Central States
Forest Health Watch

Current forest health information for land managers in Illinois, Indiana, Iowa and Missouri

November 29, 2007

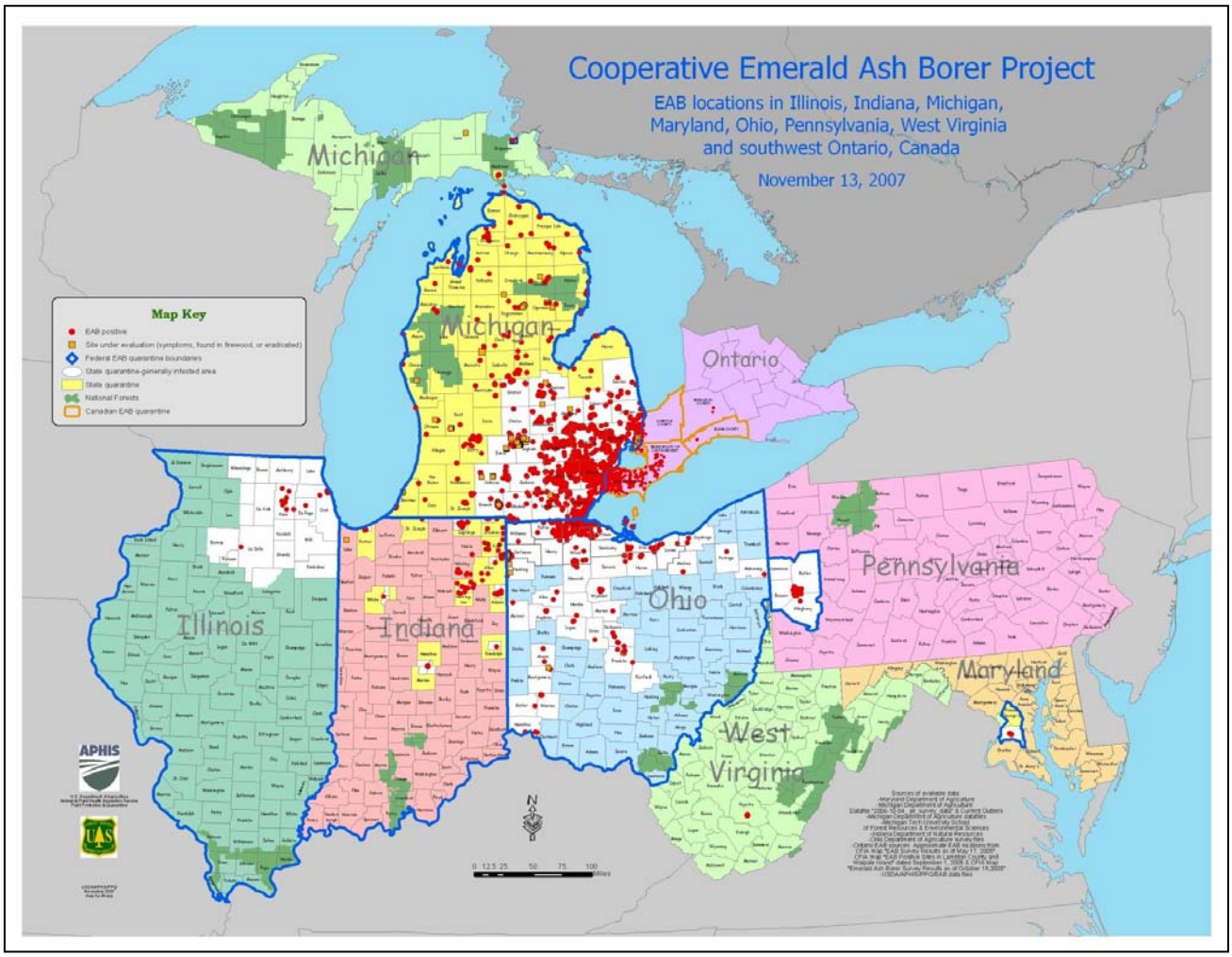
This collaborative effort of the USDA Forest Service Northeastern Area, Missouri Department of Conservation, and Indiana, Iowa and Illinois Departments of Natural Resources provides updates twice a year on forest health issues of regional interest.

Important Regional Forest Health Issues

Below you will find updates some of our "most popular" exotic forest pests: emerald ash borer, Sirex woodwasp, gypsy moth, and sudden oak death, plus an update on common pine shoot beetle.

Emerald Ash Borer

The map below shows the current known distribution of EAB. Significant additions include finds in Pennsylvania and West Virginia and an additional site in Illinois.



