United States Department of Agriculture

2016 Forest Health highlights

Illinois

Forest Resources Summary

Illinois has 4.9 million acres of forest land, up 2% from 2009. Timberland accounts for 94% with 6% in reserves and unproductive lands. Illinois forest land is concentrated in western and southern Illinois with most on the Shawnee National Forest (figure 1). Eighty-three percent (4.1 million acres) of Illinois forest land is privately owned.

Hardwoods are the dominant species with two hardwood forest-type groups, oak-hickory and elm-ash-cottonwood. These two groups make up 92% of Illinois forest land. The oak-hickory group makes up over two-thirds of the forests with the bulk containing a white oak-red oak-hickory forest type (1.7 million acres). Softwoods make up 80,300 acres or 2% of forest land (figure 2).

Forest lands consist of 75% sawtimber, 16% poletimber, and 8% saplings and seedlings. One percent (1%) is nonstocked. Currently, over half (54%) of stands are over 61 years of age.

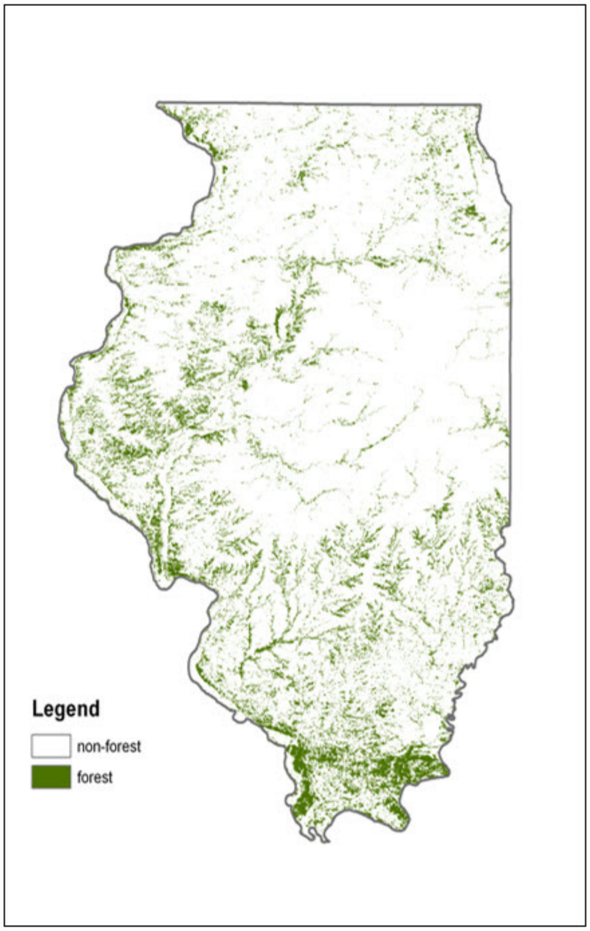


Figure 1.—Illinois forest land.

Forest Health Issues: An Overview

2016 Illinois Forest Health Highlights

Overall, the 2016 growing season was relatively quiet with no widespread forest health issues, with the exception of common foliar diseases. However, several new pests and diseases continue to be apparent and in some cases increasing, including honeylocust decline, magnolia and lecanium scales, bur oak blight, and Nectria canker.

With regards to the emerald ash borer (EAB), nearly 60% of Illinois counties are infested. Consequently, the Illinois Department of Agriculture has lifted the internal State EAB quarantine. Illinois still remains under a Federal quarantine.

Forest Service
Northeastern Area
State and Private Forestry

Illinois Department of Natural Resources

2017

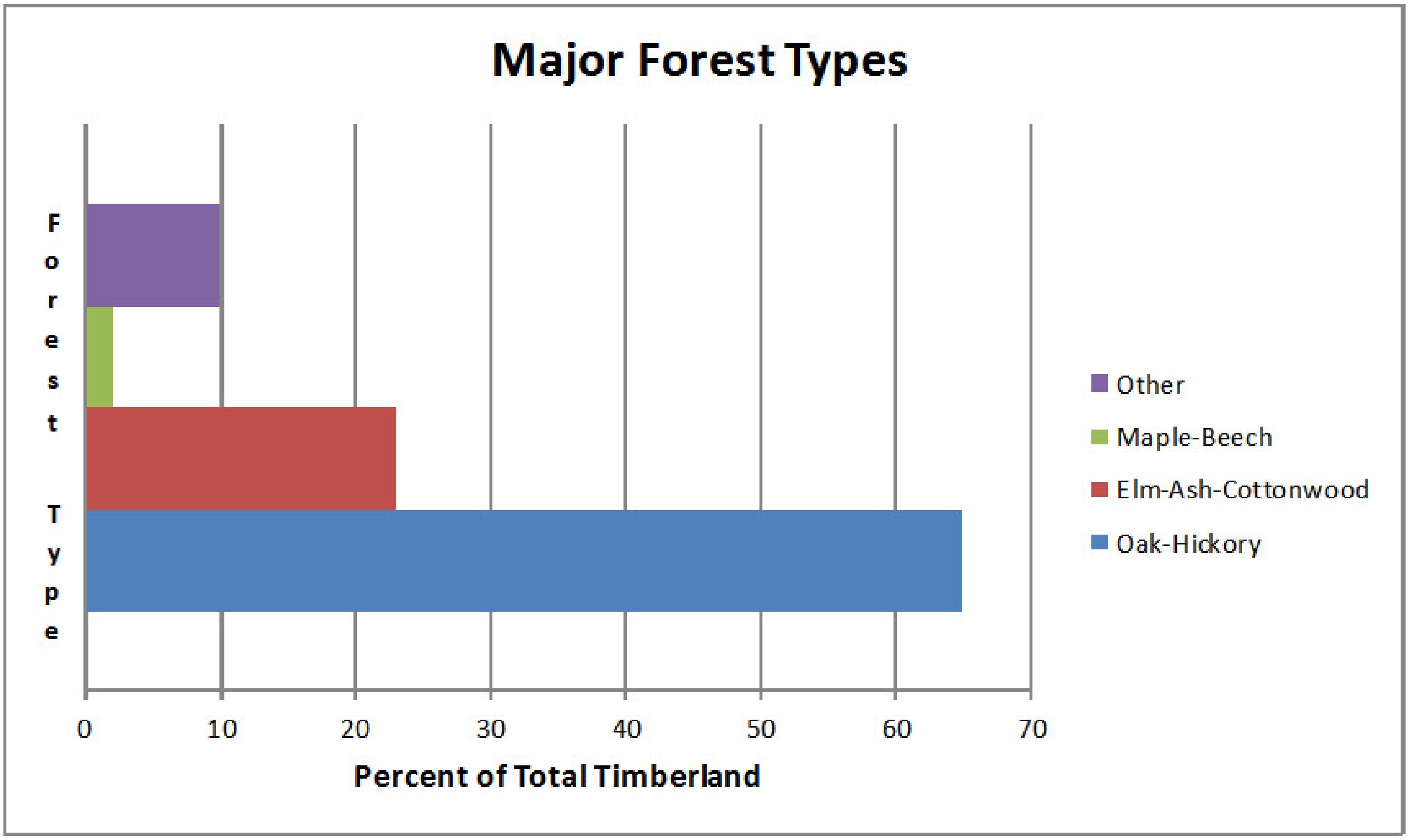


Figure 2.—Major forest types by percent of total timberland. (Source: Illinois' Forests 2005, Resource Bulletin NRS-29)

Honeylocust Decline (1)

Reports continue regarding widespread dieback and decline of mature honeylocust trees in parkways and landscapes. Field inspections have not provided conclusive causes, but common suspects include Nectria and Thyronectria cankers, drought, excessive summer rainfall, heavy infestations of honeylocust plant bug feeding damage, honeylocust borer, and lecanium scale.

With the exception of drought and/or record summer rainfall, all of the aforementioned pests and diseases are usually considered to be secondary agents. The recent 2012 drought, de-icing salts from the 2013 and 2014 snowy winters, above normal precipitation in 2015 and 2016, and common urban issues have probably predisposed these trees to the aforementioned diseases and insect pests (figure 3).

Figure 3—Honeylocust tree showing signs of thinning and decline.

