2011 Illinois
Forest Health Highlights

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I. Illinois' Forest Resources

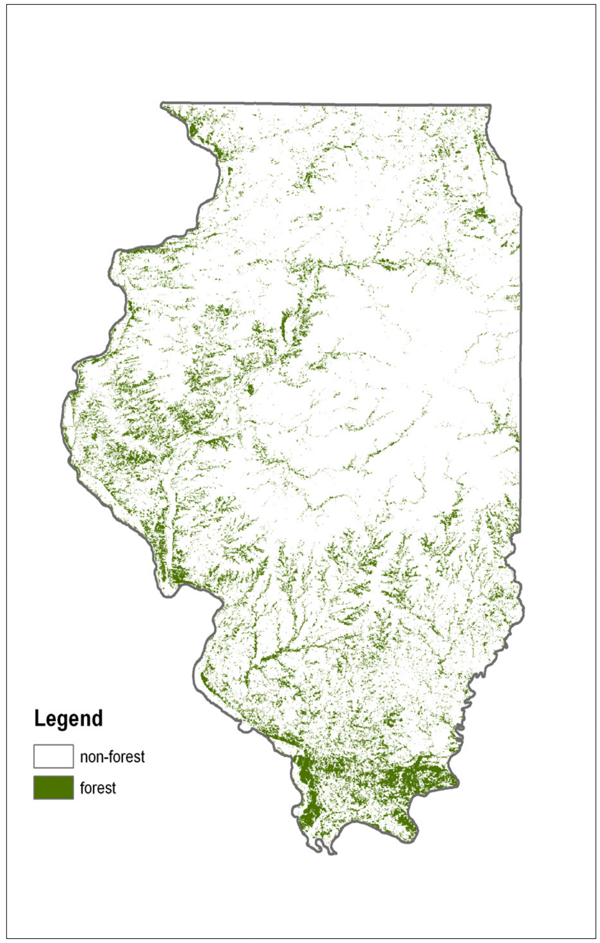

Figure 1. Illinois Forest Areas

Illinois forests have many recreation and wildlife benefits. In addition, over 32,000 people are employed in primary and secondary wood processing and manufacturing. The net volume of growing stock has increased by 40 percent since 1962, a reversal of the trend from 1948 to 1962. The volume of elms has continued to decrease due to Dutch elm disease, but red and white oaks, along with black walnut, have increased by 38 to 54 percent since 1962.

The area of forest land in Illinois is approximately 5.3 million acres and represents 15% of the total land area of the state (Figure 1). Illinois' forests are predominately hardwoods, with 90% of the total timberland area classified as hardwood forest types (Figure 2). The primary hardwood forest types in the state are oak-hickory, at 65% of all timberland, elm-ash-cottonwood at 23%, and maple-beech which covers 2% of Illinois' timberland.

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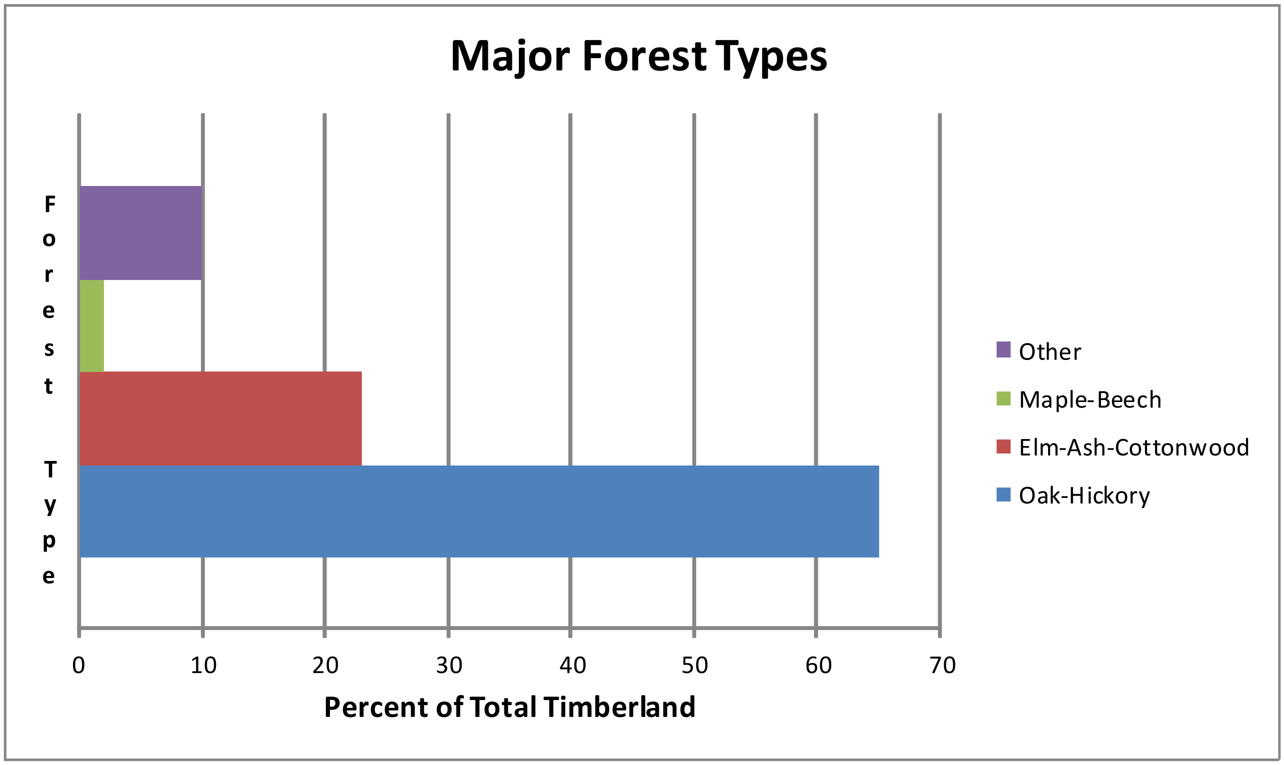


Figure 2. Major forest types by percent of total timberland. Source: Illinois' Forest 2005, NRS-29.

