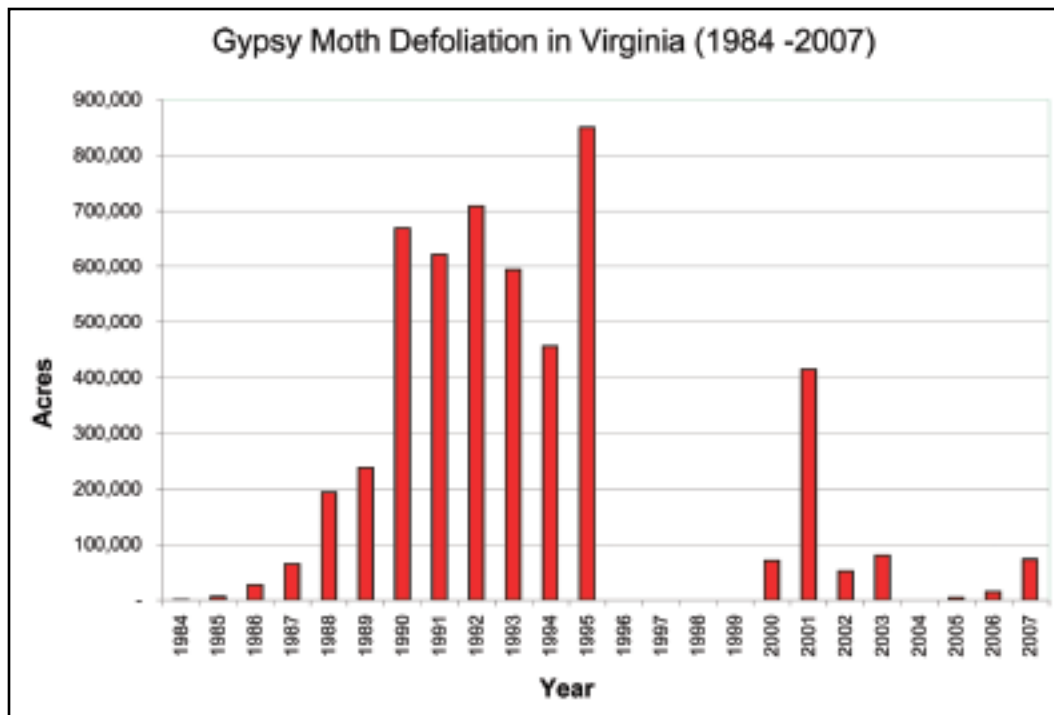


Figure 2

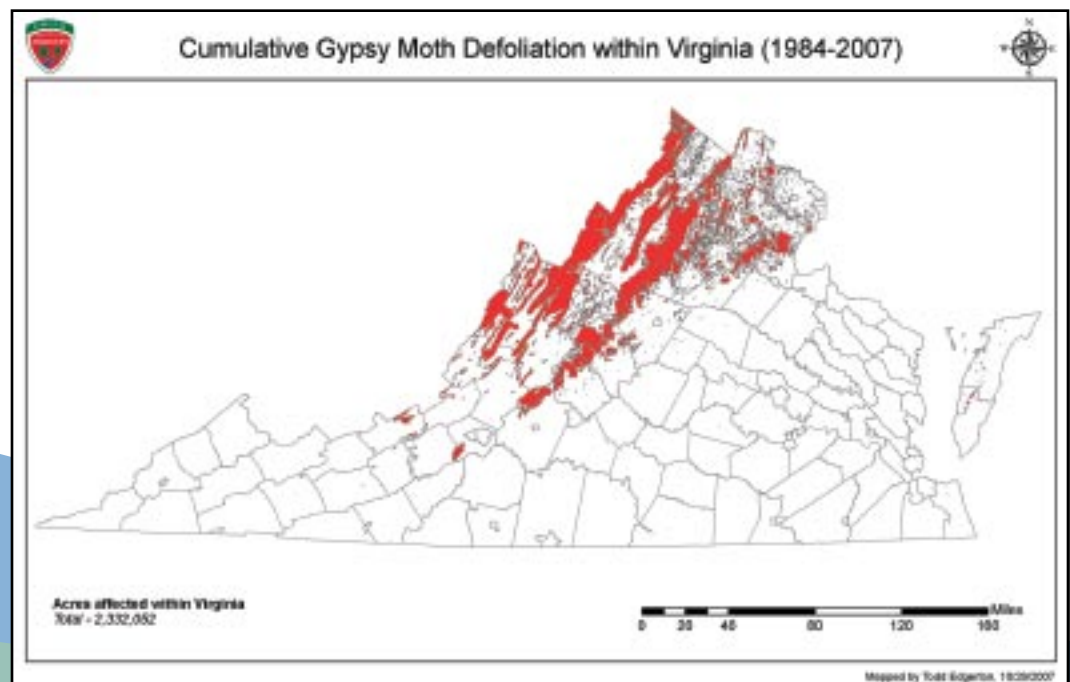


Figure 3

"Fame and tranquility can never be bedfellows."

Montaigne, 1580

UPDATES

CLIMATE CHANGE WATCH

I promised in the last issue that I would make Climate Change a regular feature in the Updates section, so here it is.

In recent news, some polar bear experts have predicted a 30 percent decline in worldwide polar bear populations over the next 35-50 years due to melting polar sea ice. Polar bears rely on these ice platforms to hunt for seals, their principal food source. Along the western edge of Hudson Bay, in the Canadian province of Manitoba, a 17 percent decline in the local polar bear population has been documented during the last 10 years. Ice is reportedly melting there about three weeks earlier than it did 30 years ago. The timing of this early melting is critical, coinciding with the best time of year for feeding when seal pups are abundant and bears are trying to put on fat that they store for the summer months when they are forced to live onshore. This decline in hunting opportunities has resulted in bears that on average weigh about 15 percent less than they did 30 years ago. Such a loss of vigor makes it more difficult to birth and raise healthy bear cubs.

Other Disturbing Tidbits From The National Climatic Data Center:

The global surface temperatures for the combined January-May 2007 period tied with 1998 as the warmest January-May on record. May 2007 was the fourth warmest on record and the warmest ever over land.

During the spring of 2007, much of Siberia was five degrees Celsius above average. This is a concern because Siberia contains one of the world's largest stores of carbon locked away in the permafrost (so much for the 'perma' part). Much of that melting permafrost will release additional greenhouse gases, such as carbon dioxide and methane, into the atmosphere.