Nectria and Thyronectria Cankers (1)

These cankers are common on many species of shade trees including birch, elm, linden, maple, and honeylocust. Thyronectria canker is more common on maple and oak. The fungi that cause these cankers usually enter through pruning wounds and areas on the trunk and major limbs that are damaged from storms and/or mechanical treatments. Once established, the canker fungi begin killing healthy vascular tissue. Infected trees attempt to heal over the cankered area and the battle begins. After several seasons, cankers take on the appearance of a target due to the concentric layers of callous tissue the tree puts down to thwart spread of the canker, resulting in a target canker. The cankers never heal and usually the tree succumbs. The fungal spores are sticky and can be spread by pruning tools and raindrop splash.

There is no cure for cankers, so prevention is key. Removing dead and dying trees helps reduce the spore inoculum load. Make sure to sanitize pruning tools after each cut, and keep trees healthy by reducing stressful agents (figures 4 and 5).

Figure 4.—Nectria canker.

Figure 5.—Nectria canker fruiting bodies.

Honeylocust Plant Bug (1)

Honeylocust plant bug (HLPB) is a common visitor to honeylocust trees. In most years it does not cause significant damage, only damaging the young new spring foliage. Later season foliage is generally not affected. The HLPB overwinters as an egg with the young nymphs appearing in spring just when honeylocust trees are beginning to leaf out. In heavy plant bug years, leaf distortion and feeding damage may be heavy, and affected trees may not be fully leafed out until mid-summer (late June or early July). By late June, the plant bugs have completed their life cycle and are gone. HLPB has only one generation per year. Shoot growth occurring later in the season will be normal, and most trees recover by late summer (figure 6).

Figure 6.—Adult honeylocust plant bug (inset) and feeding damage.

Lecanium Scale (1)

Another sap-feeding insect that was heavier this year than normal is Lecanium scale. This scale complex is common on many woody landscape plants. Scales feed on the sap of the host plant, but are rarely lethal. Heavy scale populations can weaken a plant to the point where it is vulnerable to more lethal pathogens (cankers) and borers. Lecanium scales have one generation per year with fertilized overwintering females maturing in spring and laying eggs. Eggs hatch late May to early June and crawlers are present the first half of June. Crawlers are the 1st immature life stage and this is the only stage that is mobile. After they molt, they become sessile and secrete a waxy covering. Males and females mate in late summer and the females overwinter. Soft scales produce large amounts of honeydew, which is very sticky and rich in sugars. Heavy deposits of honeydew on leaves and other surfaces can lead to growth of sooty mold, a black fungus that feeds on the honeydew. Sooty mold interferes with photosynthesis and is unsightly on ornamental plants. Chemical management of lecanium is usually not warranted as outbreaks are rather short lived due to the presence of predators and parasitoids. Chemical management may be warranted on newly planted plants and plants that are already under stress (figures 7 and 8).

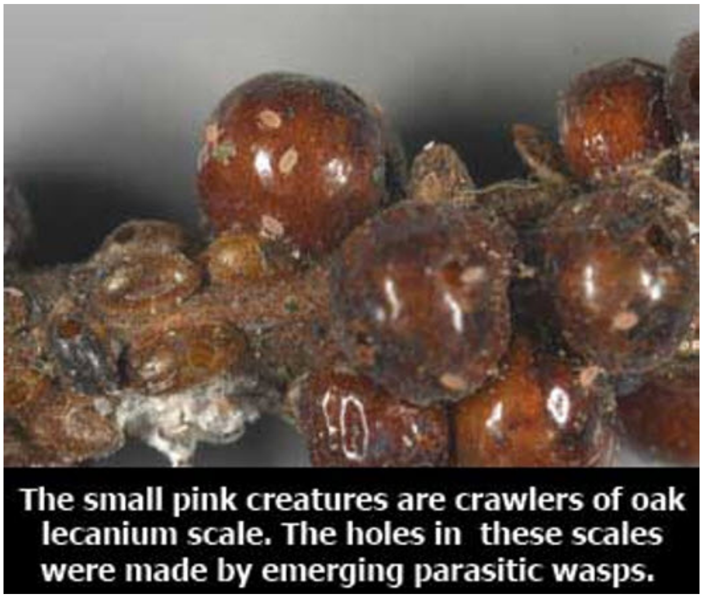


Figure 7.—Lecanium scale adults and crawlers.


Figure 8.—Lecanium scale on Turkish hazelnut.

Insect Pests

Magnolia Scale (1)

Magnolia scale, common in northern and central Illinois, is a native scale and one of the largest North American scales (can grow to the size of your thumb). It attacks star magnolia (*Magnolia stellata*), cucumbertree magnolia (*M. acuminata*), saucer magnolia (*M. soulangiana*), and lily magnolia (*M. quinquepeta*). In contrast to other soft scales, bright red crawlers are not active until late summer (September-October). The scale overwinters as an immature female. Like other soft scales, magnolia scale produces large quantities of honeydew and can blacken the leaves of magnolia plants. It is very host specific, attacking only magnolias. Chemical management of magnolia scale may be warranted with heavy populations. Keeping plants healthy will give them a fighting chance against the scale (figures 9 and 10).


Figure 9.—Adult magnolia scales.


Figure 10.—Magnolia scale crawlers.

Fall Webworm and Eastern Tent Caterpillar (1)

Small, scattered pockets of fall webworm nests and eastern tent caterpillar (ETC) tents were seen at State parks and forests throughout southern and central Illinois. ETCs were particularly numerous along I-70. Populations were comparable to previous years.

Japanese Beetle (1, 4)

Japanese beetle was evident throughout the State, but defoliation was scattered with heavy leaf feeding (greater than 50% of the tree crown) mostly in rural areas and farmstead landscapes in central and western Illinois. Basswood or linden (*Tilia* spp.) was the host of choice for 2016 compared to crabapple (*Malus* spp.) in 2015.

Viburnum Beetle (1, 6)

Viburnum leaf beetle continues to cause feeding injury in Cook County and the surrounding collar counties in Northeast Illinois. The viburnum leaf beetle (VLB) was initially found in 2009 in an urban Cook County landscape. The VLB feeds on a variety of commonly planted viburnums.

Chinese Longhorned Beetle (12)

The Chinese longhorned beetle (CLHB), *Hesperophanes campestris* (synonym *Trichoferus campestris*), is another invasive longhorned beetle to keep an eye out for. This pest appeared for the first time in 2009 near O'Hare Airport and in Crawford County in east-central Illinois (figure 11). Its arrival at O'Hare is not surprising since it is a major point of entry, but the east-central Illinois find is unsettling. The CLHB was captured near a pallet-making plant, which is consistent with the movement of infested green wood and wood products. CLHB has also been found near Minneapolis, MN, and in Quebec, Canada. The insect is originally from Asia and parts of Eastern Europe and spreads through movement of infested wood. It has a similar life cycle to the Asian longhorned beetle and causes similar damage to trees. Preferred hosts of the CLHB are presented in table 1. In cooperation with APHIS, an intensive trapping effort is ongoing including State parks, forests, natural areas, and county forest preserves.

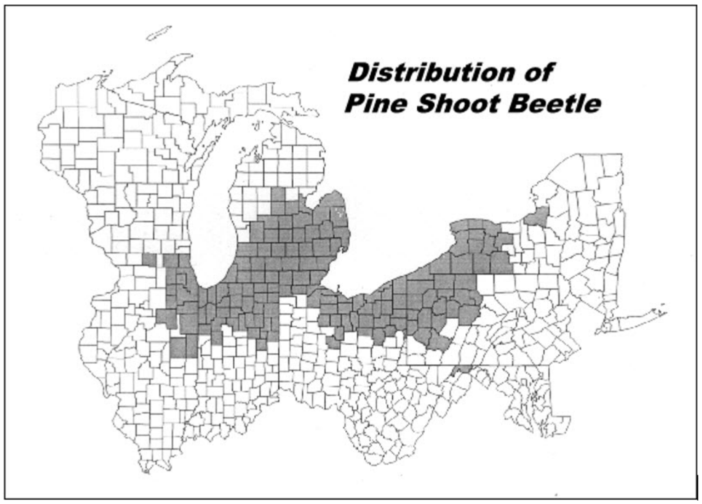
Figure 11.—Adult Chinese longhorned beetle.