Each of our Central States has been faced with the need to reallocate resources for survey, education efforts, and, in Indiana and Illinois, tree removals. The 2007 efforts are summarized by State in this table:

State	2007 EAB activities
IN	As of December 1, EAB has been confirmed in 16 counties in Indiana. New townships have been added to infested counties and two new county records have been added. All of this is in the northeast corner of Indiana. EAB has not yet been detected south of Indianapolis. Sentinel trees (girdled trap-trees and destructively sampled trees [not girdled]) were used in a two-mile "grid-based" survey to cover the entire state. Grid points that overlaid non-habitat (corn or soy bean fields) were eliminated. Risk-based sites (sawmills, campgrounds, etc.) were combined into the grid-based survey, and were established early so that girdled trap trees could be used at these sites. Destructively sampled (not girdled) trees were used after June 15 and for the majority of the grid points. A visual survey for declining trees was also conducted, with "suspect" trees felled and peeled to detect EAB. Removal and peeling of the sentinel trees began in October. As of the writing of this newsletter over 60% of the trees have been peeled. Peeling is scheduled to be completed by December 31.
IL	First discovered at three sites in Kane and Cook Counties in summer 2006. Additional sites in LaSalle and DuPage Counties were found in 2007, so now all or portions of the 18 northeastern counties are quarantined. Using a "population reduction" strategy to remove trees that contribute the most to a building EAB population. The 2007 survey focused on the 35 northern counties.
IA	No EAB yet detected. Visual surveys conducted in highest risk areas—400 campgrounds in 69 counties. 1,102 ash trees examined, with no evidence of EAB. Sentinel trees also used at 57 sites. Sentinel trees included 190 girdled standing ash and 47 planted 1 - 3" caliper containerized ash. Also used experimental purple sticky traps in 10 municipalities (10 traps per city).
MO	No EAB yet detected. Visual surveys were concentrated on private and public campgrounds and other sites with elevated risk of introduction. 952 declining ash were evaluated at 294 sites, with no detection of EAB.

All Central States have responded to the threat of EAB by evaluating the highest risk pathways of introduction, particularly firewood. At a minimum, each State has established policies to restrict bringing hardwood firewood from EAB quarantined counties or states onto state-owned properties. Most states are including educational messages about the risks of firewood movement in their communications about state campground reservations. Firewood policy has become a very complicated issue.

For more emerald ash borer status and information visit: http://www.emeraldashborer.info/
Our feature article in this edition also focuses on recent research findings on EAB.

Sudden Oak Death

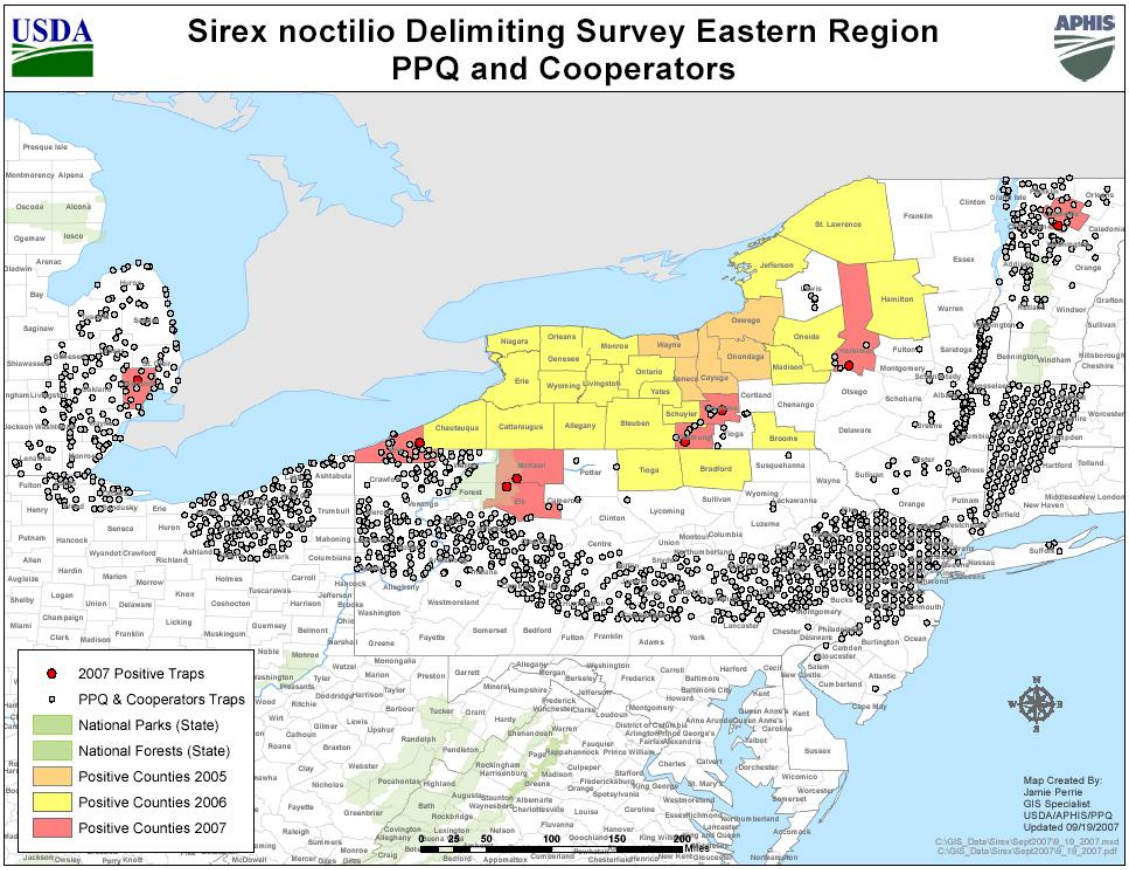
In 2007, as part of a 28-state survey that spanned the country, the North-Central States implemented stream baiting along two east-west transects, one in the north and one in the south. Stream baiting is done by placing leaves of susceptible hosts in streams to intercept spores washing through the watershed. A total of 18 watersheds were monitored in Wisconsin, Illinois, Indiana, Michigan, Missouri, and Ohio from mid-May into October. There were 5 sample periods of 1-2 weeks each, depending on water temperature. Water temperatures in mid-summer exceeded 25°C causing a hiatus in sampling. A set of rhododendron leaf baits from each sample period was sent to each of two labs: one cultured the leaf samples, the second conducted PCR analysis on the samples. Eighty-seven samples were submitted. Not all lab reports are complete, but to date there have been no *Phytophthora ramorum* positive leaves. Many other *Phytophthora* species have been recovered, indicating the method is effective in isolating the genus from the environment.

