2015 Illinois
Forest Health Highlights

Prepared by Fredric Miller, Ph.D. IDNR Forest Health Specialist, The Morton Arboretum, Lisle, Illinois

Table of Contents

I.	Illinois Forest Resources	1
II.	Forest Health Issues: An Overview	2
III.	Insect Pests	3-12
IV.	Plant Diseases	13-25
V.	Weather and Abiotic Factors	26
VI.	References	27-28

I. ILLINOIS FOREST RESOURCES

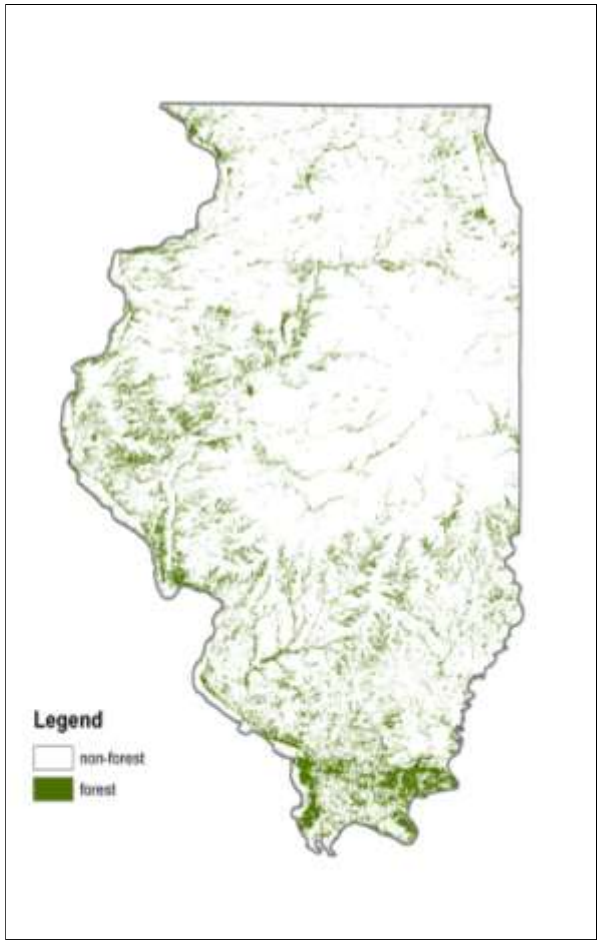

Figure 1. Illinois Forest Areas

INTRODUCTION (16):
Illinois has 4.9 million acres of forest land up 2% from 2009. Timberland accounts for 94% with 6% in reserves and unproductive. Illinois forest land is concentrated in western and southern Illinois with most on the Shawnee National Forest (SNF). Eighty-three percent (83% or 4.1 acres) of Illinois forest land is privately owned (Figure 1).

Hardwoods are the dominant species with two hardwood forest-type groups, oak-hickory (OH) and elm-ash-cottonwood (EAC). These two groups make up 92% of Illinois forest land. The oak-hickory (OH) 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% in poletimber, and 8% consisting of saplings and seedlings. One percent (1%) is nonstocked. Currently, over half (54%) of stands are over 61 years of age.