II. Forest Health Issues: An Overview

2011 ILLINOIS FOREST HEALTH HIGHLIGHTS

Arthropod Pests: Overall, the 2011 growing season was relatively quiet with no serious arthropod pest outbreaks. Two exceptions would be the **periodical cicada emergence** of the Great Southern Brood (Marlatt's XIX), and widespread outbreaks of **Gouty oak gall (GOG)** on pin oak (*Quercus palustris*) in central and southern Illinois.

Periodical Cicada Emergence

The spring of 2011 featured the emergence (13 year cycle) of the Great Southern Brood (Marlatt's XIX) (Figure 4). Moderate to heavy populations of the periodical cicada (*Magicicada* spp.) were evident in early June, 2011 throughout the southern half of Illinois (Figure 3). The adult female periodical cicada cuts narrow ovipositional slits into small (1/8 inch diameter and greater) twigs and branches, and lays a series of eggs. The eggs hatch, the young nymphs drop to the ground and spend the next 13 years developing underground where they feed on roots of woody plants. Twigs and branches with ovipositional wounds will begin to flag and show tip dieback with a few weeks (14). Moderate to heavy branch flagging was observed on forest trees, especially oaks, in Illinois state parks and forests, and wood lots. Light to moderate cicada damage was observed along the I-24 – I-57 corridor from Salem south to the Dixon Springs area Cicada damage was light west of I-57.

Figure 3. Adult periodical cicadas

The dieback of twig and branch tips does not cause serious damage to trees and can be considered a form of natural pruning. Studies by Miller (1994), and Miller and Crowley (1998) indicate that woody plants were not seriously affected by ovipositional activity and twigs and branches calloused over within one or two growing seasons. No evidence of invasion by opportunistic pathogens and/or insects was observed.

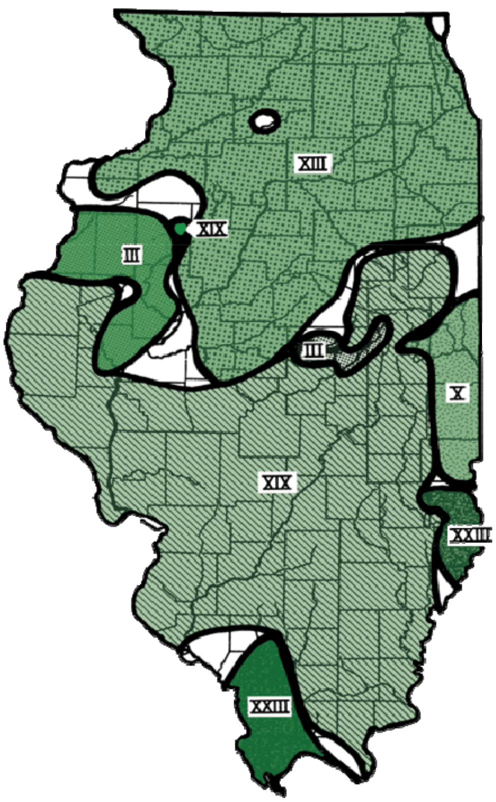


Figure 4.
Map of the 13 and 17 year periodical broods in Illinois
(Taken from Post and Jeffords. 2004. *A Trill of Lifetime*. The Illinois Steward**)**

Gouty Oak Gall (GOG)

Gouty oak gall (GOG) is a woody gall that forms on small twigs and branches of scarlet, red, pin, and black oaks (*Quercus* spp). The tiny, native, wasps, *Callirhytis cornigera* and *C. quercuspunctata* are responsible for forming the galls Figure 5) (13).

Like most gall-forming wasps, their lifecycles can be rather complex and complicated and GOG is no exception. Adults emerge in May and June, and lay eggs in major veins of oak leaves. GOG larvae form blister-like galls with adults emerging in July. After mating, the adult female lays eggs in young oak twigs. Young GOG's appear as small, brown marbles which grow to two inch diameter brown galls. Later, adults emerge from the gall completing the two-year lifecycle. (Figures 5 and 6).

Galls can be physically removed on small trees in the northern part of the insect's range (northern Illinois), but southern Illinois, galling can be quite heavy and pruning may not be practical especially on large trees. Heavy galling can cause death of twigs and branches, but generally does not kill a mature, healthy tree (13).

Heavy galling was observed in 2011 along the I-57 corridor south of I-70 (Effingham, Illinois) as far south as the Dixon Springs area, and between the I-57 and I-55 corridors from the Shawnee National Forest (SNF) north to I-70. Heavy GOG populations and tree death were observed in south-central Illinois (Eldon-Hazlett and S. A. Forbes State Parks) as well as in the Springfield, Illinois area. GOG-affected trees were in all stages of decline from newly infested trees to dead trees.

Stress agents, such as drought, soil compaction, and poor drainage are probably the predisposing agents for extensive dieback and death of pin oaks in south central Illinois, but death of individual branches by GOG was evident. Further study is needed to determine the factor(s) for extensive death of pin oaks in the affected areas.

Figure 5. Heavy infestation of GOG

Figure 6. Close up of GOG

Plant Diseases: Overall, disease incidence was typical for 2011 and comparable to previous years. Cool, wet, spring weather facilitated the development of numerous foliar diseases including apple scab and anthracnose with many different trees species being affected. Hot, dry weather in mid to late summer contributed to abiotic scorch, tree decline, and early fall color. Bur oak blight (BOB) was isolated from a tree in northeast Illinois and bacterial leaf scorch (BLS) was isolated from a single American elm (*Ulmus americana*) tree.

Weather and Abiotic Factors: Temperatures for the winter of 2011 were cooler than the previous two years and the historical average (1937-2007). The lowest 2011 winter temperature was -13^{o}F in February following a 20 inch snowfall ("Blizzard of 2011"). Snowfall was less consistent in 2011 compared to previous years and tended to come in large amounts with intervals of warm periods leading thaws and snow melts. For example, the 20 inch snowfall in February had disappeared within several weeks. The lowest temperature (-13^{o}F) was consistent for typical average minimum temperatures common to Zone 5b (1). Winter precipitation was lower than average (8.6 inches) compared to the 70 year historical average of 10.9 inches. Lack of consistent snow cover and colder temperatures can lead to winter stress, root damage, and salt injury (1). Additional monitoring of affected forest and urban trees will be required well into the near future.

