2020 Forest Health highlights
ILLINOIS

Prepared by Fredric Miller, Forest Health Specialist and Erin McMahan, Research Assistant, The Morton Arboretum, Lisle, IL

Forest Health Issues 2020: An Overview

2020 was a challenging year for everyone, but fortunately our team was able to continue visiting state parks and natural areas for forest health monitoring (with extra precautions). Overall, the 2020 growing season was less active for forest health issues than previous years, although a number of pests and diseases continued to be seen. Continuing statewide issues included possible herbicide injury to oak and other hardwood tree species, decline of spruces and pines, rapid mortality of white oaks, and the usual foliar leaf diseases, namely anthracnose, sycamore anthracnose, and apple scab. Magnolia scale was fairly common on ornamental landscape plants. EAB populations were high southern Illinois. We were on the lookout for the diseases Sudden Oak Death and Laurel Wilt but did not detect either. This year, we introduced the PlayCleanGo campaign, aimed at combatting the spread of invasive plant species in our forests, to many new state parks. Throughout the coming winter and spring, boot brushes and educational signage will be installed at high use trailheads throughout northern and central Illinois. The derecho that hit in August caused significant tree damage in the northwestern part of the state. Heavy spring rains gave way to abnormally dry summer conditions, with the exception of southern Illinois where precipitation was slightly above average

Note: much of the information provided below is similar to previous years in order to include important information on identifying and understanding forest health issues. Be sure to check out new highlights including sudden oak death surveys (pg. 4), laurel wilt surveys (pg. 5), invasive plant control (pg. 16), spotted lanternfly updates (pg. 16), and 2020 weather (pg. 19).

Insects

Magnolia Scale (1)

Magnolia scale, common in northern and central Illinois, is a native scale and one of the largest North American scales, reaching the size of your thumb (Figure 1). Populations seem to be on the increase in urban areas. 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 help them prevail against the scale.

Figure 1: Adult magnolia scales with immature crawlers.

Plant Diseases and Herbicide Drift Damage

Herbicide Drift Damage (5, 8, 9)

Signs of herbicide damage to trees were reported statewide in 2020, particularly on state and private lands bordering agricultural fields, continuing a trend seen in recent years. This mirrors reports of herbicide damage in agricultural crops that have also been increasing in the past few years. According to the Midwest Center for Investigative Reporting (31 August 2019), "Farmers in Illinois, the nation's leading soybean producing state, have reported record levels of crop damage caused by herbicide drift in 2019, with 590 dicamba-related complaints as of 23 August." "In 2017, Illinois had 246 dicamba-related complaints. In 2018, the state had 330."(8).

Types of herbicides. In general, herbicides are classified based on the types of weeds they control (grasses, broadleaf plants, woody plants, etc.), when they are applied (i.e. pre or post emergence), and their mode of action. Post emergence broadleaf herbicides selectively kill actively growing broadleaf plants and include growth regulator herbicides containing active ingredients found in 2,4-D, 2,4-DP, MCPA, MCPP, and Dicamba. These products have broad application including homes, farms, and industry. They are prone to drift and volatilization. Injury symptoms associated with these herbicides include twisted and downward cupping of leaves, and narrow, strap-like leaves on the youngest growth (Figure 2). Root uptake of these chemicals is usually more damaging to the plant and on grape the leaves will cup upward (Figure 3). These herbicides are fairly soluble and can move through the soil as well as air. As their name implies, grass herbicides kill grassy weeds. They may be applied pre or post emergence. Common pre-emergence herbicides include trifluralin and DCPA. Post emergence herbicides include fenoxaprop, sethoxydim, and fluaziop-P. These products cause yellowing/bleaching of leaves and dieback of actively growing regions. Pre-emergent products are less likely to drift compared to post emergence herbicides. Non-selective, post emergence, broad spectrum herbicides are basically designed to kill a wide variety of plants and include paraquat, glufosinate, and glyphosate.

A list of tree species sensitive to phenoxy herbicides (i.e. Butoxone, 2,4,-D, MCPA, 2,4,5-T, silvex, and Banvel) is presented in Table 1.

Figure 2: Suspected herbicide damage to oak leaves.

Figure 3: Herbicide damage on grape, most likely due to root intake (upward cupping leaves).

Table 1. Sensitivity of various trees species to broadleaf weed-killers (Taken from Hibbs, 1978).

Sensitive	Intermediate/Unknown	Tolerant
Apple	Cherry	Catalpa
Ash	Cottonwood	Linden
Birch	Honeylocust	
Boxelder	Mulberry	
Amur cork tree	Oaks	
Elm	Silver Maple	
Hackberry		
Hickory		
Horsechestnut		
Maple (sugar, red and Amur)		
Redbud		
Sycamore		
Walnut		

*Herbicide drift***.** Like with all pesticides, herbicide drift can be a problem. Factors affecting drift potential include formulation, application method, air temperature, wind, and soil factors. For example, 2,4-D (low volatile ester formulations) can vaporize and be carried by the wind while 2,4-D (amine formulations) are less likely to vaporize. Granular formulations rarely move or volatilize. It is well known that the smaller the droplet size the higher the drift potential. To avoid drift issues, it is recommended to produce larger droplet sizes along with lower pressures or use sprayers with larger orifice nozzles. Weather factors such as air temperature, wind, and relative humidity (RH) may also contribute to herbicide drift. Some herbicides may vaporize at temperatures greater than 85° F during or immediately after application. Herbicides in a vapor state can move large distances and can cause plant damage considerable distances from the point of application. Producing larger droplets and applying them closer to the target plants can minimize wind drift. Soil factors also play a role in herbicide drift. The amount of uptake by a soil-applied herbicide depends on the type of herbicide, location of plant roots in the soil, soil type, and soil moisture. Some herbicides are mobile and move rapidly in sandy and/or porous soils while others may persist in the soil

Diagnosing herbicide drift damage. **Be careful not to jump to premature conclusions when attempting to diagnose for herbicide or other chemical injury.** Correct tree diagnostics is all about "patterns, patterns, patterns". For example, are several different tree species impacted, or just one species? Is only one part of the trees impacted, or is damage more widespread? Possible factors contributing to herbicide drift damage include low temperature injury, foliar diseases (i.e. anthracnose), insect feeding (i.e. plant bugs, leafhoppers), herbicides and air pollutants. Some tree species may show damage while others will not. A question to ask is, is only the new growth affected or is the entire canopy impacted? If it is a one-time event, then later new growth should look normal. In some cases, leaf tissue analysis may be required to determine which chemical is involved in plant damage. Are there other insect and disease issues present at the same time? Has there been any disturbance to the soil around or near the tree(s) (i.e. addition of fill, construction activity, soil compaction, etc.), are there of girdling roots present, and has there a drought or flooding? **Remember, most of our problems we see with trees usually start below ground.**

Managing chemical drift damage. Unfortunately, for rural forested areas and woodlots, there is really no practical treatment other than to reduce stress factors (i.e. livestock grazing) in areas where tree symptoms are being observed. Trees growing in urban areas and home landscapes should be protected from predisposing stress factors such as construction injury, soil compaction, changes in drainage, competition from turf, and drought. Focus on tree health by mulching, watering during dry spells, and fertilizing where appropriate if nutrient deficiencies are present. Remember, older mature and over-mature trees do not react well to changes in their immediate growing environment. In most cases, healthy trees will recover from chemical damage the following season, but chronic exposure to herbicides along with the aforementioned pre-disposing factors may be enough to cause the tree to begin to decline ultimately resulting in death. If you have to apply an herbicide for any reason, avoid herbicide drift by not spraying when cross winds exceed 10 mph, using lower pressures, and using spray nozzles that produce large-sized droplets.

