Missouri Forest Health Highlights 2023

Forest Health Program | Annual Report

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Emerald Ash Borer in 110 Counties

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 36 US states and five Canadian provinces, stretching its range from Manitoba to Texas and Oregon to Maine.

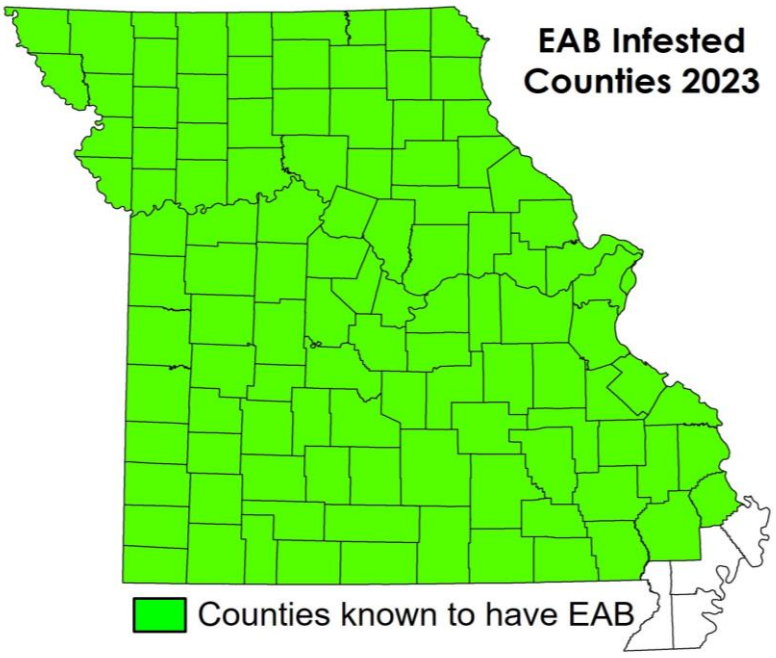


Figure 1: Missouri counties with EAB detections as of Dec. 2023.

Missouri's first detection of EAB came in 2008 in Wayne County, near Lake Wappapello. As of December 2023, 110 Missouri counties and the city of St. Louis are known to have EAB infestations. The Missouri Department of Agriculture monitored 54 purple prism traps in eight counties in 2023. Trap locations included high-risk areas like campgrounds and municipal yard waste facilities in both southeast and southwest Missouri. EAB was captured on traps in four new counties this year: Barton, Jasper, McDonald, and Vernon. Barry, Bates, and Scott counties were confirmed through larval detections in blonded trees. The final confirmation, Newton County, came from a concerned arborist noticing damage and capturing EAB adults.

Reports of EAB continue to increase across the state from MDC staff and private landowners observing bark blonding on ash trees. This bark damage is caused when woodpeckers search for insect larvae in ash trees and dislodge 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 one of the four Bootheel counties where EAB has not yet been found.

EAB populations can take a few years to build in an area. A county is often confirmed to have the pest 3-5 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-killed trees rapidly lose wood strength due to drying and fungal decay. These trees can be incredibly hazardous, posing a risk to life and property if not removed promptly. Vibrations from chainsaws or other heavy equipment can cause unexpected failures of large branches or even entire trees, so exercise extreme caution around dead and dying ash.

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: During the winter, look for woodpecker damage on the bark of ash trees, known as blonding, as an indication of EAB (left). Peeling back the bark on heavily blonded trees reveals an intricate network of EAB galleries (right). Images: MDC.

Laurel Wilt of Sassafras

In 2020, laurel wilt was detected killing sassafras in several counties in western Tennessee, just a few miles from Missouri's southeastern border. Given the proximity of this known infestation, MDC conducted a laurel wilt survey in 10 southeastern Missouri counties in the summer of 2023, placing 16 traps for the redbay ambrosia beetle and completing 56 visual surveys on sassafras. Trap catch analysis is ongoing, but to date, MDC Forest Health staff has not been able to confirm the presence of this deadly tree disease in Missouri.

