Central States

Forest Health Watch

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

January 12, 2009

This collaborative effort of the USDA Forest Service Northeastern Area, Missouri Department of Conservation, and Indiana, Iowa and Illinois Departments of Natural Resources provides technical updates twice a year on forest health issues of regional interest. Useful information can also be found in previous editions, which are available on the www at http://na.fs.fed.us/fhp/fhw/csfhw/ .

Nonnative insects and pathogens continue to be highly significant forest health issues in our region. In this edition you will find 2008 summaries on emerald ash borer, gypsy moth, and sudden oak death, as well as updates on weather and other forest health issues. Be sure to also check out this edition's Feature Article on SLAM, a strategy to SLow Ash Mortality.

Important Regional Forest Health Issues

Emerald Ash Borer (EAB)

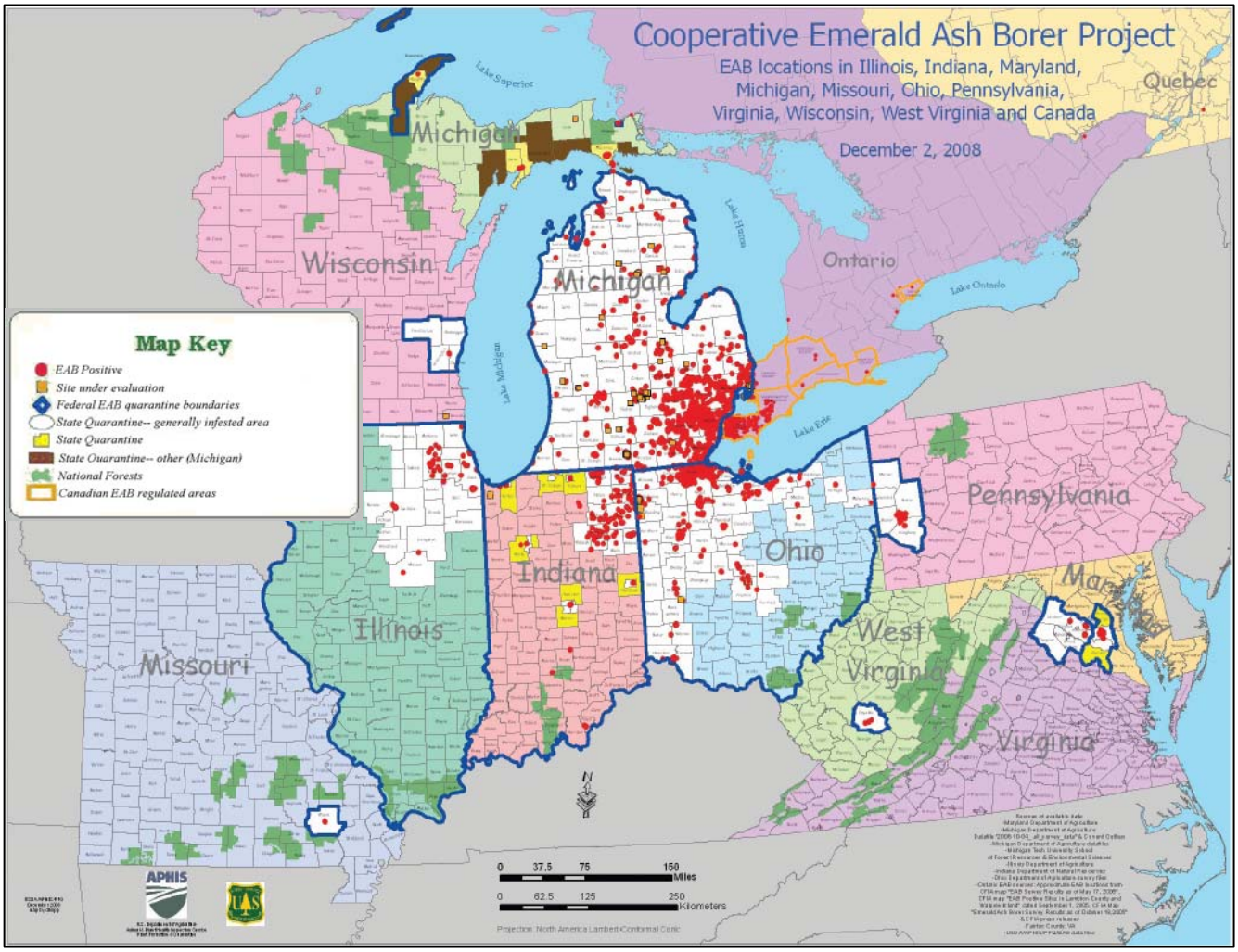
We began 2008 with known EAB infestations in only seven states: Michigan, Indiana, Ohio, Illinois, Maryland, Pennsylvania, and West Virginia. Surveys and other reports during 2008 resulted in the addition of three states (Missouri, Wisconsin, and Virginia) and significant new finds in Michigan, Illinois, and Indiana.