In China, the worst drought experienced since 1940 occurred across several provinces.

Closer to home, 2007 saw the driest spring on record across the southeastern US. On May 29th, 2007, 83 percent of the southeast, 50 percent of the western US, and 34 percent of the contiguous US were in moderate to exceptional drought conditions. Exceptional drought conditions continued through the summer and into fall for many areas in the southeast.

WEATHER



Slate River Lake in Appomattox-Buckingham State Forest at lower-than-normal water levels.

When I finished off the last issue's weather summary in March 2007, we were seeing the beginnings of what turned out to be a year-long drought. April actually saw above-average precipitation for much of the Commonwealth, especially in central and southeastern Virginia (130-200 percent of normal). Northern and western Virginia saw about 100-150 percent of normal monthly precipitation as well. The Roanoke area extending into the Piedmont to about Charlotte County saw precipitation levels about 50-90 percent of normal. Temperatures varied quite a bit as well, but most areas were actually about

*"A teacher affects eternity;
he can never tell where his
influence stops."*

Henry Adams, 1907

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normal to a couple degrees below normal for the month. Large areas of southwest Virginia were 2-5 degrees below normal.

Beginning in May and extending through July, many parts of the state extended their drought at least another few inches to as much as nine inches. The worst areas affected were the southwest, southside, northern and Coastal Plain regions. May was the driest month, but June and July also remained below average for precipitation in most locations. Temperatures in most locations were about average to a few degrees above average in May and June. July was actually slightly cooler than normal for most of the Commonwealth.