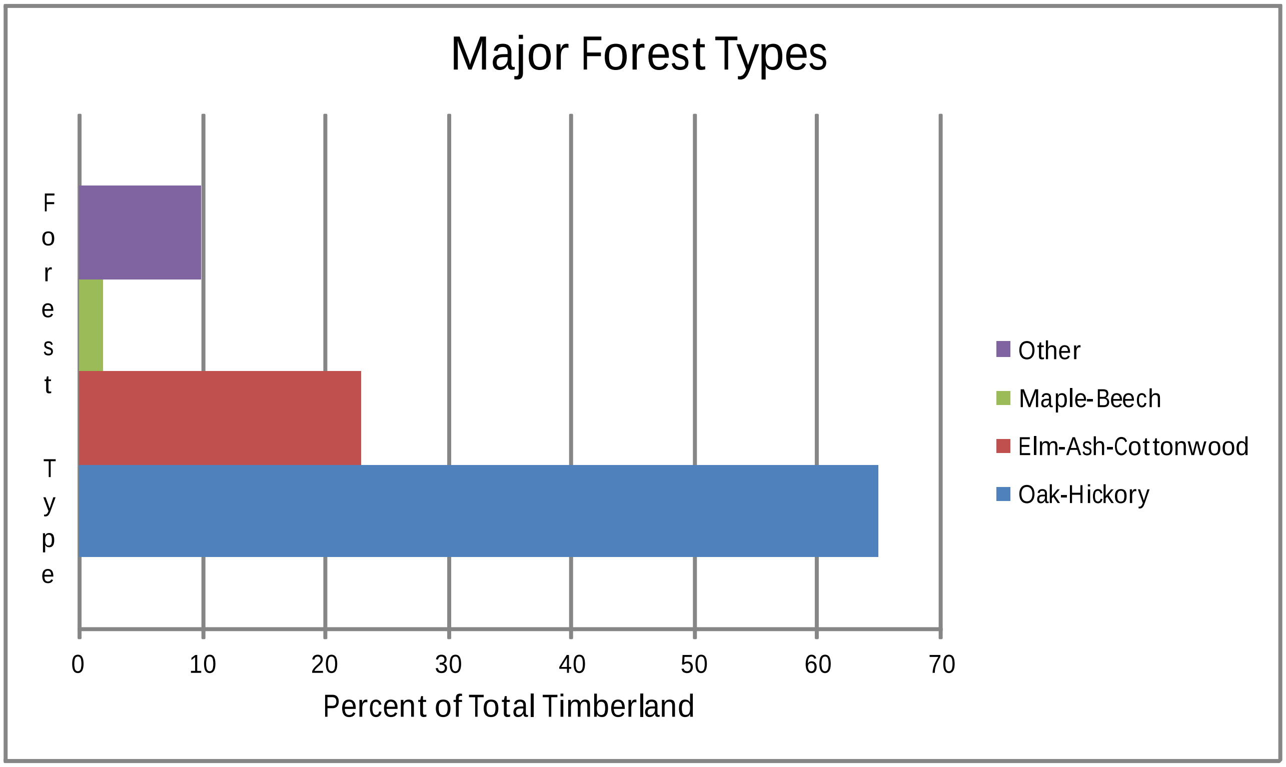

Figure 2. Major forest types by percent of total timberland. Source: Illinois' Forest 2005, NRS-29.

II. FOREST HEALTH ISSUES: AN OVERVIEW

2015 ILLINOIS FOREST HEALTH HIGHLIGHTS

Overall, the 2015 growing season was relatively quiet with no widespread forest health issues. However, several new pests and diseases are increasing including honeylocust decline, magnolia and Lecanium scales, bur oak blight (BOB), and Nectria canker.

With regards to EAB, nearly 60% of Illinois counties are infested with EAB. As a result, **the Illinois Department of Agriculture (IDA) has lifted the internal state EAB quarantine.** Illinois does still remain under a federal quarantine.

III. INSECT PESTS

HONEYLOCUST DECLINE (1). For the past several years, reports have been received 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, heavy infestations of honeylocust plant bug and leafhopper feeding damage, honeylocust borer, and lecanium scale.

With the exception of drought, 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, and common urban issues have probably pre-disposed these trees to the aforementioned diseases and insects pests (Figure 3).

Figure 3. Honeylocust tree showing signs of thinning and decline

NECTRIA AND THYRONECTRIAL 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. They usual enter through pruning wounds, storm and/or mechanical damage to the trunk and major limbs. 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 help 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 AND LEAFHOPPER (1). In addition to the cankers mentioned previously, 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 (HLPB) 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 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 then 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).

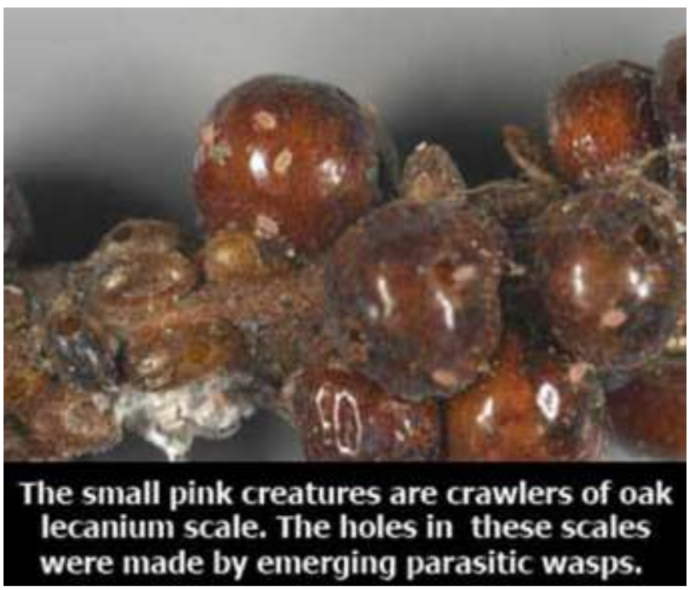

Figure 7. Lecanium scale adults and crawlers

Figure 8. Lecanium scale on Turkish hazelnut

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. acuminate*), 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 web-worm (FWW) and eastern tent caterpillar (ETC) nests were seen at state parks and forests in southeastern (Lincoln Trail S.P.) and southern Illinois (Lake Murphysboro and Pyramid S.P's). ETC 's 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 sporadic and adult beetle numbers were low with locally high numbers in some cases. Low numbers were common in east central Illinois and west to Monticello. Minor Japanese beetle feeding damage (<20% defoliation) was observed in most locations.

VIBURNUM LEAF BEETLE (1, 6). Viburnum leaf beetle continues to cause feeding injury in Cook and DuPage Counties and is becoming more obvious. The viburnum leaf beetle (VLB) was initially found in 2009 in an urban Cook county landscape. The viburnum leaf beetle feeds on a variety of commonly planted viburnums and has the potential to become a major pest of these ubiquitous woody landscape plants.

CHINESE LONG-HORNED BEETLE (12). Another invasive long-horned beetle, *Hesperophanes campestris*; synonym *Trichoferus campestris* and similar to ALB appeared for the first time in 2009 near O'Hare airport and in Crawford county in east central Illinois. 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 as the Asian long-horned beetle (ALB) and causes similar damage to trees. Preferred hosts of the CLHB are presented in Table 1 (Figure 11).

Table 1. Preferred hosts of the Chinese long-horned beetle

Apple	Mulberry	Maple	Birch
Beech	Ash	Locust	Walnut
Larch,	Fir	Cedar	Oak
Willow	Elm	Cut wood of spruce and pine.	