In **Missouri**, EAB adults were discovered in July 2008 in one of four purple sticky traps at the Army Corps of Engineers Wappapello Lake—Greenville Recreation Area two miles south of Greenville, MO, in Wayne County. The likely pathway of introduction was firewood. Examination of the site revealed infested trees within about a one-mile radius of the apparent introduction site in a campground. The Corps of Engineers has begun removing and destroying all ash trees within the core infested area in an effort to slow the spread of EAB. Of the 186 purple sticky traps placed in Missouri, no signs of EAB were found outside of the Greenville site. Missouri Departments of Agriculture and Conservation have conducted visual surveys at campgrounds, nurseries and other high risk sites around the state since 2005, with no EAB discovered to date. A University of Missouri crew also established trap trees in 2008 at selected federal campgrounds in the state. All trap trees were negative for EAB, except at the Greenville site where all three trap trees were infested with EAB. A major component of survey efforts in 2009 will be a large gridded area of sticky traps surrounding the Greenville site and additional traps at high-risk sites around the state.

In **Illinois**, EAB was first discovered in 2006 by a homeowner approximately 40 miles west of Chicago in central Kane County. As detection strategies have evolved, EAB has been documented in nine Illinois counties. New detections have been discovered by homeowners, municipalities and structured detection surveys. In March and April 2007, Illinois Department of Agriculture (IDA) implemented an EAB Population Reduction Strategy, whereby IDA assumed the cost of tree removal for EAB-infested ash trees within a half mile of a USDA confirmed EAB site. In 2008, the IDA and USDA Animal and Plant Health Inspection Service did a detection survey with purple traps baited with Manuka oil in a 100-mile wide arc, encompassing 49 counties across central and northwestern Illinois. In addition to the grid-based survey, IDA and USDA also implemented a municipal trapping program, which encouraged municipalities within the regulated area to monitor the local EAB population. As a result of the 2008 EAB survey, IDA has adjusted the existing state interior quarantine boundaries. Detections in eastern Bureau County, central McLean County and northern McLean County have led IDA to add the balance of Livingston County, the eastern half of Marshall County, and all of Woodford and McLean Counties.

In **Indiana**, EAB was first discovered in 2004 in Steuben County. By 2007, EAB had been detected in 18 counties in the northern half of Indiana, with the highest concentration in the northeast corner. In 2008, EAB was found in southern Indiana in three counties (Brown, Floyd, and Monroe). Of the three infestations in southern Indiana, one was found by the purple trap survey (Floyd County), another by a private arborist (Brown County), and the third in a girdled ash trap tree (Monroe County). During 2008, an intensive survey for EAB with purple sticky traps was conducted in a 100-mile wide band ahead of the known infestations. The results from this survey are being collated and summarized.

In **Wisconsin**, EAB was positively identified on August 1, 2008 from a homeowner report and is now known to occur in Ozaukee and Washington counties in southeast Wisconsin (just north of Milwaukee). A quarantine area including Ozaukee, Washington, Fond du Lac and Sheboygan counties has been established to limit the risk of artificial spread of emerald ash borers in ash nursery stock, hardwood firewood, timber or other articles. In an unrelated incident, two infested trees from a northern Illinois nursery were discovered at a private residence in Kenosha County and have since been removed and destroyed with no further evidence of EAB establishment.



Of significant note are additional 2008 finds of EAB in the Upper Peninsula of Michigan. One, near Houghton, was a homeowner report. The other, near Manistique, was discovered by Forest Service staff who investigated declining ash trees that they observed from the highway. Both of these finds significantly increase the known establishments of EAB in the UP.

The findings so far indicate:

- Homeowner reports are extremely important. An informed public can play a vital role in early detection of new infestations.
- Human activities (such as moving firewood or ash nursery stock) are responsible for the long-distance spread of EAB. An informed public and proactive industry response are very important to prevent this movement.
- If you see declining ash, check it out.

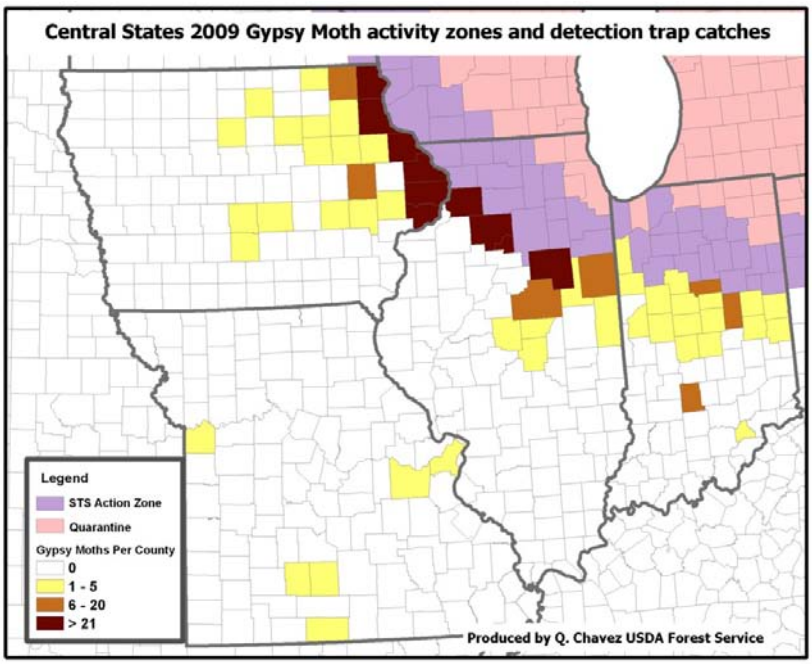
The following website provides general information on EAB and links to specific information on the infestations in Michigan, Ohio, Indiana, Illinois, Virginia, West Virginia, Maryland, Pennsylvania and Wisconsin: http://www.emeraldashborer.info/index.cfm

For information on EAB in Missouri, the Missouri EAB Action Plan, toll-free phone number, and online reporting system, visit these sites: http://mdc.mo.gov/forest/health/ashborer OR http://www.eab.missouri.edu

For information on EAB trapping, readiness plans, and other information in Iowa, visit http://www.extension.iastate.edu/pme/EmeraldAshBorer.html

Gypsy Moth (GM) Activities

The map and tables below summarize the summer 2008 activities in the Central States. Color coding in the tables matches up with the colors on the map that represent the various "zones" for GM management. In states with established populations, the state is generally divided into three zones. The "quarantine area" is the portion where GM 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 gypsy moth (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.