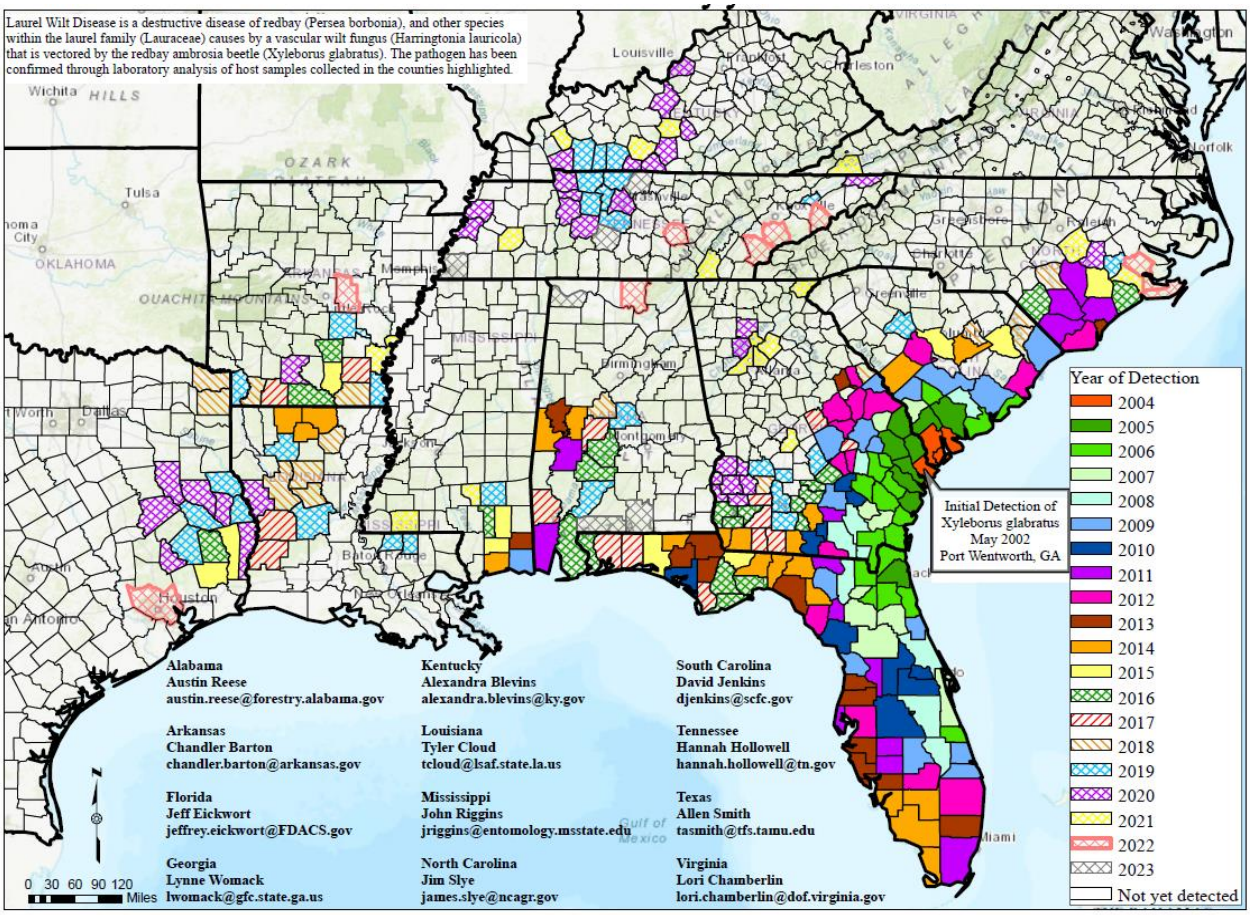


Figure 3: Current distribution of laurel wilt disease-positive counties by year of initial detection. Map created by Lynne Womack using the Laurel Wilt Public Dashboard (map date October 16, 2023).

Laurel wilt is a tree-killing insect and disease complex, which consists of the invasive redbay ambrosia beetle (*Xyleborus glabratus*) carrying a fungal counterpart, *Raffaelea lauricola*. When the redbay ambrosia beetle bores into trees, the fungus causes a lethal vascular wilt disease of sassafras and other plants in the Lauraceae family. In addition to killing sassafras, both spicebush and pondberry (a shrub already endangered by wetland habitat loss) are susceptible to laurel wilt.

Figure 4: Streaking in the sapwood is a sign of laurel wilt in sassafras. Image: Ellen Crocker, University of Kentucky.

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. Fragile frass 'toothpicks' can be found coming out of beetle 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 2020 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: Ellen Crocker, University of Kentucky.

Thousand Cankers Disease Update

First described 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. Research has suggested that the severity of TCD in eastern states (the native range of black walnut) 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 2023, MDC and the Missouri Department of Agriculture surveyed for TCD using USDA Forest Service and USDA Farm Bill funding, respectively. Trapping and visual surveys were conducted at high-risk and natural forest locations within 49 counties in the southwest and central parts of the state.

Survey activities this year included 239 walnut twig beetle traps in walnut trees or at sawmill log piles, as well as 294 visual surveys to identify potentially infested trees. Analysis of 2023 trap catches is ongoing, but no walnut twig beetles have been found to date. Since 2011, there have been 3,676 locations visually surveyed and 2,388 traps deployed.