Nationally, as of early November, 35 samples have been *Pr* positive out of 152 watersheds monitored. Only one of these samples was from a watershed not known to be previously infested (outside of California and Oregon). This occurred in western Washington, downstream from nurseries previously known to have had infected plants.

Plans for 2008 include continued focused monitoring of streams in high priority watersheds; ones that either received infected plants, are in the marketing area of nurseries or retail outlets that received infected plants, or nurseries that received other plants from infected nurseries out West. Given how much infected plant material is unaccounted for, it seems improbable that *P. ramorum* has not become established somewhere in the East. Stream baiting has proven to be an efficacious and efficient means to detect early infestations.

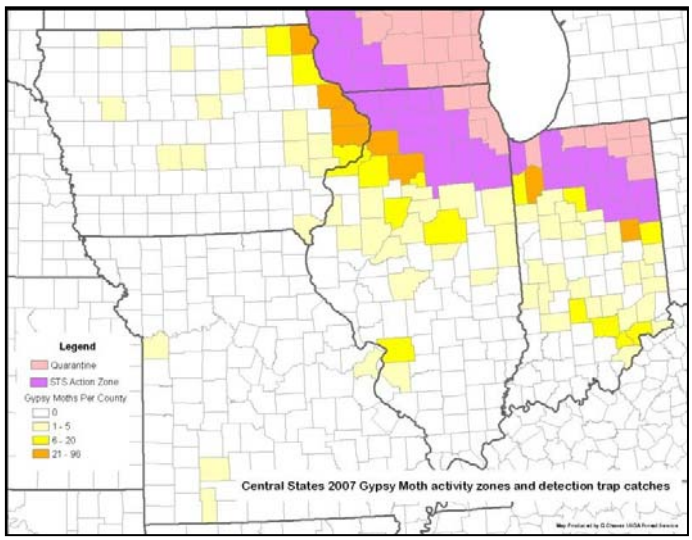
Sirex Woodwasp

Sirex noctilio is one of our newest exotic pests, with an established population first being confirmed in New York in 2005. It was later confirmed in 28 counties in New York, 5 counties in Pennsylvania, and across a large portion of southern Ontario. In 2007 this borer was detected in Macomb County, MI, and Lamoille County, VT, as well as additional New York and Pennsylvania sites. Although the 2007 data is not finalized, the survey map below indicates the locations in which Sirex has been found so far. This insect raises great concern because of its history of large-scale damage and the wide number of pine species that it has attacked in the Southern Hemisphere. Since *Pinus* species are not abundant in the Central States, *Sirex noctilio* is most likely to be a concern in natural shortleaf pine and in pine plantations. Sirex tends to attack primarily suppressed, stressed and injured trees. Since it tunnels deep into the wood, it has high potential to be transported in logs and wood products. A parasitic nematode (*Beddingia siricidicola*) has been used successfully for biocontrol in several countries. For further info on Sirex woodwasp, visit the following website:
http://www.aphis.usda.gov/ppq/ep/emerging_pests/sirexnoctilio.html



Gypsy Moth Activities

The map and tables below summarize the summer 2007 activities in the Central States. Color coding in the tables matches up with the colors on the map that represent the various "zones" for gypsy moth (GM) management. In states with established populations, the state is generally divided into three zones. The "quarantine area" is the portion where gypsy moth is considered established, and suppression activities may take place (pink on map). The "STS Action zone" is the portion of the state where treatment activities are undertaken to limit moth population, and thus "slow the spread" of GM (lavender on map). The remainder of the state is considered uninfested, and actions may be taken to eradicate any infestations that are found in those areas.