Herbicide Damage Survey Results. We still have a lot to learn about spray drift and all of the related factors contributing to herbicides moving off-target. In 2018, we initiated a statewide survey to obtain a better idea of how extensive the problem is and to better understand the causes contributing to leaf tatters and/or herbicide drift and the relationship between chronic chemical drift exposure and its effect on long-term tree health. In 2018, 2019, and 2020, leaf tissue samples were taken and submitted to a lab to test for evidence of dicamba and/or 2,4-D damage. In 2019, of the 27 leaf damage samples collected, 26 had 2, 4-D residue ranging from 4 to 237 parts per billion. All 27 leaf damage samples showed Dicamba residue, ranging from 3 to 50 parts per billion. Only 7 of the 27 samples contained triclopyr residue. Samples collected in 2020 have yet to be analyzed but more samples were submitted in 2020 than in 2019.

Sudden Oak Death (SOD)(3,18)

SOD is a disease of oaks caused by the pathogen *Phytophthora ramorum*, a water mold that also impacts over 75 other plant species throughout the world. Originally detected in California in the 1990's, the disease has killed millions of oaks on the West Coast since. The pathogen can spread through infected nursery stock and surface water and was detected in recent years in plants at several retail locations throughout Illinois. To determine whether the pathogen had the potential to spread from these locations to neighboring natural areas and parks, in the spring of 2020, surface waters around these location were tested for *P.ramorum*. **Test results were all negative and the pathogen was not detected**, but we continue to be on the lookout going forward.

Laurel Wilt and Redbay Ambrosia Beetle (16,19)

Another disease that we are on the lookout for is Laurel Wilt, a fungal wilt disease caused by the pathogen *Raffaelea lauricola.* Laurel wilt is a serious disease that is spread by the tiny redbay ambrosia beetle (*Xyleborus glabratus*) and has killed hundreds of millions of redbay trees in the southeastern United States. The fungus also affects other members of the laurel family (Lauraceae) and has killed large numbers of sassafras and commercially grown avocado trees as well. Like other wilt diseases, the fungus induces a reaction in the tree that restricts the flow of water, causing leaves and branches to wilt and turn brown, and eventually killing the entire tree (Figure 4). The redbay ambrosia beetle is very small (about 2 mm long) and is rarely seen (Figure 5), although signs including small exit holes or fine sawdust can indicate their presence. Although redbay trees do not grow in Illinois, sassafras is an important part of ecosystems in the southern part of the state and is susceptible to the wilt. The pathogen was recently detected in Kentucky, so the disease and the beetle vector were monitored for this summer in the southeastern part of the state. **No symptomatic trees nor the beetle were detected, but we will continue to monitor for this destructive fungus and its vector.**

Figure 4. Signs of laurel wilt in sassafras: brown wilted leaves (L) and dark streaks under the bark (R). Photo courtesy of University of Kentucky College of Agriculture, Food and the Environment.

Figure 5. The redbay ambrosia beetle on a finger for scale. Photo courtesy of USDA Forest Service.

Anthracnose (1, 12)

The spring and early summer months of 2020 were very wet, particularly in the northern part of the state. May rainfall averages continue to set records for high rainfall. The combination of precipitation and humidity provided an ideal environment for foliar fungal leaf diseases such as and anthracnose. Sycamore anthracnose was particularly visible this spring, defoliating trees and causing “witches brooming” of the branches (Figure 6). However, the second flush of leaves later in the season was healthy and sycamores fully leafed out.

Anthracnose 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 (Figure 6).

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.

Figure 6: Stem canker (L) and witches' brooming (R) associated with sycamore anthracnose

Oak Wilt (12)

The dreaded oak wilt is found in every Illinois county and has become a major urban and forest tree disease. **Oak wilt levels for 2020 were comparable to previous years.** This fungal disease is lethal to oaks, particularly oaks in the red group, and trees must be treated to insure survival. Anthracnose may be confused with oak wilt later in the season. (Figure 7) Be sure to properly diagnosis the problem before employing management options. Prevention is important, so remember not to prune between April and June, and consult with experts before removing an infected tree because the disease can spread through the root grafts. The only way to be absolutely sure is to send in samples to a plant clinic to confirm which fungus is involved. Keep in mind, that a tree could have both oak wilt and anthracnose at the same time. For more information about Oak Wilt, please consult the Illinois Forest Health Highlights from previous years.

Figure 7: Side by side comparison of oak wilt and anthracnose symptoms in oak. The bottom left photo shows the dark streaking under the bark in oak wilt.

Rapid White Oak Mortality (RWOM) (11)

We continue to be on the alert for RWOM, which has been observed in parts of Missouri since 2012 and in Illinois for the last few years. Reports continued to be received from Illinois in 2020 involving rapid decline (within one growing season) and in some cases death of white oaks (Figures 8 and 9). Further monitoring and field studies are planned for 2021 to determine if RWOM is involved.

In 2018, we conducted a statewide survey similar to the larger one carried out by the Missouri Department of Conservation (MDOC) in 2014, which interviewed 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 Some of the results of the MO survey can be found in previous issues of this report.

Listed below are a few of the major findings from the 2018 Illinois RWOM survey.

- RWOM has been observed in widely distributed portions of Illinois
- Common on dominant and co-dominant white oaks >10" DBH.
- Many trees were on sites with a history of herbicide damage and/or drought.
- Half or more of all trees still had wilted leaves attached, leaf cupping, and inner branch dieback.
- Nearly all were reports from private land with a majority oak (white oak) tree composition.
- Over half of the cases were found on ridgetops, the rest were on lower, toe and bottom slopes

For additional details, refer to *Missouri Forest Health Update* (December, 2014) pages 5-6 (11).

Figures 8 and 9: White oaks dying from RWOM

Thousand Cankers Disease of Black Walnut

To date, neither the walnut twig beetle (WTB) nor the TCD fungus has been detected in eastern black walnut trees in Illinois. However, the causal agent of TCD, *Geosmithia morbida* (*Gm*) has been found throughout Illinois associated with a number of different ambrosia beetle species. **As of December 2020, no new finds of TCD or WTB have been reported for the eastern United States.** As in previous years, four (4) unit Lindgren funnel traps (LFT's) were deployed throughout the state in state parks, natural and conservation areas, forests, and county forest preserves (Figure 10).