August was unusually hot, with temperatures 3-5 degrees above average in most locations. However, despite a complete lack of any tropical systems, many areas saw close to average rainfall amounts. A passing system in mid-August brought heavy rains to much of the Commonwealth, particularly areas to the south and west of Richmond, some of which saw rainfall totals between 4 and 8 inches in one evening. The southwest continued to see the least amount of rainfall with the exception of the Grayson Highlands and surrounding regions. Entering September, much of southwest Virginia was categorized as being in extreme to exceptional drought conditions.

September brought little drought relief. Almost everywhere precipitation levels were less than 50 percent of normal and in many areas less than 25 percent. Likewise, temperatures were 2-6 degrees above normal for the month. October began bone-dry for everyone and we looked to be entering a record-breaking fall fire season. Warm weather persisted, most places being 6-10 degrees above normal for the monthly average.

“Where is the wisdom we have lost in knowledge? Where is the knowledge we have lost in information?”

T.S. Eliot, 1934

Precipitation was virtually non-existent until October 23rd, when a system that seemed to catch everyone by surprise developed out of the west and stalled over Virginia for three days. Although it was not a tropical depression, it had the effect of one – light to moderately heavy rain fell steadily over most locations. Most areas received 2.5-5 inches of rain, some areas well over 5 inches. Parts of the southwest received less than 2.5 inches even though they needed it the most. While not a drought buster, this rainfall came at the right time and changed the complexion of fire season for the better.

Despite earlier predictions that this would be an active hurricane season, high-level winds in the upper atmosphere of the Atlantic were tearing apart any tropical system that tried to get organized. Not even a tropical depression would make it anywhere near the North American continent north of the Gulf of Mexico all year. A persistent pattern had been in place all spring and summer where high pressure over the Southeast and Mid-Atlantic kept weather fronts stationary for days to weeks over the middle of the country. States like Texas saw record-breaking rain and flooding and not so much as a drop fell for months in many location east of the Mississippi River. Later this pattern was identified as part of a La Niña event, which would mean above average temperatures and drought extending into winter.

MISCELLANEOUS DEFOLIATORS

As predicted, the variable oakleaf caterpillar outbreak in central Virginia seemed to have peaked last year. Only minimal defoliation occurred in Hanover, Powhatan and Chesterfield counties, which saw the worst of the defoliation last year. Natural enemies typically cause caterpillar outbreaks to crash within two to three years. At the tail end of the defoliation in 2006, there was lots of evidence of diseased larvae and ground beetle predation of caterpillars that had dropped to the ground to pupate and overwinter (Forest Health Review, November 2006).

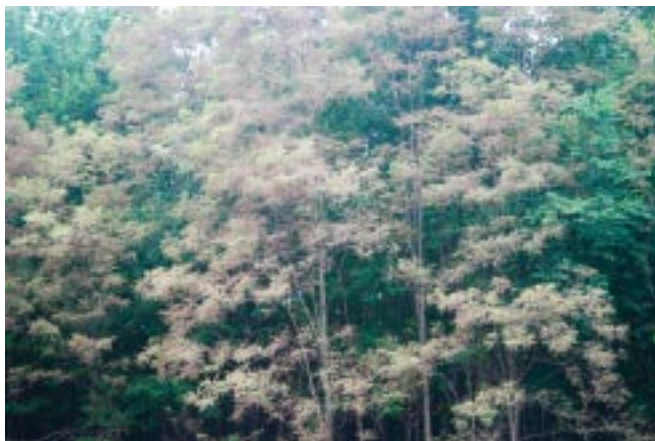
Locust leafminer outbreaks are an annual occurrence in

Virginia, but I can't remember a year where the trees appeared to be so heavily impacted. If I had not seen this many times before, I would be certain all of these completely brown trees were dead. It's amazing these locust trees live through this stress year after year. The fall webworm was also locally quite heavy.

The fall cankerworm appeared on Bull Run Mountain along the Prince William/Fauquier county line once again. This is a popular hot spot for fall cankerworm outbreaks (see Forest Health Review, May 2007). For the most part, the defoliation was moderate to slightly heavy, but not severe. Most trees had refoliated by late June and it was hard to tell anything had occurred there.