Like many areas of the Midwest, spring, 2011 was very stormy accompanied by loss of life, and extensive property and tree damage (i.e. Joplin, Missouri tornado). Starting in early May, 2011, heavy winds, rain, and tornadic activity were common throughout much of Illinois extending into mid-summer (July). Storm damage such as twisted and broken branches and limbs, uprooted trees, and flooding were very evident particularily after a late May storm in southern and southeastern Illinois. Additional storm damage and remnants of the May storms were still evident later in the summer (July). Forest and urban trees were equally affected. Storm damage in parts of northeastern Illinois (many western and northwest suburbs of the Chicago metro area) also suffered extensive damage. The effect of these storms in terms of cleanup efforts, material disposal, restoration pruning, invasion by opportunistic pathogens and arthropods, and hazard assessment will need to be monitored for a number of years.

III. Exotic Pests

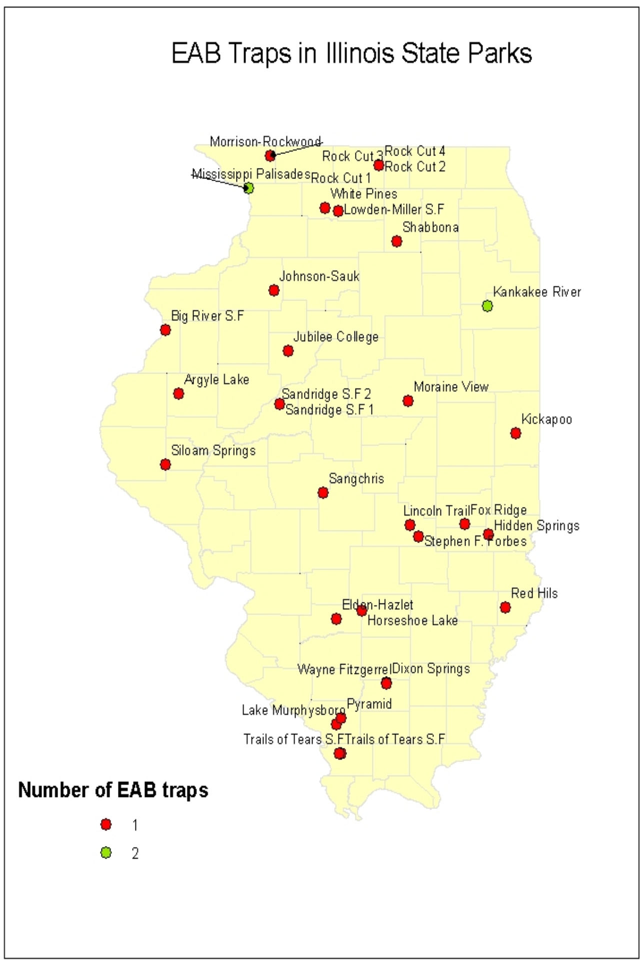


Figure 7. Distribution of EAB purple traps in 2011

Emerald Ash Borer (EAB)
The emerald ash borer (EAB) continues to spread throughout Illinois. New positive finds for 2011 include Effingham and Marion counties in southern Illinois. This represents a 70-100 mile jump from the previous 2010 find in Champaign county in east central Illinois. Refer to Figure 8 below for EAB quarantined counties in Illinois. The positive EAB find in Effingham county was at a rest stop along the I-57 corridor and just north of the I-70 interchange. It is speculated that the beetle probably hitch hiked along the interstates. The second EAB positive (Marion county) was found in a group of trees in a remote agricultural area. This find is puzzling due to its remote location from interstates and extensive plantings of ash. It is in close proximity (<10 miles) of a state park. A major railroad line runs through the area and it is possible that the beetle traveled on a train passing through the area. The railroad line does have sidings in the area and is also a main route into adjoining EAB infested states. It appears that the railroad could be another effective avenue for moving adult EAB's long distances.

EAB purple traps were deployed in 30 Illinois state parks and forests, seven (7) county forest preserves districts, and on property of private forest landowners. (Figure 7). To date, no new EAB finds have resulted from this trapping program. However, due to the recent finds in southern Illinois, more intensive trapping is planned for 2012 at the aforementioned sites.

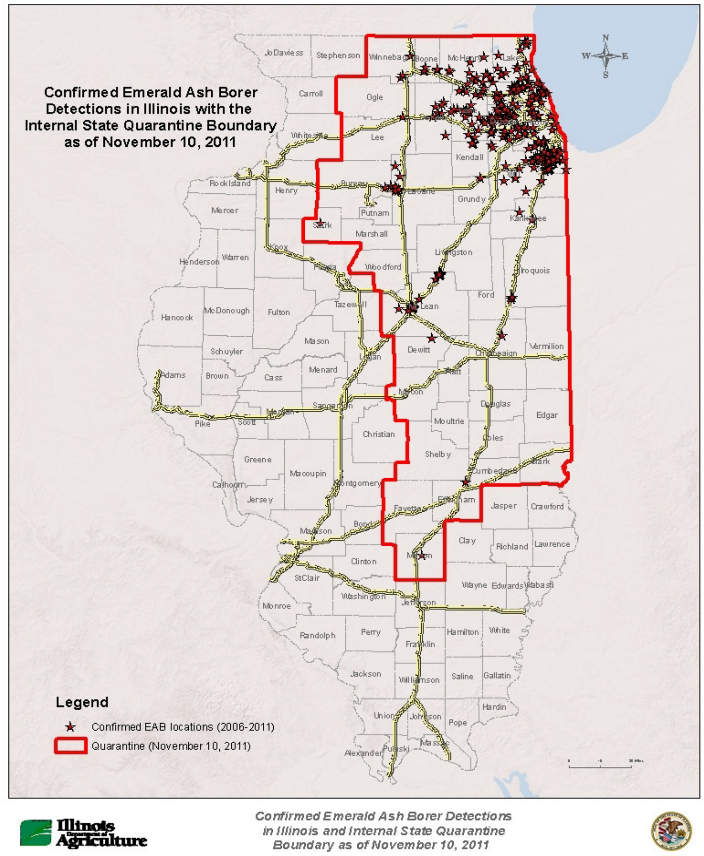
Arthropod associates of the emerald ash borer (*Agrilus planipennis*) in northern Illinois (*Elaine Mitchener and Fredric Miller*)

The emerald ash borer (EAB) is a phloem feeding wood boring insect that kills its host by destroying the vascular system of the tree. Unlike many other borers, EAB has the capability to attack both healthy and stressed ash trees. As with any organism, competition for available resources is a major factor. One area of EAB biology that needs further attention is what other Arthropod species are associated with EAB tree colonization and what impact, if any, do these species have on EAB for the phloem resource within a given ash tree.