States without established populations:

	# traps set	Total moths captured	Comments
Iowa	4947	175 (was 20 in 2006)	Traps were placed by coordinated effort of State and Federal agencies and city and county foresters across Iowa. GM populations have been building in Wisconsin counties adjacent to where most of the Iowa moths were caught in 2007, so many of these catches could represent "blow" or natural dispersal of male moths. No egg masses have been found. Trapping will be intensified around areas with 2007 catches. No eradication treatments are planned for 2007.
Missouri	9906	7 (was 17 in 2006)	Traps were placed in 80 out of 114 counties. Trapping density is based on risk of introduction, with the highest density of traps being set in the lakes regions and St. Louis, because of their elevated risk of introduction by out-of-state visitors. All 2007 catches were single male moths. Four of the positive traps were located in the St. Louis metro area. The other positive traps were one each in Green County (near Springfield), Jackson County (Kansas City metro area), and Stone County (SW Missouri, near a large theme park).

States with established populations:

	Quarantine Area	Slow-The-Spread (STS) Actions	Counties with STS treatments	STS trapping results	Trapping trends outside quarantine and STS area
Illinois	Lake County was previously considered generally infested and under quarantine. Three new counties (McHenry, Cook and DuPage) were added to quarantine in 2007	4,600 acres treated with mating disruption pheromone flakes. 2,700 acres treated with two applications of Btk .	Cook, DuPage, Kane, and Winnebago	38,276 moths captured in the 5,342 traps set in the 18 county STS trapping area (northern Illinois)	6,708 traps were set by APHIS in 85 counties in central and southern Illinois. A total of 246 gypsy moths were caught across 24 counties, mostly near the STS line. 16 moths were captured within a one- mile delimit grid in Madison County (southern Illinois), indicating a possible infestation. Egg mass surveys will be conducted at the highest risk sites this winter.

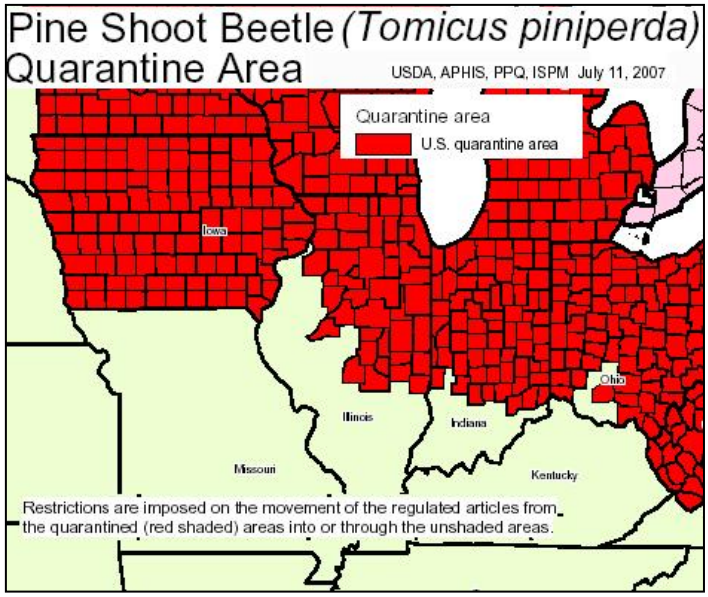
States with established populations (cont.):					
	Quarantine Area	Slow-The-Spread (STS) Actions	Counties with STS treatments	STS trapping results	Trapping trends outside quarantine and STS area
Indiana	Steuben, LaGrange, Elkhart, Noble, DeKalb, Allen, and Porter counties are under quarantine. St. Joseph is proposed for quarantine in 2008. Defoliation was observed in a small area of Allen County.	15,650 acres on 3 sites were treated with mating disruption; 11,260 acres on 13 sites with Btk. Two of these sites (in Allen and Delaware Counties) showed continued GM populations after treatment. Six sites were treated with Dimilin from the ground.	Whitley, Allen, Porter, Marshall, Elkhart, and Delaware.	4,733 moths were captured; mostly in the eastern part of the zone, adjacent to the infested area. A site in Delaware County that was treated in 2007 had high catches and egg masses were found.	Traps set by APHIS & IDNR in the remainder of the state below the STS zone captured 162 moths, which is up slightly from 2006 (146 moths).