The trapping in 2008 yielded a large increase in moths in northeast Iowa, northern Illinois, and northern Indiana. It is noteworthy that moth catches were also up significantly in southeastern Minnesota. Additional information on the current status of GM 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/

States without established populations:			
	# traps set	Total moths captured	Comments
Iowa	4732	626 (was 175 in 2007 and 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 2008. The STS Action Zone was extended into eastern Iowa in 2008, but no treatment activities are planned for 2009. To date, reproducing populations (e.g. egg masses and other life forms) have not been found. Delimit trapping will continue.
Missouri	11,794	10 (was 7 in 2007 and 17 in 2006)	Traps were placed in 96 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 2008 catches were single male moths. Four of the positive traps were located in St. Louis County. There were two positive traps in Franklin County and one positive trap each in Jackson, Ozark, Webster, and Wright Counties.

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	Four counties in northeastern Illinois (Lake, Cook, DuPage, and McHenry) are under quarantine. No new counties were added in 2008.	No mating disruption pheromone flakes applied in 2008. 2,195 acres treated with 2 applications of Btk. Treatments in 2008 were down from 7,300 acres in 2007 and 24,363 acres in 2006.	Cook, DuPage, and Will	133,050 moths captured in the 6,748 traps set in the 18 county STS trapping area (northern IL). This is up from 38,522 in 2007.	6500 traps were set by APHIS in 85 counties in central and southern IL. A total of 374 gypsy moths (up from 246 in 2007) were caught across 27 counties, mostly near the STS line. Moths were captured for the third year in a row in Madison County (southern IL), and this site will be delimit trapped (again) in 2009. Egg mass surveys will be conducted at this and other highest risk sites this winter.
Indiana	Steuben, LaGrange, Elkhart, Noble, DeKalb, Allen, and Porter counties are under quarantine. St. Joseph is proposed for quarantine in 2008. Defoliation was observed on 7 sites in 3 counties (Allen, Dekalb, and Noble).	Two sites (8,768 acres) were treated with mating disruption; 13 sites (4,103 acres) were treated with Btk. Dimilin was used for ground treatment on one site in Whitley County. Delimit surveys following Btk application revealed that treatment in the Fort Wayne area failed.	Lake, LaPorte, St. Joseph, Elkhart, Whitley and Allen.	9,321 moths were captured in the STS action zone, mostly in the eastern part, adjacent to the infested area (which captured 42,726 moths, about 4x higher than 2007 catches), so some of these may be due to a "blow" event. A site in Delaware Co. that had high catches in 2007 and was treated in 2008 caught 0 moths.	Traps set by APHIS & IDNR in the remainder of the state below the STS zone captured 82 moths, which is down from 2006 (146 moths) and 2007 (162). Eradication treatments were conducted on 547 acres (two sites) in Delaware and Scott Counties. In addition, 1,861 acres were treated with pheromone flakes to eradicate gypsy moth on the Hoosier NF in Monroe County.

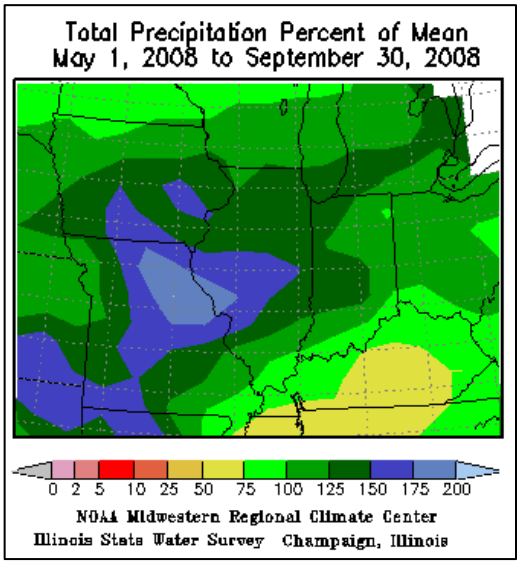
Sudden Oak Death (SOD)

We have been conducting SOD detection surveys throughout the Midwest since 2005. For the first two years we collected leaves from potential host plants that exhibited symptoms similar to those caused by *P. ramorum*. Since 2006 we have been baiting streams with rhododendron leaves in high and moderate risk watersheds (risk based on environmental constraints and the presence of host plants; and, the discovery in a state of *P. ramorum*-positive plants at nurseries or retailers). We have never found a *P. ramorum* positive sample anywhere in the mid-west or northeast outside of a nursery or retail outlet.

All of the surveys have been conducted through a cooperative effort between the Forest Service, universities and state departments of natural resources. Terrestrial surveys were conducted during the leaf-on season; stream baiting is done in the spring and fall when water temperatures are below 22 degrees C. Diagnostics are conducted using PCR and culture, with 100% replication by independent laboratories.