Beginning in the winter of 2007, a study was initiated with the following objectives:

- To identify what arthropods are commonly found in healthy ash trees
- To identify the arthropod complex ("EAB associates") associated with EAB infested trees
- To determine what impact, if any, competition from EAB associates might have on the available phloem resource and development of EAB life stages

Figure 8. Illinois EAB quarantine as of 10 November 2011



Bolts from healthy and EAB infested trees were collected 18 central and northern Illinois counties during 2007 -2011. The bolts were placed in rearing containers and held under ambient conditions. All Arthropods were allowed to emerge and then placed in glass vials with 70% alcohol for future identification. At the end of the season, the bolts were peeled and the relative percentage of EAB and non-EAB galleries were visually estimated (nearest 5%) for each bolt. Available phloem surface area was estimated by measuring the diameter of each end of the bolt and the length of the bolt (Figure 9).

A summary of phloem utilization by EAB, the eastern ash bark beetle, red-headed ash borer and clear-wing moth borers is presented in Table 1. In 2008, the eastern ash bark beetle (EABB) consumed the majority of phloem available in non-EAB infested ash trees. A reversal occurred for 2009 and 2010. Ash tree suspected and/or known to be infested with EAB had little if any colonization by the EABB (Figure 10) and 43% of the phloem was consumed by EAB larvae (Table 1). These preliminary results suggest that trees not infested with EAB are primarily colonized by the eastern ash bark beetle (EABB) (*Hylesinus varius*) along with a few ash clearwing borers (*Podosesia sygringae*). In contrast, trees known to be EAB infested have minimal gallery formation by the ash bark beetle (Table 1). Based on the results presented here, it appears that there is very little direct competition between EAB and ABB for the phloem resource.

The red-headed ash borer was present, but not in large numbers and is not considered a major phloem competitor. It is found associated with dead wood (firewood) and does not typically infest living phloem tissue. Other associates included members of the Buprestidae and Cerambycidae families, but were less than 1% of the total insects collected. The only significant predator collected was a very small number (<1%) of clerid beetles (Cleridae). This family of beetles includes common predators of bark beetles.

Figure 9. Ash bark beetle galleries

Figure 10. Adult ash bark beetle

Table 1. Summary of ash phloem utilization by EAB and EAB associates (2008-2010)

	Mean Percent Phloem Utilization		
Associate	**2008**	**2009**	**2010**
• Emerald ash borer	<1%	10%	43%
• Eastern ash bark beetle	50%	<1%	1%
• Ash clear-winged borer	<1%	<1%	<1%
• Red-headed ash borer[1]	<1%	<1%	5%

[1]The red-headed ash borer is not considered a primary phloem competitor. It infests dead wood

A summary of the parasitic insects reared from non-EAB infested and EAB-infested ash trees is presented in Table 2. Hymenopteran belonging to the Eurytomidae, Ichneumonidae, and Pteromalidae made of 28%, 29%, and 31% of all insects reared from ash tree logs, respectively. The remaining 12% of insects reared including members of the Braconidae, Eupelmidae, and Torymidae Hymenopteran families (Figures 11 and 12). All of the aforementioned families are known to contain parasitoids of wood-boring insects. Positive identification is in progress to determine if any or all of these insects might be potential EAB biological control agents.

Table 2. EAB Associates reared from non-EAB-infested and EAB-infested ash trees in northern Illinois (2008-2011).

Order Hymenoptera Family	% of Total Insects Collected
• Apiidae	1%
• Braconidae	4%
• Eupelmidae	5%
• Eurytomidae	28%
• Ichneumonidae	29%
• Pteromalidae	31%
• Torymidae	3%

Figure 11. Braconid parasitoid

Figure 12. Ichneumonid parasitoid

Evaluation of 18 Asian and European ash (*Fraxinus* spp.) genotypes for susceptibility for colonization by the emerald ash borer (*Agrilus planipennis*) (*Fredric Miller, Devin Krafka, and Kunso Kim*)

The objectives of this project are to determine (1) the relative susceptibility of 18 Asian and European (*Fraxinus*) taxa to the emerald ash borer (*Agrilus planipennis*) and (2) the preference of selected *Fraxinus* taxa for feeding by adult emerald ash borers.

For details on the materials and methods, refer to the 2010 issue of *Forest Health Highlights*.

Results from the no-choice laboratory feeding studies for European and Asian ash are as follows:
European No- Choice Laboratory Feeding Bioassay 2009: Adult EAB's feeding on *Fraxinus angustifolia* var. *austalis* consumed 22% of the leaf tissue while *F. angustifolia* var. *pannonica*, *F. excelsior*, and *F. ornus* all removed an average of 3%.

Asian No-Choice Laboratory Feeding Bioassay 2010: Adult beetles feeding on *F. chinensis* ssp. *rhynchophylla, F. longicuspis* var. *siebolidiana* removed <8% of leaf tissue. Biotype that with medium susceptibility included *F. bungeana*, *F. chinensis*, *F. platypoda* and *F. mandshurica* var. *japonica* with 10-15% of the foliage consumed. Highly susceptible species (24-32% foliage consumed) included *F apertisquamifera*, *F. insularis, F. paxiana*, *F. stylosa* and *F. pennsylvanica* (highly preferred species)

Asian and European No-Choice Laboratory Feeding Bioassay 2011: Additional European and Asian species were tested in 2011. EAB feeding and percent beetle mortality was fairly consistent. Mortality rate were higher on less suitable hosts and lower on more suitable hosts. Biotypes with low susceptibility consisted of *F. angustifolia* var. *pannonica*, *F. apertisquamifera, F. chinensis, F. chinensis* ssp. *rhychophylla, F. mandshurica, F. mandshurica* var. *japonica* and *F. syriaca*. Highly susceptibility biotypes included *F. angustifolia* var. *austalis* and *F. longicuspis* var. *siebolidiana*.