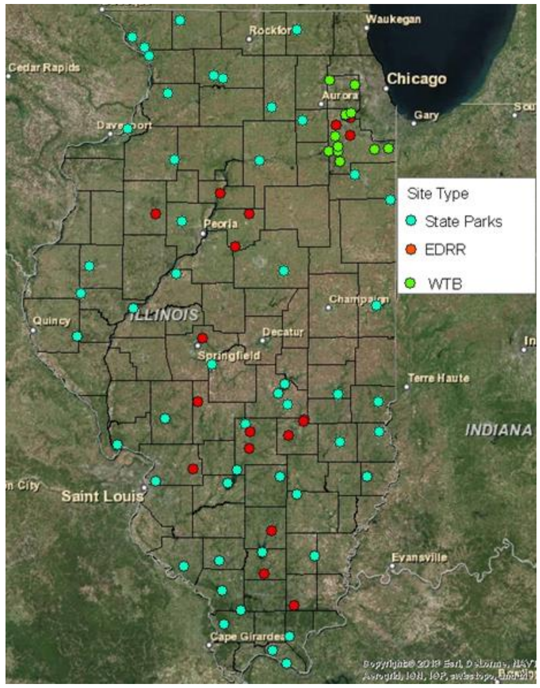

Figure 10: Distribution of WTB four-unit LFT's

Bur Oak Blight (7, 14)

Bur oak blight (BOB) continued to be a presence in 2020. The fungal disease was first reported in Illinois in 2012. Initial finds were in northern Illinois, but more recently, BOB has been found in central Illinois counties (Figure 11) Details on the biology, impact, and management of BOB has been reported in previous editions of the Forest Health Highlights (FHH) and also in the September 11, 2017 issue of the University of Illinois, Home, Yard, and Garden Newsletter.

Beginning in late summer, 2017, a county-by-county BOB survey was initiated. The survey was continued in 2019 to include central and southern Illinois. Results from our survey along with samples received at the University of Illinois Plant Clinic (UIPC) are presented in Figure 11.

The movement of BOB into central Illinois could be due to several factors including climate change making the environment more favorable for infection, better public awareness about BOB and symptoms to look for, and the suggested findings that *Q. macrocarpa* var. *oliviformis* is more susceptible to BOB. The wet weather this spring most likely encouraged this fungal disease.

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 12-15). Research on the biology, epidemiology, and chemical management of BOB is ongoing under the direction of Dr. Tom Harrington at Iowa State University.

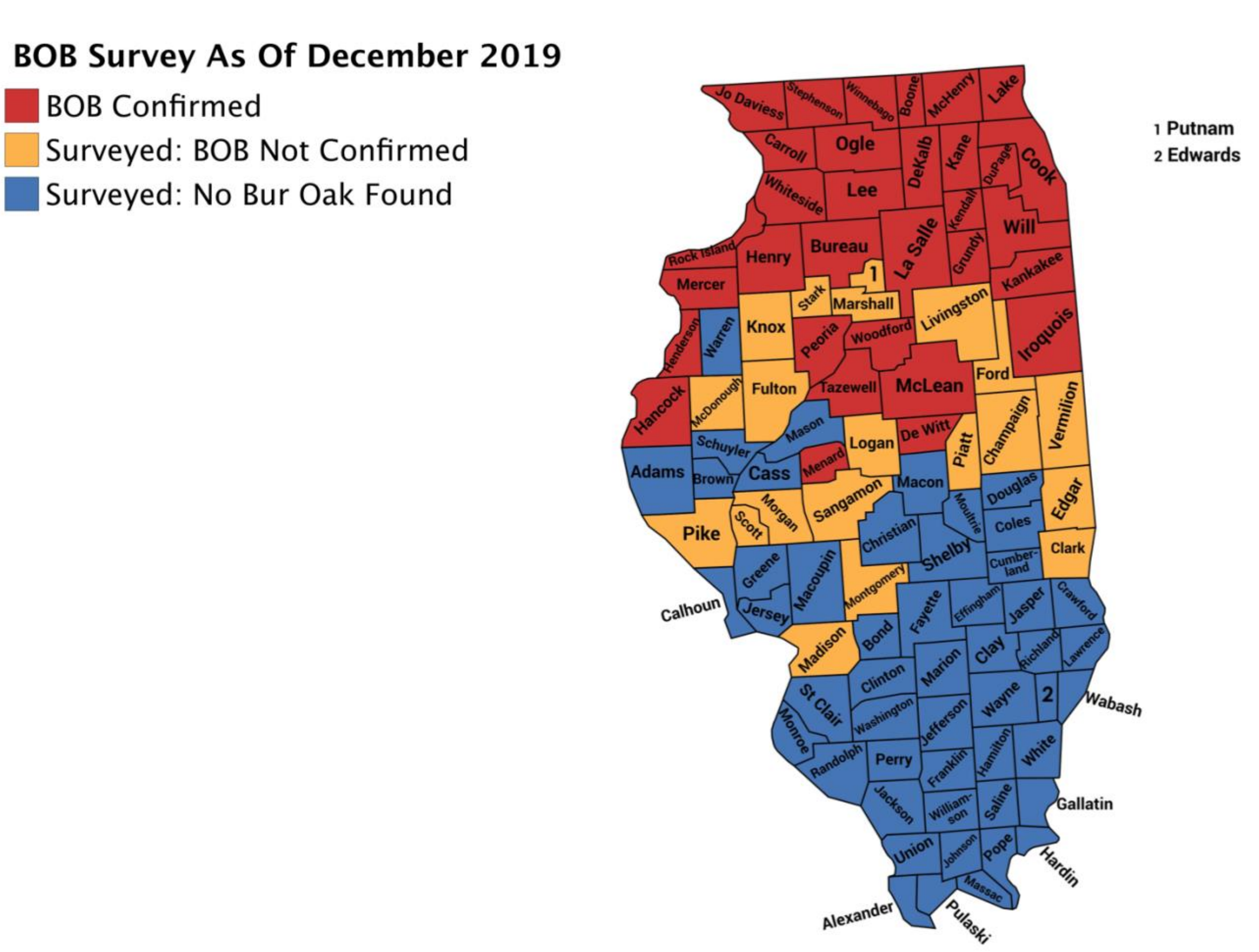

Figure 11: Distribution of BOB in Illinois, 2019

Figure 12: Bur oak blight (BOB) leaf symptoms on underside of leaf

Figure 13: Bur oak leaf blight symptoms

Figure 14: Bur oak blight (BOB) on bur oak

Figure 15: Black, pimple like fungal fruiting bodies on bur oak leaf petiole

General Decline of Conifers and Other Trees (15)

During 2020, we continued to receive a number of reports concerning the decline and death of spruces, pines, and hardwoods growing in windbreaks, privacy plantings, farmsteads, parkways, and home landscapes. While there are a variety of factors responsible, there are several pertinent abiotic and biotic factors to consider.

Let's review what we mean by tree decline and the possible factors that lead up and contribute to the decline process. Decline describes the most significant feature or general nature of disease syndrome, but typically does not identify causal relationships or the causal agent. Tree death is consequence of invasions by secondary, opportunistic and saprophytic organisms not capable of causing disease in healthy, unstressed trees.

The host-stress-decline (HSD) model is as follows:

- **Healthy tree plus stress leads** to altered trees/tissues and dieback begins
- **Altered trees/tissues plus more stress leads** to further dieback
- **Severely altered trees/tissues plus secondary organisms leads to** tree/tissue invasion and loss of ability to respond to improved conditions, resulting in decline and eventually death. The stress may be acute (i.e. sudden and death follows), chronic, or long term ending in tree death, or the tree may stabilize.

Symptoms associated with the HSD model include, but are not limited to, slow growth and thin canopies, undersized, distorted or chlorotic leaves, leaf scorch, premature fall color, abnormally large fruit crops (called "distress crops"), twig and branch dieback, and/or adventitious trunk sprouts.