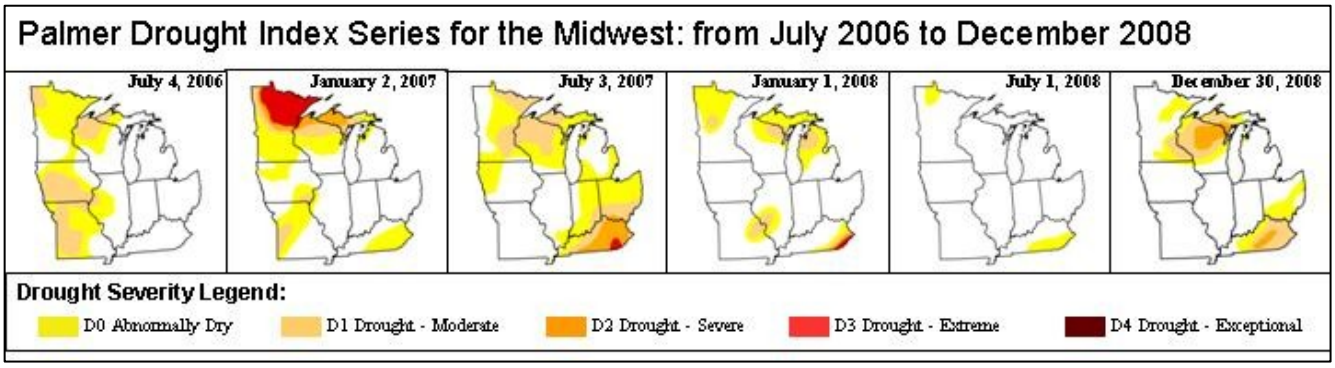
Plans for next year including focusing on watersheds in Mississippi and Washington where persistent positives of unknown origin have been recovered. We're scaling back in the Midwest and Northeast since there have been no positives to date and no new introductions since 2006. For additional information on the protocols please visit: http://www.fhm.fs.fed.us/sp/sod/sod.shtm

Weather Overview



2008 was a wild weather year, with severe storms, torrential rains and tornados throughout the Central States. Spring rains, snow melt and storms led to minor flooding throughout the region in March and April, then parts of Missouri and Iowa felt the fury of tornados in May. But excessive rains in May and into June led to severe flooding in Iowa, Illinois, Indiana, and also southwest Missouri. Crops were washed away, barge traffic on the Mississippi was shut down, and the Wabash River in Indiana cut a new course, shortening itself by at least 6 miles. The massive erosion and deposition of soil that occurred in affected areas permanently changed some forested sites.

July brought additional heavy rains, and more flooding in Iowa and Missouri. In September Hurricane Ike again led to excessive rain events, this time in Missouri, Illinois, Indiana and Iowa. The precipitation map shows that during the 2008 growing season, virtually all of the area in the Central States received at least 100% of normal precipitation, and significant areas were 150-200% above normal. The result is that any lingering pockets of drought in the Central States were extinguished (see the Palmer Drought Index map series for a sequential view of drought conditions from July 2006 through December 2008). Of course the downside is that that much of the precipitation has occurred as part of excessive or severe weather events. Unfortunately one of the predicted effects of global climate change is an increase in the proportion of precipitation that comes from extreme weather events.



What else is being reported across the Region

Asian Longhorned Beetle (ALB) in Illinois

Illinois is the first Asian longhorned beetle infested state to be declared eradicated. From 1998 to 2003, 1,551 infested and 220 high-risk host trees were removed in the Chicago metropolitan area of Illinois. The infested area in Illinois is now zero square miles. The last ALB detection in Chicago was in 2003. Restoration efforts to replace trees removed because of the beetle have resulted in the planting of 2,682 non-host trees. On October 22,

