Missouri Forest Health Highlights 2020

Forest Health Program | Annual Report

Missouri Department of Conservation | mdc.mo.gov

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IN THIS ISSUE

EMERALD ASH BORER NEARLY STATEWIDE

The emerald ash borer (EAB), *Agrilus planipennis*, is an invasive beetle that has killed millions of ash trees in North America. It was initially discovered in the Detroit, Michigan area in 2002, but EAB likely entered that region at least a decade earlier via wood pallets and crating from China. EAB has now been detected in 35 US states and five Canadian provinces, stretching its range from Manitoba to Texas and Colorado to Maine.

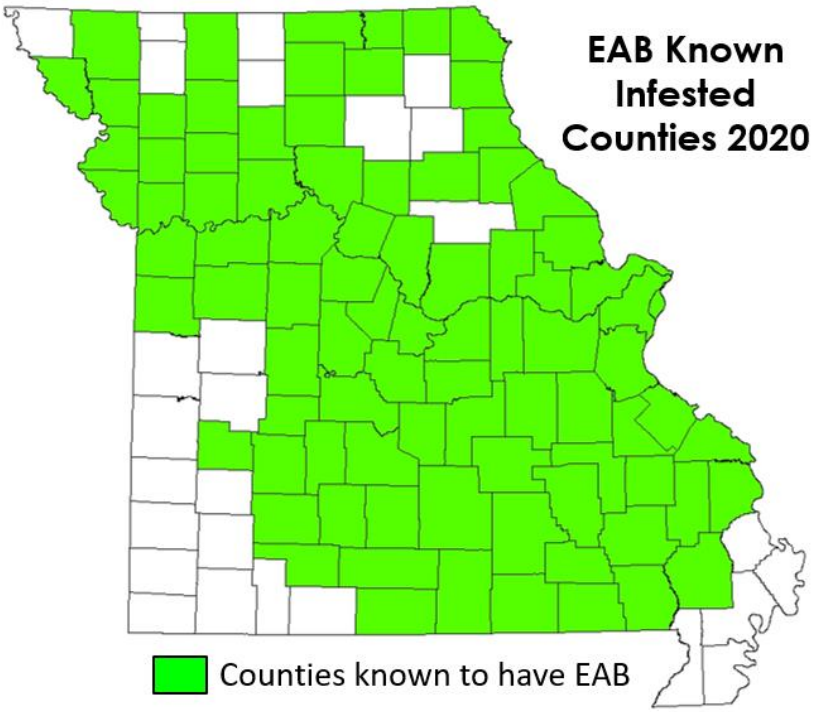

Figure 1: Missouri counties with EAB detections as of December 2020

Missouri's first detection of EAB came in 2008 in Wayne County, near Lake Wappapello. As of December 2020, 87 Missouri counties and the city of St. Louis are known to have EAB infestations. Twelve new county detections occurred during 2020: Carroll, Cedar, Chariton, Christian, Daviess, Johnson, Lafayette, Livingston, Moniteau, Monroe, Saline, and Sullivan.

The Missouri Department of Agriculture monitored 123 purple prism traps in 19 counties throughout the state in 2020. Trap locations included high-risk areas like campgrounds and municipal yard waste facilities. EAB was captured on traps in six counties this year.

The remaining six new EAB county detections came from the public and Missouri Department of Conservation staff observing bark blonding on ash trees. This bark damage is caused when woodpeckers search for insect larvae in trees and pop off the trees' outer bark to reveal highly noticeable, light-colored inner bark. To find new areas of EAB infestation, look for ash trees with bark blonding in late winter or early spring. **Please report suspected EAB infestations, especially if the location is in a new county where EAB has not yet been found.**

EAB populations can take a long time to build in an area. A county is often confirmed to have the pest several years before residents start noticing dying ash trees in forests and urban areas. Unfortunately, by the time trees are showing signs of bark blonding, it is usually too late to save them using an insecticide treatment. Affordable options are available to protect healthy, high-value ash trees from EAB. Please see details in the Emerald Ash Borer Management Guide for Missouri Homeowners.

EAB populations can expand slowly on their own to new areas, but EAB can move long distances in a short amount of time by hitchhiking in ash firewood. To slow the spread of EAB and other invasive forest pests, don't move firewood. Buy it as close as possible to the location you plan to burn it, or harvest firewood on site, if permitted.