Sinclair and Hudler (1988) described five different HSD scenarios:

- Perennial or continual irritation by one factor
- Drastic injury plus secondary stress
- Interchangeable pre-disposing, inciting, and/or contributing factors

- Synchronous cohort senescence (trees of a similar age declining as a group)
- Multiple factors may weaken a tree, then trigger decline and exacerbate problem by continual influence

The decline of maples, spruces, and other conifers tend to follow either the HSD synchronous cohort senescence or the multiple factor scenarios described by Sinclair and Hudler (1988). Interchangeable pre-disposing, inciting, and/or contributing factors include the introduction of new biotic or abiotic factor(s) or a change in supply of factor(s) in a stressful environment triggering decline or "***spiral of diminishing health***" (Figure 16). Synchronous cohort senescence suggests trees of similar age and growing together, display group behavior. For example, mature and over mature trees may come under stress due to seasonal water shortage, decline occurs combined with drought or climatic changes, and then opportunistic pathogens and insects hasten tree decline.

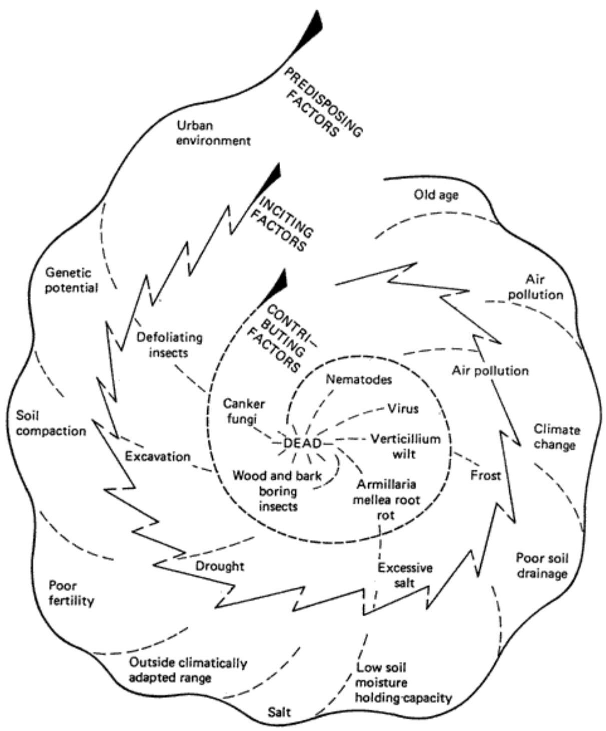

Figure 16: "Decline-death spiral" from Manion (1981)

Spruce and conifer decline. Since the 2012 drought, we have had extremes in weather each year with above average precipitation. Spring of 2020 had record-setting precipitation followed by dry conditions throughout the rest of the summer and much of fall. How does this affect the health of conifers? Conifers do not like "wet feet" so trees trying to grow in heavy (i.e. clay) wet and/or poorly drained soils on berms on in low areas will struggle. Saturated soils are very hostile to tree roots causing root rots and death of fine root hairs. These root hairs are very important in helping the tree take up water and nutrients necessary for tree growth. A second factor is air temperature. Think about the name

“Colorado blue spruce” (as they say, “it is all in the name”) and then consider our Illinois climate. Spruces prefer moderate summer temperatures with coarse, well-drained soils. In particular, planting Colorado blue spruce in areas with poorly drained soils and potentially hot dry summers violates the axiom “right plant for the right place”. Once a conifer becomes stressed, then it is predisposed to a number of disease and insect problems, namely needle cast diseases and tip blights, cankers, pine wilt disease, wood-boring beetles and bark beetles. With the exception of pine wilt disease, none of these secondary agents are lethal to the tree but are just one more stressor the tree has to contend with.

Needle cast disease (1, 12). Two very common diseases affecting conifers, *Rhizosphaera* needle cast and *Diplodia* (i.e. *Sphaeropsis*), were observed throughout the state in 2020. 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 (Figures 17 and 18).

Rhizosphaera needle cast attacks needles of Colorado blue, Norway, and white spruce and pines (Figure 17). The fungal needle disease is most common during cool, wet springs with high relative humidity (RH). Faint yellow bands will occur on the needles four to 11 months after infection. Later small, dark brown to black fruiting bodies (i.e. pycnidia) will appear in spring. Rhizosphaera needle cast disease usually starts on branches on the lower tree crown and progresses upward. Premature needle drop is common giving the canopy a thin appearance, branch dieback, and an unsightly appearance.

Figure 17: Rhizosphaera needle cast

Diplodia tip blight (1) (Figure 18) (*Diplodia pinea*) is a common fungal disease of stressed conifers, or two and three needle pines such as Austrian pine (*Pinus nigra*), Scots pine (*Pinus sylvestris*), red pine (*Pinus resinosa*), Mugo pine (*Pinus mugo*), Ponderosa pine (*Pinus ponderosa*) and occasionally Eastern white pine (*Pinus strobus*). Diplodia tip blight may also be found on Douglas-fir (*Pseudotsuga menziesii*), Norway spruce (*Picea abies)*, Colorado blue spruce (*Picea pungens*), American larch (*Larix laricina*), noble fir (*Abies procera*), silver fir (*Abies alba*), some true cedars (*Cupressus* spp.), arborvitae (*Thuja* spp.), and junipers *(Juniperus* spp.). The disease is rarely found on trees under 15 years of age and is more severe on trees over 30 years of age. It most often affects ornamental plantings under stress due to drought, hail or snow damage, over shading, compacted and unfertile soils, restricted rooting volumes, and insect activity. The fungus kills current year shoots and sometimes branches.

Diplodia tip blight kills needles at the tips of branches usually starting in the lower half of the tree and moves upward. Infected needles will be stunted, turn yellow, and then brown (Figure 18). Typically, all current season's needles are killed and resin droplets may be seen on the dead shoots. Pycnidia, which look like black pepper, appear during summer and fall, at the base of the needles under the fascicle sheath (Figure 18). They may also be found on the scales of second year seed cones. Under severe infections, whole branches may dieback to the trunk. Like Rhizosphaera needle cast, Diplodia tip blight is most common under cool wet conditions.

Figure 18: Diplodia tip blight (Left) and pycnidia fruit bodies (Right)

Cytospora, a stress-related canker disease (1, 12). Cytospora canker of spruce is definitely a stress-related disease, particularly of Colorado blue spruce (Figure 19). 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 distal to the canker to die resulting in a loss of ornamental quality and landscape function (1).

Figure 19 (Left and Right): Branch dieback associated with Cytospora canker on spruce

Phomopsis Canker. A fourth disease, Phomposis canker, is getting renewed attention. This canker attacks spruce (*Picea* spp.), hemlock (*Tsuga* spp.), and true firs (*Abies* spp.). The causal agents of Phomopsis canker are *Disporthe eres* and *D. minospora*, the latter being more virulent. While symptoms are similar to Cytospora canker probably leading to misdiagnosis in the field, Phomopsis cankers appear as sunken dark areas on the stem with browning vascular tissue, and canopy dieback (Figure 20). Unlike Cytospora canker, resin is not always present, and you have to peel the bark back to see the discolored cankered area (Figure 21). Pycnidia fruit bodies are formed resulting in black pads of branch tissue from which the spores erupt (Figure 22).