Preliminary Conclusions:
- *F. bungeana*, *F. chinensis*, *F. angustifolia* var. *austalis* appear to be more suitable for adult EAB feeding.
- *F. apertisquamifera*, *F. insularis*, *F. languinos*, *F. oxycarpa* var. *tamariscifolia*, *F. pallisae* and *F. syriaca* appear to be less suitable for adult EAB feeding
- EAB feeding and percent beetle mortality were fairly consistent. Mortality rates were higher on less suitable hosts and lower on more suitable hosts.

Asian Long-horned Beetle (ALB)
No new sightings of ALB have been discovered to date. The original ALB infested areas are no longer under quarantine and the Illinois quarantine is now lifted since ALB has not been found since 2007. Visual monitoring is on-going.

Brown Marmorated Stink Bug (BMSB)
Historically, this newest arrival to the Eastern and Midwestern states had been reported as close as Pennsylvania and Indiana (Elkhart county). This insect has a broad range host including tree fruits, vegetable, and woody landscape plants (3). In 2010, the BMSB was found in Illinois. To date (2011), there have been no new BMSB finds.

Viburnum Leaf Beetle (VLB).
As reported in the 2009 Forest Health Highlights (FHH), the viburnum leaf beetle (VLB) was 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. The VLB was added to our watch list and to date (2011), no new finding of the VLB has been reported.

Chinese Long-horned Beetle (CLHB)
Another invasive long-horned beetle, the Chinese long-horned beetle (*Hesperophanes campestris*; synonym *Trichoferus campestris*) appeared in Illinois for the first time in 2009 near O'Hare airport and in Crawford county in east central Illinois (Figure 13). Its arrival near O'Hare airport 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 movement of infested green wood and wood products.

It has also been found near Minneapolis, MN and in Quebec, Canada. The insect is originally from Asia and parts of Eastern Europe and spread 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 3 (12). In cooperation with APHIS intensive trapping, using Lindgren funnel traps (LFT's) baited with a pheromone , was conducted in 2011 to 30 state parks and forests. The CLHB was not found in any of the traps. Trapping will be expanded in 2012 to include county forest preserves and private woodlot cooperators.

Table 3. Preferred hosts of the Chinese long-horned beetle (12)

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

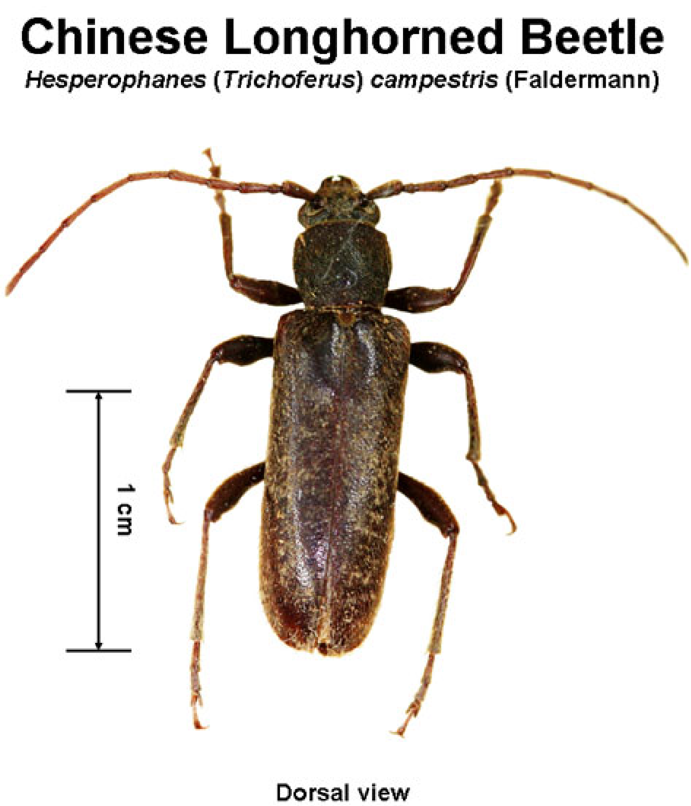


Figure 13. Adult Chinese Long-horned Beetle

Thousand Cankers Disease of Walnut (TCD)
As of fall, 2011, TCD has not been found in Illinois. However, because of the confirmed find in Tennessee in 2010, and additional positive finds in Virginia and Pennsylvania in 2011, extensive survey efforts, coupled with professional outreach and education, were implemented in 2011. Field surveys were conducted in 30 state parks and forests, forest preserves in the seven (7) county area around Chicago, and a number of private woodlot cooperators in western and northwestern Illinois (Figure 14). Survey efforts included visual assessments of declining walnut trees and documentation of walnut plantings and walnut natural stands. A statewide walnut tree population data base is being developed in cooperation with IDNR District Foresters and the Illinois CAPS to facilitate field monitoring efforts and diagnosis in 2012. It appears that a marketable twig beetle pheromone will become available by the 2012 field season. If so, traps containing the pheromone will be deployed as described above.

Sudden Oak Death (SOD)
As of 2011, SOD has not been found in Illinois.