Additional information on the current status of gypsy moth and treatment areas can be obtained from the webpage for the "Decision Support System for the Gypsy Moth Slow-the-Spread Program" at http://da.ento.vt.edu/

Common Pine Shoot Beetle

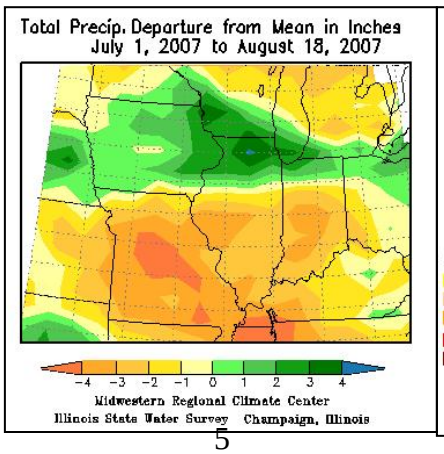
The common pine shoot beetle (PSB), *Tomicus piniperda*, native to Europe and Asia, is primarily a pest of pines. The adult beetles damage shoots of pine during maturation feeding. They reproduce in stumps and slash, where they generally cause little economic damage. In the Central States, one of the biggest impacts of PSB is quarantine issues surrounding Christmas trees from infested counties.

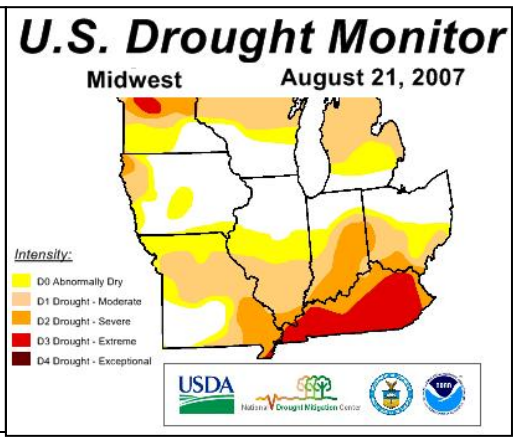
PSB has not yet been detected in Missouri. It was detected in Dubuque and Scott counties in Iowa in 2006, and the entire state was subsequently placed under quarantine. In Indiana, one additional quarantine county (Switzerland) was added in 2007. In Illinois, PSB was trapped in Mercer and Rock Island counties, but this is not yet reflected on the quarantine map.



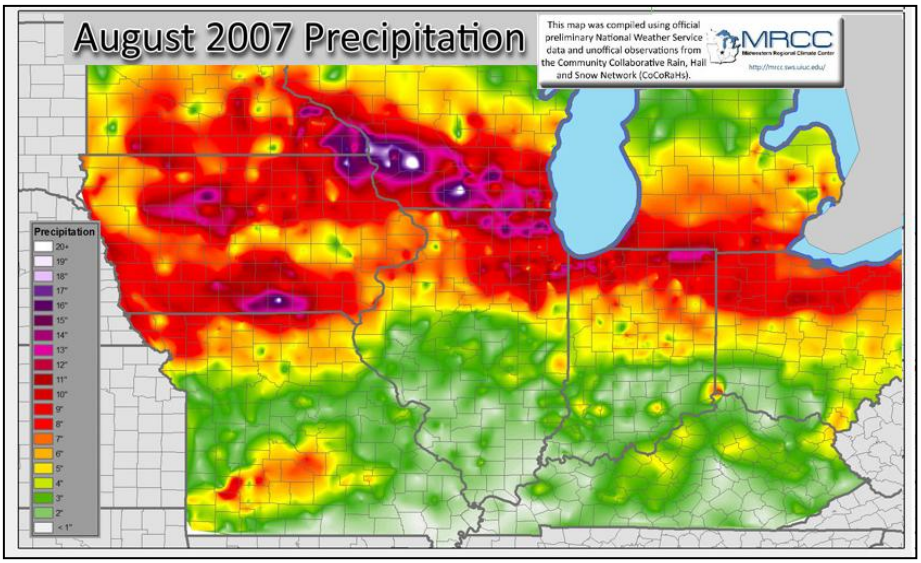
Weather Overview

According to the Midwest Climate Information Center, drought occurred throughout the Midwest during the six week period from July 1-August 18; the map (see figure) of rainfall departure from normal during this period clearly shows that the southern

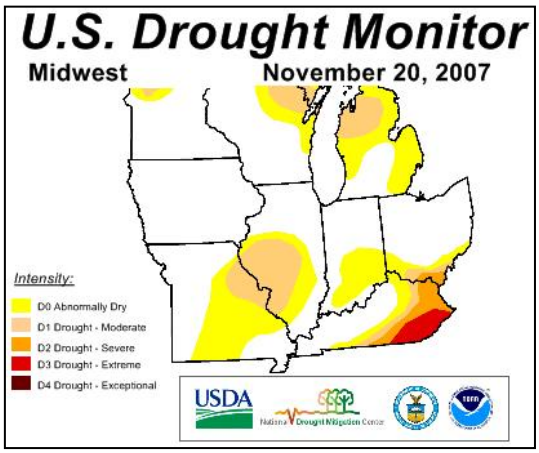




portion of the Central States suffered the greatest lack, while Iowa and northern Illinois fared quite well. By August 21, drought conditions were pronounced throughout much of Missouri as well as southern Illinois and Indiana (see figure).



