2022 Forest Health highlights ILLINOIS

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FOREST HEALTH ISSUES FOR 2022: AN OVERVIEW

2022 was a challenging year for trees. We started off the spring and early summer somewhat wet, and then in most parts of the state it turned hot and dry extending into fall and early winter. Some areas experienced heavy downpours that led to flooding, but precipitation was spotty and localized. On the bright side, the drier spring and early summer did help reduce the incidence of foliar diseases like apple scab, cedar apple rust, powdery mildew, anthracnose, needle tip blight of pines, junipers, and arborvitae, and needle cast diseases. Continuing statewide issues included herbicide injury to oaks and other hardwood tree species, decline of spruces and pines, and rapid mortality of white oaks and oak decline. Emerald ash borer (EAB) populations continued to progress in areas of central and southern Illinois. Throughout the field season, the Illinois Forest Health team was on the lookout for diseases such as Sudden Oak Death (SOD) and Laurel Wilt (LW) but fortunately, neither one was detected. Additionally, a statewide survey was initiated to determine the presence of Japanese stiltgrass and chafflower.

Note: The 2022 issue of Illinois Forest Health Highlights (IFHHs) will focus on new and emerging, and a few on-going forest health issues (i.e. spotted lanternfly, elm zigzag sawfly, laurel wilt, weather, rapid white oak mortality and oak decline, and herbicide drift damage) affecting forest tree and woody plant species. Be sure to check out new highlights including sudden oak death and laurel wilt surveys, invasive plant control, spotted lanternfly (SLF) updates, and a brief summary of 2022 weather. For details on chronic insect pests (i.e. EAB) and diseases (foliar and needle cast diseases, cankers), please refer to previous issues of Illinois Forest Highlights (FHHs).

PLANT DISEASES AND HERBICIDE DRIFT DAMAGE

Herbicide Drift Damage (2, 4, 5)

Signs of herbicide damage to trees continued to be reported statewide in 2022, particularly on state and private lands bordering agricultural fields.

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 1**). Root uptake of these chemicals is usually more damaging to the plant and on grape the leaves will cup upward (**Figure 2**). 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-emergence 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.

Figure 1. Suspected herbicide damage to oak leaves. Mature oak leaves displaying severe distortion, cupping, twisting and strapping due to suspected herbicide damage.

Figure 2. Herbicide damage on grape, most likely due to root intake (upward cupping leaves).

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**.

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
Amur cork tree	Honeylocust	
Birch	Mulberry	
Boxelder	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^{o}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 tree impacted, or is damage more widespread? Other maladies may mimic herbicide damage including low temperature injury, foliar diseases (i.e. anthracnose), insect feeding (i.e. plant bugs, leafhoppers), 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. 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 girdled roots present, and has there been a drought or flooding? Remember, most of the 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 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 and vitality 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. **A summary of herbicide leaf tissue sampling for 2018-2022 is presented in Figure 3.**