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

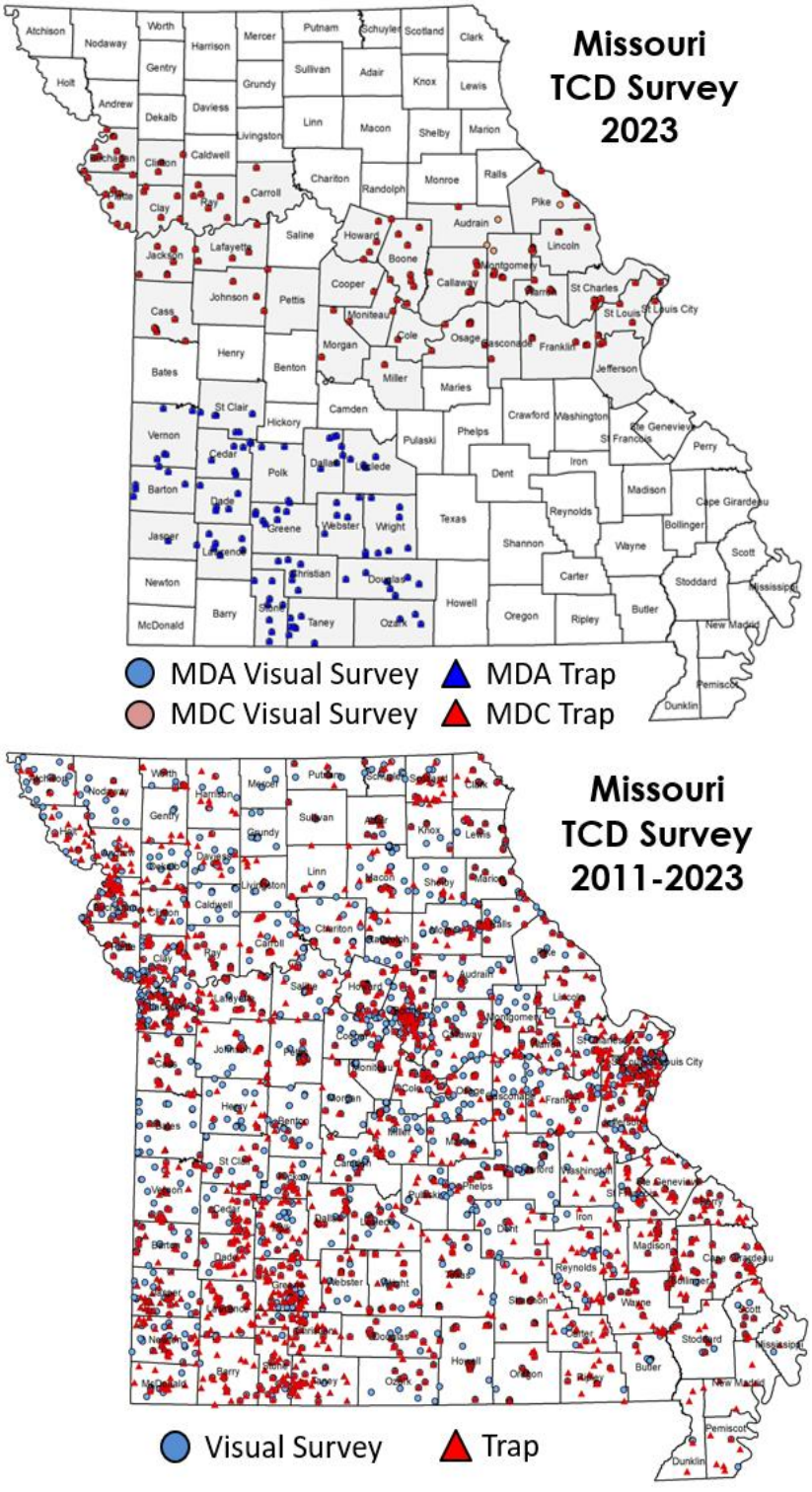


Figure 7: Locations of TCD traps and visual surveys in 2023 (top), and all trap and visual survey locations since 2011 (bottom).

Spongy Moth Survey Results

The multi-agency Missouri Cooperative Spongy Moth Program conducted its annual survey to detect the presence of spongy moth (*Lymantria dispar*; formerly known as gypsy moth) by placing and monitoring 6,234 traps in 54 counties. Five male moths of European/North American genetic origin were captured statewide in 2023. Three moths were captured in St. Louis County while a fourth showed up in nearby St. Charles County. The fifth moth was captured on the eastern edge of Jackson County, making this the first spongy moth detection in the western part of the state since 2016. Spongy moth males are frequently found in Missouri's urban centers, most likely because of the number of people (and hitchhiking pests!) moving to and through those areas. Next summer, the locations where moths were captured will be intensively surveyed to confirm no breeding populations of spongy moth are present.

Missouri is not known to have any established populations of spongy moth. It is very easy, however, to accidentally transport this pest's egg masses to our state. People moving to Missouri from 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 spongy moth pheromone are used to survey for the foliage-feeding pest (left). Five male spongy moths, including the one pictured, were captured in sticky traps in Missouri in 2023 (right). Images: MDC.

2023 Weather Updates

Figure 9: Oak with severe freeze damage to the first set of leaves. Image: MDC.