During the latter part of August, heavy rains occurred in the northern part of the Central States (see figure for August precipitation), but unfortunately these rains came in heavy storms with high winds. The lack of rain continued in the southern portion of the region into mid-October. Storms around October 18 broke the drought, but also caused severe damage, particularly in Illinois and Indiana.



So far, November has been fairly dry throughout the region, with the exception of north central Indiana. If dry conditions continue, expect drought to redevelop in the southern portion of the region.

In September, climatologist Mark Seeley of the University of Minnesota presented a talk on climate change to the North Central Forest Pest Workshop in Minnesota. Dr. Seeley noted that Minnesota weather records show recent significant trends, including an increase in mean annual temperature (especially winter temperatures), an increase in water vapor (higher dewpoints), and an increase in annual precipitation (with a larger proportion of our precipitation coming from thunderstorms). The main rainfall occurrences in the Central States during the 2007 growing season appear to match this trend of receiving a large proportion of precipitation from storm events. If this trend continues, it has implications on the availability of that moisture for tree growth, as much of the precipitation flows away in storm drainage rather than soaking into the soil. Wind and storm damage to our forests will also increase as a forest health consideration.

What Else is Being Reported Around the Region

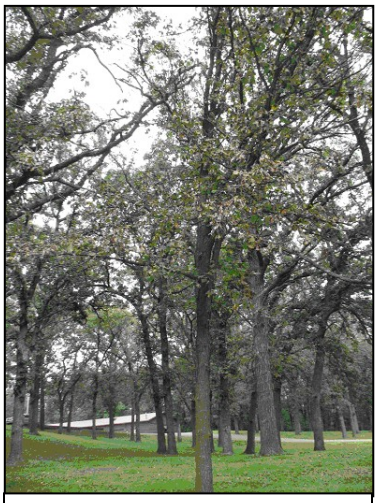
The first tree in **Missouri** known to be attacked by the **banded elm bark beetle (BEBB),** *Scolytus schevyrewi*, was detected in 2007 in St. Louis. BEBB has been collected in Missouri many times since 2004, but previously only in trapping surveys. In July 2007, three *S. schevyrewi* were collected from the bark surface of a 3-inch dbh 'Homestead' elm in Forest Park, a 1,400 acre park regarded as the "Crown Jewel" of St. Louis. The tree was oozing foaming sap from multiple sites. At another site within the same park, larvae, pupae and adults of bark beetles were found in early October in a dying Homestead elm (3-inch dbh). Homestead elms are Dutch elm disease-resistant hybrids. Trees at this second site were drought stressed. Subsequent dissection of the main stem of the dying elm revealed that more than 90% of bark beetle adults were *S. schevyrewi*, and less than 10% were *S. multistriatus*, the smaller European elm bark

beetle. This find indicates that BEBB does indeed have the potential to be an additional threat to our elm resource.

In **Missouri,** massive populations of **aphids** appeared in mid-summer on many deciduous tree species. The greatest number of reports about aphid activity initially came from near Kansas City, but later in the season reports increased in central and southwestern Missouri. Several aphid species are involved in these outbreaks, with each species typically feeding on a narrow range of host trees. The walnut aphid (*Chromaphis juglandicola*) appears to be the species that has exploded in numbers on black walnut trees. High numbers of other aphids are present on oaks, hickories, pecan, elm, maples, sweetgum, tulip poplar, willow, and redbud. Aphid feeding, particularly in late summer, does not normally cause major damage to trees. However, the large numbers seen in some areas this year could pose a threat to the health of trees already weakened by the severe freeze in early April. Aphid predators can be expected to take advantage of this prey population boom. Huge numbers of the Asian multicolored lady beetle (*Harmonia axyridis*) were observed feeding on aphids on black walnut.

Another sapfeeding insect, **Lace Bugs,** showed up in **Missouri** in mid-summer. Large numbers were reported on various white oaks and sycamore. Populations were particularly high on bur oaks, where entire tree crowns have obvious foliar discoloration. This was also detected during aerial surveys in **Iowa** as widespread discoloration of bur oaks.