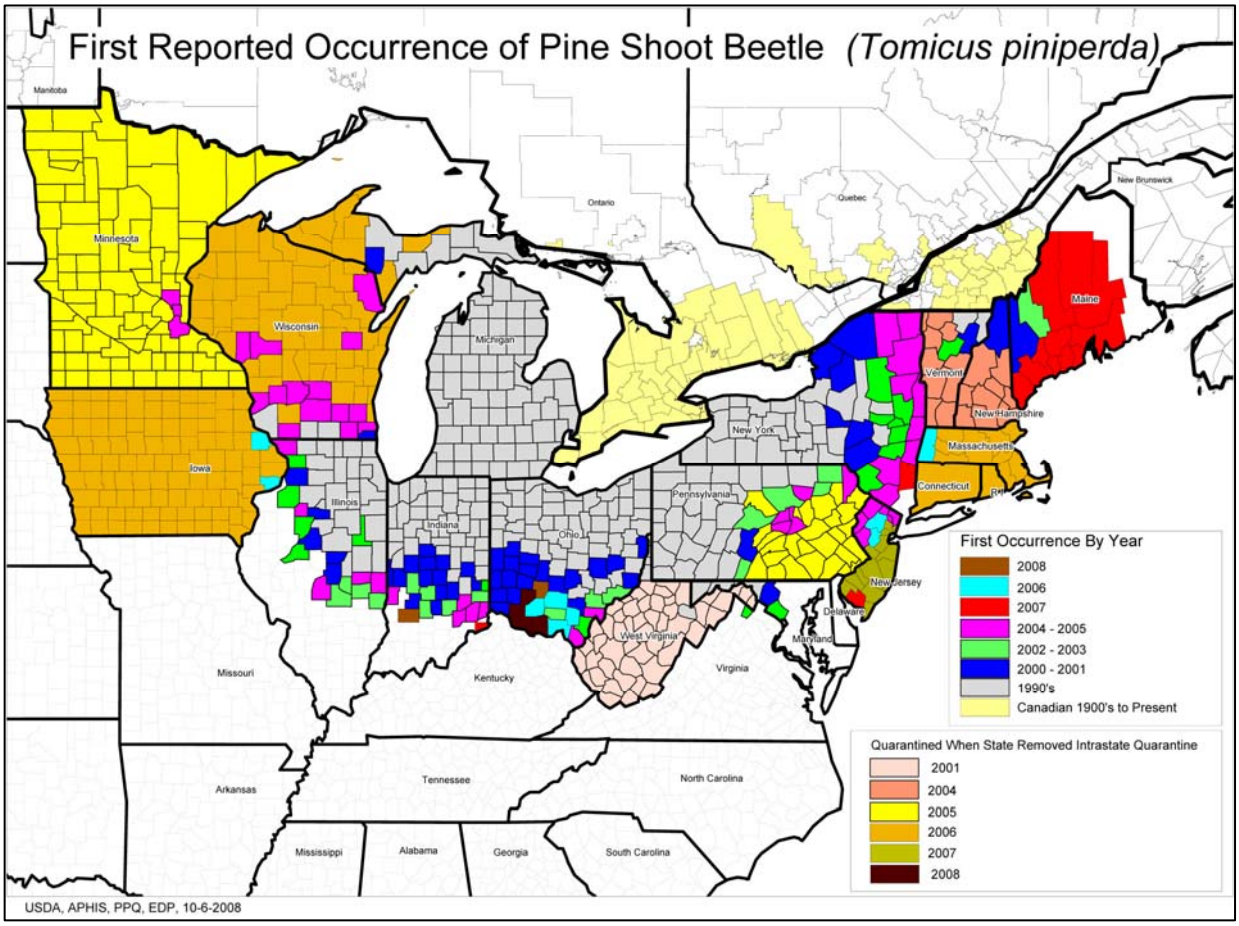
the Illinois ALB Cooperative Eradication Program received a Secretary's Honor Award for Excellence "for outstanding leadership in the successful eradication of the Asian longhorned beetle from the Chicago, Illinois, area, resulting in the protection of the nation's forest resources."

On August 5, 2008, an insect specimen collected in Deerfield, IL, was confirmed by the Systematic Entomological Laboratory as ALB. The beetle was found in a parking lot in the Village of Deerfield, located about 12 miles north of the northern boundary of the previously regulated area of Chicago. In response, 9,511 primary host trees were surveyed, and APHIS officials also investigated companies within the surrounding area who imported cargo from Asia as a potential source of introduction. No infested trees have been identified in Deerfield, Northbrook, Northfield Township or Highland Park. Survey activities have ceased, and a public outreach campaign is being organized to ask the public to assist the program in locating the source of the beetle.

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 2008, Illinois trapped 12 counties in central Illinois and did not detect PSB. They intend to trap in nine different counties in 2009. In Indiana, trapping in nine counties resulted in one new county (Greene) added to the quarantine.



Aspen mortality

High levels of **aspen mortality** have recently been observed in northeast Iowa. The aspen mortality in Iowa comes in the wake of recent reports of high levels of aspen mortality in the Intermountain West and Lake States, and begs the question of whether there is commonality.

In Colorado, reports of rapid onset of alarming, landscape-scale mortality have been in the news. Indeed, they have witnessed levels of mortality that exceed the normal expected levels due to succession of aging stands. Recent research has described the situation, where stands predisposed by old age, low density, southern aspect and low elevation have suffered rapid decline incited by acute drought, and then large numbers of trees have died from a complex of contributing mortality agents, including cankers, bark beetles and borers.

In the Lake States, forest health surveys and site visits have documented pockets of aspen mortality along with widespread decline symptoms such as small leaves and very thin crowns. Since aspen is not a long-lived species, aspen mortality is not unusual. In the Lake States, aspen grows on a wide range of sites, and there are a large number of younger stands originating from harvesting activities as well as stands that are **predisposed** by low stocking or old age. This variability makes it difficult to characterize a typical situation, however close inspections of many of the dying trees reveal wood boring beetle larvae. One native species, the bronze poplar borer, is very abundant at this time. An **inciting** condition (in this case, drought) has stressed these trees and made them susceptible to death by a **contributing** agent, the bronze poplar borer. This insect rarely kills trees quickly; 2 to 3 years of attack are usually required. The abundance of this insect in declining trees may indicate that the worst is yet to come for Lake States aspen.

In Iowa, the aspen mortality consistently occurred in stands of older clones, and the main cause of tree death was the root disease *Armillaria mellea*. The decadence of older clones of aspen may have been a predisposing factor. Armillaria appears to have functioned as a contributing agent in tree death, as it often kills hardwoods that are under stress or otherwise weakened. The interconnectedness of the common root system (a characteristic of clonal origin stands) may have exacerbated the situation. We do not know what factor(s) may have incited the decline and mortality event. The situation in Iowa primarily differs from Colorado and the Lake States by representing a much smaller scale scenario with different factors and causal agents involved. All three cases roughly follow the classic “decline sequence”: predisposed stands are subjected to inciting events that leads to decline and ultimately demise due to contributing agents. The Iowa DNR is responding by establishing vigorous replacement stands of aspen. They are planting the new patches, so that they will not be clonal nor have the continuous common root system.