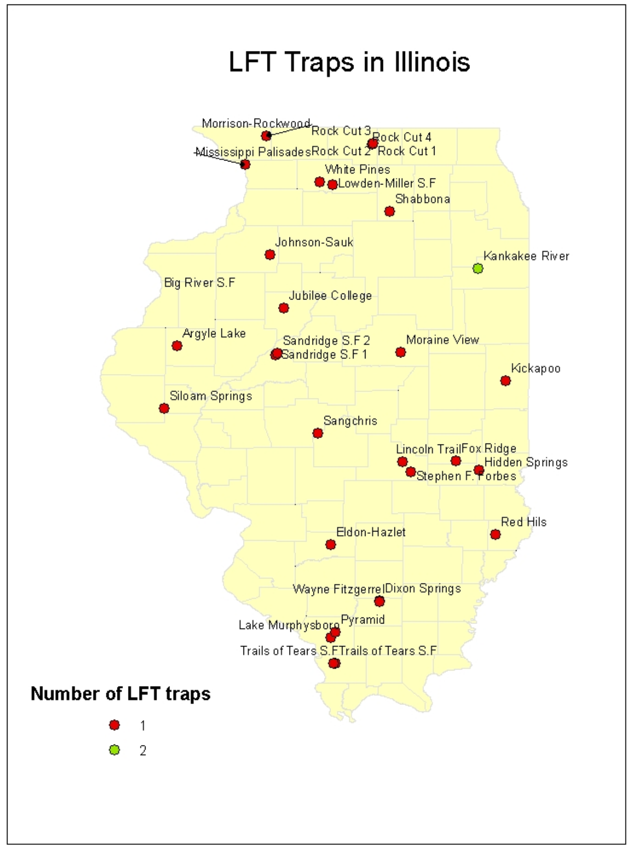


Figure 14. Distribution of Lindgren funnel traps in Illinois, 2011

IV. Plant Diseases

Dutch Elm Disease (DED): This vascular wilt disease has been with us for decades and continues to kill American and red elms throughout Illinois. Plant clinic reports indicate that DED cases continue to be a problem and levels were comparable to 2010 levels (1).

Oak Wilt (OW): The dreaded oak wilt is found in every Illinois counties and has become a major urban and forest tree disease. Plant clinic reports for 2011 indicate that 2011 OW disease incidence was comparable to previous years (1)

Verticilium Wilt (VW): This very ubiquitous and opportunistic vascular wilt fungus continues to be prevalent throughout Illinois and 2011 was no exception. Trees stressed from the chronic 2005-2011 droughts and floods are particularly susceptible to VW. Positive isolations of VW have been found in sugar maple, red maple, ash, smoketree, Japanese maple, saucer magnolia, and, three-flowered maple (1).

Bacterial Leaf Scorch (BLS): Bacterial leaf scorch resembles abiotic scorch, but is caused by a bacterium, *Xylella fastidiosa*. It is thought to be spread by leafhoppers and spittlebugs (Figures 15 and 16). Refer to Table 4 for a listing or susceptible and non-susceptible hosts of BLS. (5)

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 (1).

Historically, since 1999, the University of Illinois Plant Clinic (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 far JoDaviess county in extreme northwest Illinois (13). With the exception of Champaign county with 40 positive samples, the remaining 9 counties have had 1-3 positive cases confirmed (15). 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 (7) oak positives including northern red, swamp white, pin and several unidentified oak species (3). Eleven (11) BLS samples submitted in 2010 to the Morton Arboretum Plant Clinic (MAPC). Of those 11 samples, two (2) were positive, one (1) inclusive and eight (8) were negative. The positives were found on oaks growing in Du Page and Cook counties (15).

Figure 15. Bacterial leaf scorch symptoms

Figure 16. Spittle bug

Table 4. 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	Chinkapin oak
American sycamore	Sawtooth oak
	Common sassafras
	Tulip tree
	Japanese zelkova

Bur Oak Blight (BOB)

Bur oak leaf blight is a fungal disease that attacks a bur oak (*Quercus macrocarpa*) with severe symptoms occurring on *Q. macrocarpa* var. *oliviformis* (Figure 17). 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). 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 18). 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 (4,16).

Figure 17. BOB tree symptoms

Figure 18. BOB foliar symptoms

Foliar Diseases

As previously mentioned, May and June, 2011 were cool (50 to 60^{o}F) and wet. This provides an ideal environment for many common fungal leaf diseases including apple scab and anthracnose. Apple scab, a leaf spot disease, was extremely common on apple species and crabapple varieties. Many of the older variety crabapples were completely defoliated by mid-summer. Also, due to anthracnose, sycamores were very slow to leaf out and did not have a full canopy until late June or early July. While not life-threatening, these diseases can reduce the photosynthetic capacity of trees leading to a reduction in food production, promote premature leaf drop, and pre-dispose trees to secondary agents mentioned above (1).

Canker Diseases

Stress related diseases such as *Cytospora* canker were also common. Diplodia tip blight on Austrian (*Pinus nigra*) and Scots pine (*P. sylvestris*) was widespread in urban landscapes. Disease incidence was comparable to previous years (1).

Ash Decline and Dieback

Considerable ash (*Fraxinus* spp.) decline (both green and white ash) was observed along the I-57 corridor south of I-70 to extreme southern Illinois (Dixon Springs area). Declining ash were also observed earlier in the season (early June) along the I-64 corridor from south central Illinois (Mt. Vernon area) west to the East St. Louis, IL. In addition, ash decline was specifically noted in east central Illinois (Kickapoo S.P.) in early June. On-site conversations with IDNR personnel indicated ash trees had been declining for several years. Extensive dieback (50% or greater) was observed in mid-July. 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). Most trees showed thinning canopies and dieback. Death was also a common symptom. Luley, et. al. (1994) documented ash yellows in nine (9) Illinois counties including Wayne, Jefferson, and Washington, and Vermillion which is consistent with our 2011 field survey observations.

Oak Decline and Chlorosis

In addition to oak trees infested with GOG, oak mortality was observed in areas of western Illinois (Argyle Lake S.P.). Preliminary results from samples taken in the Macomb, Illinois area suggest that the declining oak trees may be infected with *Ischnoderma resinosum* (Personal communication: Dr. Tom Green and Stephanie Adams). A conclusive diagnosis is pending outcome of samples currently being cultured.

Small numbers of chlorotic oaks were observed along the Mississippi River valley between Trail of Tears S.F. and Lake Murphsyboro S.P. in southeastern Illinois and in northwestern Illinois along the bluffs of the Mississippi River valley from the Fulton-Savannah, Illinois corridor north to the Elizabeth, Illinois area including Mississippi Pallisades S.P.

On a more serious note, sudden mortality of white oaks (Q. alba) was observed in western Illinois along the Mississippi River valley. Trees began to decline and wilt and die within a matter of weeks. A similar report was received from the University of Missouri Plant Clinic in Columbia (Personal Communication from Simeon Wright and Rob Lawrence). The cause for this rapid mortality is unknown, but definitely deserves more attention in 2012.