For more information or to report possible EAB, send an email to Forest.Health@mdc.mo.gov.

Figure 2: Areas with high EAB populations experience extreme 'blonding' of ash trees as woodpeckers remove bark in search of larvae.

LAUREL WILT OF SASSAFRAS

In 2019 laurel wilt was detected killing sassafras trees in several counties in western Kentucky and Tennessee. Since then, infested areas in these states continue to expand and include a recent detection in a western Tennessee county that borders the Missouri bootheel (see map).

Laurel wilt is a tree-killing insect and disease complex, which consists of the invasive redbay ambrosia beetle and its fungal counterpart, *Raffaelea lauricola*. When introduced to trees by the redbay ambrosia beetle, the fungus causes a lethal vascular wilt disease of sassafras and other plants in the Lauraceae family. In addition to killing sassafras, research has shown that spicebush and endangered pondberry are also susceptible to laurel wilt.

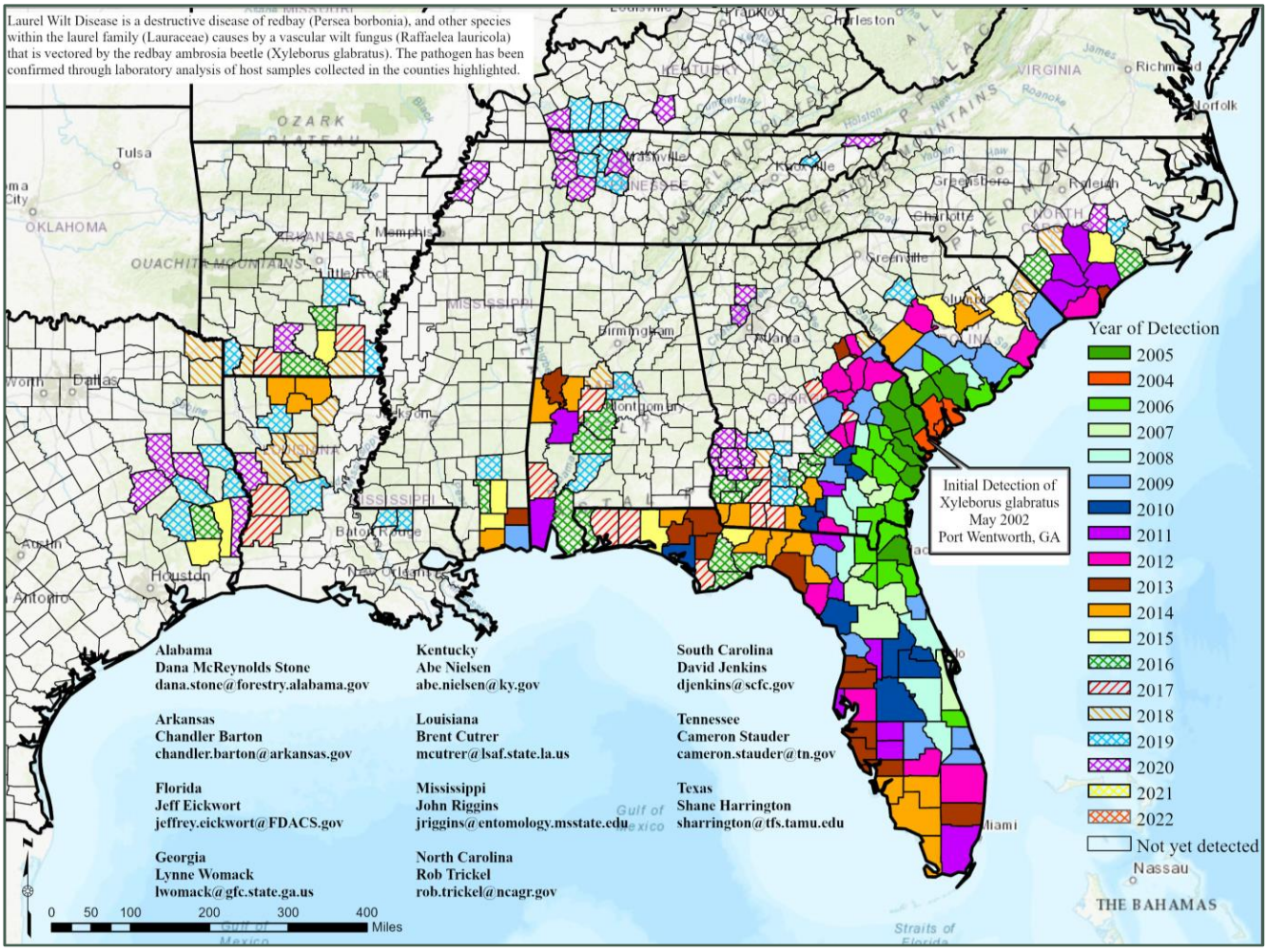

Figure 3: Current distribution of laurel wilt disease positive counties by year of initial detection.

Figure 4: Streaking in the sapwood is a sign of laurel wilt in sassafras. Image: J Slye, NCFS.

Symptoms of laurel wilt on sassafras include rapidly wilting leaves that turn reddish-brown, dark staining in the sapwood, and small ambrosia beetle exit holes in the bark. Occasionally frass 'toothpicks' can be found coming out of exit holes. Entire clumps of sassafras may wilt, as the disease can quickly spread through lateral roots to nearby trees.

Although laurel wilt has not yet been identified in Missouri, expanding infestations in neighboring states and the recent find near the Tennessee-Missouri border mean that this tree-killing pest could arrive at any time. MDC's Forest Health staff ask Missourians to report dying sassafras by sending an email to Forest.Health@mdc.mo.gov.

Figure 5: Laurel wilt is a vascular disease that can easily spread through lateral roots, causing entire clumps of sassafras to wilt. Image: Chip Bates, Georgia Forestry Commission.

THOUSAND CANKERS DISEASE UPDATE