The lesson to be learned is that you should evaluate the age distribution of your stands, particularly tree species that are characteristically short-lived (such as aspen, white birch, willow, and pin oak). If the stands of these species are predominantly in older age classes, you should expect that widespread mortality will occur following inciting events (such as defoliation or drought). You can consider what species are likely to replace these short-lived species when widespread mortality does occur. If the potential replacements are not desirable, you should manage the landscape to provide a mosaic of younger stands intermixed with the older stands.

Bur Oak Decline and Tubakia

Widespread "browning" of bur oak foliage in late summer has been observed across much of the Midwest for several years. Repeated defoliation may lead to reduction of stored starch reserves and ultimately decline and death of heavily affected trees. Typically, the leaves of affected trees 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 been observed on bur oaks, but not white or red oaks. Initially the problem was diagnosed as *Tubakia dryina*, a common leaf pathogen on red oaks.

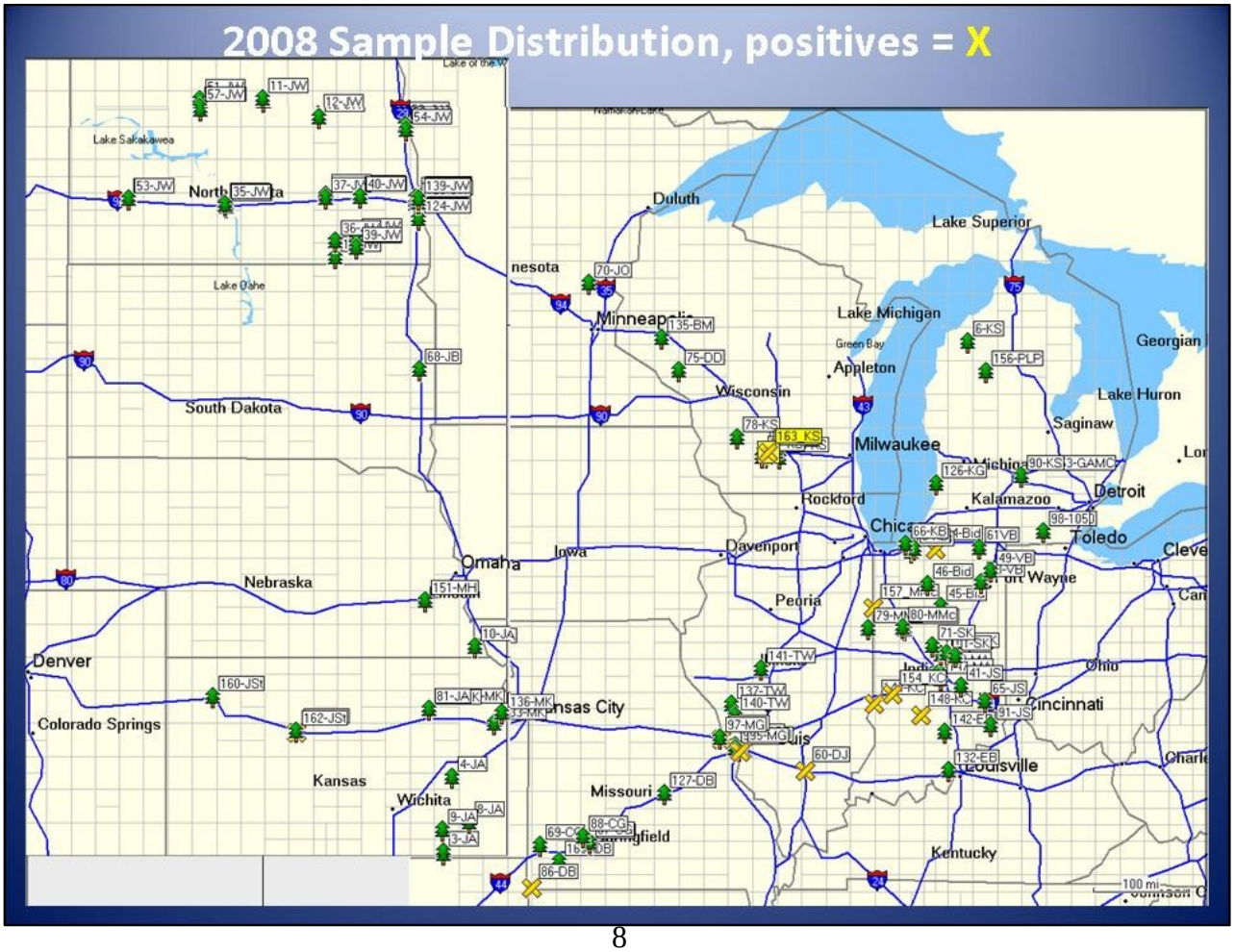
In 2008, Dr. Tom Harrington at Iowa State University initiated studies to investigate the causal agent of the widespread bur oak browning. Based on DNA sequence analyses and morphology of cultures, the *Tubakia*

species that is consistently associated with blighted bur oak trees in Iowa is distinct from the common leaf-spot fungus on red oak. The *Tubakia* species associated with bur oak blight apparently moves into twigs and branches as an endophyte and can probably overwinter in the host in this manner. This might explain how the leaf symptoms tend to be uniform across affected branches and often uniform throughout the entire crown in the most seriously affected trees. Trees seriously affected one year tend to be severely affected the next year, and leaves of affected trees may be colonized by the fungus even before leaf symptoms appear in late July.