Figure 11. Adult Chinese Long-horned Beetle

COMMON 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^{o}F) days in spring. Adults aggressively colonize pine stumps, logs or trunks of weaken 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).

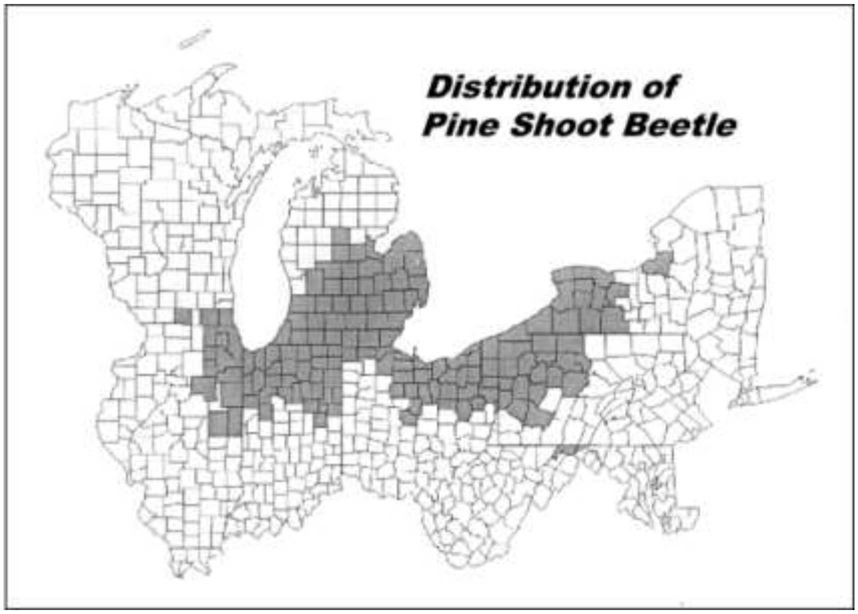

Figure 12. Distribution of the pine shoot beetle (PSB)

Figure 13. Adult PSB feeding in pine stem

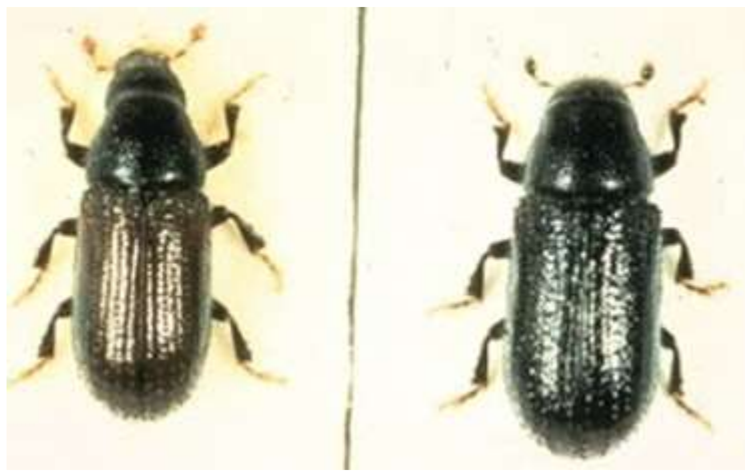

Figure 14. Adult pine shoot beetle (PSB)

Figure 15. Pine shoot beetle damage

UPDATE ON EMERALD ASH BORER (1). The EAB continues to spread with additional finds in Iowa, Minnesota, Wisconsin, and Missouri. EAB was confirmed in ten (10) new Illinois counties in 2015 with 60% of Illinois counties confirmed for EAB. The new counties include Madison, Mercer, Jackson, Saline, Hamilton, Wayne, Clay, Jefferson, Washington, and Bond. As a result, the IDA 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 greater than 1-inch DBH (Figures 16 and 21).

The first year of a multi-year biological control project was initiated in Boulder, Colorado, Syracuse, New York, and Naperville, Illinois to determine the capability of parasitoids and chemically treated trees to reduce EAB caused mortality. The multi-year 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 an areas with treated trees. Sorting of parasitoid traps is ongoing with results on parasitoid abundance and establishment to be determined (Figures 17—20).