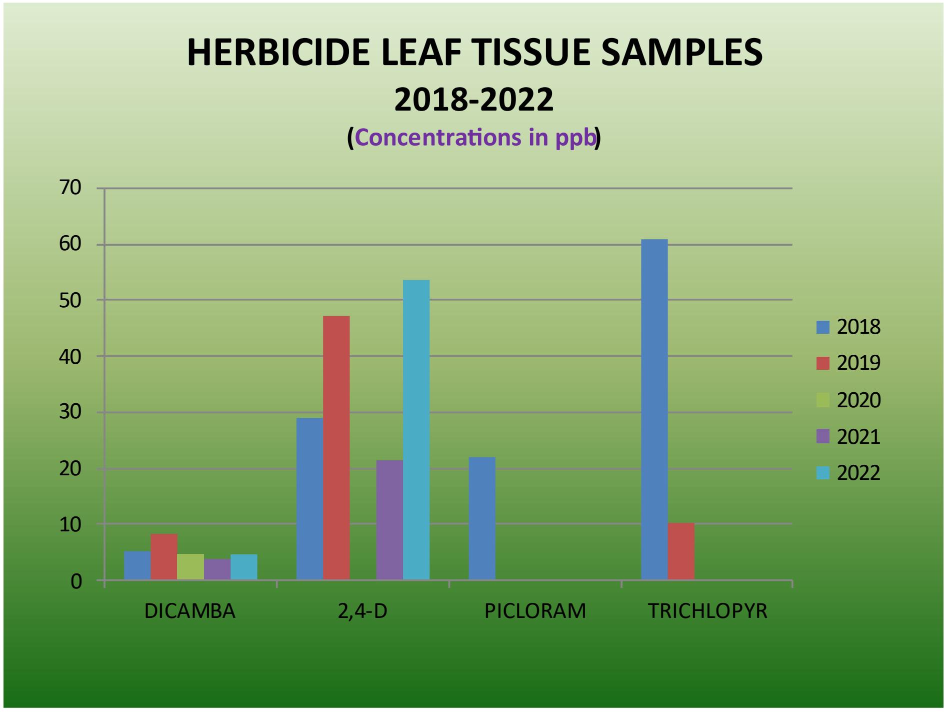


Figure 3. Summary of herbicide leaf tissue sample test results (ppb) for 2018-2022.

SUDDEN OAK DEATH (SOD) (1, 12, 14)

SOD is a disease of oaks caused by the pathogen *Phytophthora ramorum*, a water mold that also impacts over 100 other plant species throughout the world. The disease was originally detected in California in the 1990s and has since killed millions of oaks on the West Coast. The pathogen can spread through infected nursery stock and surface water. In 2020, it was detected in plants distributed to 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 and fall of 2022, surface waters around these locations were sampled and analyzed for the presence of *P. ramorum*. **To date, test results have been all negative and the pathogen was not detected. Testing will continue in 2023.**

LAUREL WILT AND THE REDBAY AMBROSIA BEETLE (10, 13, 15)

Another serious disease that we are monitoring for is Laurel Wilt. It is a fungal wilt disease caused by the pathogen *Raffaelea lauricola* which is spread primarily by the tiny redbay ambrosia beetle (*Xyleborus glabratus*) and several other beetle species. The disease has killed hundreds of millions of redbay (*Persea borbonia*) and swamp bay (*P. palustris*) trees, two important understory species, in the southeastern United States. The fungus also affects other members of the laurel family (Lauraceae) including sassafras (*Sassafras albidum*), spicebush (*Lindera benzoin*), and commercially grown avocado (*P. americana*) trees. 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, sawdust “noodles”, or fine sawdust can indicate their presence. ***For noodle images refer to https://www.forestryimages.org/search/action.cfm?q=ambrosia+beetle+noodle.***

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 western Kentucky, so the disease and the beetle vector were monitored for in 2020 and 2021 in southern and central Illinois. **To date, no symptomatic trees or redbay beetles were detected.** We will continue in 2023 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.

OAK WILT (7)

Oak wilt is found in every Illinois county and has become a major urban and forest tree disease. Oak wilt levels for 2022 were comparable to previous years. This fungal disease is lethal to oaks, particularly oaks in the red oak group, and trees must be treated preventatively with fungicides to insure survival. Anthracnose may be confused with oak wilt later in the season. **(Figure 6)** Be sure to properly diagnosis the problem before employing management options. Prevention is important, so remember not to prune between April and September, 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 of a diagnosis 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 previous issues of *Illinois Forest Health Highlights* (IFHHs).