Late Spring Freeze

Severe damage was seen across nearly 202,000 acres of forests stretching from Dallas County to Jefferson County when overnight conditions on April 23rd and 24th dropped to 25°F for several hours each night. Many tree species in these areas, particularly oaks and sycamores, were in the early stages of leaf development when the cold temperatures occurred. In valleys and low-lying areas where cold air settled the longest, nearly every tree showed complete loss of the first flush of leaves. Trees growing on ridgetops were spared from injury in many places. Some of the hardest hit areas, particularly just north of Rolla, did not begin to green up until late May.

For some locations, 2023 marked the third or fourth growing season in a row with a spring freeze that damaged leaves. Spring freeze injury on trees appears to be increasing in frequency as warmer temperatures earlier in the growing season result in earlier budbreak, particularly in the southern half of the state. Early spring defoliation increases tree stress, making trees more susceptible to pests and pathogens, especially when drought follows like it did in 2023.

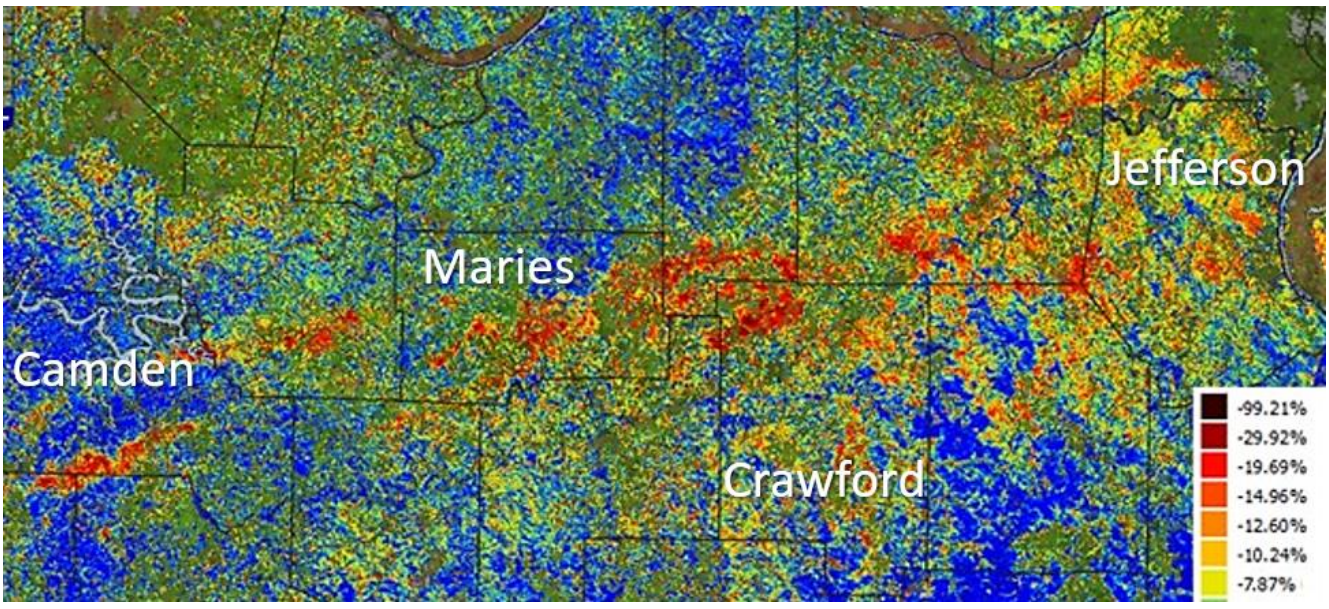


Figure 10: Map of counties showing freeze injury on trees in April 2023. Red areas indicate intense damage while blue and green indicate little to no freeze injury. Image: Derived by MDC staff using the USDA Forest Service's U.S. Forest Change Assessment Viewer.

The 2022 Drought Continued into 2023

The last several years have been anything but normal regarding weather patterns across the state. Most notably, trees have experienced several drastic shifts from wet-to-dry and dry-to-wet conditions. It's no longer a rare event for Missouri trees to receive more than three inches of rain in 24 hours (sometimes in less than an hour!), then not get another drop for three to six months. This type of water stress—both super wet and very dry—has the potential to stress tree roots and leave them more susceptible to pests and pathogens.

In 2023, all counties spent weeks to months in drought conditions. According to the U.S. Drought Monitor, a tool that monitors broad-scale conditions, Missouri started the year with half of its 45 million acres abnormally dry to severely droughty. These conditions were the cumulative effect of drought that set in starting in July 2022. Throughout February and into March of 2023, drought subsided with only 2-5% of the state showing dry conditions. By the end of March, however, drought acreage was beginning to increase, and a small area in west-central Missouri was experiencing severe drought. Drought conditions across the state increased rapidly in late April through May as spring rains failed to arrive. By early June, 86% of the state was in drought, with 8% of the land area in extreme drought.