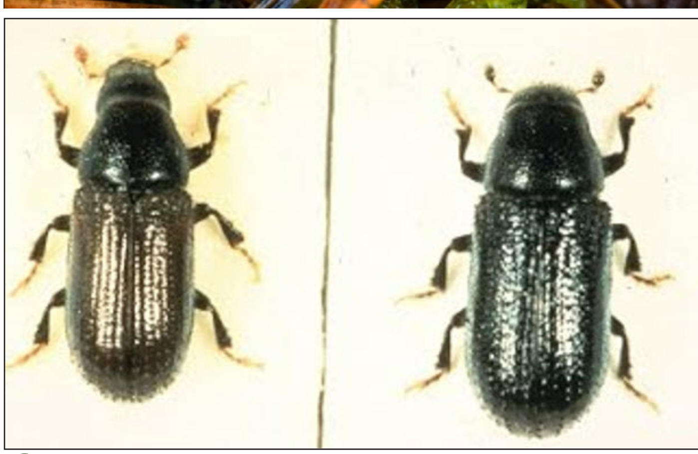
Table 1. Preferred hosts of the Chinese longhorned beetle (12).

Type of Tree
Apple
Ash
Beech
Birch
Cedar
Elm
Fir
Larch
Locust
Maple
Mulberry
Oak
Pine (cut wood)
Spruce (cut wood)
Walnut
Willow

Common Pine Shoot Beetle (7)

The pine shoot beetle (*Tomicus piniperda*) (PSB) has been in Illinois for several decades, first discovered in 1992 in Ohio. **In September 2015, APHIS expanded its pine shoot beetle regulatory area to include all of Illinois.** The pine shoot beetle (PSB) is very small (3-5 mm long) or about the size of a match head. PSB is native to Europe and Asia. PSB has one generation per year with overwintering adults emerging on warm (50-54 °F) days in spring. Adults aggressively colonize pine stumps, logs, or trunks of weakened and stressed trees. Females lay eggs in galleries in the cambial region and the larvae construct horizontal galleries 1.5 to 3.5 inches long. Larvae develop and emerge as adults in May and June through 2-mm-diameter exit holes. Upon emerging, adults fly to living, healthy pines, but prefer taller trees. Adults feed inside lateral shoots from May through October. Scotch pine is preferred, but Austrian, eastern white, red, and jack pines may be attacked. Adults exit the shoots in October and November and enter the thick bark at the tree base to overwinter. Damage from PSB is the destruction of shoots during maturation feeding, resulting in a reduction in tree height and diameter growth. PSB is particularly damaging to Christmas tree plantations (figures 12-15).





Figures from the top left, counter-clockwise:

Figure 12.—Distribution of the pine shoot beetle.

Figure 13.—Adult pine shoot beetle feeding in pine stem.

Figure 14.—Adult pine shoot beetle.

Figure 15.—Pine shoot beetle damage.

Update on Emerald Ash Borer

The emerald ash borer (EAB) continues to spread with additional finds in Iowa, Minnesota, Wisconsin, and Missouri. EAB was confirmed in 10 new Illinois counties in 2015 with 60% of Illinois counties confirmed for EAB. The new counties included Madison, Mercer, Jackson, Saline, Hamilton, Wayne, Clay, Jefferson, Washington, and Bond. No new county finds have been reported for 2016. As a result, **the Illinois Department of Agriculture has dropped the internal EAB quarantine**. Recent estimates (2014) indicate EAB has killed 6.1 million ft^3 of ash wood volume, up from 1.5 million ft^3 in 1985. Illinois forests have an estimated 145.3 million ash trees larger than 1 inch d.b.h. (figures 16, 21, 22).

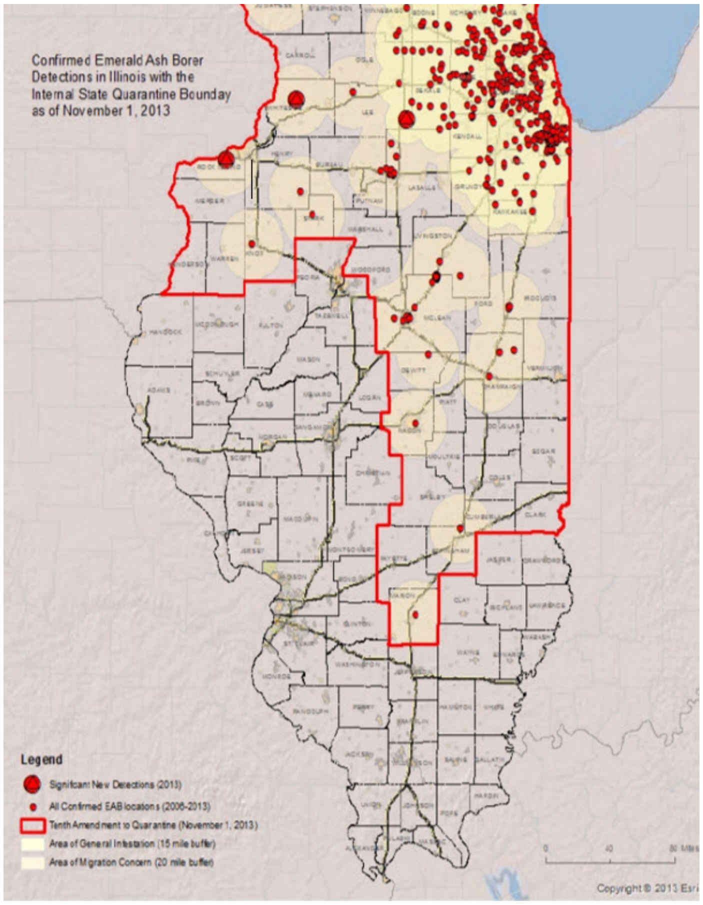
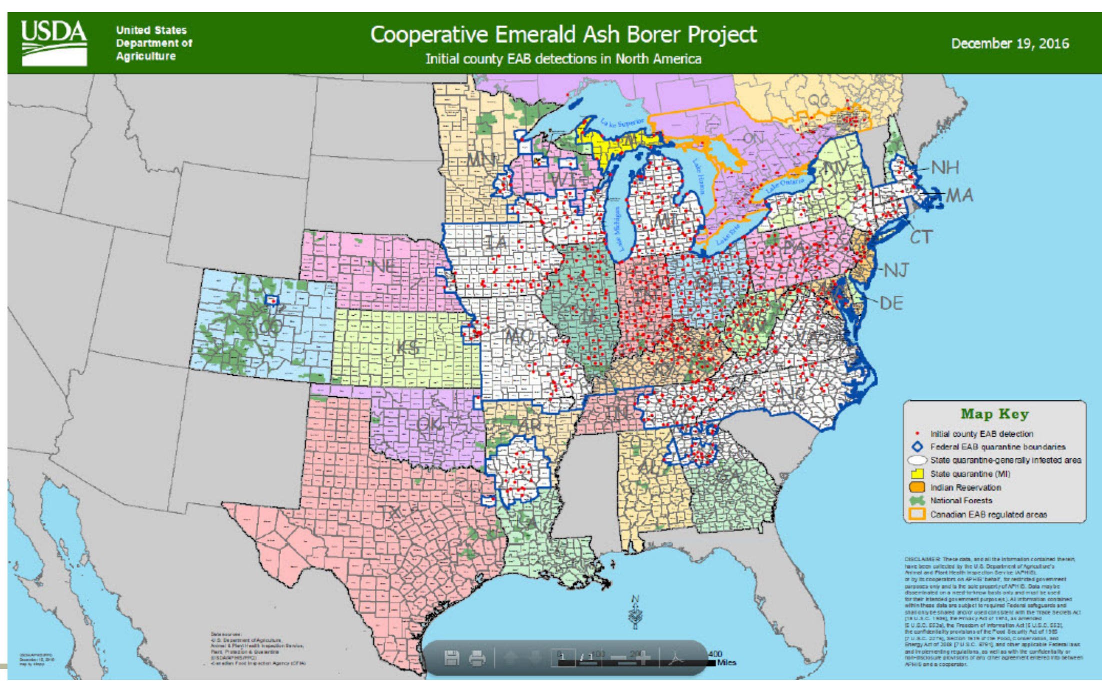


Figure 16.—2013 EAB Quarantine Map.

Figure 21.—EAB larvae parasitized by Tetrastichus planipennisi *observed in peeled branch samples.*

Figure 22.—Distribution of EAB in U.S. as of 19 December 2016.



EAB Parasitoid Study

In 2015, a multiyear biological control project was initiated in Boulder, CO; Syracuse, NY; and Naperville, IL, to determine the capability of parasitoids and chemically treated trees to reduce EAB-caused mortality. The multiyear study is being established in urban forests and natural forest stands. The purpose of the project is to see if parasitoids can eventually take over control of EAB, reducing the need for chemically treated trees, and if the parasitoids can function in areas with treated trees.