Identified in 2008, thousand cankers disease (TCD) is a disease complex consisting of the tiny walnut twig beetle (*Pityophthorus juglandis*) and a fungus (*Geosmithia morbida*) it carries to walnut trees. In Missouri, black walnut is the primary species susceptible to TCD.

TCD is the result of walnut twig beetles tunneling into the bark of walnut branches where they feed on the phloem and introduce *Geosmithia morbida*. As the fungus grows, it creates areas of infected tissue called cankers. Thousands of small cankers, along with walnut twig beetle tunnels, can coalesce to girdle branches, resulting in a decline in tree health and ultimately, tree death. Recent research suggests that the severity of TCD in eastern states is related to site and environmental conditions, including drought.

Survey and detection work for TCD is ongoing in Missouri. To date, the walnut twig beetle has not yet been detected, and Missouri is not known to have TCD.

Figure 6: Walnut twig beetle tunnel and cankering under the bark of a small walnut branch (left). Walnut twig beetle trap in a walnut tree (right). Images: MDC.

TCD Survey

In 2020, MDC and the Missouri Department of Agriculture conducted surveys for TCD using USDA Forest Service and USDA Farm Bill funding, respectively. Survey activities this year included 250 walnut twig beetle traps in walnut trees or at sawmill log piles, as well as 280 visual surveys to identify potentially infested trees. Trapping and visual surveys occurred at high-risk locations within 43 counties in central, east-central, northwest, and southwest Missouri. Branch samples were collected from symptomatic trees for lab evaluation; results showed none had any evidence of TCD. Analysis of trap catches is ongoing, but at this time there is no evidence of walnut twig beetle at any surveyed location. Since 2010, there have been 2,905 locations visually surveyed and 1,756 WTB traps deployed.

Since early detection of TCD is difficult, reports of walnut tree dieback and decline are very important. Visit the MDC Learn how to Identify TCD webpage to learn more about the symptoms of TCD. Please report symptomatic walnut trees to Forest.Health@mdc.mo.gov.