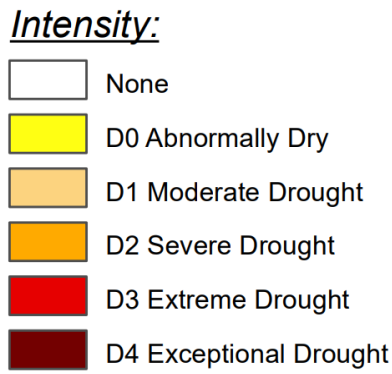


Figure 11: U.S. Drought Monitor's drought severity index has six categories ranging from no drought (white) to exceptional drought (dark red). An explanation of these categories and the data used to derive weekly maps can be found at droughtmonitor.unl.edu Image: US Drought Monitor.

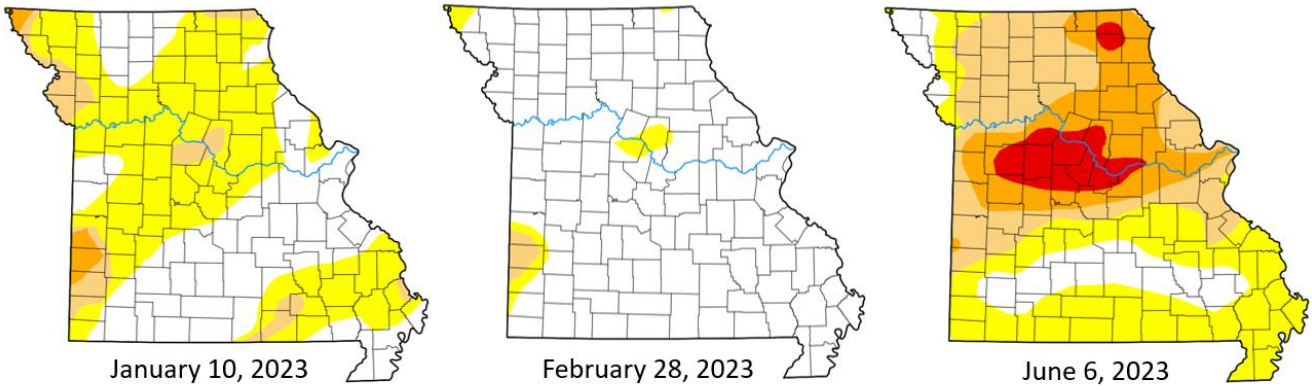


Figure 12: U.S. Drought Monitor maps for 2023: January 10 (left), February 28 (middle), and June 6 (right). Each map shows varying levels of drought. These maps were created, respectively, by Richard Tinkler (CPC/NOAA/NWS/NCEP), Richard Heim (NCEI/NOAA), and Lindsay Johnson (National Drought Mitigation Center).

Throughout the summer, rains occurred occasionally in the southern third of the state, reducing the levels of drought observed there from none to moderately dry. The rest of the state, however, was largely in severe or extreme drought, and by mid-July, 26% of the state was in extreme or exceptional drought. Conditions improved mildly later in August and early September, and then slowly declined into more drought through the warm, dry fall. By the end of October, only a quarter of the state was considered drought-free. November precipitation also proved lacking in many areas, and by mid-December, 100% of the state was abnormally dry to extremely droughty.

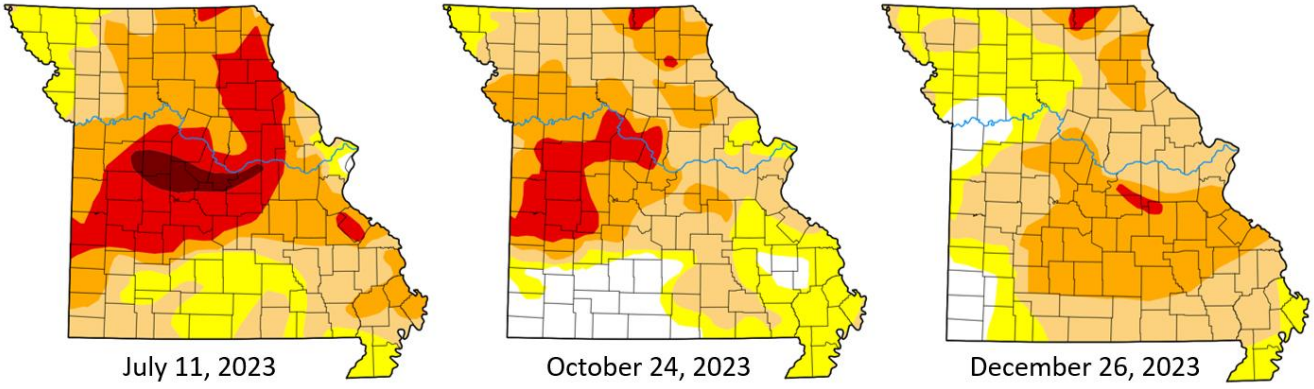


Figure 13: U.S. Drought Monitor maps for 2023: July 11 (left), October 24 (middle), and December 26 (right). Each map shows varying levels of drought. These maps were created by Richard Tinkler (CPC/NOAA/NWS/NCEP) and Rocky Bilotta (NCEI/NOAA).