Based on 2015 and 2016 yellow pan trap catches, the parasitoids are establishing and have dispersed up to 1 mile from their initial release point. In addition, EAB larvae parasitized by *Tetrastichus planipennisi* have been found in and reared from peeled branch samples taken from study trees in both the release and control sites (figures 17-20).

Figure 17.—Yellow pan trap for monitoring EAB parasitoids.

*Figure 18.—*Tetrastichus planipennisi *– gregarious, larval endoparasitoid.*

*Figure 19.—*Spathius agrili *– larval ectoparasitoid.*

*Figure 20.—*Oobius agrili *– solitary egg parasitoid.*

EAB and White Fringetree

In early 2015, EAB was confirmed to have been found associated with white fringetree (*Chionanthus virginicus*) (figure 23) at several locations in Dayton, OH. This is the first report of EAB being able to complete its life cycle on a non-*Fraxinus* host. Some of the white fringetrees had evidence of mechanical girdling damage. Trees were growing in open areas with partial shade with known EAB infestations nearby and trees were showing classic symptoms of an EAB infestation. Chemical management of EAB in white fringetree could be difficult as white fringetree flowers are pollinated by bees and produce fleshy fruits eaten by birds. Close relatives of white fringetree include swamp privet, devilwood, and cultivated olive trees. Time will tell whether EAB will shift to these hosts once the majority of *Fraxinus* spp. have been exhausted. Stay tuned! **For the original report, refer to: RAPID COMMUNICATION:** *White Fringetree as a Novel Larval Host for Emerald Ash Borer* by Don Cipollini, Department of Biological Sciences, Wright State University, 3640 Colonel Glenn Highway, Dayton, OH 45435, USA. E-mail: Don.cipollini@wright.edu. J. Economic Entomology. 1–6 (2015). DOI: 10.1093/jee/tou026.

Figure 23.—White fringetree (Chionanthus virginicus).

Yellow Poplar Weevil (3)

The yellow poplar weevil (*Odontopus calceatus*) (YPW) is a leaf-mining weevil that is also called the "sassafras mining weevil" and "magnolia leafminer." Known hosts include yellow poplar (*Liriodendron tulipifera*) (preferred host), sassafras (*Sassafras albidum*), and magnolia (*Magnolia grandiflora*). YPW is common in Appalachia, but also in the Northeastern and Southeastern U.S. In Illinois, it has been reported in the St. Louis area. Outbreaks of YPW were reported in 2015 from West Virginia and surrounding States. The last recorded outbreak goes back to the 1960s. YPW is a small (2.5 to 3.9 mm long) black beetle, feeds on the foliage of the above hosts, and has one generation per year. Adults overwinter in leaf litter with feeding beginning in late April and early May. Rice-shaped holes appear in leaves and are about 1/8 inch in diameter. The weevil also attacks swelling buds in spring leaving puncture marks. Mating occurs in May and June and eggs are laid on the leaf midrib. Newly hatched larvae bore into the leaf mesophyll (middle portion of leaf) forming a mine. Multiple larvae may be found in just one mine. Affected leaves may drop from the tree. Upon maturation, the larvae pupate. Adults emerge shortly after and feed on the foliage leaving the upper epidermis intact. Feeding produces chlorotic spots giving the tree canopy a "scorched" appearance. By mid-July, adults undergo aestivation (response to unfavorable conditions) and prepare to enter diapause. In the early 1960s, parasitism appears to have greatly impacted weevil populations in Kentucky with 50% parasitism of weevil pupae in some locations. Several late (24 May) spring frosts/freezes in the Ohio River Valley in 1966 froze much of the tulip poplar foliage along with weevil larvae. YPW may be limited in northern ranges due to its vulnerability to cold spring weather (figures 24-26).

Figure 24.—Adult yellow poplar weevil.

Figure 25. Adult yellow poplar weevil feeding damage.

Figure 26. Adult yellow poplar weevil feeding damage.

Plant Diseases

Anthracnose and Scab Diseases (1, 14)

The spring and summer of 2016 were very wet with record-setting rainfall, breaking a 101-year record, for July and August accompanied by high humidity. This combination of precipitation and humidity provided an ideal environment for foliar fungal leaf diseases such as apple scab and anthracnose. Apple scab was found on common apple and crabapple with dark to olive-green blotches on the leaves. Heavy scab levels can cause premature leaf drop by mid-summer, as seen in 2016. This year was a bit different because most crabapples did not refoliate because of the continued high humidity and precipitation throughout July and August, which resulted in high inoculum levels (i.e. spores) well into early fall. Isolated years of heavy apple scab are usually not detrimental to trees, but repeated multiyear defoliations can predispose plants to invasion by borers (i.e. flat-headed apple tree borer) and cankers. Fungal foliar sprays can be applied, but require a very regimented schedule.

Anthracnose, another group of diseases, was very common this year and not just on sycamores. Anthracnose is a general term for many foliar diseases that attack a wide range of hosts including, but not limited to, sycamore, maple, oak, ash, and dogwood. Anthracnose is a foliar disease, infecting the foliage and causing black necrotic areas. Most anthracnose fungal species are host specific. Weather conditions promoting anthracnose are 50-55 ^{o}F temperatures along with high humidity and rainfall. The fungus may also infect twigs. There are also differences in susceptibility within hosts. For example, white oaks are more susceptible to oak anthracnose compared to red oaks. In the case of sycamore anthracnose, the fungus also infects the twigs, resulting in stem cankers. Spores produced from fruiting bodies associated with twig cankers have a short trip from the twig to the new foliage, making leaf infection much more severe. In addition, twig infection may result in witch's brooms with short internodes and a "bushy" growth habit. The witch's brooms are easy to see during the winter months.

Several tree diseases and abiotic factors may resemble anthracnose. Early in the growing season, late spring freezes and frosts may kill new growth. All the new leaves will be affected, and the entire leaf will probably be brown and may be killed. In addition, frost damage will extend across a wide variety of species and be very apparent in low-lying areas with cold air drainage. New growth will look normal. Most foliar fungal leaf diseases, including anthracnose, are not lethal to trees. However, repeated defoliation events such as those in 2016 can lead to tree stress and predisposition to secondary lethal agents.

Oak wilt, on the other hand, is lethal to oaks, and trees must be treated to ensure survival. Anthracnose may be confused with oak wilt later in the season. Be sure to properly diagnosis the problem before employing management options. **Listed on the next page are some general diagnostic tips for comparing oak anthracnose and oak wilt (figures 27-31).** The only way to be absolutely sure is to send samples to a plant clinic to confirm which fungus is involved. Keep in mind, a tree could have both oak wilt and anthracnose at the same time.

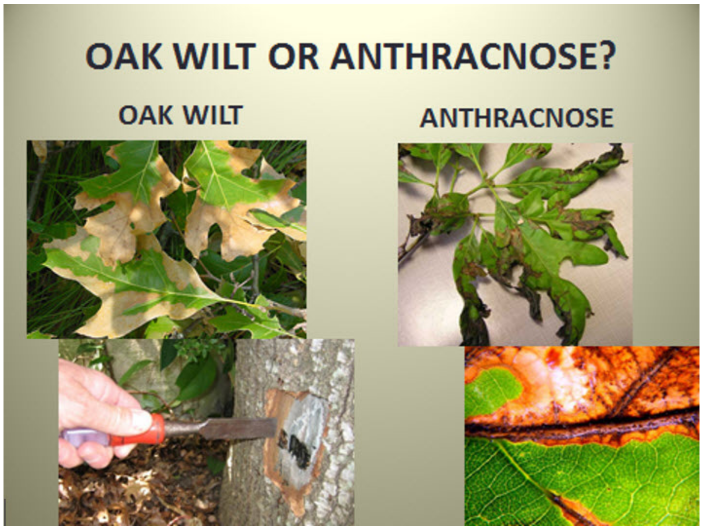


Figure 27.—Oak Wilt vs. Anthracnose.

Figure 28.—Oak anthracnose signs and symptoms.

Figure 29.—Leaf necrosis caused by sycamore anthracnose.

Figure 30.—Stem canker associated with sycamore anthracnose.

Figure 31.—Witch's brooming sycamore twigs.