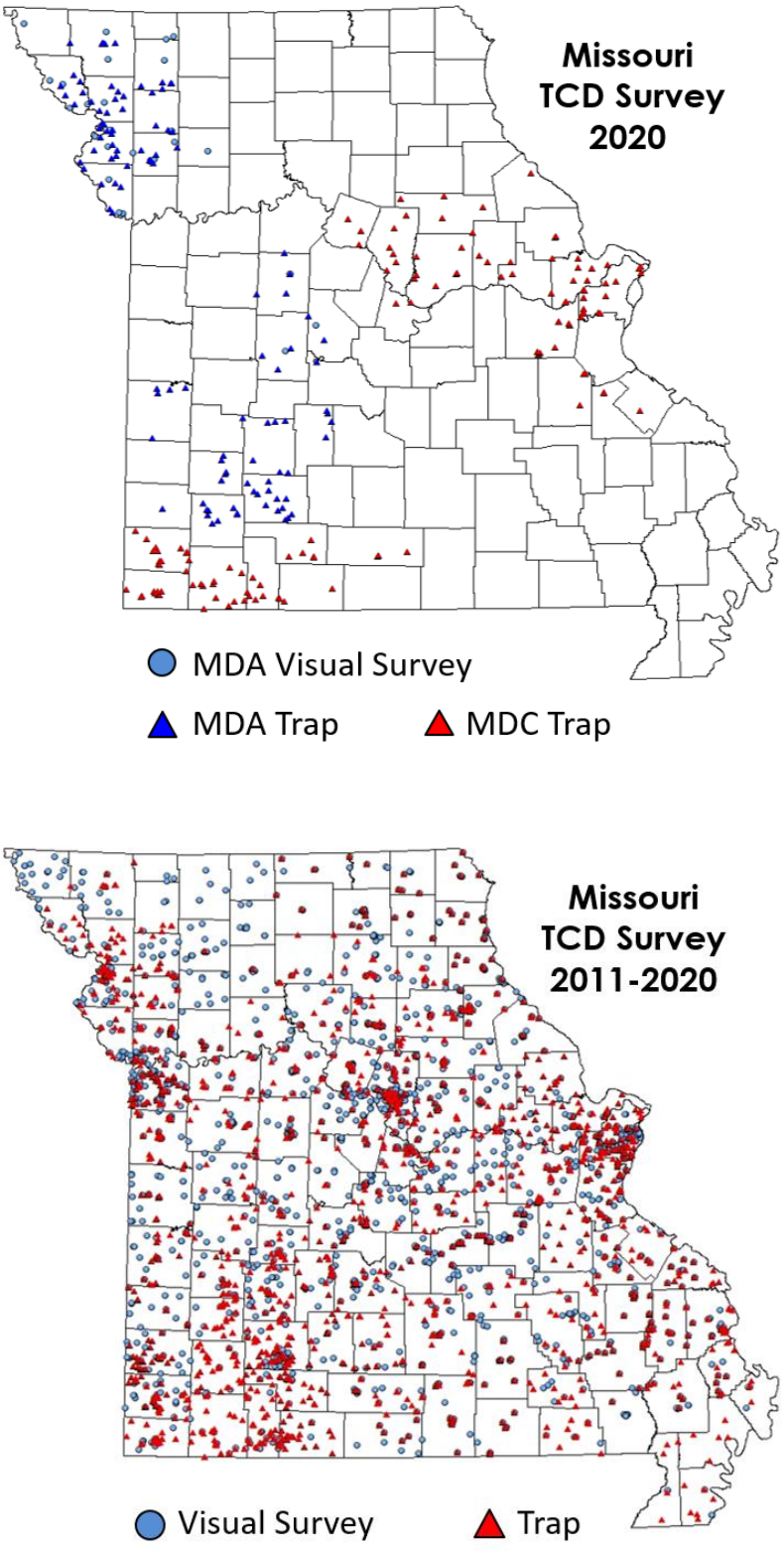

Figure 7: Locations of TCD traps and visual survey in 2020 (top), and all trap and visual survey locations since 2011 (bottom).

GYPSY MOTH SURVEY RESULTS

The multi-agency Missouri Cooperative Gypsy Moth Program conducted its annual survey to detect the presence of gypsy moth (*Lymantria dispar*) by placing and monitoring 6,894 traps in 70 counties. Four male European gypsy moths were captured statewide in 2020; one in St. Charles County, one in St. Louis City, and two in St. Louis County. Next summer, the areas where moths were captured will be intensively surveyed to confirm no breeding populations of gypsy moth are present.