As we enter 2024, 93% of the state needs precipitation. Final annual rainfall totals showed central and northeastern Missouri counties recorded nearly 20 inches of rainfall below the annual average (even less rain than in 2012!) while weather stations in the southern part of the state saw average to above average precipitation totals. More information on weather data can be obtained from the Midwest Regional Climate Center and the Missouri Mesonet Historical Weather Database.

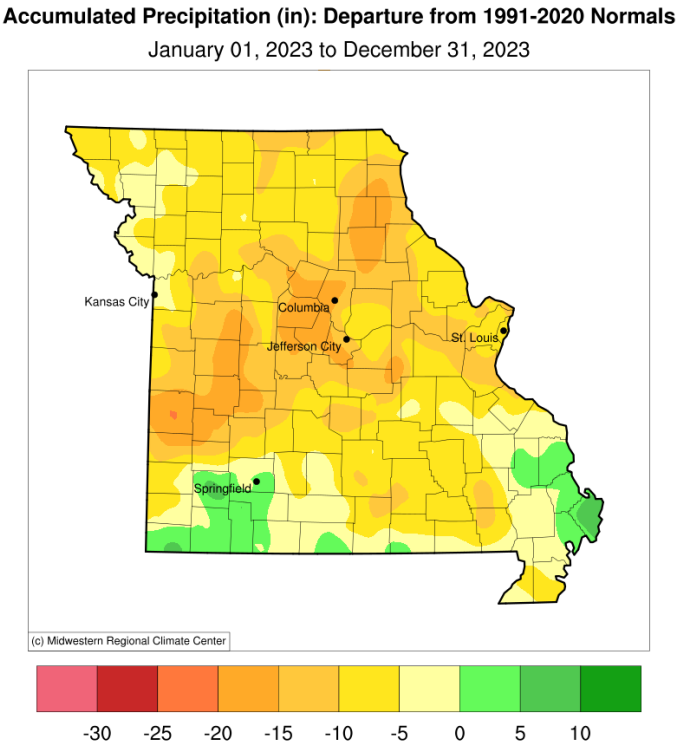


Figure 14: (right) This map uses Missouri's average annual rainfall (1991-2020) of 43.5 inches to generate broad-scale precipitation surpluses and deficits. Map generated by the Midwest Regional Climate Center cli-MATE tool.

Oddities of the Ozarks

Post Oak Grasshoppers

Figure 15: The colorful post oak grasshopper eats leaves from a variety of oak species. Image: Steve Katovich, USDA Forest Service.

In early June 2023, MDC Forest Health staff were contacted by Pioneer Forest staff regarding a grasshopper outbreak. A logging crew on the Reynolds-Shannon County line encountered a few acres where grasshoppers numbered by the hundreds of thousands. Oaks were defoliated in the area, and hundreds of grasshoppers were present on the ground and walking up the trunks of trees. We identified the grasshopper as *Dendrotettix quercus*, the post oak grasshopper, and learned that local outbreaks have been recorded in Missouri and Texas as far back as the 1890s.

This species is known to cause significant early-season defoliation on oaks during outbreak years. Like most native insect outbreaks, it is uncommon to see them in such high numbers. Fortunately, they likely have short, 1-2-year boom cycles before natural enemies catch up with them. These outbreaks are not a huge concern for otherwise healthy trees, but defoliated trees that experience subsequent drought or other stressors may be at risk for long-term decline. Be on the lookout for this grasshopper in 2024 and send photos of any potential outbreaks to Forest.Health@mdc.mo.gov.

Scorch on Shortleaf Pine

June also brought a forest health report from Carter County, this time from a district silviculturist for the Mark Twain National Forest. Many shortleaf pines in the area were showing brown needles, but the trees didn't appear to be dying from a beetle outbreak. After conducting a site visit, MDC Forest Health staff determined that winter scorch was likely the cause. Dothistroma needle blight was found on some needles, likely because of the environmental injury. Shortleaf pine is generally resistant to this disease, but climate change may increase the presence of this pathogen over time. If you see dead or dying shortleaf pine, please report the location by sending an email to Forest.Health@mdc.mo.gov.

Figure 16: Browning needles on a shortleaf pine. Image: MDC.

Oak Decline Widespread in 2023

Throughout 2023, the MDC Forest Health program received several reports of oak mortality on federal, state, and private land south of the Missouri River. We conducted several site visits and concluded that oak decline, along with the expected set of secondary insect and disease issues, was the cause for tree mortality. Oak decline can occur in any forest stand in any year, but large-scale mortality usually follows severe droughts and is most noticeable in forests dominated by red oak species.