Oak Wilt Symptoms and Signs

- **Red oaks are very susceptible**, but all oaks can be killed
- Spreads through root grafts and bark beetles
- Caused by vascular wilt fungus and produces **fungal mats** under bark
- Red oaks can die within one year while white oaks may take years
- Leaves turn brown from tip and outer leaf edges
- Premature leaf drop and defoliation occur

Oak Anthracnose Symptoms and Signs

- Fungus infects twigs, buds, and leaves, and distorts and kills leaves
- Considered a minor stress and trees usually recover

- **Most severe on white oaks**, red oaks are mildly affected
- Fungus is most prevalent during cool, wet springs and summers
- Leaves have irregular, water-soaked blotches that start along veins
- Leaves become distorted, cupped, and drop from tree

Management Options for Oak Wilt

- **Early diagnosis required and prevention is best**
- Do not prune oaks from April to June
- Break root grafts between healthy and diseased trees
- **Injections of fungicides** may be effective for white oaks with <30% crown dieback
- Prune out infected branches
- **Sanitation**: Split and dry oak firewood and chip and burn small branches

Management Options for Oak Anthracnose

- **Fungicide injection treatments** every 2 to 3 years may be effective, if warranted
- **Foliar fungicide sprays** every 2 weeks may be effective, if warranted
- Use **host plant resistance** by planting 'Ovation' and 'Exclamation' London planetree, which are less susceptible to sycamore anthracnose (figures 32-33)
- Reduce other stresses

Rapid White Oak Mortality (13)

You should still be on the alert for rapid white oak mortality (RWOM), which has been observed in parts of Missouri since 2012. In 2014, the Missouri Department of Conservation conducted a survey by interviewing district foresters, private landowners, consulting foresters, and other land managers to determine the extent of RWOM and possible factors contributing to the die off of white oaks (figures 34-39).

Figures from the top right:

*Figure 32.—'Ovation' London Planetree (*Platanus acerifolia *'Morton Euclid').*

*Figure 33.—'Ovation' London Planetree (*Platanus acerifolia *'Morton Euclid').*

Figure 34.—White oak dying from RWOM.

Figure 35.—White oak mortality from RWOM.

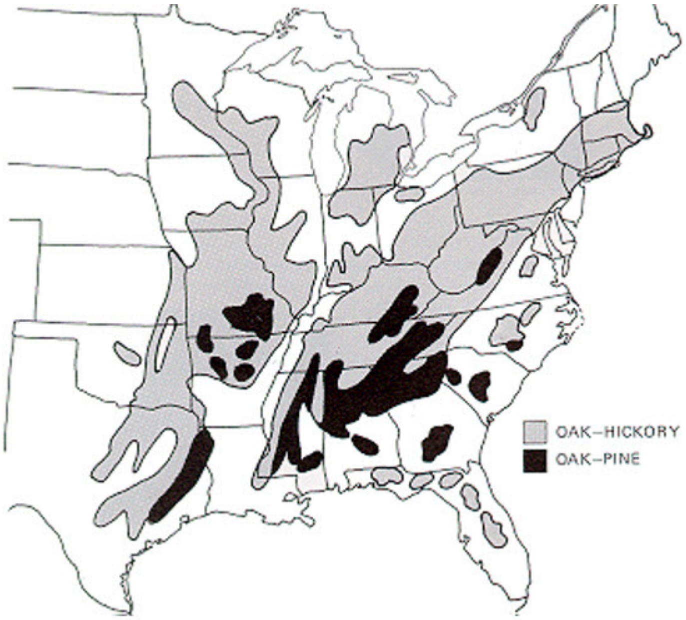


Figure 36.—Distribution of oak-hickory and oak-pine forest types.

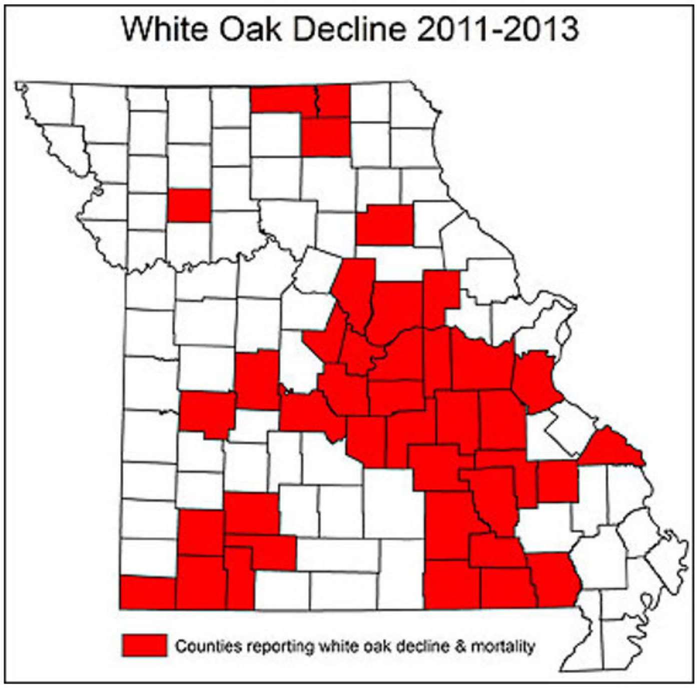


Figure 37.—Distribution of RWOM in Missouri, 2011-2013.

Figure 38.—Ozark region of Missouri.

Figure 39.—Geographic regions of Missouri.

Listed below are a few of the major findings from the 2014 RWOM survey:

- RWOM has been observed in portions of Missouri and Iowa
- Common on dominant and codominant white oaks >10″ d.b.h. growing on high-quality sites and on lower slopes of all aspects next to seasonal drainages
- Mortality occurred on protected and exposed aspects with 12% slopes
- Surface soil textures were loams, and silty and sandy loams with low water-holding capacity
- A third of sites had restrictive layers at the 1- to 5-foot soil depth
- Majority of oak mortality is found on Salem Plateau of Ozark Highlands
- Distant sites of RWOM in northeastern Missouri (Lewis County) and western Missouri (Henry County) are much different being located in the Glaciated Plains and the Osage Plain, respectively
- *Armillaria*, *Hypoxylon*, *Phytophthora*, two-lined chestnut borer, and ambrosia beetles have been implicated
- Symptoms include branch dieback, cankers, fallen bark, and wilted leaves still attached
- Trees die within one season

Recent site conditions and management activity included:

- Severe drought
- 2007 late spring freeze and 2012 frost
- Flooding
- Insect defoliation
- Timber stand improvement
- Timber sales and salvage cuts
- Moderate to severe burns

In Illinois, there have been a few isolated cases of oak mortality, but they have not been confirmed as RWOM. For additional details, refer to *Missouri Forest Health Update* (December 2014) pages 5-6.

Thousand Cankers Disease of Black Walnut

To date, neither the walnut twig beetle (WTB) nor the thousand cankers disease (TCD) fungus has been detected in eastern black walnut trees in Illinois, and no new finds have been reported for the Eastern United States. As in previous years, four-unit Lindgren funnel traps (LFTs) were deployed throughout the State in State parks, natural and conservation areas, forests, and county forest preserves (figure 40).

Role of Ambrosia Beetles and Bark Weevils Serving as Vectors of TCD and Other Canker-Causing Fungi in Hardwoods (10, 11)

A statewide trapping survey program was first initiated at the beginning of the 2014 field season continuing through the 2016 field season to determine if other bark beetles and weevils may be involved in the transmission of *Geosmithia morbida*, the causal agent of thousand cankers disease. Preliminary results are presented below for the 2014–2016 trapping seasons.

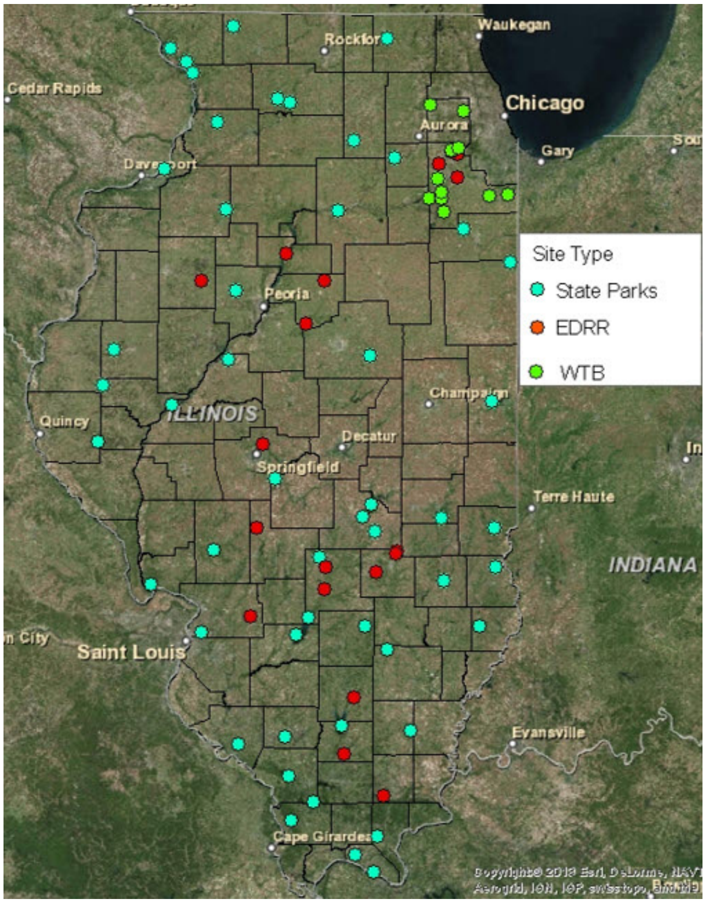


Figure 40.—Distribution of WTB four-unit Lindgren funnel traps for 2016.