Missouri is not known to have any established populations of gypsy moth. It is very easy, however, to transport gypsy moth egg masses to our state accidentally. People moving to Missouri from gypsy moth-infested states are legally required to examine all outdoor articles for tan, fuzzy egg masses. Please remove these masses before moving items to Missouri.

Figure 8: Sticky traps containing gypsy moth pheromone are used to survey for the gypsy moth (left). Four male European gypsy moths were captured in sticky traps in Missouri in 2020 (right). Images: MDC.

2020 WEATHER UPDATES

Late Spring Frost

A hard freeze in mid-April caused damage to trees in various parts of the state. Depending on the location, differences in spring phenology resulted in damage ranging from injury to expanding leaves and buds, to branch dieback and late leaf out. In parts of the Missouri Ozarks, frost pockets resulted in cold injury to trees growing in low-lying areas. Expanding leaves in these areas were severely injured and trees reflushed several weeks later. As the season progressed, this damage resulted in valleys where trees were significantly further behind than those on the hilltops, with a distinct division between affected and non-affected trees.

Figure 9: Magnolia foliage and flower with cold injury. Image: MDC.

In other parts of the state, cold injury to buds resulted in trees that leafed out much later than expected or had distorted, misshapen leaves. This type of damage is sometimes confused with herbicide injury, insect feeding, or disease. Cold injury to buds or stems may be difficult to identify due to the amount of time between damage and appearance of symptoms. For this reason, it is useful to make note of late frosts or abnormally cold spring weather events and keep them in mind later in the growing season when diagnosing tree health concerns.

Figure 10: Cold injury to newly expanded leaves on oaks resulted in trees that dropped their leaves and reflushed several weeks later. Image: MDC.

Another Good Year for Anthracnose

The term anthracnose refers to a set of disease symptoms caused by several different pathogens and affect a variety of trees. Severity of disease depends on weather conditions, timing, growth stage and the host species. While anthracnose diseases affect many deciduous trees, including oak, ash, and maple, sycamore was the most commonly affected in Missouri in 2020. Sycamore anthracnose is among the more serious of the anthracnose diseases.

Sycamore anthracnose was reported across much of the state this spring due to prolonged cool, rainy weather that created ideal conditions for the pathogen, *Apiognomonia veneta*. Symptoms of sycamore anthracnose include leaf and shoot blight, twig cankers, dieback, and even branch deformity over time. Infected leaves display purple-brown lesions along major veins or may be stunted due to cankers in twigs. Repeated loss of buds and twigs due to cankers can cause dieback and deformity of branches.

Many anthracnose-infected sycamores dropped their first set of leaves but put out a new flush by mid-summer when warm, dry conditions returned. Trees severely affected by anthracnose typically survive with good tree care. For more information on anthracnose, as well as treatment and care recommendations for diseased trees, visit the Anthracnose of Shade Trees Forest Health Alert.

Figure 11: Severe anthracnose infection can cause sycamore trees to drop their first flush of leaves. Image: MDC.

ARMILLARIA ROOT ROT

Throughout the summer and fall, MDC Forest Health staff identified Armillaria root rot in numerous urban and landscape trees. Armillaria root rot is a common root disease of trees caused by several closely related species of Armillaria fungi. This native disease can affect many tree species but is most frequently observed on oak, maple, and elm in Missouri.

Armillaria infections frequently go unnoticed as the fungi parasitize the root systems of living trees. Often, Armillaria is identified late in in the infection, and only then by removing the bark on major roots or the root collar to expose white mycelial tissue. In some species, such as sassafras, armillaria infection can result in dark sap weeping through the bark.

Symptoms of Armillaria root rot initially include stunted leaves, reduced tree vigor, and canopy thinning. As the disease progresses, significant branch dieback becomes noticeable and root and heart rot weaken the structural integrity of trees. In some cases, the disease progresses quickly, resulting in trees that wilt suddenly in late summer. These symptoms can be similar to those of other diseases, making it easy to misdiagnose Armillaria.

Figure 12: Trees suffering from Armillaria root rot often display symptoms of decline, including branch dieback, thin canopy, and discolored leaves (top). Removing the bark from the root collar of the above tree revealed white mycelial "fans" characteristic of Armillaria (bottom). Images: MDC.