Figure 20 (Left and Right): Phomopsis canker symptoms on Colorado blue spruce

Figure 21: Cankered area versus healthy tissue

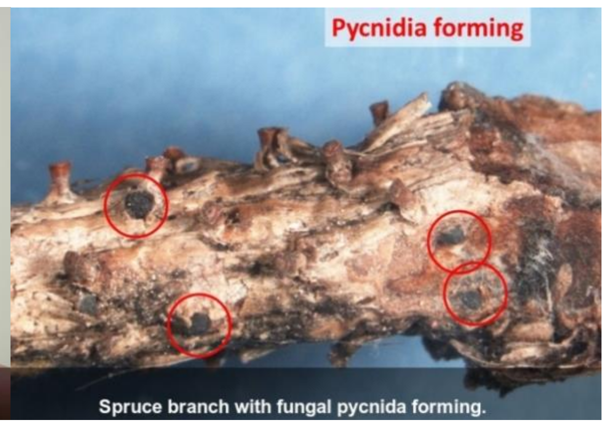

Figure 22: Fungal pycnidia on spruce

Management of spruce and pine decline

Cultural. Since cones and dead tips contain the fruiting bodies that produce millions of spores, remove and destroy all infected cones and dead and dying branches and shoots during dry weather. Pruning tools should be disinfected between cuts by dipping them in alcohol or bleach (one part bleach to nine parts of water). Maintain tree health because the disease is more severe on trees that are under stress. Keep the tree watered during dry periods. Maintain a layer of mulch under the tree to conserve moisture. Because the fungus can also infect wounded tissues, avoid pruning trees from late spring to early summer when they are most susceptible. Plant less susceptible conifer species and provide good air circulation by proper tree spacing.

- **Sanitation.** Remove trees in poor condition to prevent future fungal infections and insect infestations
- **Chemical.** Registered fungicides can be applied for control of Rhizosphaera needle cast disease and Diplodia tip blight by spraying on a regular basis for the first two months after bud break. Fungicide treatments have not shown to be effective for Cytospora or Phomopsis cankers

Invasive Plants

One of the major threats to the health of our forests is invasive plants, plants that have been introduced from other parts of the world, and with no herbivores to keep them in check, take over forests and outcompete our native plants. This year, the Illinois Forest Health Program has broadened to address this important issue by expanding the PlayCleanGo campaign in Illinois through a multi-state grant coordinated by the North American Invasive Species Management Alliance (NAISMA). PlayCleanGo promotes the protection of our natural resources by educating outdoor enthusiasts of the dangers of invasive pests and plants in our natural areas. Part of their campaign focuses on the installation of boot brush stations with educational signage to help promote their message of slowing and stopping the spread of invasive plant species. The goal of these stations is to inform park visitors of the importance of keeping our forests healthy and to provide a useful tool for removing any invasive plant seeds that may be lingering on their footwear. The signs also provide examples of the common invasive plant species found in each park's area of the state (Figure 23). We expanded on the work started by partners in southern Illinois by ordering 72 more stations to be installed by hiking trails in many parks. Keep an eye out for these stations in state parks as they are installed by local volunteers and park staff!

Figure 23: A recently installed boot brush station (photo courtesy of NAISMA).

New Invasive Insects to Watch Out For

Spotted Lanternfly (13, 17)

The spotted lanternfly (SLF) (*Lycorma delicatula*) has now been detected in Pennsylvania, New York, Massachusetts, Virginia, New Jersey, and Delaware. **This year, a dead adult SLF was found as close as Michigan.** Native to China, India, Japan, Korea, and Vietnam, the SLF apparently is able to survive and is considered highly invasive due to its wide host range of more than 70 plant species and lack of natural enemies. The young nymphs are wingless, black initially, but developing red patches as the nymphs mature, and have white spots on their body and legs. Adults are large (1-inch-long and ½ inch wide) with black legs and head, yellow abdomen, and light-brown to gray forewings (Figure 24 and 25). The hind wings are scarlet red with black spots. SLF females lay egg masses containing 30-50 eggs that are gray-brown and covered with a shiny grey waxy covering. The SLF has one generation per year (univoltine) with eggs hatching in the spring and early summer and adults appearing in July through August. Egg-laying begins in September and continues through November (Figure 26).

Upon egg hatch, the young nymphs disperse and begin feeding on a wide range of hosts and producing large amounts of honeydew. Adults are found on tree trunks, stems, and near leaf litter at the base of the tree. Adults are poor flyers, but strong jumpers. They favor Tree-of-Heaven (*Ailanthus altissima*) and grapevine (*Vitis vinifera*) as host plants. In the fall, the adults also favor Tree-of-Heaven for feeding and egg laying. Adult females will tend to lay eggs on smooth-trunked trees or any vertical smooth natural and/or man-made surface. They are able to lay egg masses on trucks, train cars, RV's, etc., so can easily travel to new locations. Heavy feeding may lead to plant stress and may lead to plant death. Sooty mold typically develops in association with honeydew diminishing the plant's ability to produce food (photosynthates). The SLF has the potential to greatly impact the grape, orchard, logging, tree and wood-products, and green industries.

Since Tree-of-Heaven (Figure 27), also non-native and invasive, is a critical host for SLF for part of its life cycle, efforts to prepare for the potential spread of SLF have thus far included a statewide survey of locations of Tree-of-Heaven. Knowing the locations of populations of the tree will aid us in monitoring and responding to this pest threat. This winter and into the spring of 2021, we will survey for Tree-of-Heaven in Illinois state parks.

Figure 24: Spotted lanternfly nymph (Left) and Adult spotted lanternfly (Right)

Figure 25: Adult spotted lanternfly

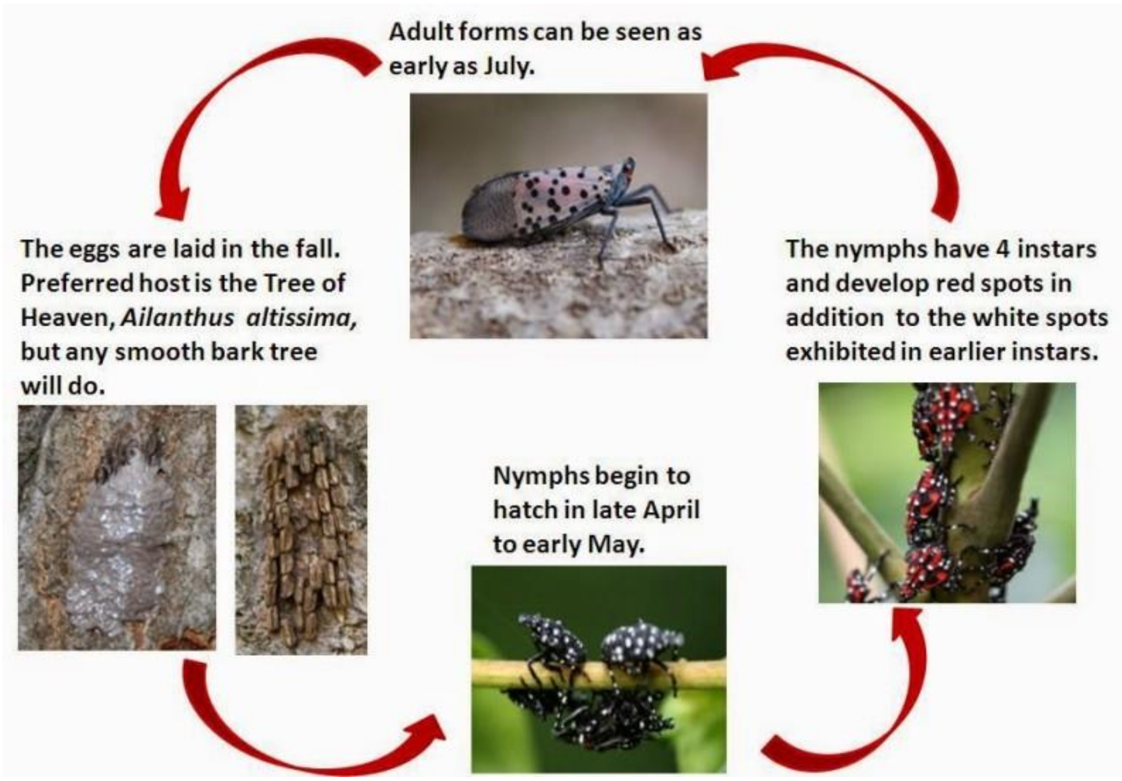

Figure 26: Life cycle of the spotted lanternfly

Figure 27: Photos of Tree-of-Heaven. Courtesy of USDA NRCS (L) and Northwest Michigan Invasive Species Network (R)