Bacterial Leaf Scorch Survey

Bacterial leaf scorch (BLS) is a disease of hardwoods caused by the bacterium *Xylella fastidiosa*. This pathogen is transmitted from infected plant tissues into the xylem of healthy trees by sap-feeding insects. It colonizes and physically clogs the tree's water conducting tissues or xylem, resulting in symptoms of water deficit, or "scorch," in the leaves. Leaf discoloration begins at the leaf margin and moves toward the midrib, often late in the growing season. Symptoms recur each year and spread over the tree's crown, thus, reduction in growth and dieback are common in affected trees. The pathogen is considered a native except for strains that infect Citrus.

BLS has been a significant shade tree problem in the eastern and southeastern US for many years. Recently it has been reported or suspected as a problem in landscape trees in the upper Midwest. The northernmost distributions of BLS have been found in mulberry (*Morus* sp.) in Nebraska and in oaks in southern Ontario by past researchers. It has previously been reported in hardwoods in North Dakota, South Dakota, Illinois, Indiana, and Missouri. Despite these reports we did not have solid evidence to conclude that BLS was widely present throughout our North Central and Plains states. In 2008 a regional survey was implemented to test samples from across the upper Midwest. Dr. Gerry Adams from University of Michigan used real-time PCR to evaluate samples submitted by the states, as shown on the included map. The big yellow Xs represent positive BLS samples. Often there are multiple samples behind one marker due to collections of individual trees in proximity to one another.



A total of 174 samples were submitted from 11 states. There were 16 positive samples, representing Illinois, Indiana, Kansas, Missouri and Wisconsin. There were not any positives in approximately 60 samples of many hosts from North Dakota this year, nor in Nebraska or South Dakota. Apparently extensive sampling is needed to locate infected trees in the north. Missouri, Illinois, and Indiana were known to have previous positive tests prior to this survey, and this was confirmed. Oklahoma provided a positive sample from pin oak this year to double-check their ELISA assays. The most northerly positive sample processed this year was from Wisconsin, which was a new state report. Iowa did not submit any samples to this regional survey. From this survey and a corresponding survey in the more northeastern states, white ash, white oak, and witch hazel were determined to be a new host species. The survey will be continued in 2009, with a focus on filling in geographic gaps and sampling earlier in the season in northern states.

Other Relevant issues outside our region

Walnut Twig Beetle and Thousand Cankers Disease of Black Walnut

Thanks to Manfred Mielke for providing this information.

Very high levels of dieback and mortality have been observed in black walnut planted in the West, particularly Colorado and Oregon. We are not aware of any reports of this disease in black walnut in its native range. A pest alert recently written by scientists at Colorado State University is available on the internet at http://www.suddenoakdeath.org/pdf/Monthly%20Reports/Sep08Files/Pest_Alert_July_28_Revision.pdf. An excerpt from this pest alert states: "Initial symptoms involve a yellowing and thinning of the upper crown, which progresses to include death of progressively larger branches. During the final stages large areas of foliage may rapidly wilt. Trees often are killed within three years after initial symptoms are noted. Tree mortality is the result of attack by the walnut twig beetle (*Pityophthorus juglandis*) and subsequent canker development around beetle galleries caused by a fungal associate (*Geosmithia* sp.) of the beetle. A second fungus (*Fusarium solani*) is also associated with canker formation on the trunk and scaffold branches. The proposed name for this disease complex is thousand cankers."

There are many unknowns about the disease. Most of the successful beetle attacks and subsequent canker development have been on stressed eastern black walnut (*Juglans nigra*), especially drought stressed. There has been a significant multi-year drought preceding the latest reports in the communities surrounding Denver and Boulder, Colorado. Walnut twig beetle is native to the natural range of Arizona walnut, although it may have far broader distribution, since it now has also been found throughout the range of California black walnut. There has been speculation that the beetle, perhaps due to warming climate, is expanding its range. Others report that it has been widespread for at least a decade, or believe it is native throughout the range of native western walnuts. For certain it is being noted on walnuts in Colorado, Utah, Idaho, and Oregon for the first time. The species of fungus implicated in the canker has not previously been known to occur in the U.S., and eastern black walnut is not native to the west.

The geographical separation of eastern black walnut in our region and the walnut twig beetle from the west is such that the highest risk means of introduction into the eastern U.S. is via infested logs or wood. This insect is a phloem feeder rather than a wood borer, which reduces the chance that it will be successfully moved in processed wood products. There is currently some concern that the insect and pathogen will extend east through forested riparian areas. Be alert for any signs of widespread dieback or unexplained mortality of eastern black walnut (*Juglans nigra*), particularly in these riparian areas. Look specifically for the signs and symptoms addressed in the pest alert. Rapid detection and removal of infected trees currently remains the primary means of managing thousand cankers disease. Should you feel you are observing these symptoms, notify your local forestry agency or state forest health professionals.