When weather conditions are favorable in early fall, Armillaria can produce masses of light-brown honey mushrooms at the bases of trees or from roots near the soil surface. This year, Armillaria mushrooms were widely reported across the state, especially in Missouri's St. Louis and central regions. While the mushrooms can be helpful in identifying Armillaria, tree health professionals should not rely on the presence of mushrooms for diagnosis.

In urban or yard settings, Armillaria root rot can result in hazardous trees and difficulty establishing new trees. Read more about this disease in the Armillaria Forest Health Alert, available on the MDC Missouri Forest Health news webpage. The Forest Health Program also has a new fact sheet available with photos and tips for identifying Armillaria in the field. Please email Forest.Health@mdc.mo.gov if you would like a copy of this fact sheet.

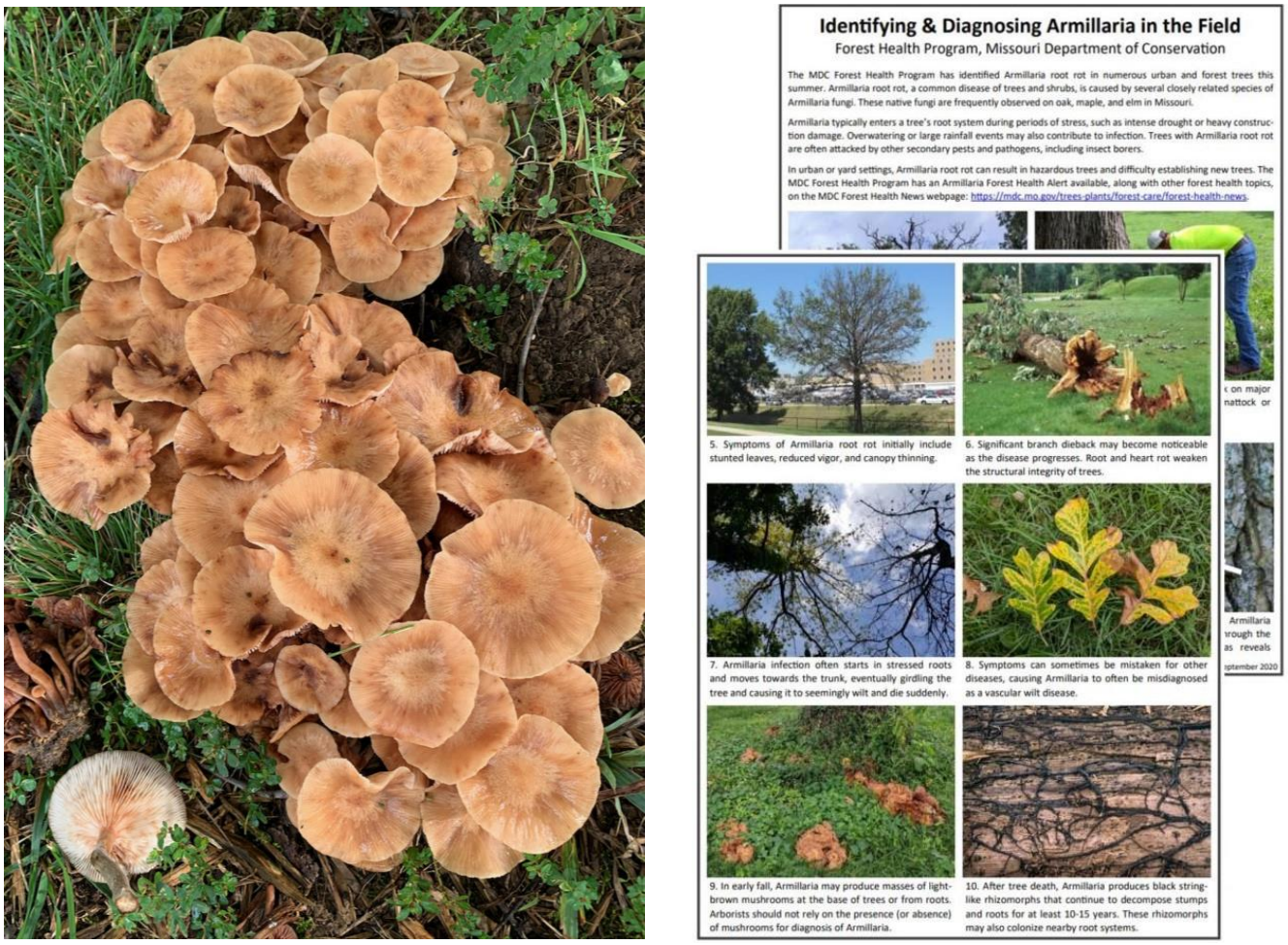

Figure 13: When conditions are favorable in early fall, clusters of brown Armillaria mushrooms may form on the base or roots of infected trees (left). The MDC Forest Health Program has a fact sheet titled "Tips for Identifying and Diagnosing Armillaria in the Field" available upon request (right). Images: MDC.

MULTIPLE REPORTS OF PINE BARK ADELGID

The pine bark adelgid (*Pineus strobi*) is occasionally observed in Missouri on mature eastern white pine. During the spring and summer of 2020, it was reported in nearly a dozen locations around the state. It is unclear if recent mild weather patterns or some other factor led to the increased number of reports. Fortunately, natural enemies are likely to control these sap-feeding insects in the upcoming growing season, reducing their populations naturally without the need for insecticides.

Figure 14: Large numbers of pine bark adelgid result in a white waxy coating on the trunk or branches of eastern white pine. Images: MDC.

HERBICIDE INJURY COMMON ON TREES

If you follow agricultural news, you have likely heard about some of the herbicide concerns in Missouri and surrounding states. Since the 2017 growing season, millions of acres of crops—from soybeans to peaches, grapes, and watermelons—have been injured by new over-the-top formulations of dicamba and 2,4-D used on soy and cotton fields. Injury has also been reported on many different tree species in both yard and forest settings. For more in-depth information, view MDC Forest Entomologist Robbie Doerhoff's 2020 EAB University Webinar on YouTube: https://youtu.be/ZdxeoX2QobY.