Hickory Decline

In recent years, reports of dieback and mortality of hickory have been reported in areas of the upper Midwest (Figure 19). Bitternut hickory (*Carya cordiformis*) and shagbark hickory (*C. ovata*) appear to be most affected. Symptoms include thinning canopies, dead branches and eventually tree death (17).

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, borers (*Agrilus otiosus* and *Xylobiopsis basilaris*), and the fungus *Ceratocysis smalleyi*. In some cases, Armillaria root rot fungus has been found associated with recently dead trees (17).

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 would not be economical and/or practical (17).

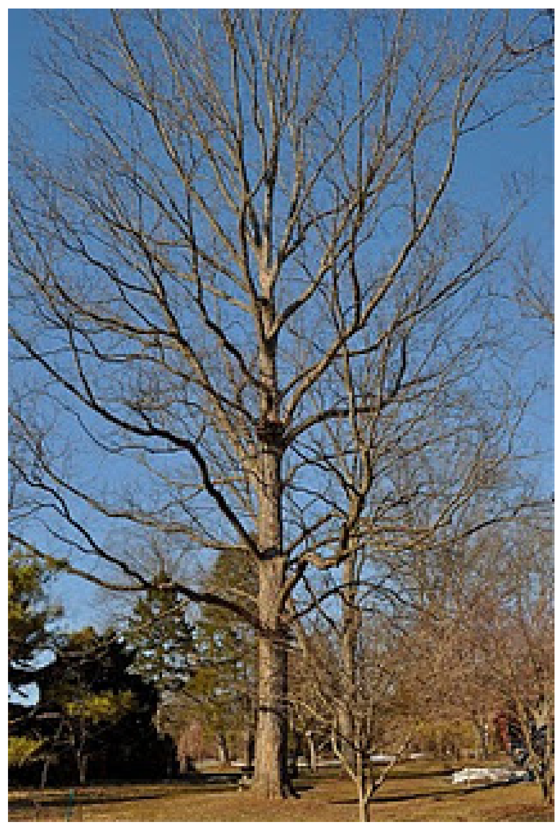


Figure 19. Hickory decline

Pine Decline
Dying and dead Scots (*Pinus sylvestris*) and Austrian (*P. nigra*) pines were observed statewide throughout 2011 in urban and forested areas. Individual trees showed evidence of bark beetle activity, feeding damage and emergence of the Carolina pine sawyer beetle (*Monochamus* spp), and the blue stain fungus (*Ceratosystis pini*). No effort was made to test individual trees for the pinewood nematode (*Bursaphelencus xylophilus*). The mid to late summer droughts and hot weather of 2010 and 2011 probably predisposed these trees to the above pests and diseases.

In addition, white pine (*P. strobus*) decline was observed western Illinois (Argyle Lake S.P.). Conversations with private landowners also indicated pockets of white pine blister rust (*Cronartium ribicola*) in areas of northwestern Illinois.

Needle Cast and Tip Blight Diseases
Two very common diseases affecting conifers, *Rhizosphaera* needle cast and *Diplodia* (i.e. *Sphaeropsis*) tip blight were prevalent again in 2011. These fungal leaf diseases cone-bearing tree species causing premature needle cast or a browning and/or death of the growing tip, respectively. While not fatal, they stress trees and reduce overall ornamental qualities and growth rates of affected trees (1).

Stress-Related Canker Diseases
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. The cankers cause branches to die distal to the canker resulting in a loss of ornamental quality and landscape function . If allowed to progress, it may eventually kill the tree (1).

V. Insect Pests

Bark Beetles (BB) and Wood-borers (WB): Bark beetles attack primarily stressed trees including both hardwoods and conifers. Prolonged drought or a variety of abiotic and biotic stresses may pre-dispose trees to bark beetle attacks.

Based on field observations and in conversations with green industry members and foresters, 2011 appeared to a normal year for bark beetle activity. No major bark beetle outbreaks were observed or reported for 2011.

In addition, engraver beetles and the Zimmerman pine moth continue to be chronic problems for many of our common urban forest conifer species particularly Scots, Austrian pine, and mugo pines. As above, both of these insect pests tend to attack stressed conifers growing on sites with poor drainage, drought stress, soil compaction, and construction damage just to name a few.

Fall Webworm (FWW)
Small scattered pockets of fall webworm (FWW) nests were seen at state parks and forests in southeastern (Lincoln Trail S.P.) and southern Illinois (Lake Murphysboro and Pyramid S.P's). FWW populations were comparable to previous years.

Japanese Beetle (JB)

Japanese beetle was evident throughout the state , but defoliation was sporadic and not nearly as extensive as in previous years. Heavy Japanese beetle damage (50-75% defoliation) was common on lindens, crabapples, and Siberian elms throughout central and southern Illinois (south of I-80 between the I-57, I-39, and I-55 corridors, and north and south between the I-70 and I-80 corridors). Overall, Siberian elms (*Ulmus pumila*) experienced heavy defoliation with 75-100% defoliation rates common. *Ulmus pumila* (Siberian elm) is considered to be moderately preferred by Japanese beetle and heavily preferred by the elm flea weevil (2,9). A combination of elm flea weevil and Japanese beetle feeding can cause severe defoliation of Siberian elm by late summer.

Elm Flea Weevil (EFW)

The European flea weevil (EFW) (*Orchestes alni*) has been a pest in the upper Midwest since 2003, but has been in the U.S. since 1982. The EFW is a very tiny insect (1/16th inches long) with the characteristic long snout. (Figure 20). Adults are reddish-brown with black heads. Adult EFW's emerge in May and early June and begin feeding on young leaves chewing small holes in the leaf (Figure21). Adult females lay eggs and the young larvae begin mining the leaf-tip eventually becoming a blotch-like mine. Larvae pupate within the leaf and emerge as a adults in mid to late summer. Adults over winter in under loose bark and in litter under infested trees (1). EFW feeding damage should not be confused with the elm leaf miner (*Kaliofenusa ulmi*) which is a blotch-mining sawfly. While the adult elm leafminer (ELM) emerges about the same time as the EFW there are subtle differences in larval feeding and biology. ELM larvae typically form blotch-like mines throughout the leaf in contrast to the leaf tip mines associated with EFW larvae. Also, by mid-June, mature ELM larvae drop from the leaf and enter the soil to pupate. Adult emergence does not occur until the following spring with one generation per year.