Feature Topic:

SLAM: A Strategy to Slow Ash Mortality due to emerald ash borer infestation

by Steve Katovich

Managing emerald ash borer (EAB) introductions has been a challenge. Yet, land managers do have viable tools to utilize against EAB. While the likelihood of eradication is very low, there is a possibility of maintaining local beetle populations at low levels and thereby significantly reducing the spread and intensity of tree mortality. The proposed multi-year strategy, referred to as SLAM, uses a combination of management tactics with a focus on keeping EAB populations suppressed. This approach should be feasible since we have the ability to:

- Attract and concentrate dispersing EAB adults onto trees that are girdled.
- Apply selected insecticides that kill adult beetles that feed on the leaves of treated trees.
- Use either insecticides or tree removal to eliminate eggs, larvae and other life stages.
- Remove a significant amount of ash phloem through selective cutting of ash trees.

Research has shown that the rate at which ash tree mortality advances is related to EAB density. As populations build and coalesce, the area of dead, dying and declining ash trees increases dramatically. A do-nothing or a regulation-only approach means that EAB populations will build and advance unchecked, literally killing billions of ash trees in rural and urban forests in a relatively short amount of time.

SELECTING AN APPROPRIATE SITE

The SLAM strategy relies to a great extent on the ability of girdled trees to attract the majority of dispersing beetles. This attraction to "stressed" trees works best in locations where EAB is relatively newly introduced, or at a low population level. In these locations most existing ash trees are still relatively healthy and the creation of scattered stressed (girdled) trees acts as a beacon to dispersing EAB adults. Though older infestations may not be ideal locations to implement a SLAM strategy, they still may benefit from many of the suggested suppression tactics. Focused insecticide treatment programs, phloem removal projects, timely removal of infested trees, and creation and removal of sinks (girdled trap trees), should reduce EAB numbers under a variety of EAB population pressures.

SLAM should be feasible under both urban and rural situations. The strategy does not rely on one specific action or tactic, rather it suggests multiple actions that can be used by themselves or in combination to accomplish a reduction in the numbers of EAB produced in an area.

MAJOR COMPONENTS OF A SLAM PROJECT

Surveys - delineating EAB density and distribution

As mentioned above, a SLAM strategy is more likely to be successful when implemented at an EAB site that is localized and where the overall EAB density is relatively low. This implies that a first step in the SLAM strategy is a comprehensive detection program focused on finding EAB introductions soon after arrival. Once a population is found, surveys should identify the extent and density of the local EAB population. Accurate information about the spatial distribution of infested trees is useful in focusing suppression activities.

Surveys – determining local ash distribution and density

A reasonably accurate assessment of ash abundance, distribution and tree size will be useful for planning suppression activities. Efficient placement of phloem reduction projects, insecticide treatment areas, and sinks, require knowledge of the local ash resource.

Suppression of EAB populations

Actions, both direct and indirect, can be taken to reduce existing EAB populations. Direct actions against EAB populations are possible by destroying EAB life stages. Indirect actions revolve around the reduction in the amount of food available for EAB population expansion. EAB larvae feed and develop on ash phloem. The following suppression activities are known to be effective in some situations:

- ***Removal of trees known to be infested*:** Infested trees should be removed before adult emergence occurs. SLAM relies heavily on the elimination of EAB lifestages; each female beetle that is allowed to emerge, mate and disperse has the potential to add as many as 200 eggs to the next generation of EAB.
- ***Sinks – systematic grids or clusters of girdled trees*:** Girdled ash trees are more attractive to adult EAB than healthy ash trees. Female beetles preferentially lay eggs on girdled trees unless there are other stressed trees nearby. This concentrates EAB egg laying on known trees. Destroying these trees in fall or winter should eliminate a considerable proportion of the local EAB brood. Girdled trees deployed in a systematic grid can provide useful survey data. Clusters of girdled trees (3-6 freshly girdled ash trees) generate a substantial plume of volatile compounds that are attractive to dispersing adult beetles.
- ***Insecticide treatments:*** Within the concept of SLAM, insecticide treatments can serve two important purposes; first, they can create toxic trees that kill dispersing EAB adults, and with some products, kill eggs and larvae. Second, trees treated with the appropriate insecticide products become uninhabitable by EAB, basically removing their phloem from the local food supply. Obviously, some treatments can also protect high-value trees from invading EAB.
- ***Phloem reduction:*** Phloem reduction revolves around constraining EAB density and spread by reducing the amount of food available to EAB. Less food should result in lower beetle production, fewer offspring. Phloem reduction can be accomplished in many ways; reduction in phloem does not imply complete removal of the ash resource in an area. Studies have found that a large proportion of local phloem is often located in a relatively small number of large diameter trees. Therefore, removal of a few large trees can sometimes eliminate much of the available EAB food resource. Every ash tree does not need to be counted, treated or removed.

Public Outreach – Communication and Education

The success of SLAM projects will require support from local landowners. Their actions can be either beneficial, such as adding to the number of insecticide treated trees; or detrimental, such as moving infested firewood. Eliciting public support will require clearly articulated goals and objectives and a reliable and accessible support network for local landowners.

This write-up is a very brief introduction to the concept of SLAM; if interested in more information please contact the author at the USDA Forest Service (e-mail skatovich@fs.fed.us).

This newsletter is also available on the WWW at:

http://na.fs.fed.us/fhp/fhw/csfhw/

Northeastern Area

Indiana

For More Information:

Forest Health Protection
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