The Illinois statewide trapping program is conducted in cooperation with Dr. Jenny Juzwik, U.S. Forest Service Plant Pathologist. Previous findings by Dr. Juzwik from her work in Indiana and with others in Missouri found bark weevils with the *G. morbida* fungus on their bodies. At this point in time, these bark weevils are not considered to be a major vector in the spread of TCD but this does raise the question: are there other insects in addition to walnut twig beetle involved in TCD transmission? Stay tuned! **For additional information on Dr. Juzwik's findings, refer to Juzwik, J.; Banik, M.T.; Reed, S.E.; English, J.T.; Ginzel, M.D. 2015. *Geosmithia morbida* found on weevil species *Stenomimus pallidus* in Indiana. Plant Health Progress. doi:10.1094/PHP-RS-14-0014.**

2014 LFT Trapping Program

A total of 782 specimens were recovered from 4- and 12-unit LFTs deployed throughout Illinois. *Xyleborinus saxeseni* made up 32% of total specimens recovered followed by *Xylosandrus crassiusculus* with 19% and *Xylosandrus germanus* with 9% of the total. The bark weevil *Stenomimus pallidus* was not found in any of the trap collections. No TCD fungus was found associated with any of the above beetle specimens.

2015 LFT Trapping Program

The trapping program was repeated in 2015 at most of the same locations as in 2014, and a total of 1,555 specimens were recovered. Of these, 75% were bark beetles. Longhorned beetles made up 8% of the total, and weevils accounted for 3% of the specimens recovered from the traps.

2016 LFT Trapping Program

Results from the 2016 trapping season are in progress and will be tabulated in early 2017, but early impressions suggest results are similar to previous years.

Black Walnut Trap Tree Program

In late spring 2014, concurrently with LFT deployment, two to three small (2-4 inches d.b.h.) black walnut trees were selected per trapping site for use as trap trees. The trees were girdled by removing a 3- to 4-inch-wide band of the bark, and the girdled area was sprayed with glyphosate to accelerate the decline process. A total of 200 trap trees were established in 60 different State parks and forest preserves. In early fall of 2014, the trap trees were harvested, brought back to The Morton Arboretum, cut into 12-inch-long bolts, and placed in 5-gallon plastic rearing buckets with pint-size collection jars attached to the bottom of the bucket. The rearing buckets were held in a lab at room temperature from early September until mid-December 2014. Two to three times per week, the buckets were inspected for emerging insects. The insects were placed in plastic centrifuge tubes and held in a freezer for later processing.

2014 Trap Tree Rearing Project

A total of 1,500 specimens were recovered from the 2014 trap tree survey project. *Xylosandrus crassiusculus* made up 95% of the specimens trapped followed by *Hylesinus aculeatus* and *Xyleborinus saxeseni* at 2% and *Xylosandrus* *germanus* and *Neoclytus acuminatus* at 1%, respectively. No WTB or TCD fungus was found associated with the bark beetle specimens.

2015 Trap Tree Rearing Project

In 2015, approximately 50 sites were surveyed throughout Illinois. Slightly lower numbers of beetles (total of 1,000 specimens) were recovered. Species composition was similar to 2014 results with *Xylosandrus crassiusculus, Hylesinus aculeatus, Xyleborinus saxeseni, Xylosandrus germanus,* and *Neoclytus acuminatus* making up the vast majority of the samples collected (figures 41, 42, 43). No WTB or TCD fungus was found associated with eastern black walnut trap trees.

Figure 41.—Adult Xylosandrus crassiusculus.

Figure 42.—Adult Xyleborinus saxeseni.

Figure 43.—Adult Xylosandrus germanus.

2016 Trap Tree Rearing Project

The trap tree rearing project was repeated in 2016 at approximately 60 sites throughout Illinois (figure 44). Results from the rearing are ongoing at the time of this report.

Figure 44.—Black walnut trap tree bucket rearing project.

Bur Oak Blight (8, 15)

Details on the biology and impact of bur oak blight (BOB) have been reported in previous editions of the Forest Health Highlights. By way of update, BOB was confirmed in Grundy, DuPage, and DeKalb Counties in 2015 and in Rock Island and southern Cook Counties in 2016. BOB is not immediately lethal to bur oak, but may eventually kill a tree over a period of years. Sampling for BOB is best conducted in late summer (i.e. August and September) when the disease is fully expressed (figures 45-48).

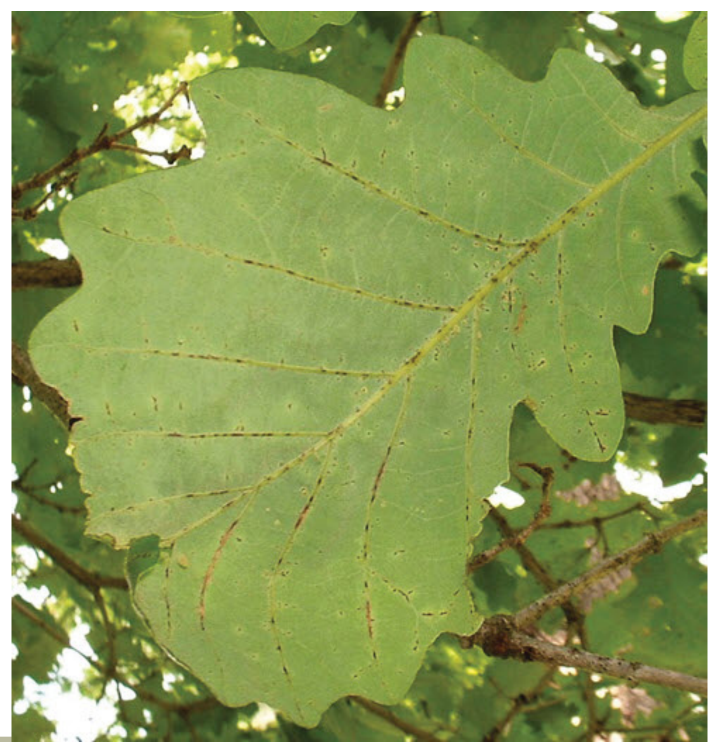


Figure 45.—Bur oak blight leaf symptoms on underside of leaf.

Figures from the top left:

Figure 46.—Bur oak leaf blight.

Figure 47.—Bur oak blight on bur oak.

Figure 48.—Fungal fruiting bodies (pycnidia) on bur oak leaf petiole.

Dutch Elm Disease (1, 14)

This vascular wilt disease has been with us for decades and continues to kill American and red elms throughout Illinois. Based on reports provided by the University of Illinois Plant Clinic (UIPC) and Morton Arboretum Plant Clinic (MAPC), Dutch elm disease cases continue to be a problem and levels were comparable to 2015 levels.

Oak Wilt (1, 14)

The dreaded oak wilt (OW) is found in every Illinois county and has become a major urban and forest tree disease. UIPC reports for 2012 indicate that 2012 OW disease incidence was higher compared to previous years (11). It is very likely that the 2012 drought contributed to or even accelerated the development of OW in predisposed trees. Oak wilt levels for 2016 were comparable to previous years.

Verticillium Wilt (1, 14)

This very ubiquitous and opportunistic vascular wilt fungus was common in 2016 and at levels seen in previous years. Flooding and drought over the last 7 years, including the severe 2012 drought, has and will continue to predispose woody plants to this wilt. Sugar maple, red maple, ash, smoketree, Japanese maple, saucer magnolia, and three-flowered maple are just a few examples of susceptible hosts (3).