Webs of the fall webworm.



Defoliation by locust leafminer.

TULIP TREE SCALE

A widespread outbreak of the tulip tree scale (*Toumeyella liriodendri*) appeared on tulip poplar trees on the eastern slopes of the Blue Ridge in Nelson County. Affected trees were visible from the Massies Mill area north to Wintergreen. Although these are native insects with a variety of natural enemies, large outbreaks in natural forests are not uncommon. Intense infestations can cause greatly weakened trees, sparse foliage, dead branches and distorted trunks. Trees are often covered in a black, sooty mold, which grows on the 'honeydew' secretions of the scale insect. Mortality is possible, particularly among seedlings and saplings, which hinders future development of economically viable tulip poplar stands.

SOUTHERN PINE BEETLE



Moderate defoliation of tulip poplar trees in the upper canopy, caused by the tulip tree scale.

“Who owns this landscape? The millionaire who bought it or the poacher staggering downhill in the early morning with a deer on his back?”

Norman McCaig, 1969

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SOUTHERN PINE BEETLE PREVENTION PROGRAM

With a third consecutive year of drought conditions, many folks are surprised that southern pine beetle (SPB) activity has not been worse. It is a misconception that droughts cause SPB outbreaks, but they can certainly make outbreaks more serious when they occur due to increased tree stress and vulnerability to the beetle.

While overall spring trapping indicated generally low populations, a few locations, particularly Chesterfield County and Pocahontas State Park, had trap catches in the spring that suggested increasing activity. This was not too surprising as there were a number of small SPB spots in the park last year. While no activity was apparent in early summer, the first indications of increasing activity occurred when a 100-acre SPB spot was discovered in northern Dinwiddie County in August. This spot was initiated in a large block of old pine and likely went unnoticed for a month or two before reaching the edge of a field. The landowner agreed to do some salvage cutting to limit the spread of the infestation. Significant activity also showed up in Chesterfield County. In late September, Rich Reuse aerially surveyed Pocahontas State Park and much of the southern and western portions of the County in a helicopter and discovered quite a few spots, many small and a few large. Other areas just recently reported to have SPB spots are eastern Amelia and northeast Nottoway counties. These latter locations have yet to be documented and mapped.

These late-year discoveries may foretell a significant rise in SPB activity in 2008. Typically, an increase in the activity of Ips and turpentine beetles will coincide with an SPB outbreak, although these insects can also be very active and prevalent in the absence of SPB.

Our cost-share efforts for pre-commercial thinning have gone up considerably since last year. However, there is much more that can be done, and we recently increased our cost-share amount from 50 percent to 60 percent in an effort to attract more landowners to sign up for this program. We have similarly increased our cost-share rate for landowners wishing to plant longleaf pine. In May 2007, John Nowak of the USDA Forest Service, Forest Health Protection and director of the Southern Pine Beetle Prevention Program visited the Virginia Department of Forestry to review our program. He spent a half day at Appomattox-Buckingham State Forest where Wayne Bowman and Tom Zaebs discussed some of the loblolly pine spacing studies being conducted there. Another day was spent at Garland Gray Forestry Center and environs to review our longleaf restoration program and to view an example of a pre-commercially thinned stand adjacent to an unthinned stand. This latter event was well attended by Region 1 representatives as well as members of DCR's Natural Heritage Program and, of course, Billy Apperson and Jerre Creighton. USDA Forest Service funding for this program will probably go down gradually starting in 2008, but it continues



John Nowak (left) of the USDA Forest Service talks with Wayne Bowman (center) and Tom Zaebs about pine stocking density at Appomattox-Buckingham State Forest.

"The only reward of virtue is virtue; the only way to have a friend is to be one."

Ralph Waldo Emerson, 1841

to be strong and will keep us going for at least another three to four years, if not longer.