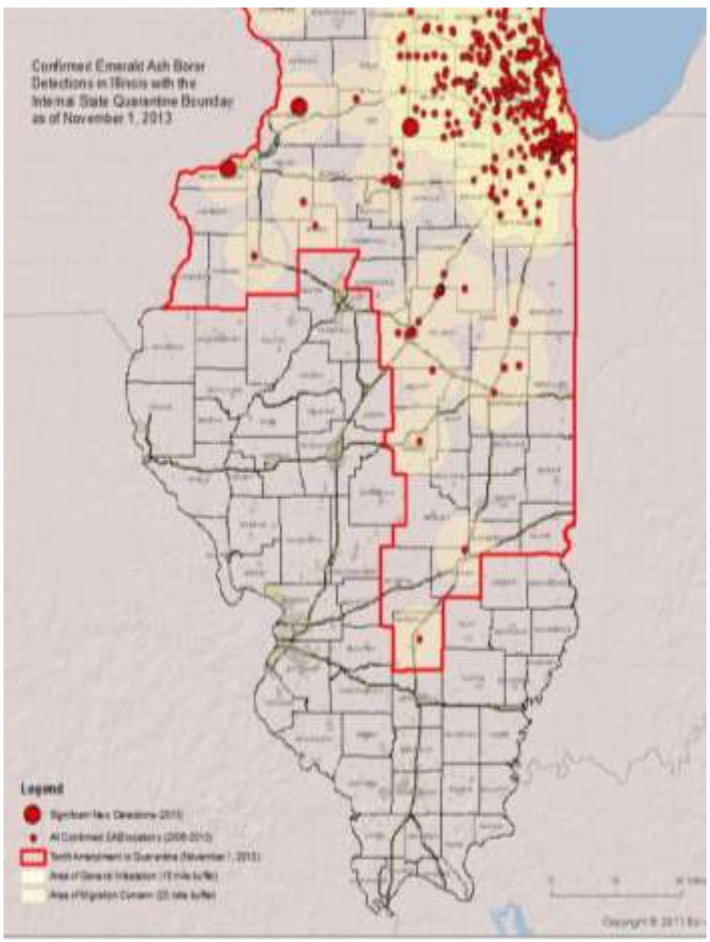

Figure 16. 2014 EAB Quarantine Map

Figure 17. Yellow pan trap (YPT) for monitoring EAB parasitoids

Figure 18. Tetrastichus planipennisi - Gregarious, larval endoparasitoid.

Figure 19. *Spathius agrili* – larval ectoparasitoid

Figure 20. *Oobius agrili* – solitary egg parasitoid

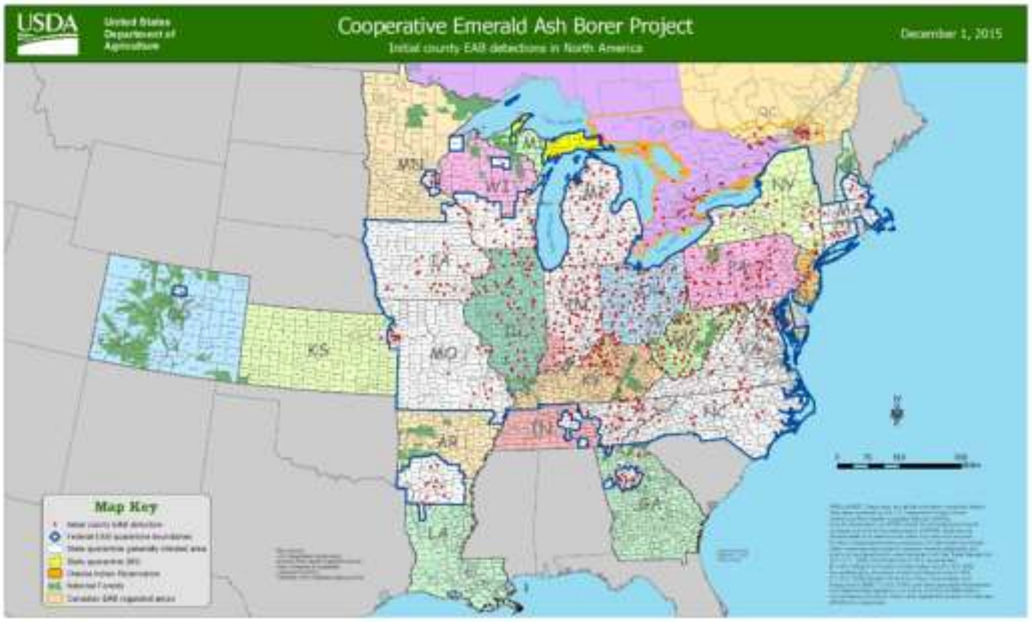

Figure 21. Distribution of EAB in U.S. as of 1 December 2015

EAB and White Fringe Tree. In early 2015, EAB was confirmed to have been found associated with white fringe tree (*Chionanthus virginicus*) at several locations in Dayton, Ohio (Figure 22). This is the first report of EAB being able to complete its life cycle on a non-*Fraxinus* host. Some of the white fringe trees had evidence of mechanical girdling damage. Trees were growing in open areas with partial shade with known EAB infestations nearby. Trees were showing classic symptoms of an EAB infestation. Chemical management of EAB in white fringe tree could be difficult as white fringe tree flowers are bee-pollinated and produce fleshy fruits eaten by birds. Close relatives of white fringe tree 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. Econ. Entomol. 1–6 (2015); DOI: 10.1093/jee/tou026

Figure 22. White fringe tree (*Chionanthus virginicus*)

YELLOW POPLAR WEEVIL (3). The yellow poplar weevil (*Odontopus calceatus*) (YPW) is a leaf-mining weevil and 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 northeast 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 1960's. YPW is a small (2.5 to 3.9 mm long) black beetle and 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 1960's, 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 23—25).

Figure 23. Adult yellow poplar weevil

Figures 24 and 25. Adult yellow poplar weevil feeding damage

IV. PLANT DISEASES

RAPID WHITE OAK MORTALITY (13). RWOM has been observed in parts of Missouri since 2012. In 2014, the Missouri Department of Conservation (MDOC) conducted a survey 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 26—31).