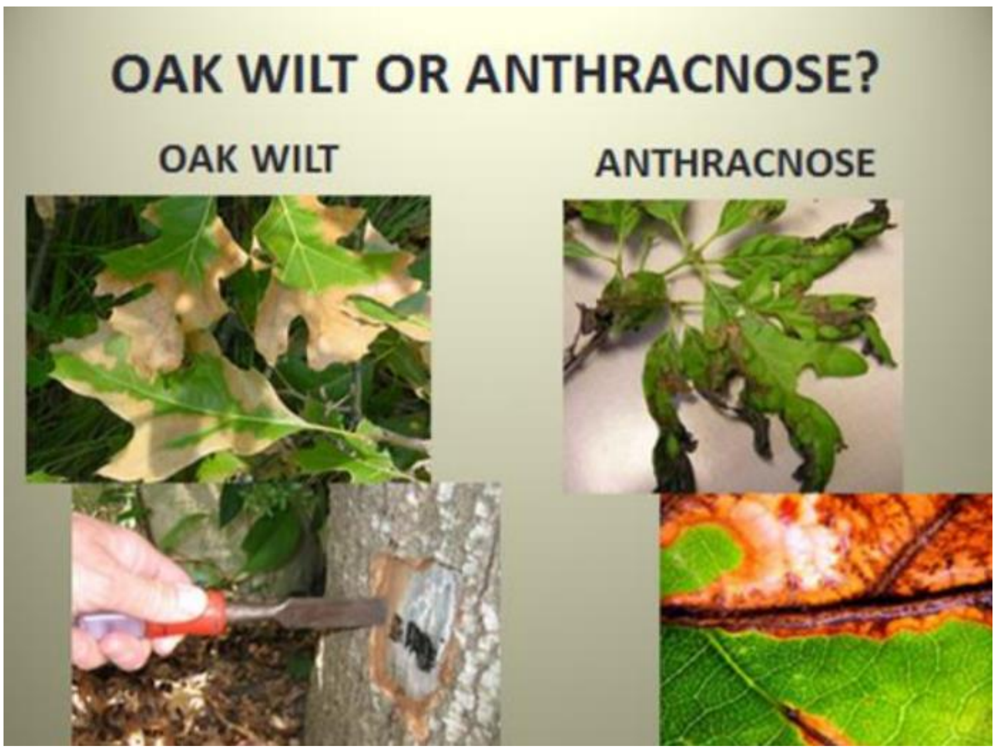


Figure 6. Side by side comparison of oak wilt and anthracnose symptoms in oak. The bottom left photo shows the dark streaking under the bark in oak wilt.

RAPID WHITE OAK MORTALITY (RWOM) AND OAK DECLINE (6)

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 2022 involving rapid decline (within one growing season) and death of white oaks and other oak species (**Figures 7 and 8**). Further monitoring and field studies are planned for 2022 to determine what factor(s) may be responsible for RWOM. Field observations in 2022 suggest that record breaking spring precipitation (i.e. 2017-2020) followed by hot, dry summers, may have led to a build-up of *Phytophthora* and other root-rotting fungal pathogens. The only way to accurately diagnose which pathogen is causing a root rot is through laboratory diagnosis. An intensive research effort is planned for 2023 to better understand the relationship between abiotic and biotic factors and their role in RWOM.

For additional details on RWOM, refer to *Missouri Forest Health Update* (December, 2014) pages 5-6 (11) and the *2020 Illinois Forest Health Highlight* (page 8).

Figures 7 and 8. White oaks dying from RWOM.

THOUSAND CANKERS DISEASE (TCD) OF EASTERN BLACK WALNUT

To date, neither the walnut twig beetle (WTB) or the TCD fungus has been detected in eastern black walnut trees in Illinois, and no new finds have been reported for areas of the eastern U.S.

NEW INVASIVE PESTS

Spotted Lanternfly (8, 11)

The spotted lanternfly (SLF) (*Lycorma delicatula*) has now been detected in many eastern and northeastern states and more recently, as close as Indiana. Native to China and found in India, Japan, Korea, and Vietnam, the SLF 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, initially black but develop red patches as they 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 9 and 10).** 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 July through August. Egg-laying begins in September and continues through November (**Figure 11**).

Upon egg hatch, the young nymphs disperse and begin feeding on a wide range of hosts 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*), black walnut (*Juglans nigra*), and grapevine (*Vitis vinifera*) as host plants. In the fall, the adults seek out 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. and can easily travel to new locations. Heavy feeding may lead to plant stress and 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 12),** 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.