Figure 17: Browning crowns with leaves still attached generally indicate infection by Armillaria root rot. Image: MDC.

Oak decline is a natural cause of death in oak trees. It is caused by a combination of environmental stress, infection by fungal diseases, and insect attacks on trees. Often it is the older, dominant trees that are most susceptible. Early signs of oak decline include reduced diameter growth, crown dieback starting from the branch tips, dead large branches in the upper crown, chlorotic and dwarfed foliage, and foliage that displays early autumn leaf color. Recently killed trees may show Armillaria mushrooms (honey fungus) around the base of the tree in the autumn after cooler temperatures and fall rains. Trees infested with bark beetles and wood boring beetles will have exit holes on the trunk where adults emerge after they spend time feeding on the tree's cambium and wood as larvae. Affected trees usually die in two to five years but may live a decade or more.

Figure 18: Armillaria mushrooms popping up at the base of an infected tree in late September. Image: Skip Easter, MO Consulting Forester.

Drought is the number one inciting factor setting the stage for oak decline in red oaks. Drought can kill trees outright, but short of that, it stresses trees, reducing their growth, vigor, and ability to fight off disease and insect attacks. Unfortunately, it can take trees a few years to recover their health and vigor

after a severe drought period, or that drought can be what pushes an aging tree into decline.

Figure 19: The early stage of Hypoxylon canker looks tan and velvety. Image: MDC.

Droughts will continue to occur in Missouri, and Armillaria root rot, Hypoxylon canker, and wood-boring insects are endemic to oak forests, which means that oak decline will occur again. A good general rule to follow in forest management is to maintain high tree vigor and good health to minimize loss of growth and life to extreme weather and forest pests. One way to do this in oak forests is to thin the forest through harvesting to reduce tree density and competition for water and nutrients. The more susceptible red oak trees can be removed in the thinning if they are merchantable, especially if they are approaching 80 to 90 years of age. Reducing tree density promotes the health and vigor of the remaining trees.

Thinning is also important in restoring oak and pine woodlands and savannas. These natural communities were once common throughout Missouri but are relatively rare today. These natural communities add tremendous diversity in ground flora and fauna and wildlife habitat across the landscape.

Regardless of the management goal in thinning a forest, care should be taken in the logging operations to protect the remaining trees by avoiding damage to crowns during tree felling and to tree trunks and roots during log skidding. Injured trees are more susceptible to insect and disease attacks and are less able to survive a drought.

Read the full article written by Dan Dey and Robbie Doerhoff in the October 2023 issue of the *Missouri Conservationist*.

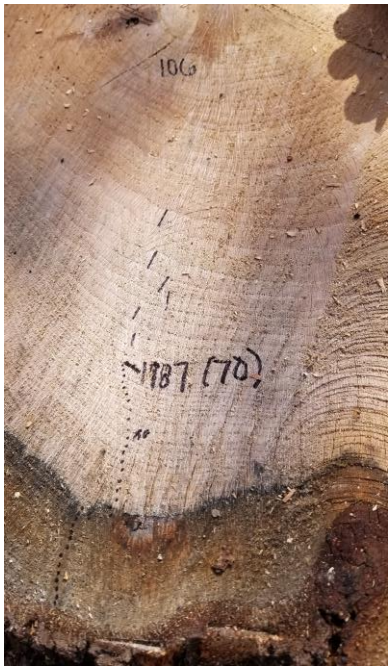


Figure 20: Tree rings can be useful in determining tree age and general date of decline. Many dead or dying oaks in 2023, like this 106-year-old black oak, showed decline in growth since the severe drought in 2012. Image: MDC.

Rapid White Oak Mortality Update

White oak (*Quercus alba*) is one of Missouri's most economically and ecologically valuable tree species. So, when white oaks started dying in 2011, private landowners and public land managers were very concerned. During the record-setting drought of 2012, tens of thousands of white oaks died in a few months, prompting researchers to name the issue Rapid White Oak Mortality (RWOM) to help distinguish it from traditional oak decline. White oaks have continued dying in the years since 2012, but at a much lower rate.

In 2014, researchers at the University of Missouri partnered with MDC, the USDA Forest Service, and Pioneer Forest to determine the reasons for RWOM. The study found that trees affected by RWOM are those growing on lower slopes or along drainages where water runs after heavy rains. RWOM often occurs in pockets a few acres in size and on sites considered good for white oak growth. Tree ring data from research sites suggest that tree age may not be a factor in RWOM, but white oaks 10-18 inches in diameter (measured 4.5 feet from the ground) are most often affected. Insects and fungal diseases found in most oak decline areas were also found in RWOM locations, with an additional root-rotting pathogen not native to the US, *Phytophthora cinnamomi*, also found at some sites.