The appearance of herbicide injury symptoms on an individual tree varies based on the tree's species and its relative health, the time of year, and the herbicide used. Herbicide injury symptoms caused by dicamba or 2,4-D generally include curled, cupped, pale, twisted, and/or strap-like leaves. In some cases, the tips of twigs can be twisted and deformed or even killed. Large trees severely injured by these herbicides typically have thin crowns and few normal leaves. Oaks, sycamore, redbud, and bald cypress are particularly sensitive.

Figure 15: White oak with thin canopy and distorted leaves caused by a growth-regulating herbicide. Images: MDC.

Trees often recover from moderate herbicide injury, but severe or repeated damage may ultimately lead to tree decline and death. It's best to take a wait-and-see approach—some trees may make a full recovery within a couple of growing seasons. To help trees recover, provide supplemental water 2-3 times per month during dry periods (aim for 10 gallons of water per diameter inch). Encourage the growth of fine feeder roots by installing a 3 inch-deep organic mulch ring. Avoid fertilizing injured trees for at least a year so as not to encourage excess growth.

Unfortunately, the US Environmental Protection Agency recently decided to renew the registrations on over-the-top dicamba products for another five years, despite the vast amount of herbicide injury that has been reported since the release of these formulations in 2017. If you notice herbicide injury on your trees or garden plants in 2021, report the damage to the Missouri Department of Agriculture's Bureau of Pesticide Control. You can fill out an online form at http://agriculture.mo.gov/plants/pesticides/incidentreport.php.

Figure 16: Willow oak with moderate (left) and severe (right) herbicide injury. Image: MDC.

FIREWOOD: CAMPGROUND OUTREACH

The MDC Forest Health Program is working with campground and RV park owners to help spread the message of safe firewood usage and the importance of not moving firewood. There is a variety of free outreach items available for campground and RV park offices, including a new "What's in Your Firewood Brochure", brochure holders, magnet notepads, pens, kid activity sheets, and crayons.

Figure 17: A variety of outreach items are available to campgrounds and RV park offices. Image: MDC.

If you know of a campground or RV park office interested in obtaining any of these free items, please send an email to Forest.Health@mdc.mo.gov.

Questions?

Contact your local Forester with the Missouri Department of Conservation.

Find contact information for your county at:

mdc.mo.gov

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This 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.