Figure 9. Spotted lanternfly nymph (Left) and adult spotted lanternfly (Right).

Figure 10. Adult spotted lanternfly.

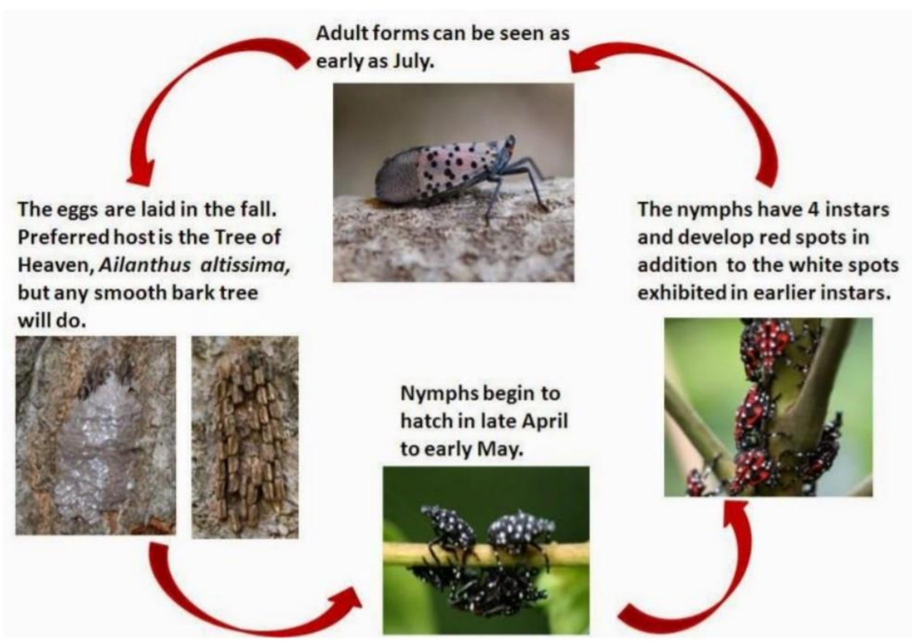


Figure 11. Life cycle of the spotted lanternfly.

Figure 12. Photos of Tree-of-Heaven. Courtesy of USDA NRCS (L) and Northwest Michigan Invasive Species Network (R).

Zig-zag Elm Sawfly (16)

What a name! The zig-zag sawfly (*Aproceros leucopoda*), which is native to Asia, found its way to Canada in 2000 and to the U.S (Virginia) in 2021. It is a defoliator of most elms, particularly Siberian elm (*Ulmus pumila*) and American elm (*U. americana*). The jury is still out as to whether it will be a serious problem for other elm species and hybrids. There is the potential for the insect to have important ecological impacts for elms used in urban forests and landscapes and the fact that 500 insect species depend on elms. The sawfly reproduces parthenogenetically (no males) and can have 4 to 6 generations per year (Scary!). The adults are strong flyers (can disperse 30 to 50 miles per year). The larvae feed from the edge of a leaf in a zigzag pattern. After pupation, very rapid adult emergence follows (**Figures 13 and 14**).

Figure 13. Elm zigzag sawfly larva and feeding damage.

Figure 14. Adult elm zigzag sawfly.

WEATHER AND ABIOTIC EVENTS: 2022 WEATHER TRENDS

The 2022 growing season was similar to 2021 with moderately wet conditions in late spring to early summer. However, by mid-summer, hot and dry conditions were common (**Figures 15 and 16**). This trend has continued into the fall and early winter with most areas of Illinois classified as moderately dry to severe drought (**Figures 17 and 18**). Where rainfall did occur, it was spotty and very localized. Areas of north-central and west-central Illinois received above normal fall (i.e. September) precipitation, while the rest of the state was well below normal (**Figure 19**). To date, very low precipitation conditions persist throughout the state.