Weather and Abiotic Events (2, 10)

Derecho Damage

On August 10, a derecho, a complex of storms that created severe winds of over 75 mph as well as a number of weak tornados, tore through Iowa, Northern Illinois, and Indiana. In its wake, in addition to damage to homes, buildings, and crops, it left many downed trees in cities and state parks in the northern part of the state (Figure 28 and 29). Damage was widespread and many cities lost a large portion of their tree canopies.

Figure 28. Trees damaged by the August derecho in Kewaunee (Photo courtesy of Diana Kaskauskas).

Figure 29. Trees damaged by the August derecho at Starved Rock State Park (Photo courtesy of Diana Kaskauskas).

2020 Weather Trends

The weather for 2020 followed a pattern similar to what we have seen in previous years; very wet springs, followed by hot, dry weather the latter part of the summer. We started off the year with a warmer than normal January to March which resulted in some trees beginning to break dormancy. This was followed by a cold April and May (Figure 30). The first two weeks of May were cooler than normal and dry. A hard freeze occurred in early May and in some areas, young, newly emerging oaks were severely damaged giving the tree canopies a scorched appearance. This was particularly common in low areas and drainages where cold air tends to pool. The weather changed quickly, however, for the latter half of May had warmer temperatures and heavy rains which led to saturated soils and flooding. Rainfall amounts in May of 2020 (ORD=9.51 in. and MDW=7.65 in.) broke May of 2019 records, and May of 2019 records broke May of 2018 records (Figure 31). **All** of the five wettest Mays recorded at O'Hare airport have occurred since 2004, or to put it another way, "the wet springs have been very wet!" Additionally, most of northern Illinois experienced above average spring snowfall with totals ranging from less than 1 inch in central Illinois to over 6 inches along the I-80 corridor (Figure 32).

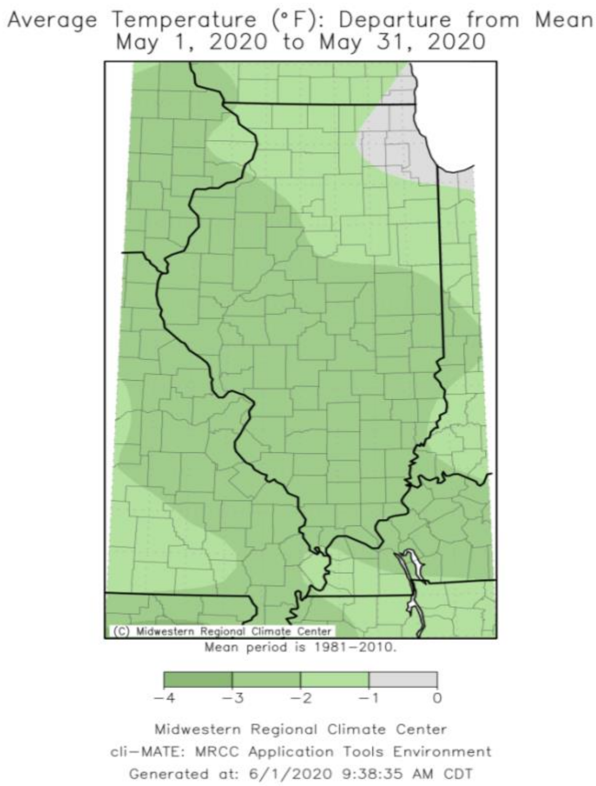

Figure 30: Average temperature (F) (departure from mean) for May, 2020

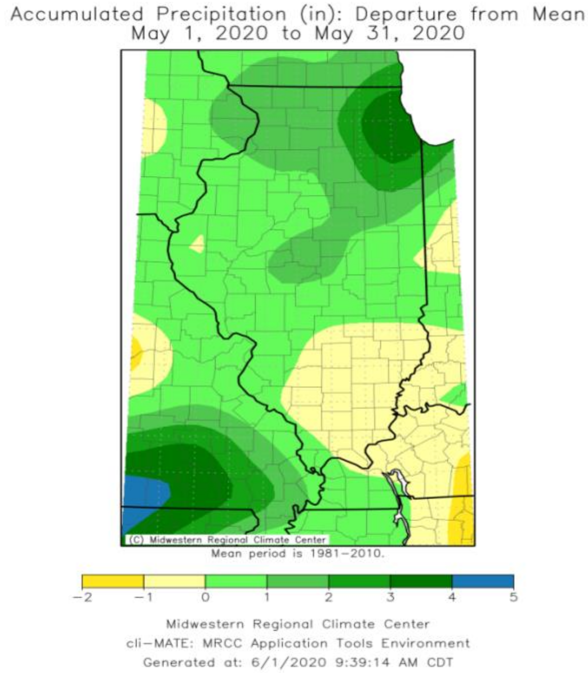

Figure 31: Accumulated precipitation (in.) departure from mean for May, 2020

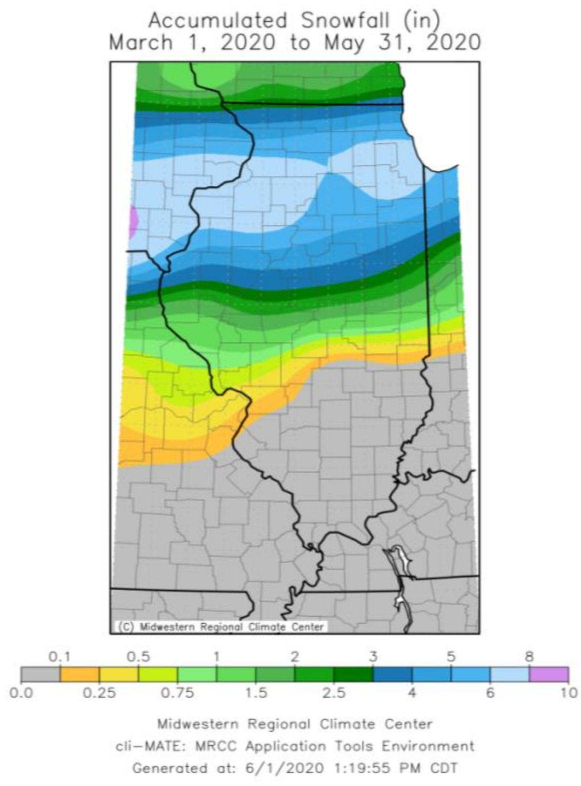

Figure 32: Accumulated snowfall (in.) for March – May, 2020

Once June arrived, precipitation began to moderate, but temperatures began to rise. By mid-July, it became warmer than normal (Figure 33) and there was very little precipitation, particularly for the northern half of the state (Figure 34). This pattern continued right on through August and September with very warm temperatures. By late August, most of the northern half of Illinois was in the abnormally dry to moderate drought categories with a slight break in September (Figures 34-38). Southern Illinois continued to receive rainfall.