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 co-dominant white oaks >10" DBH 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 NE MO (Lewis County) and Western MO (Henry County) are much different being glaciated plains and the Osage plain, respectively
- *Armillaria*, *Hypoxylon*, *Phytophthor*a two-lined chestnut borer (TLCB), and ambrosia beetles have been implicated
- Symptoms include branch dieback, cankers, fallen bark, 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 (TSI)
- Timber sales and salvage cuts
- Moderate to severe burns

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

Figure 26. White oak dying from RWOM

Figure 27. White oak mortality from RWOM

Figure 28: Distribution of oak-hickory and oak-pine forest types

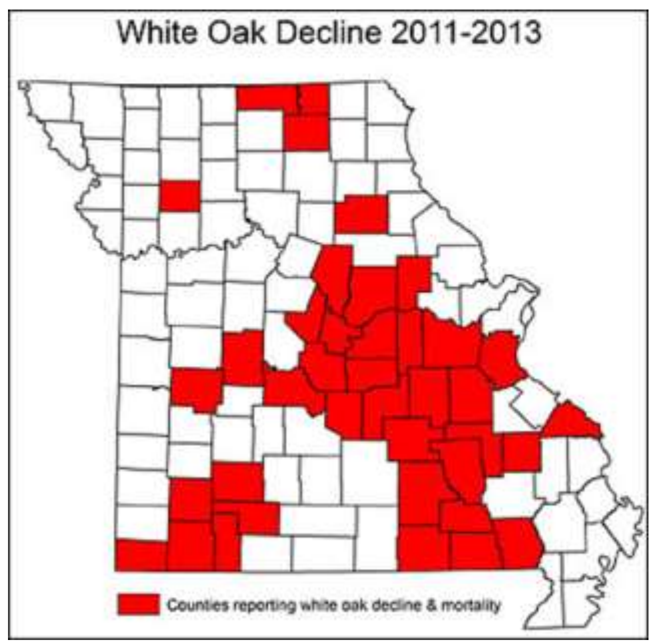

Figure 29. Distribution of RWOM in Missouri, 2011-2013.

Figure 30. Ozark region of Missouri

Figure 31: Geographic regions of Missouri

THOUSAND CANKERS DISEASE OF WALNUT

To date, neither the WTB nor TCD has been found in Illinois. Beginning in early summer, 2015, four unit LFT's were deployed along with a newly developed pheromone for detection of the walnut twig beetle (WTB). Traps were placed at sites including 50 state parks, forests, natural areas, county forest preserves, private woodlots, and wooded areas near mills (Figure 32). In addition to trapping, visual assessments of declining walnut trees, and documentation of walnut plantings and walnut natural stands were conducted and developed.

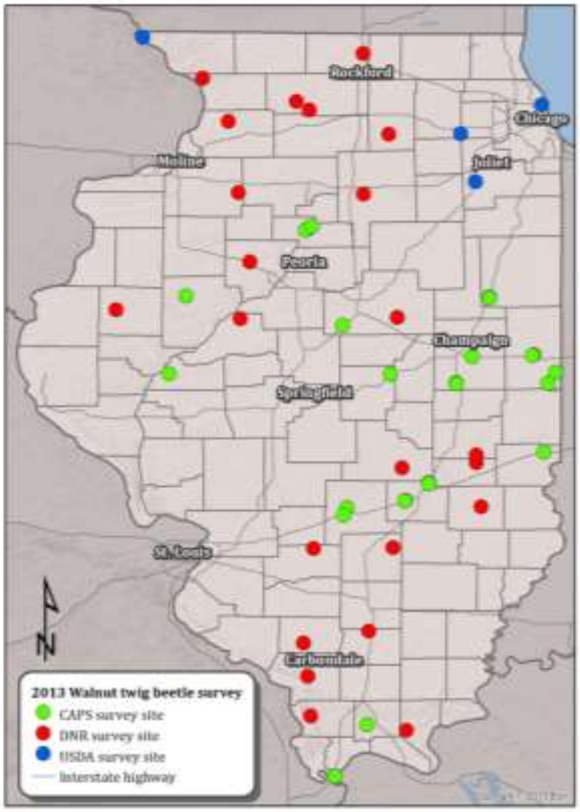

Figure 32. Distribution of LFT's for 2015

Key:
Blue symbols = EAB 12 Unit Green LFT's;
Red dot symbols = WTB 4 Unit Black LFT's;
Orange diamond symbols = Hardwood Borers 12 Unit Black LFT's

AMBROSIA BEETLE AND BARK WEEVIL TRAPPING AND REARING PROGRAM (10)

A statewide trapping survey was initiated for the 2014 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 (TCD). This effort is in cooperation with Dr. Jenny Juzwik, Plant Pathologist with the USFS. Previous findings by Dr. Juzwik from her work in Indiana 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. The raises the question, are there other insects in addition to walnut twig beetle (WTB) 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., and 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 four unit LFT traps deployed throughout Illinois. *Xylororinus saxesenii* made up 32% of total specimens recovered followed by *Xylosandrus crassiusculus* with 19%, and *Xylosandrus germanus* with 9% of 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. A total of 1,555 specimens were recovered from four unit LFT traps baited with the WTB pheromone. Of these, 75% were bark beetles. Long-horned beetles made up 8% of the total and weevils accounted for 3% of the specimens recovered from the traps (Figure 32).

2014 Rearing Project. In late spring, 2014, two to three small (2-4 inches DBH) black walnut trees per trapping site were selected at many of the WTB-LFT trapping sites 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 glysophate to accelerate the decline process. A total of 200 trap trees were established in 60 different state parks and forest preserves. In early fall, 2014, the trap trees were harvested, brought back to The Morton Arboretum, cut into 12 inch long bolts and placed in five (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. Approximately, twice a week, the buckets were inspected for emerging insects. The insects were placed in plastic centrifuge tubes and held in a freezer for later processing.
A total of 1,500 specimens were recovered from the 2014 Illinois statewide trap tree survey project. *Xylosandrus crassiusculus* made up 95% of the specimens trapped followed by *Hylesinus aculeatus* and *Xyleborinus saxeseni* at 2% and *Xylosandrus germannus* and *Neoclytus acuminatus* at 1%, respectively. No TCD fungus was found associated with the bark beetle specimens (Figures 33—35).