Bacterial Leaf Scorch (1, 9, 14)

Bacterial leaf scorch (BLS) resembles abiotic scorch, but is caused by a bacterium, *Xylella fastidiosa* (figure 49). It is thought to be spread by leafhoppers and spittlebugs (figure 50). Tree hosts include elm, hackberry, maple, mulberry, oak, sweetgum, sycamore, and planetree (table 2) (5). Since 1999, UIPC records show that BLS has tested positive in 10 Illinois counties stretching from Jefferson, Madison, and St. Clair Counties in southern Illinois through parts of central Illinois (i.e. Sangamon, Champaign, Douglas-Moultrie, Iroquois), north to Cook and DuPage Counties, and to Jo Daviess County in extreme northwest Illinois (11). With the exception of Champaign County, with 40 positive samples, the remaining 9 counties have had 1-3 positive cases confirmed. In terms of hosts, BLS has been found in bur, northern red, pin, white, swamp white, and shingle oaks from 1999–2008. In 2008, BLS was found in seven oak positives including northern red, swamp white, pin, and several unidentified oak species. Eleven BLS samples were submitted in 2010 to the MAPC. Of those 11 samples, two were positive, one was inconclusive, and eight were negative (1). The positives were found on oaks growing in DuPage and Cook Counties.

Historically, in 2011, a total of 22 trees were tested for *Xylella fastidiosa.* One sample, taken from an American elm (*U. americana*), tested positive (Cook County), and six were elevated and inconclusive. Eleven samples were taken from trees growing at The Morton Arboretum. Additional samples were received from western and northwestern suburbs of Chicago, and western Illinois, but were negative (1). Reports received from UIPC indicate that BLS symptoms were more pronounced in 2012, probably due to drought stress. BLS for 2016 was comparable to previous years.

Figure 49.—Bacterial leaf scorch symptoms.

Figure 50.—Spittle bug.

Table 2. Tree species known to be susceptible and not susceptible to BLS (5).

Susceptible Species	**Non-Susceptible Species (*Based on Observations*)**
American elm	European black alder
Gingko	Northern catalpa
Hackberry	Kentucky coffeetree
Red maple	Amur cork tree
Silver maple	Chinese elm
Sugar maple	Sugar hackberry
Black oak	Shagbark hickory
Bur oak	Shellbark hickory
English oak	Pignut hickory
Northern red oak	Katsuratree
Pin oak	Littleleaf linden
Swamp white oak	Cucumbertree
White oak	Black maple
American sweetgum	Chinquapin oak
American sycamore	Sawtooth oak
-	Common sassafras
-	Tulip tree
-	Japanese zelkova

Ash Decline and Dieback (11)

Considerable ash (*Fraxinus* spp.) decline (both green and white ash) continued to be observed along the I-57 corridor south of I-70 to extreme southern Illinois (Dixon Springs area). Declining ash were also observed later in the season (July–August) along the I-64 corridor from south-central Illinois (Mt. Vernon area) west to East St. Louis, IL. Most trees showed thinning canopies and dieback. Death was also a common symptom. Trees were examined periodically throughout the summer, but there was no evidence of EAB. This trend has been going on since 2008 and may be caused by ash decline and/or ash yellows. Luley and others (1994) documented an outbreak of ash yellows in this geographic area. More specifically, ash decline continued to appear in east-central Illinois (Kickapoo State Park) in July and August. Ash decline was also observed in other areas of east-central and southern Illinois (Fox Ridge, S.A. Forbes, and Wayne Fitzgerrell State Parks).

Needle Cast Disease (1, 14)

Two very common diseases affecting conifers, *Rhizosphaera* needle cast and *Diplodia* (i.e. *Sphaeropsis*), were present in 2016. Both of these fungal leaf diseases attack the needles of cone-bearing tree species, causing premature needle cast or a browning and/or death of the growing tip, respectively. While not outright fatal, they stress the trees and reduce overall ornamental qualities and growth rates.

Stress-Related Canker Diseases (1, 14)

Cytospora canker of spruce is definitely a stress-related disease, particularly of Colorado blue spruce. Spruces are a common urban forest and landscape species. The cankers are initially found on the undersides of the branches and result from some type of stress. Spruce trees growing in urban environments are very prone to this canker. While not fatal, the cankers cause branches to die distal to the canker, resulting in a loss of ornamental quality and landscape function (1).

Pine Wilt Disease (1, 5, 14)

Pine wilt disease (PWD) is a chronic problem primarily affecting Scots, Austrian, jack, mugo, and red pines. White pine is less commonly infected. PWD involves a longhorned beetle (*Monochamus* spp.), a nematode (*Bursaphelanchus xylophilus*), a conifer host (*Pinus* spp.), and sometimes the blue stain fungus (*Ceratocystis* spp. or *Ophiostoma piceae*). The adult Carolina sawyer beetle serves as a vector for the pinewood nematode. As the beetle feeds on the branches and twigs of healthy pines, the nematodes leave the beetle and enter the tree via feeding wounds. Nematodes kill host trees by feeding on the cells surrounding the resin ducts. Resin leaks into the tracheids, resulting in "tracheid cavitation," or air pockets in the water transport system. As a result, the tree is not able to transport water upward, resulting in wilting and tree death. Tree death usually progresses from the canopy top downward, turning yellow and then to a rusty red. Needles turn a grayish green color, but the needles do not fall from the tree. As the disease progresses, conifer bark beetles usually invade and inoculate the tree with blue stain fungus. The combination of all of these factors results in the death of the tree within weeks or months.

The length of time that it takes for wilting and tree death to occur is dependent upon many factors. Trees predisposed to this disease due to flooding, drought, soil compaction, construction damage, etc., will be more vulnerable. With the record-setting rains of June 2015, pines growing in heavy clay soils, saturated soils, and flooded areas will be vulnerable to PWD and other secondary agents such bark beetles, root rots, and borers. Properly siting and selecting pines (i.e. avoid heavy clay and poorly drained soils) is key to preventing PWD. Once a tree has contracted PWD, it should be removed as soon as possible to avoid spreading the nematodes to other healthy trees. Chemical treatments are not practical or economical for large numbers of trees. Emamectin benzoate is used against pinewood nematode and might be warranted for individual, high-value landscape or seed orchard trees (figures 51-55).

Figure 51.—Pine wilt disease.

Figure 52.—Adult Carolina pine sawyer beetle.

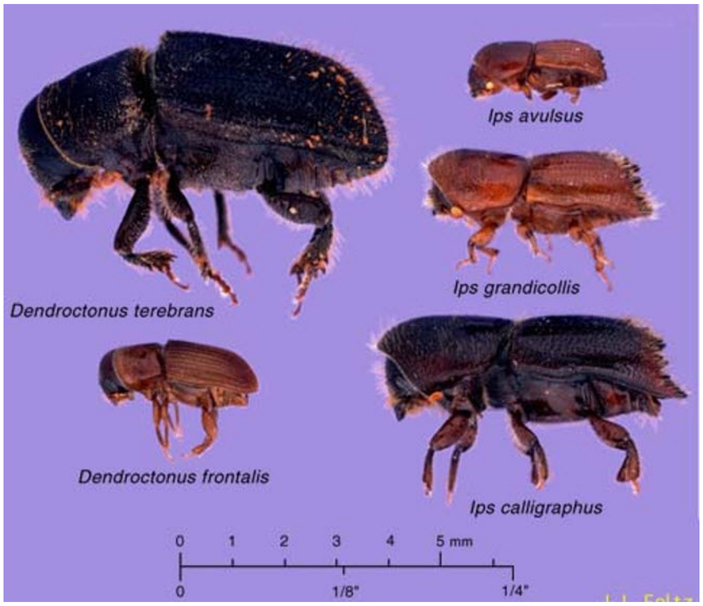


Figure 53.—Assorted bark beetle species.