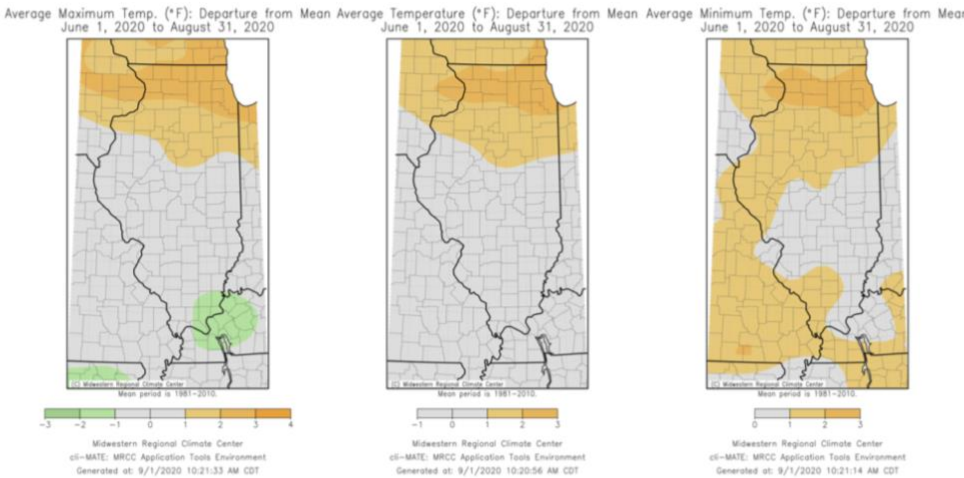

Figure 33: Mean maximum temperatures (F) and departure from mean for June through August, 2020

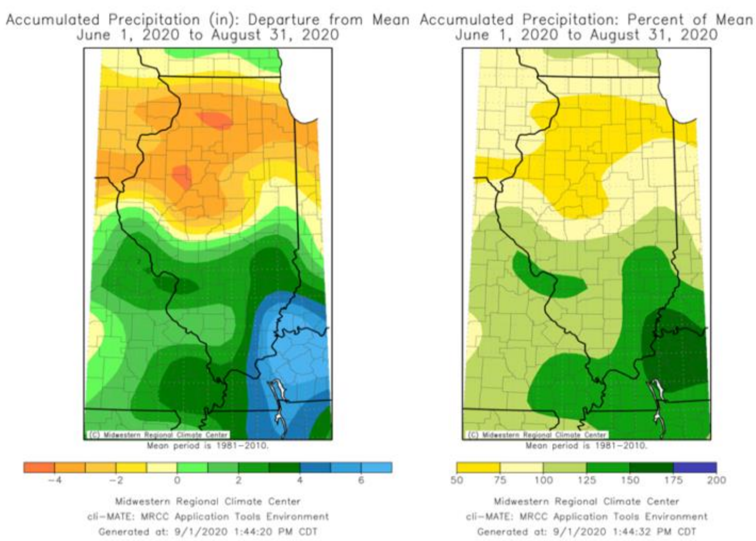

Figure 34: Accumulated precipitation (in.) and departure from normal for June through August, 2020