2015 Rearing Project. The trap tree rearing project was repeated in 2015 at approximately 50 sites throughout Illinois. Results from the rearing are still ongoing at the time of this report.

Figure 33. Adult *Xyleborinus saxeseni*

Figure 34. Adult *Xylosandrus crassiusculus*

Figure 35. Adult *Xylosandrus crassiusculus*

BUR OAK BLIGHT (8, 14). Bur oak leaf blight is a fungal disease that attacks bur oak (*Quercus macrocarpa*) with severe symptoms occurring on *Q. macrocarpa* var. *oliviformis* (Figure 36). It has been found in Kansas, Nebraska, Minnesota, Iowa, Wisconsin, Illinois and Missouri. In 2011, BOB was found isolated from a tree in Winnetka, Illinois (north shore area of Chicago) and in 2012 from a single tree in Lake County, Illinois. No BOB samples were not received in 2014 and no new finds were recorded.

BOB is caused by the *Tubakia* sp fungus resulting in blighting of the tree over a period of years. It starts in the lower portions of the tree and moves upward. Leaf symptoms usually do not show up until late summer (Figure 37). Severely affected trees may die after protracted years of defoliation. Bur oaks growing in established savannahs and upland areas appear to be more vulnerable. Oaks growing in bottomlands and/or dense forests appear to be less affected (Figures 38—41).

Details on the biology and impact of BOB has been reported in previous editions of the Forest Health Highlights (FHH). By way of update, BOB was have been confirmed in Grundy, DuPage, and DeKalb counties in 2015. To date, these finds are the farthest east BOB has been found in Illinois with the exception of a recent find in Lake County in northeast Illinois. BOB is not immediately lethal to bur oak, but can 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. Research is currently ongoing at Iowa State University on the biology, epidemiology, and chemical management of BOB.

Figure 36. BOB tree symptoms

Figure 37. BOB foliar symptoms

Figure 38. Bur oak blight (BOB) leaf symptoms on underside of leaf

Figure 39. Bur oak leaf blight (BOB)

Figure 40. Bur oak blight (BOB) on bur oak

Figure 41. 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. DED cases continue to be a problem and levels were comparable to 2014 levels.

OAK WILT (1, 14). The dreaded oak wilt is found in every Illinois county and has become a major urban and forest tree disease. Reports for 2012 by the UIPC indicate that 2012 OW disease incidence was higher compared to previous years. It is very likely, that the 2012 drought contributed or even accelerated the development of OW in pre-disposed trees. Oak wilt for 2015 was comparable to previous years.

VERTICILIUM WILT (1, 14). This very ubiquitous and opportunistic vascular wilt fungus was comparable to levels seen in previous years. Flooding , excessive precipitation, and drought over the last seven years including the severe 2012 drought and record rainfall in June, 2015, have and will continue to pre-dispose woody plants to VW. Sugar maple, red maple, ash, smoketree, Japanese maple, saucer magnolia, and three-flowered maple are just a few examples of VW susceptible hosts.

BACTERIAL LEAF SCORCH (1, 9, 14). Bacterial leaf scorch resembles abiotic scorch, but is caused by a bacterium, *Xylella fastidiosa* (Figure 42). It is thought to be spread by leafhoppers and spittlebugs (Figure 43). Tree hosts include elm, hackberry, maple, mulberry, oak, sweetgum, sycamore, and planetree (Table 2). Since 1999, the 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. 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 submitted in 2010 to the MAPC. Of those 11 samples, two were positive, one inclusive and eight were negative. 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 (11) 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. Reports received from the UIPC indicate BLS symptoms were more pronounced in 2012 probably due to drought stress. BLS in 2015 was comparable to previous years.

Figure 42. Bacterial leaf scorch symptoms

Figure 43. Spittle bug

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

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	Chinkapin oak
American sycamore	Sawtooth oak
	Common sassafras
	Tulip tree
	Japanese zelkova

PINE WILT DISEASE (5). 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 long-horned 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 into 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.

Wilting and tree death can occur in just a few weeks to months depending on other factors. Trees predisposed due to flooding, drought, soil compaction, construction damage, etc. will be more vulnerable. With the record setting rains of last 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 selection of 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 really not practical or economical for large numbers of trees.
Emamectin benzoate (Tree-Age) is labeled for use against pinewood nematode and might be warranted for individual, high value landscape or seed orchard trees (Figures 44—48).