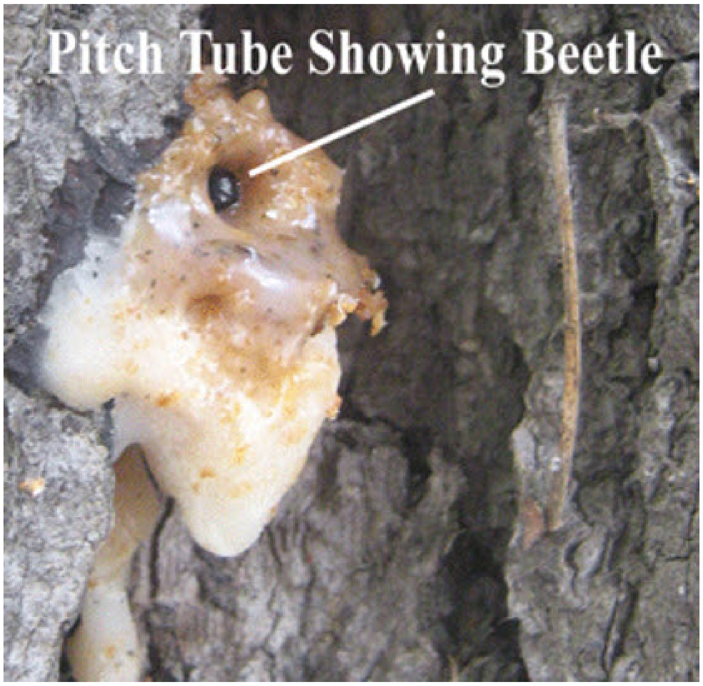


Figure 54.—Pitch tube and bark beetle.

Figure 55.—Blue stain fungus.

Hickory Decline (17)

In recent years, dieback and mortality of hickory have been reported in areas of the upper Midwest (figure 56). Bitternut hickory (*Carya cordiformis*) and shagbark hickory (*C. ovata*) appear to be most affected. Symptoms include thinning canopies, dead branches, and eventually tree death (13).

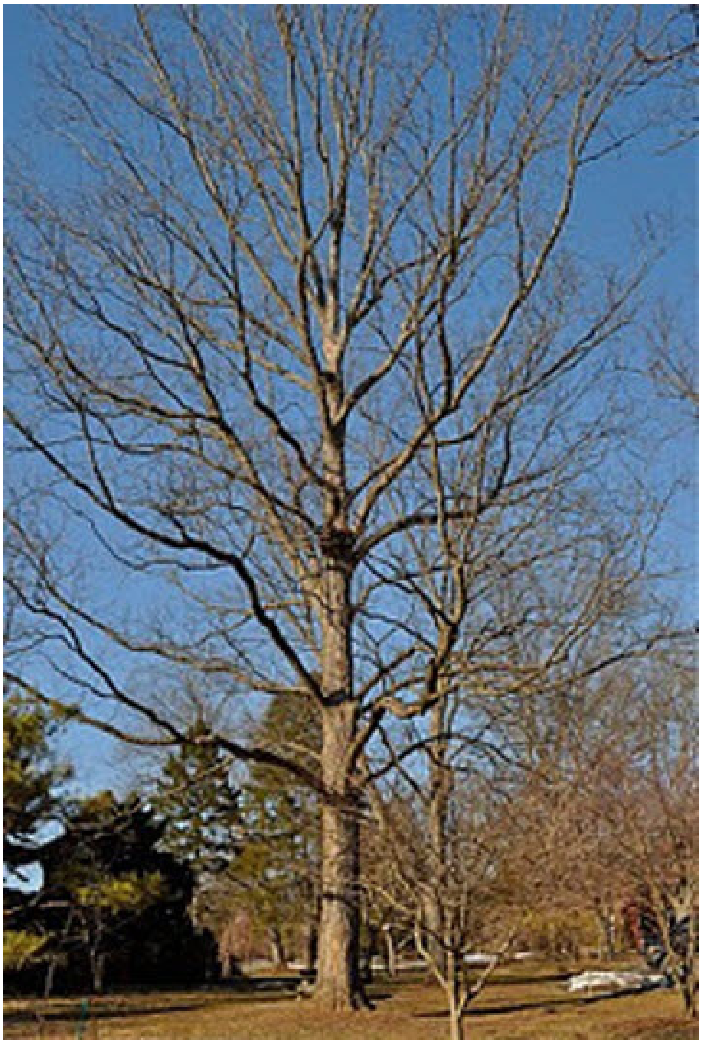


Figure 56.—Hickory decline.

Historically, death of hickory trees was attributed to the hickory bark beetle (*Scolytus quadrispinosus*) following droughts. Recent research seems to indicate that hickory decline may include a complex of biotic and abiotic factors such as bark beetles (*Xylobiopsis basilaris*), borers (*Agrilus otiosus*), and the fungus *Ceratocystis smalleyi*. In some cases, *Armillaria* root rot fungus has been found associated with recently dead trees (13). Hickory decline and dieback are most common in overstocked stands. Current management practices include sanitation by removing dead and dying trees to reduce bark beetle breeding habitat and insecticide applications to the trunk of individual trees. Widespread use of insecticides for forest stands is not considered to be economical or practical (13).

Heterobasidion spp. of Red Pine

This fungus is a root and basal stem rotting fungus that colonizes cut stumps and then moves through root systems to adjoining trees. The fungus eventually colonizes the lower stem, leading to wind throw and death of affected trees. In the Midwest, white, red, and jack pines are most susceptible (figure 57). Thinned and/or harvested pine stands are prone to this disease. Prevention is the best approach. Treating freshly cut stumps with a fungicide along with good sanitation and stump removal are important management tactics. Aerial and ground surveys from 1962 to 1971 by Hanson and Lautz confirmed *Heterobasidion annosum* being present in southern Illinois. Since 1971, there is no record of further *H. annosum* surveys. Statewide surveys in 2016 did not indicate any new finds of *Heterobasidion* spp. in red pine.

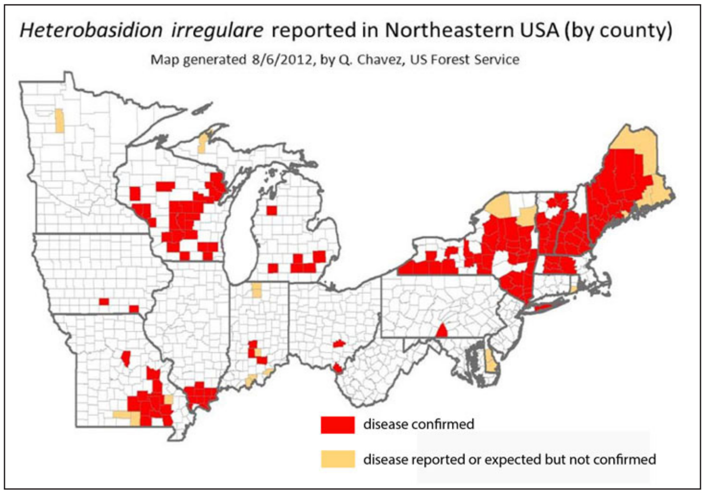


Figure 57.—Distribution of Heterobasidion irregulare *in the Northeastern and Midwestern United States.*

Weather and Abiotic Events (2)

Overall, spring and summer of 2016 were very wet with record-setting rainfall, breaking a 101-year record for July and August accompanied with high humidity. As mentioned above, this combination of precipitation and high humidity provided an ideal environment for a variety of foliar fungal leaf diseases, namely apple scab and anthracnose. Fall of 2016 was dry in most parts of the State with mild temperatures up through early December. In early December, more winter-like conditions occurred accompanied by significant snow fall. Several Arctic outbreaks occurred during the last half of December.

Based on 2016 field observations, some tree species went into early fall color again this year as in 2015. Maples in particular in northeastern Illinois were turning color in August and early September in spite of mild temperatures. While I do not have any conclusive evidence, my impression is that the wet summers of June 2015 and July and August, 2016, may have contributed to fine root mortality on typically heavy clay and poorly drained urban soils. This pattern of early fall color is similar to observations in the latter half of summer, 2013, following the 2012 drought. Looking back over the last five growing seasons, we have experienced a record-setting drought in 2012, a dry July and August in 2013, record June rainfall in 2015, and record precipitation in July through August in 2016. The combination of all of these factors may still be affecting fine root recovery and regeneration and may be responsible for the aboveground symptoms we are seeing. Time will tell if this trend continues in 2017 and beyond.

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PLEASE NOTE: The information presented in this summary is not to be considered to be comprehensive nor all inclusive. Information presented here is based on visual and observational surveys and reports by Fredric Miller, Ph.D., IDNR Forest Health Specialist; IDNR Forest Health field technicians; IDNR district foresters; private landowners; homeowners; Stephanie Adams, plant pathologist; The Morton Arboretum Plant Diagnostic Clinic; and members of the green industry.

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Forest Health Programs

State forestry agencies work in partnership with the U.S. Forest Service to monitor forest conditions and trends in their State and respond to pest outbreaks to protect the forest resource.

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