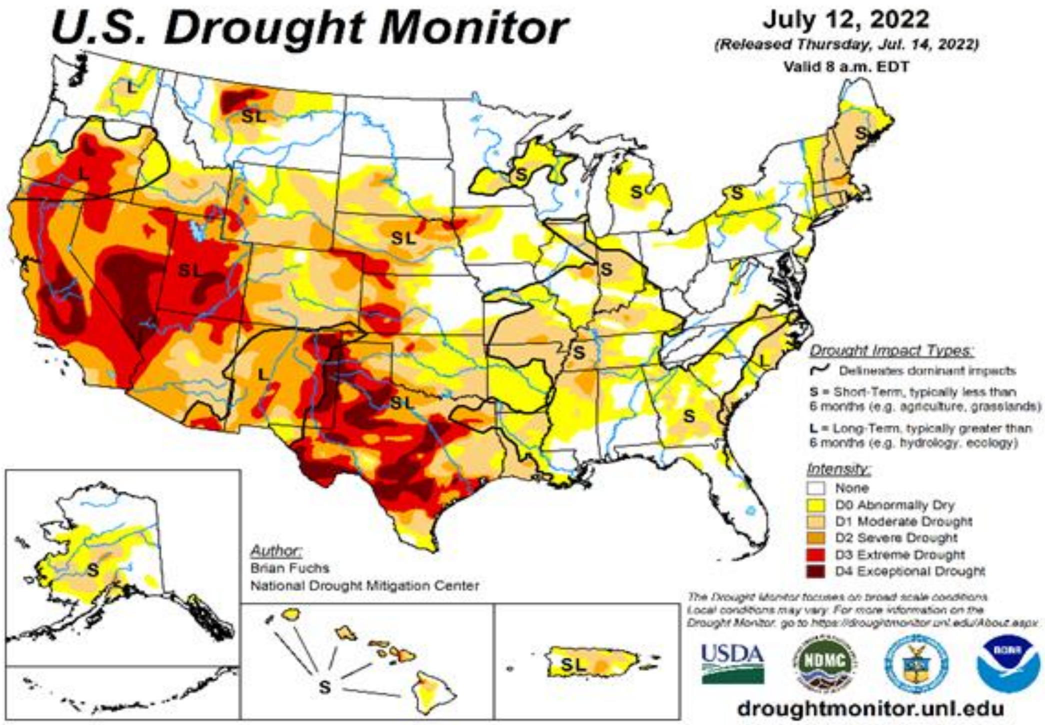
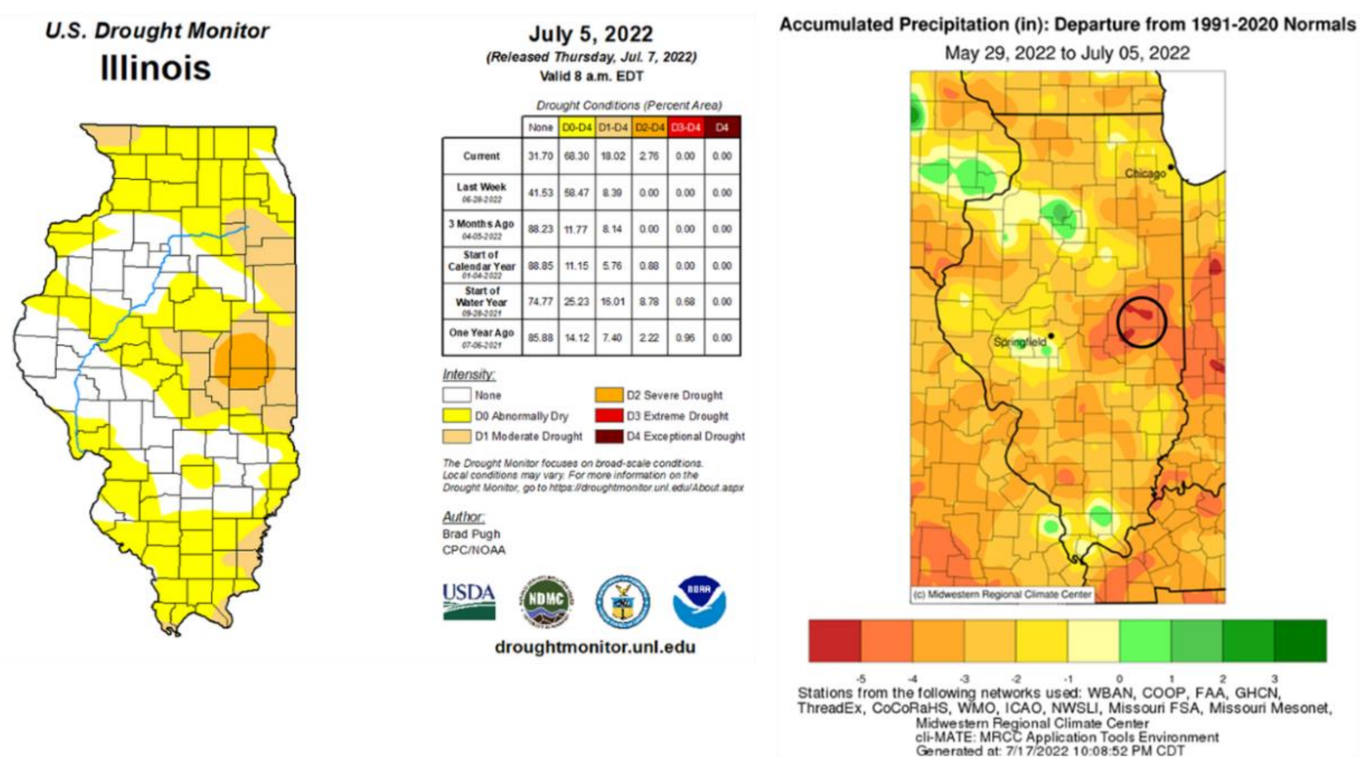