Figure 44: Pine wilt disease

Figure 45: Adult Carolina pine sawyer beetle

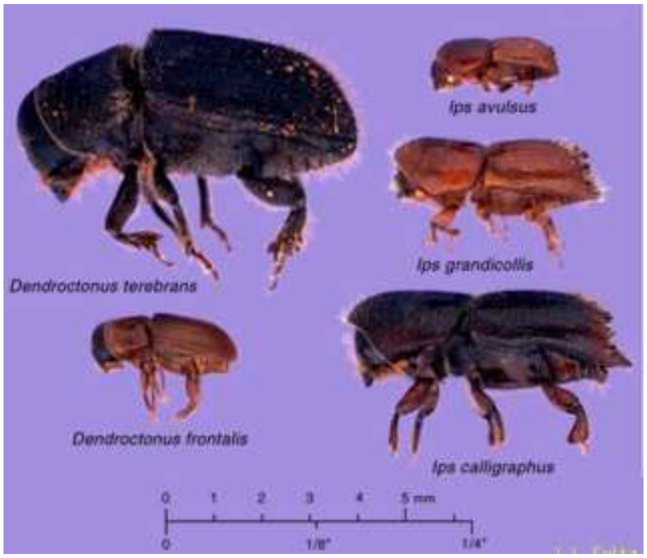

Figure 46. Assorted bark beetle species

Figure 47. Pitch tube and bark beetle

Figure 48. Blue stain fungus

FOLIAR, ROOT ROT, VASCULAR, DECLINE, AND CANKER DISEASES (1, 14). Overall, disease incidence were comparable to 2015. Near normal spring temperatures and heavy and prolonged precipitation was favorable for most common foliar diseases. Stress related diseases like *Cytospora, Botryosphaera, Thyronectria,* and *Fusarium* cankers, oak wilt, and white pine decline were at normal levels. *Phytophthora* root rots were present probably due to excessive rainfall and poor drainage, and wrong plant siting. *Phomopsis* and *Pestilotia* tip blight of juniper and arborvitae was observed statewide.

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 the 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, et al. (1994) documented an outbreak of ash yellows in this geographic area.

More specifically, ash decline continued to appear in 2015 in east central Illinois (Kickapoo S.P.) 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 S.P.'s).

NEEDLE CAST DISEASE (1, 14). Two very common diseases affecting conifers, *Rhizosphaera* needle cast and *Diplodia* (i.e. *Sphaeropsis*) were present in 2015. 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. Coupled with chronic drought, a deadly combination may result.

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. In addition, there has been an increase of *Thyronectria* canker on honeylocust and the honey locust borer in areas of northeast Illinois. It is anticipated that other cankers will make their appearance for some time into the future.

HICKORY DECLINE (17). In recent years, reports of dieback and mortality of hickory have been reported in areas of the upper Midwest (Figure 49). Bitternut hickory (*Carya cordiformis*) and shagbark hickory (*C. ovata*) appear to be most affected. Symptoms include thinning canopies, dead branches, and eventually tree death.

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 and* borers (*Agrilus otiosus*), and the fungus *Ceratocysis smalleyi*. In some cases, Armillaria root rot fungus has been found associated with recently dead trees.

Hickory decline and dieback is 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 be economical nor practical.

Figure 49. Hickory decline

***HETEROBASIDION SPP* OF RED PINE.** The 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 50). 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 and 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. 2014 statewide surveys did not indicate any new finds of *Heterobasidion* spp. in red pine.

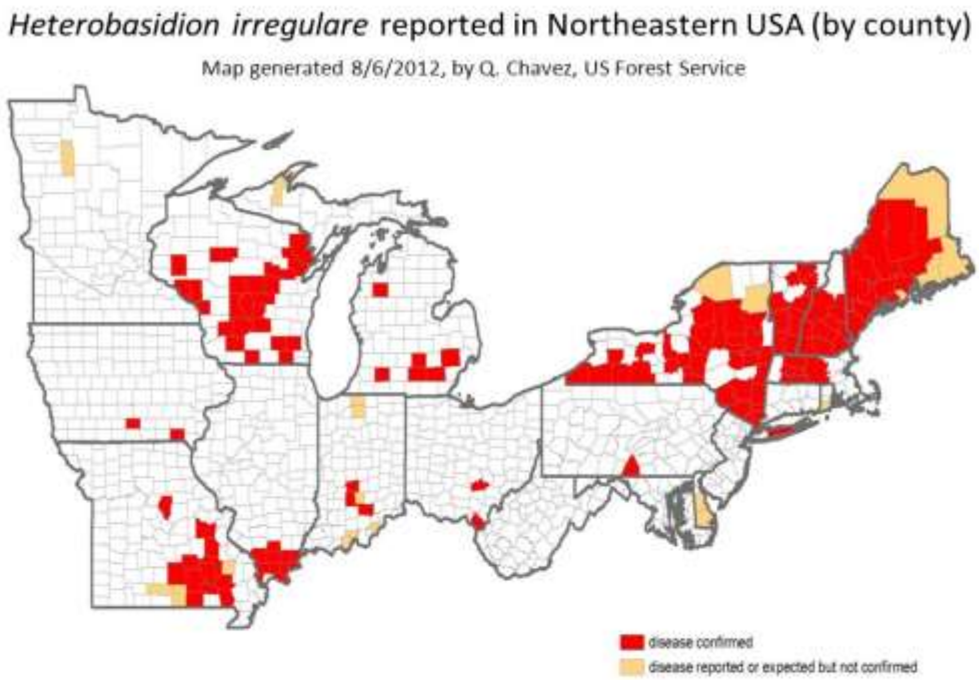

Figure 50 Distribution of Heterobasidion annosum or *irregulare* in the North-

V. WEATHER AND ABIOTIC FACTORS (2)

Spring, 2015 turned out to be a very wet season. Rainfall amounts for May – July were 19.69 inches and it was the wettest May-July on record and 7.88 inches above the 20th Century average. Record rainfall occurred during June, 2015 being the wettest June in Illinois history with a mean statewide precipitation of 9.53 inches beating a record from 1902 and 5.33 inches above average. June, 2015 was also the second wettest month on record for Illinois going back to September, 1926 with 9.62 inches. With these rains, came flooding and saturated soils for extended periods of time. Some areas of Illinois received as much as 29 to 31 inches of rainfall from May – July, 2015. The 2015 May-July period is in direct contrast to May - July 2012 which was the third driest period on record with only 5.60 inches or precipitation (6.21 inches below average).