We recently hired a full-time forester, Nathan



Jerre Creighton (far left) leads a discussion on pre-commercial thinning with a group from Region 1 and John Nowak (far right) of the USDA Forest Service in attendance.

Lojewski, to assist Billy Apperson with the Virginia longleaf restoration program. In addition, Nathan will be responsible for helping increase awareness of the cost-share program for pre-commercial thinning and longleaf restoration through landowner outreach, placement of signage, educational seminars, etc. Nathan recently hit the ground running this October when he was put to immediate use assisting with longleaf pine cone and seed collection from our native trees. We are really glad to have him on board.



Nathan Lojewski (center) discusses longleaf pine with Billy Apperson (right) and Jerre Creighton on a native longleaf pine site in Suffolk, VA.



Native longleaf pine growing in Suffolk, VA.

EMERALD ASH BORER

I wrote an in-depth article on emerald ash borer (EAB) in the previous issue (Forest Health Review, May 2007), focusing on the recent eradication efforts in Maryland. Because of the proximity of EAB to our border along the Potomac River, survey efforts were concentrated in those areas from Alexandria south through Prince William, Stafford, King George and Westmoreland counties. While we did not find any evidence of emerald ash borer in our survey areas this year, recent discoveries in southwestern Pennsylvania and central West Virginia suggest that it is spreading rapidly. If it is not already in Virginia, it likely will be very soon.

One of the primary ways EAB is able to spread so quickly is believed to be the transport of infested firewood. Many folks traveling across state lines to go camping bring firewood with them, and some may unknowingly be moving ash wood infested with EAB larvae. If one maps the location of known EAB infestations from their point of origin around the Detroit, Michigan, area through Ohio and Indiana, it becomes clear that they are roughly following the routes of major interstates. We need to limit the practice of moving firewood, particularly across state lines. Many out-of-state travelers

“The secret of being a bore.....is to tell everything.”

Voltaire, 1737

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and campers who bring firewood with them often end up in one of Virginia's state parks. Firewood collected locally could probably be provided to campers entering the park system at a minimal cost to them. One way or another, the future of ash is grim in Virginia and elsewhere. While it's difficult to say whether ash trees in a particular location will be affected by EAB in five years or 50, it's probably wise to start thinking about alternative tree species to plant if you want those trees to live for a long time.

EUROPEAN WOODWASP

We are still on the lookout for the European woodwasp, *Sirex noctilio*. At this point, its range still appears to be New York and northern Pennsylvania. In cooperation with VDACS and USDA APHIS, more than 75 traps were placed across the Commonwealth to detect this pest. None were detected, although we typically catch a few different species of native woodwasps.

SUDDEN OAK DEATH

Last year, we began a pilot study with support from the USDA Forest Service to survey for the pathogen that causes sudden oak death (SOD), *Phytophthora ramorum*. This study involves sampling streams baited with rhododendron leaves, which are infected by the water-born spores of *P. ramorum* and other native species of *Phytophthora*. Details of this method are described in the previous issue of the Forest Health Review (May 2007). This pilot study demonstrated that this detection method is much more efficient and less labor intensive than the previous method of sampling leaves along land-based transects.

“Work to survive, survive by consuming, survive to consume: the hellish cycle is complete.”

Raoul Vaneigem, 1967

Therefore, our sampling procedure this year has been completely stream-based. Todd Edgerton, the forest health forester, carried out this project and sampled from nine watersheds that covered approximately 67,000 acres. Once again, no evidence of *Phytophthora ramorum* was found in leaf samples sent to a Virginia Tech lab for analysis.

HEMLOCK WOOLLY ADELGID

Surveys this year confirmed that the hemlock woolly adelgid (HWA) is present in Scott County. This was the last county in southwest Virginia where HWA had not been officially confirmed. Halifax, Campbell, Louisa and Goochland Counties are the last counties in Virginia reported to have native hemlock stands but have not been officially listed as infested. These counties all have isolated patches of hemlock disjoined from the major range of this species and may have been isolated enough to avoid early infestations. It seems likely to me, however, that these counties would also be found to have HWA if one looked hard enough. Maybe after reading this, one of those county



Hemlock trees at James River State Park in Buckingham County, VA.

foresters will give me a call to confirm its presence (hint, hint).