Figure 15. Nationwide drought monitor for July 2022.



	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
Current	31.70	68.30	18.02	2.76	0.00	0.00
Last Week 06-28-2022	41.53	58.47	8.39	0.00	0.00	0.00
3 Months Ago 04-05-2022	88.23	11.77	8.14	0.00	0.00	0.00
Start of Calendar Year 01-04-2022	88.85	11.15	5.76	0.88	0.00	0.00
Start of Water Year 09-28-2021	74.77	25.23	16.01	8.78	0.68	0.00
One Year Ago 07-06-2021	85.88	14.12	7.40	2.22	0.96	0.00

Figure 16. Illinois drought monitor index for July, 2022

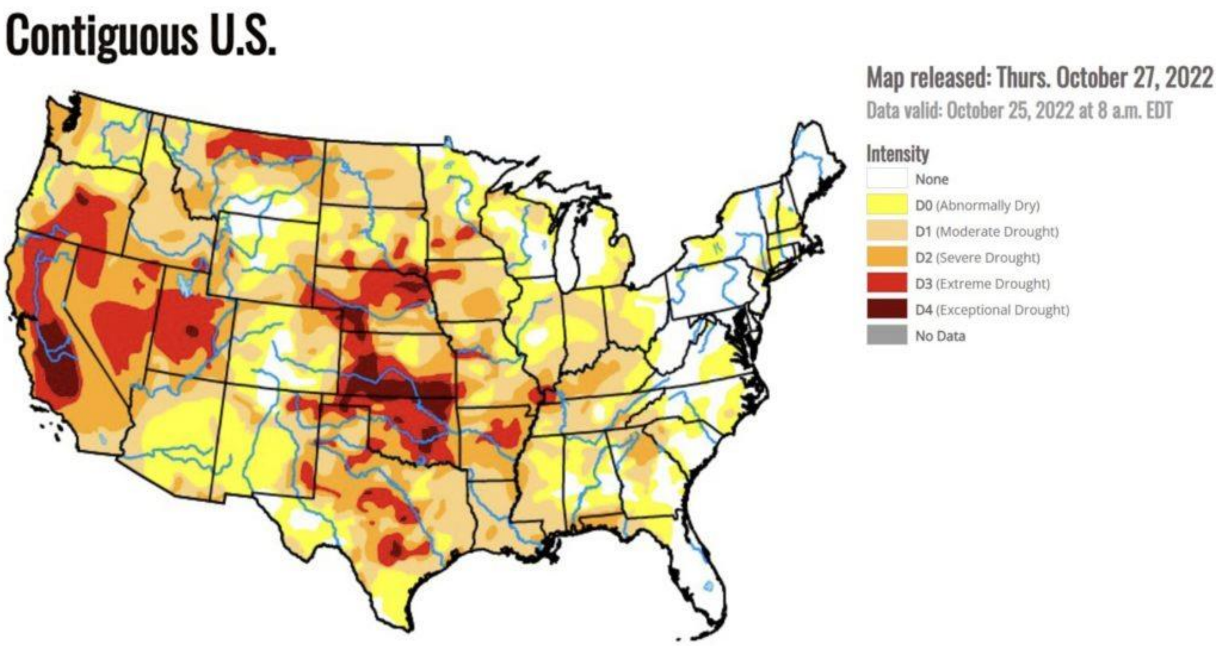


Figure 17. Drought monitor for October 2022.

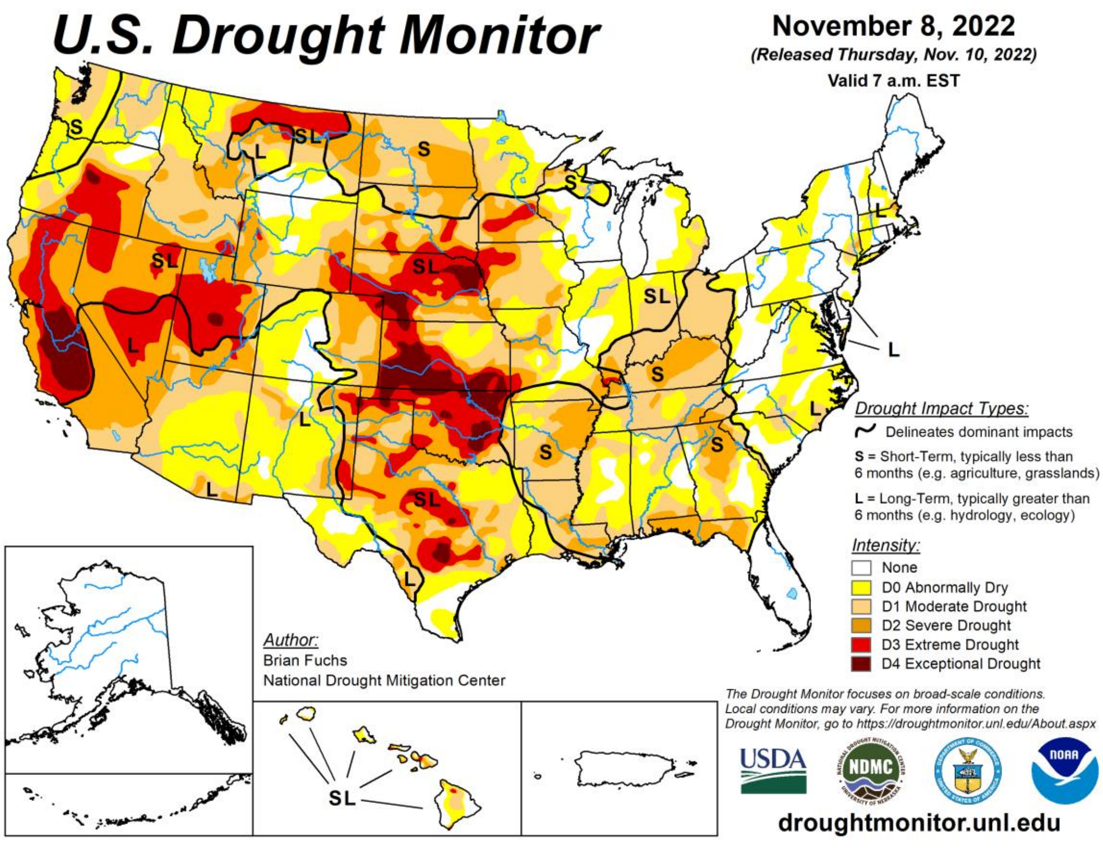


Figure 18. Drought monitor for November 2022.