There have also been many reports in **Iowa** over the past few years of **bur oaks turning brown** and losing leaves starting in July and progressing through the summer. This year was the worst year so far for this problem, with extensive browning noticed in many trees. The leaves often turn brown along the veins and in vein-delimited V-shaped areas. Small brown spots are often visible on the leaves. As the leaves turn completely brown, they fall off. The disease tends to affect the entire tree, working from the bottom of the tree up, and it is common to see completely affected trees growing adjacent to completely healthy trees. The symptoms have only been observed on bur oaks, not white or red oaks. In **Minnesota** and **Wisconsin**, similar symptoms have been called "**Tubakia leaf spot**", and in **Iowa** the Tubakia fungus is consistently found on symptomatic leaves. However, there are questions as to whether this fungus, usually known to cause a minor leaf spot disease on red oaks, is actually the cause of the problem. There are also concerns and questions about how widespread this problem is, and what impact it may have on our bur oaks. If the premature defoliation causes a new flush of leaves to open at the end of July or August, these trees will have less stored reserves for next spring's leaves. If the same tree continues to be affected several years in a row and produces replacement leaves each year, the tree may eventually run out of stored reserves and die. The Iowa DNR has established permanent plots at three sites across the state to see if the same bur oaks are infected each year. Trees will be monitored for new flushes of leaves in July and August, as well as overall health and decline. If you are observing similar damage to bur oaks, please report it to your State's forest health specialist(s).



Late summer "browning" of bur oak in Iowa. *Photo courtesy Aron Flickinger*

Trees in **Missouri** have been stressed this year by winter ice storm damage, a severe April freeze, and a long summer drought. Consequently, isolated pockets of **dying shortleaf pines**, ranging from a few individuals to several dozen trees, have appeared in southeastern Missouri. Foliage starts fading and entire tree crowns turn reddish brown in a few weeks. In many cases, bark beetle attacks occur on the upper trunk and limbs, and no evidence of attack is seen on lower trunks. Bark beetle attacks are also occurring on various ornamental pines around Missouri. Three *Ips* species (*I. avulsus, I. grandicollis, I.*

calligraphus) are common in shortleaf pine and other pines growing in Missouri. *Ips pini* often attacks eastern white pine.

The duration of Ips outbreaks in forest stands is often short-lived, lasting only one season. If infested spots are isolated and widely scattered, the best course of action often is to let the infestation die out on its own. Cutting and removing trees to stop the outbreak may actually accelerate it, because harvesting produces fresh host odors (attractants), logging slash (potential breeding sites), and additional stress or injury to the residual stand. The best strategy for landscape trees is to prevent infestations by increasing tree vigor through good tree care and providing supplemental water during droughts. Healthy trees capable of producing high resin flow can resist bark beetle attacks. But once *Ips* beetles and associated fungi have successfully colonized a tree and foliage begins to fade, there is no way to save it. Infested trees should be cut and removed to prevent beetle attack on nearby pines. Care should be taken when removing dead trees so that residual trees are not injured.

Shortleaf pine in Texas County, Missouri, killed by *Ips* spp. *Photo courtesy Rob Lawrence.*

Feature Topic: Emerald ash borer research-- what's the frass?

By *Steve Katovich, Entomologist, USDA Forest Service*

Emerald ash borer (EAB) was initially identified in the Detroit area in 2002 though it had apparently made its entry into North America 8-10 years earlier. Soon after the initial identification was made, the gravity of this introduction was becoming evident; dead and dying ash trees were already widespread in the Detroit metropolitan area as well as in nearby Windsor, ON. Managers were grasping for information about an insect that the scientific community knew very little about. EAB is a member of the beetle genus *Agrilus*, a genus relatively well represented in North American hardwood forests. But this Asian *Agrilus* beetle was not well studied in its native habitat in Asia, and only sketchy details on host range and life cycle could be gleaned from a few brief Chinese reports.

Beginning within weeks of the initial reports, research efforts were underway. Was this species limited to attacking ash or were other tree genera at risk? How far could the beetle fly? How quickly was spread across the landscape occurring? How many eggs were laid by one female? Was the life cycle one year or two? Was the insect limited by cold tolerance? Did the beetle require stressed host trees in order to be successful or could it infest and kill healthy ash trees? There were many unanswered questions in the summer of 2002.

There are still lots of unknowns, but we do know a great deal more today about emerald ash borer than we did in 2002. Beginning in 2003, the USDA Animal and Plant Health Inspection Service (APHIS) has sponsored an annual research review focused on emerald ash borer. Proceedings from the 2003, 2004, 2005 and 2006 reviews are available on www.emeraldashborer.info . To find the reviews click on the research button and then scroll down the page. The reviews are listed by year just above the subheading "survey research."

In addition to these reviews a number of emerald ash borer research reports, journal articles and other information is available on the internet. If interested check out these web addresses:
http://www.emeraldashborer.info/Research.cfm
http://ncrs.fs.fed.us/4501/eab/current/
http://ashalert.osu.edu/mainpage.asp?pageview=research

The 2007 research review was held October 23-24, in Pittsburgh, Pennsylvania. The proceedings for that session should be available soon. Some of the highlights include:

- Work on dendrochronological reconstruction of infestations is being headed by Nate Siegert at Michigan State University. Infestations can be aged through analysis of increment cores. This work has yielded some very useful information on spread rates and has been used to pinpoint an area west of Detroit that was probably an initial point of EAB introduction. Spread models using this information have estimated early spread rates of about 4 miles per year for a new infestation. As local populations build and become established the models suggest a spread rate approaching 18 miles per year. Both of those numbers are much higher than initial spread estimates of ½ mile per year. A number of spread models are under development by various groups all trying to better understand and predict EAB spread across the landscape.