In Virginia, Interstate 81 passes roughly through the center of hemlocks' range. As you drive through the Roanoke region and north, hemlock mortality generally increases, reaching levels as high as 90-95 percent in Shenandoah National Park. As you drive into southwest Virginia, mortality decreases since HWA has not been present there as long. On average, hemlock mortality levels in the Jefferson National Forest are about 10 percent, but this is highly variable. Many hemlock trees are in fair condition despite being infested for five or more years. It is not entirely clear what role tree genetics and site play in hemlock resistance to HWA.

In the fall of 2005, we obtained 300 beetles of the HWA predator *Laricobius nigrinus* from Virginia Tech to release into James River State Park in Buckingham County. This is a unique environment in that it contains an isolated stand of hemlock along the bluffs where the James River meets the Tye River. The HWA infestation was in its early stages in 2005, and most trees appeared to be very healthy. Since the release, we have surveyed every spring and fall to monitor the trees condition and to look for evidence that *L. nigrinus* had successfully reproduced and established itself. We made our first recovery of *L. nigrinus* in April 2007. Two suspect larvae were collected from HWA infested branches and sent to Virginia Tech for genetic testing. There is a native species of *Laricobius* (*L. rubidus*) that cannot be distinguished from *L. nigrinus* from the larval stage, thus the need for genetic testing.

Although, two predators do not seem like a lot, remember that these are very small beetles and we released only 300 of them. Of course, we hope to find more in future surveys, but this is at least an indication that biological controls being released into the environment are surviving and reproducing on their own. Of course, the next hurdle is for them to reach numbers that will be sufficient to suppress the adelgid and slow down the rate of hemlock decline. Whether this will ever be achieved remains to be seen, but with the continued release of a greater number and variety of biological control agents, we can at least be hopeful.

INVASIVE WEEDS

We continue to look at market options for tree-of-heaven (*Ailanthus altissima*). Charlie Becker has been working with Virginia Tech on *Ailanthus* lumber and pallet testing to evaluate physical properties, workability and proper drying procedures. Charlie has also experimented with making *Ailanthus* charcoal, which appears to be well received. Its potential for use as firewood is also being evaluated. Apparently, pulp mills will accept it if it's mixed in with other species.

Jerre Creighton continues to evaluate control options for tree-of-heaven using Garlon 4. Details of this work are provided in the Forest Research Review (March, September 2007). In a nutshell, it's looking like a cut and stump spray treatment, as well as a stump spray followed by cutting, work equally well at killing trees and preventing re-sprouting. Furthermore, it's beginning to look like these treatments will work well regardless of the time of year they are applied, although more testing is needed.



Autumn olive is a widespread invasive shrub, but its berries are highly prized by birds and other wildlife, which facilitate seed dispersal.

"I always have a quotation for everything. It saves original thinking."

Dorothy L. Sayers, 1932

UPDATES

We were fortunate to receive a substantial increase in our invasive weed budget from the USDA Forest Service, Forest Health Protection this year. Much of the additional money will be spent on needed weed control work on the Lesesne, Whitney and Paul State Forests. Control will be primarily focused on *Ailanthus* and Asian bittersweet (*Celastrus orbiculatus*), but will also address other problems such as Kudzu (*Pueraria montana*) and multiflora rose (*Rosa multiflora*) as needed. Jerre Creighton may also use this opportunity to establish research and demonstration plots in some of these control areas to look at some forest ecological trends with and without weed control. Hopefully such sites can be used to educate the public in the future.

Plans are underway to establish an invasive species trail along the pre-existing trail surrounding the Central Office in Charlottesville, with marked posts and a trail guide with a narrative and photos associated with each stopping point. Hopefully this work will be completed in 2008 and will be another good opportunity to educate the public about this growing and pervasive problem in our forests.



Asian bittersweet is a rapidly spreading vine that can carpet the forest floor and wind its way up trees until it overtops them.



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