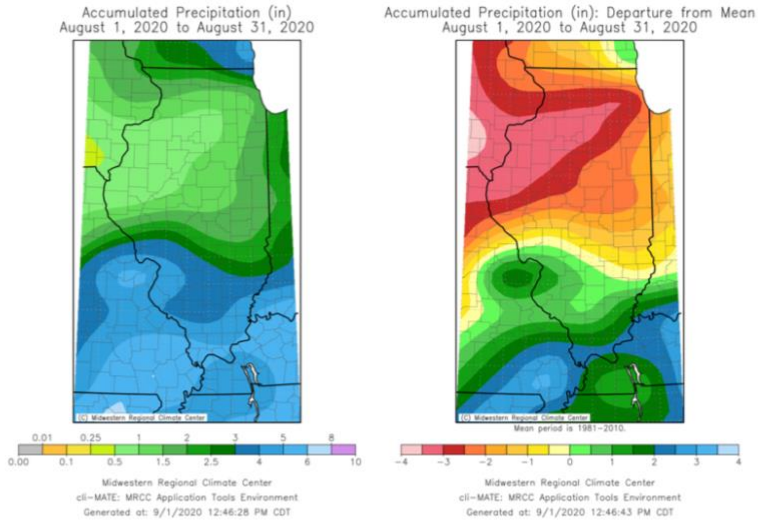

Figure 35: Accumulated precipitation (in.) for August, 2020

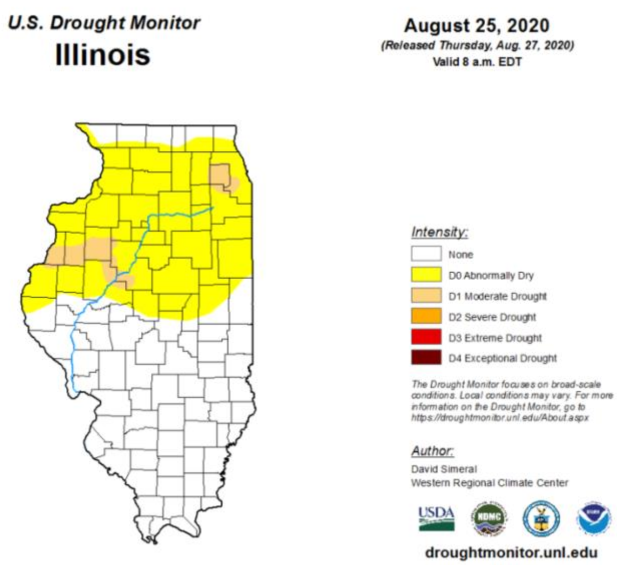

Figure 36: U.S. drought monitor for August, 2020

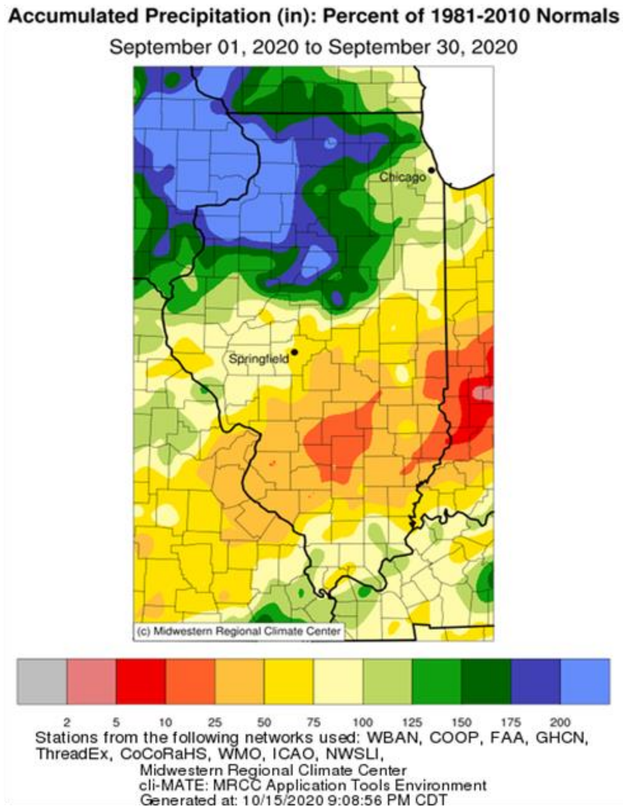

Figure 37: Accumulated precipitation (in.) for September, 2020

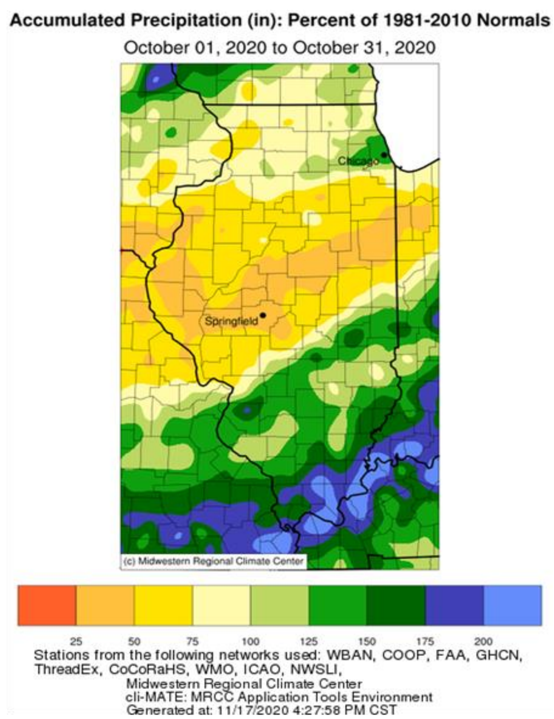

Figure 38: Accumulate precipitation (in.) for October, 2020

By November, conditions began to moderate in northern Illinois with the region exiting drought status. However, central Illinois continued to stay dry with abnormally dry to moderate drought (Figure 39). The first part of December was dry, at the time of this report; some moisture has been received along with seasonal temperatures.

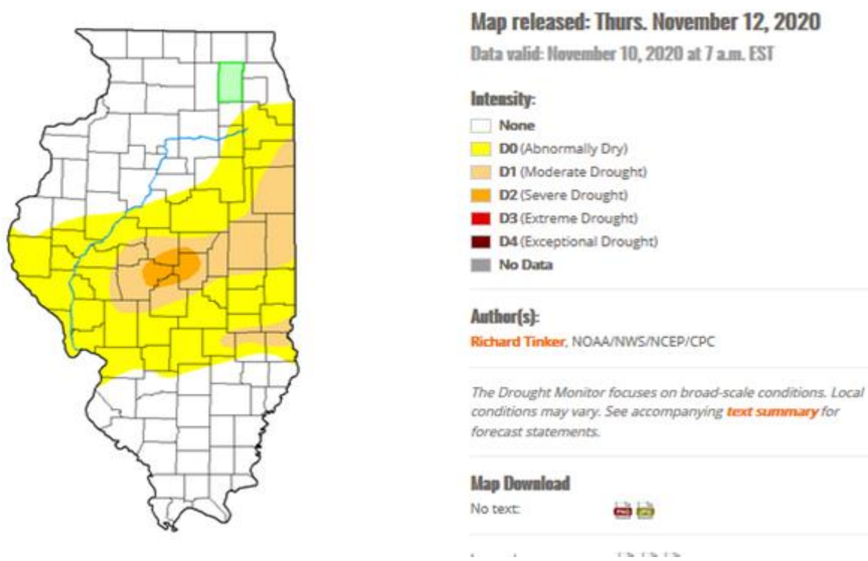

Figure 39: U.S. drought monitor for November, 2020

References

1. **Adams, S., 2016.** *The Morton Arboretum Diagnostic Plant Clinic and Plant Health Care Reports*. The Morton Arboretum, Lisle, Illinois.

2. **Angel, J. 2019. Illinois CoCoRaHS Newsletters.** Volumes 13: 1-12.

3. **California Oak Mortality Task Force.** Sudden Oak Death Homepage. https://www.suddenoakdeath.org/

4. **Cleveland, T. and D. Plewa. 2017.** University of Illinois, Home, Yard, and Garden Newsletter, Issue 15, 11 September 2017.

5. **Fraedrich, B.R. 2018.** Diagnosing and Preventing Herbicide Injury to Trees. Bartlett Tree Research Laboratories Technical Bulletin TR-43. 5 pp.

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

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

8. **Hettinger, J. 2019.** Despite federal, state efforts, dicamba complaints continue. Midwest Center for Investigative Reporting (August 27, 2019). https://investigatemidwest.org/2019/08/27/despite-federal-state-efforts-dicamba-complaints-continue/

9. **Hibbs, R. 1978.** Recognition of weed-killer injury to trees. Journal of Arboriculture 4(8): 189-191.

10. **Midwestern Regional Climate Center**. 2000-2019. cli-MATE: MRCC Application Tools Environment. https://mrcc.illinois.edu/CLIMATE/welcome.jsp

11. **Missouri Forest Health** Update (December, 2014). Pp. 5-6.

12. **Pataky, N. and S. Porter. 2008-2016.** *Woody Plant Disease Updates*. University of Illinois Plant Clinic (UIPC). Urbana, Illinois.

13. **Pennsylvania Department of Agriculture. 2019**. Spotted Lanternfly Alert. https://www.agriculture.pa.gov/Plants_Land_Water/PlantIndustry/Entomology/spotted_lanternfly/SpottedLanternflyAlert/Pages/default.aspx5.

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

15. **Sinclair, W.A. and G.W. Hudler. 1988.** Tree decline: Four concepts of causality. Journal of Arboriculture 14(2): 29-35.

16. **University of Kentucky.** Kentucky Pest News: Laurel Wilt Disease: A Threat to Kentucky Sassafras Trees. July 7, 2020. https://kentuckypestnews.wordpress.com/2020/07/07/laurel-wilt-disease-a-threat-to-kentucky-sassafras-trees/

17. **USDA APHIS.** Spotted Lanternfly. https://www.aphis.usda.gov/aphis/resources/pests-diseases/hungry-pests/the-threat/spotted-lanternfly/spotted-lanternfly

18. **USDA APHIS Hungry Pests**. Sudden Oak Death. https://www.aphis.usda.gov/aphis/resources/pests-diseases/hungry-pests/the-threat/sudden-oak-death/hp-sudden-oak-death

19. **USDA APHIS.** Laurel Wilt. https://www.invasivespeciesinfo.gov/terrestrial/pathogens-and-diseases/laurel-wilt

PLEASE NOTE: The information presented in this summary is not to be considered 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, Erin McMahan, M.Sc., Research Assistant, The Morton Arboretum, seasonal interns with The Morton Arboretum, IDNR Forest Health field technicians, IDNR district foresters, private landowners, homeowners, The Morton Arboretum Plant Diagnostic Clinic, and members of the green industry.

REPORT PREPARED BY: Fredric Miller, Ph.D. IDNR Forest Health Specialist, and Erin McMahan, M.Sc., Research Assistant, The Morton Arboretum, Lisle, Illinois.

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.