Figure 20. Adult flea weevil **Figure 21. Adult flea weevil feeding damage**

Larval and adult feeding is usually considered an aesthetic issue, but coupled with heavy Japanese beetle feeding damage (as mentioned above) preferred hosts can be completely defoliated by mid to late summer.

Research conducted at The Morton Arboretum (11) and by Condra et al. (2010) indicate that *U. pumila* (Siberian elm) and 'Homestead' elm are the most susceptible to EFW feeding damage. In addition, long term field feeding preference studies conducted at The Morton Arboretum have indicated that elm hybrids with Siberian elm and *U. carpinifolia* parentage are strongly preferred by EFW (11). Refer to Table 5 for a listing of highly preferred hosts and host preference by geographic origin.

Table 5. Summary of elm flea weevil (EFW) medium to heavy feeding damage on elms (*Ulmus* spp) and very low to low feeding damage and by geographic origin (The Morton Arboretum (2004-2009).

Elm Biotype (*Medium to Heavy*)	**Elm Biotype (*Very Low to Low*)**
U. laevis	*U. propinqua var. suberosa*
U. Morton Glossy 'Triumph'	*U. glabra*
U. davidiana var. *manshurica*	*U. alata*
U. americana f. pendula	*U. macrocarpa*
U. lamellose	*U. thomasii*
U. castaneifolia	*U. crassifolia*
U. foliaceae	*U. parvifolia* var. *coreana*
U. procera	*U. americana* 'Moline'
U. berganniana	*U. 'Morton Plainsman* x *U. parvifoia*
U. pumila	
U. japonica x *U. wilsoniana*	
U. davidiana x *U. pumila*	
U. pumila x *U. americana*	
U. pumila x *U. rubra*	
'Sapporo Autumn Gold' (*U. pumila*)	
U. carpinifolia x *U. pumila*	
U. carpinifolia hybrids	
U. sukaczevii	
U. x *hollandica*	

Table 5 cont.

Origin	Field Feeding Damage Rating (FFDR)[1]
• Asia	2.2
• Complex Asian hybrids	2.0
• Europe	3.9
• North America	0.4
• Zelkova spp.	0.7
• Simple and complex hybrids of *U. pumila* and *U. carpinifolia*	4.5

[1]FFDR is based on a scale of: 0=no feeding damage; 1=very low; 2=low; 3=moderate; 4=heavy; and 5=severe feeding damage

VI. Weather/Abiotic Related Damage

As is common almost every year, flooding occurred in southwestern and western Illinois areas adjoining the Mississippi River floodplain (Figures 22-23). Aerial and ground surveys conducted in summer and early fall, revealed large areas of river bottomlands were still flooded as late as August and early September, 2011. To date, no extensive tree decline and/or death has been observed. Future monitoring will be required for trees growing in areas where flooding is less common or sporadic. Tree species adapted to consistent flooding have adaptive characteristics and usually do not show extensive dieback and mortality (10).

Results from a 20 year study following the Great 1993 Mississippi River flood has revealed the following conclusions (10):

- Lindens, sugar maple, evergreens and conifers, and most flowering ornamentals and fruit bearing trees will not tolerate even a short duration flood event. If these trees species are growing in areas prone to flooding, they will probably not survive longterm
- Tougher trees, such as silver maple, Siberian elm and other elms, honeylocust, and green ash (assuming EAB does not get it first), usually will survive fairly extensive and prolonged flooding
- Depending on the duration of flooding and time of the year, species such as hackberry and oak will vary in their susceptibility and/or resilience against flooding.
- Species diversity is extremely important when planning for and managing trees in an urban forest setting
- A comprehensive tree inventory is critical in order to properly plan for and assess the potential economic, environmental, and ecological effect of a major flood event

In contrast to abundant spring and early summer rainfall, and subsequent flooding, July and August precipitation was much below normal for most of central Illinois. Visual observations in July and August revealed drought conditions as evidenced by brown lawns and extensive leaf scorch on many woody plant species. Because of the rapid development of drought conditions, Illinois State Climatologist, Jim Angel calls this phenomenon a “flash drought” analogous to a flash flood except dry. This sudden change in precipitation may explain the extensive leaf scorch symptoms, early fall color and leaf senenescence, and in some cases whole tree mortality observed in portions of central and northern Illinois by July and August. At the time of this writing, some areas of western Illinois are still experiencing abnormally dry to severe drought conditions.

Figures 22-23 Flooding `

VII. Invasive Plant Species

No formal statewide surveys or studies were conducted in 2011 related to invasive plant species. However, in 2010, an invasive plant study related to EAB caused tree mortality was initiated at two different locations in northeastern Illinois.

Site #1 is located in unincorporated Bloomingdale, Illinois in a residential area where EAB had been discovered in 2009. The infested area was an un-developed woodlot bordering on a wetland. Site #2 is a natural woodland located at the Fermi National Research Lab, Batavia, Illinois. EAB was first confirmed at Fermi in 2007 and has since spread throughout the Fermi Lab grounds. Refer to the 2010 Forest Health Highlights (FHH) report for details on study plot establishment and measurement.

The most common invasive plants found so far at both plots include common buckthorn (*Rhamnus cathartica,*L.), garlic mustard (*Alliaria petiolata*), and bittersweet nightshade (*Solanum dulcamara,* L.). Other woody species documented include box elder (*Acer negundo,* L.) and American elm (*Ulmus americana*, L.).

VIII. Professional Training Clinics and Public Outreach

Two training workshops were conducted in late summer, 2011; one at The Morton Arboretum outside Chicago and a second in Springfield, Illinois. Attendees included commercial and municipal arborists, IDNR district foresters, consultants, master gardeners, and natural resource managers. Workshop participants received classroom instruction and hands on field training on proper pest and disease identification, diagnosis, and sampling techniques. Training topics included TCD, BLS, BOB, common Arthropod pests, and abiotic diseases.

Public outreach events for 2011 included town hall meetings, news releases, and PSA's, addressing management options for EAB and how individual homeowners and communities can prepare for tree mortality and subsequent effects of EAB on urban forests and shade trees.

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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.*