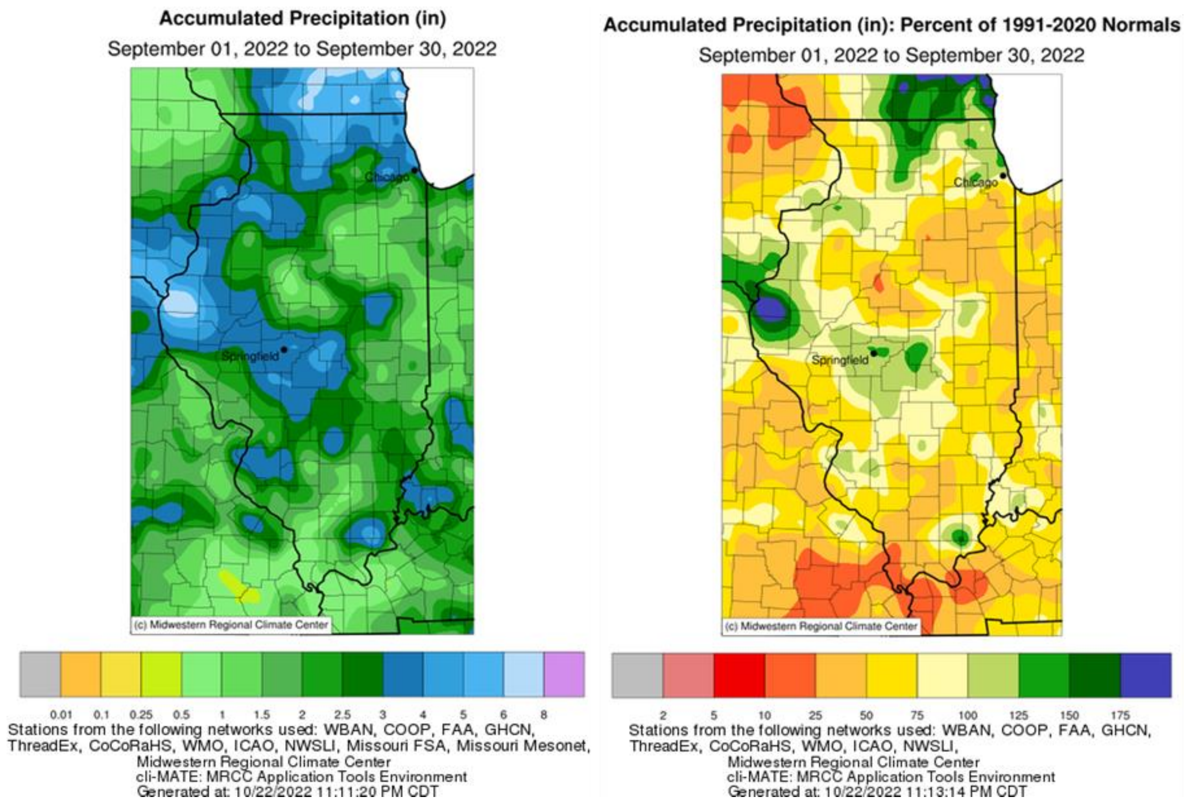


Figure 19. Accumulated precipitation (in.) (R) and departure from mean for September 2022 (L).

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PLEASE NOTE: *The information presented in this summary is not to be considered comprehensive or all inclusive. Information presented here is based on visual and observational surveys and reports by Fredric Miller, Ph.D., IDNR Forest Health Specialist, and Morton Arboretum, Research Interns., IDNR Forest Health field technicians, IDNR district foresters, private landowners, homeowners, The Morton Arboretum Plant Diagnostic Clinic, and members of the green industry.*

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