- Ohio State University (OSU) researchers reported on impact studies done in southeast Michigan. They found that mortality levels for ash trees have been basically 100 percent in the study area that included stands with green, white and black ash. Some trees are still alive but these are infested and in very poor health. Except for seedlings, all tree size classes were infested and killed. There were some subtle differences in how quickly black, green and white ash died, but in the end all three species were killed. In a related OSU study, tree mortality rates at the stand level were modeled. Basically, once EAB was visually detected in a stand, you had approximately seven years before complete ash mortality was reached.

- Emerald ash borer genetic studies are underway. Researchers and managers would like to know where the initial EAB introductions originated; this could help with a number of issues including the search for suitable biological control agents. Based on limited information, North American EAB populations appear to have originated in China, not Korea or Japan. Also, there is some evidence to suggest that more than one introduction may have occurred into North America.

- A number of studies are underway that are looking at what attracts EAB adults. If found and identified, attractants could be used to develop baits or traps for monitoring purposes. Unfortunately, this work is proceeding slowly. Buprestid beetles are not known to produce sex pheromones, though some evidence of a pheromone was reported at the meeting by USDA ARS researchers. Penn State researcher John Lelito and others have reported male beetle attraction to pinned EAB adults on ash leaves. This appears to be largely visual attraction with male beetles using cuticular chemicals to determine the sex of the beetle they have landed upon. If a male lands on a female mating often occurs.

- Trap design and bait development is being studied by many groups. Most of the studies focus on color and how that or may not attract EAB adults, and host odors which are basically smells emanating from ash trees. Color attraction by EAB has been discussed at these meeting for the past several years. Some previous studies have shown an apparent affinity for EAB with purple, thus an emphasis on purple traps. This year, a study found shades of green were more attractive than purple. Host odors play an important role in EAB finding host trees. Some of the initial EAB research reported in 2003 and 2004 showed that EAB could differentiate between ash trees and other

hardwoods, and further, they landed on girdled ash trees in greater numbers than non-girdled ash trees. Clearly, ash trees, and stressed ash trees in particular, emit volatile chemicals that EAB can perceive. The problem has been identifying the key chemical components and then making that chemical blend more attractive than a local ash tree. Researchers at this meeting discussed two plant compounds, Manuka oil and Phoebe oil, which apparently smell like ash volatiles to EAB. Adding these oils to traps significantly increases trap catch. The Manuka oil comes from New Zealand, while the Phoebe oil is from Brazilian walnut.

In addition to color and host odors, the actual location of traps appears to be important. Most studies have concluded that traps exposed to sun are more attractive; traps, if used, should be baited with one of the attractive oil compounds and placed high in the crown of an ash tree, exposed to sunlight.

Despite all of the trap design and attractant work, a large-diameter, open-grown girdled trap tree still appears to be the most attractive object to EAB adults. A Michigan Tech study concluded that large stressed ash trees (girdled trees) "stand out" to EAB.

- Dan Herms at OSU has been monitoring ash species susceptibility to EAB. Dan has found no evidence that native North American ash have the inherent capability to resist EAB invasion. Interestingly, Manchurian ash, a species that has evolved with EAB does appear to have resistance in the OSU studies to date. Other research groups have started crossing studies between Asian ash and North American ash species. This work may help decipher the mode of resistance in Asian ash and perhaps the likelihood of finding or developing resistant trees.

- Many insecticide studies were reported. Clearly, products are available that can protect individual ash trees. Most of the studies indicate that systemic insecticides have the most promise and that treatments are most likely to be successful if trees are treated before larvae are found in the tree. Most of the tested insecticides do not kill larvae tunneling under the bark; rather, they work by accumulating in leaf tissue where EAB adults often feed before laying eggs. Additional materials are being evaluated that appear to be transported into cambial and phloem tissue where they can kill feeding larvae. This would be a big step forward in protecting infested trees. Also under evaluation are less invasive methods of insecticide application. Reports were positive on applications of some insecticides mixed with bark penetrants and then sprayed directly onto the lower stem. This method could avoid soil applications or injection wounds. If interested in specific insecticide recommendations we suggest you contact your land grant university extension entomologist.

- Though insecticide protection for individual trees looks promising, studies on products for landscape level treatments or woodlot applications have not reported much progress.

- Several studies related to natural enemies of EAB and biological control efforts were reported. Previous work in China had found three potential biocontrol agents that received release approval in Michigan in 2007. These three small wasps are being monitored and evaluated. One species is an egg parasite and the other two species are larval parasites on EAB larvae. Natural enemies are unlikely to eliminate EAB, but they could bring some stability to a system that is tilted strongly in favor of EAB at this time.

Northeastern Area

Indiana

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