After the wet May – June, 2015, rainfall was not evenly distributed throughout the state. The statewide average for July rainfall was 4.84 inches (1.2 inches above the 20th Century average). Other areas had much less rainfall. August – September rainfall followed a similar pattern. The statewide average for August was 2.95 inches (0.64 inches below averate) and quite variable statewide. Some Chicago suburbs in northeast Illinois received nearly eight inches of precipitation while other areas of the state only received 2 to 3 inches being more the norm. This trend continued into September with uneven rainfall distribution. Most of the state received 3 to 5 inches of rainfall, but western and far southern Illinois were much drier with less than 3 inches of precipitation. Highest rainfall amounts were recorded in east central Illinois with nearly 12 inches while areas in far western Illinois received less than a one inch for the entire month of September. More extensive rains have returned for October and November.

Symptoms associated with heavy June rains and flooding followed by lengthy dry spells from July – October included early fall color, leaf scorch, dieback, and decline. Leaf scorch and early fall color was most prevalent on maples and oaks particularly in urban forest and landscape settings. It is suggested that the saturated soils for extended periods probably had a negative effective on root growth and respiration resulting in the death of fine root hairs and absorbing roots. Arrival of drier weather and sporadic rainfall in mid to late summer and extending in to early fall (July – October) exacerbated the problem resulting in a slower root recovery period as seen with the aforementioned symptoms. These same symptoms were observed in the second half of 2013 following the 2012 drought.

VIII. References

1. Adams, S., 2015. *The Morton Arboretum Diagnostic Plant Clinic and Plant Health Care Reports*. The Morton Arboretum, Lisle, Illinois.

2. Angel, J. 2015. Illinois CoCoRaHS Newsletters, July, August, September and October, 2015. Volumes 7-10.

3. Burns, D.P. and L.P Gibson. 1968. The leaf-mining weevil of yellow poplar. Canadian Entomologist 100: 421-429.

4. Condra, J., C. Brady, and D.A. Potter. 2010. Resistance of landscape suitable elms to Japanese beetle, gall aphids, and leaf miners, with notes on the life history of *Orchestes alni* and *Agromyza aristata* in Kentucky.

5. Donald, P.A., Stamps, W.T, and M.J. Linit. 2003. The Plant Health Instructor: Pine wilt disease. 11pp. DOI: 10.1094/PHI-I-2003-0130-01.

6. Gill, C. 2010. *Plant Health Progress*. Pennsylvania State University (PSU) (17 October 2010).

7. Haack, B. and D. Kucera. 1993. New introduction: Pine shoot beetle (*Tomicus piniperda).* USDA Pest Alert. NA-TP-05-93. 2pp.

8. Harrington, T. 2011. *It looks like bur oak blight (BOB) really isn't new*. Iowa State University, Horticulture Home Pests News. February, 2011

9. Hartman, J. 2007. *Bacterial leaf scorch.* PPFS-OR-W-12. University of Kentucky Cooperative Extension Service

10. Juzwik, J., Banik, M.T., Reed, S.e., English, J.T., and Ginzel, M.D. 2015. *Geosmithia morbida* found on weevil species *Stenomimus pallidus* in Indiana. Plant Health Progress. Doi: 10.1094/PHP-RS-14-0014

11. Luley, C., M. Mielke, J. Castello, J. Carlson, and J. Appleby. 1994. Ash crown condition and the incidence of ash yellows and other insects and diseases in Illinois, Iowa, Missouri, and Wisconsin. Plant Disease. 76: 1209-1212.

12. Minnesota Department of Agriculture. 2011. *Invasive pest alert: Chinese longhorned beetle.*

13. Missouri Forest Health Update (December, 2014). pp 5-6.

14. Pataky, N. and S. Porter. 2008-2012. *Woody Plant Disease Updates*. University of Illinois Plant Clinic (UIPC). Urbana, Illinois.

15. Pokorny, J. and T. Harrington. 2011. *Bur oak blight.* Pest Alert-NA-PR-02-11. USDA Forest Service.

16. USDA. 2015. Forests of Illinois, 2014. USDA Resource Update—FS-39. 4 pp.

17. Wisconsin DNR. 2007. *Hickory dieback and mortality in Wisconsin*.

PLEASE NOTE: *The data presented in this summary are not to be considered to be comprehensive nor all inclusive studies. The narrative reported here is based on visual and observational surveys by Dr. Fredric Miller, IDNR Forest Health Specialist, IDNR Forest Health field technicians, IDNR district foresters, Stephanie Adams of The Morton Arboretum Plant Diagnostic Clinic, informal conversations with consultants and members of the green, natural resources, and forest industries.*

Project was funded in whole or in part through a grant awarded by the USDA, Forest Service, Northeastern Area State and Private Forestry.
The USDA is an equal opportunity provider and employer.