After several years of research, the findings were unclear as to what officially caused RWOM, leading researchers to surmise a combination of weather patterns, tree stress, and secondary pest and pathogen issues worked together to kill white oaks. As Missouri's climate continues to change in the coming decades, it is possible that RWOM could happen again, particularly in areas that have been hit by late spring frosts and outbreaks of jumping oak gall.

Figure 21: RWOM on the Huzzah Conservation Area (photo taken in 2014). This level of white oak mortality has not been observed in nearly a decade. Image: MDC.

State Champion Beech Removed

Sadly, all good things must come to an end. Or, rather, all big trees eventually meet their demise. This was the case in 2023 for Missouri's state champion American beech tree, an iconic specimen located on the river campus of Southeast Missouri State University in Cape Girardeau. This tree had been towering next to the Mississippi River for an estimated two hundred years, sprouting around the time Missouri became a state in 1821.

Figure 22: Missouri's state champion American beech with MDC Community Forester Jennifer Behnken for scale. Photo: MDC

This gigantic tree was beginning to deteriorate, both above and below ground. Old injuries in the canopy had led to cracking and decay in several large branches. The recent loss of a massive branch prompted increased concern for the safety of people on campus.

Figure 23: Fresh fruiting bodies of brittle cinder fungus appear gray with white margins. Old fruiting bodies can be seen near the ground in the form of a black crust. Photo: MDC.

In May, MDC was called to assess the tree, and Community Forester Jennifer Behnken, along with Forest Entomologist Robbie Doerhoff, provided a site visit. In addition to the structural issues, the pair also noticed fresh signs of brittle cinder fungus, *Kretzschmaria deusta*, on the root flares. This root rot is common on beech and maple, and occasionally attacks the roots of other deciduous trees like birch, oak, and basswood. Brittle cinder fungus increases the hazard level of a tree as it rots roots underground. There is no treatment for the fungus, nor is there any way of knowing how advanced it was in the root system of this massive tree. The University had no choice but to remove the tree at the end of July. It was 17 feet in circumference with a height of 109 feet and a spread of 97 feet. The wood was salvaged for projects at the university and MDC's local nature center.

Herbicide Injury Common in Missouri

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 on this issue, watch MDC Forest Entomologist Robbie Doerhoff's 2023 webinar titled "Dicamba & 2,4-D: Old Herbicides Causing New Problems" on YouTube.

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 (especially white oak), sycamore, redbud, and bald cypress are particularly sensitive.

MDC Forest Health staff have been tracking herbicide injury on trees since 2018. We visit four locations in the Missouri Bootheel to monitor the same trees each year. In 2023, we installed long-term monitoring plots near established Continuous Forest Index (CFI) plots to gain a better understanding of how agricultural herbicides affect off-target trees and plants. In addition to monitoring herbicide residues and growth rates on plot trees, we are collecting data on seed production and viability, insect feeding and presence, leaf decomposition, soil health, and native plants flowering within each plot.

Figure 24: A white oak seedling showing significant herbicide injury at MDC's Seventy-Six Conservation Area tested positive for dicamba (33 ppb) and MCPP (18 ppb) in early June. Image: MDC.

While dicamba and 2,4-D used on crops has been the focus of MDC's herbicide monitoring, we have also seen a wide range of herbicide issues across many different land use types. We used to think of herbicide injury as only being common on trees growing along field edges; now we commonly see trees injured in yards, parks, on college campuses, and even on MDC areas and around our office complexes. Much of the herbicide injury in these urban settings is due to accidental drift onto trees during landscape weed spraying or, in some cases, volatility from dicamba and 2,4-D used by lawncare companies to control broad-leafed weeds. Whatever the source or active ingredient, the result is the same: herbicide injury increases tree stress.

The good news is that trees generally recover from light to moderate herbicide injury, but the bad news is that 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 in a yard setting, 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 and stress.

If you notice herbicide injury on your trees or garden plants in 2024, report the damage to the Missouri Department of Agriculture's Bureau of Pesticide Control. It may be several months before an inspector can visit your property. To provide evidence for your herbicide report, take leaf samples from the affected trees as soon as you notice symptoms of injury, wrap the leaves in a paper towel and freeze in a zip-top bag. Frozen leaf samples can be tested for herbicide residues many months after collection. Don't forget to take photos of the injured vegetation. We found that placing a light-colored paper behind an injured leaf helps improve the focus and quality of the photo.

Figure 25: (right) This bur oak on MDC's Paydown Access was injured by direct particle drift of an unknown herbicide cocktail sprayed on a nearby farm field in May. Growth that was developing at the time of the exposure grew strappy and distorted, while new growth after the spray event was abnormally large and slightly cupped downward. Image: MDC.

Watch out for invasive forest pests!

Asian Longhorned Beetle Survey

The Asian longhorned beetle (ALB), *Anoplophora glabripennis*, is at the top of Missouri's most wanted forest pest list due to its wide host range (14 different tree genera!). Because ALB can easily hitchhike in firewood, MDC Forest Health Technician Joel Critchlow searched high and low for this pest in 26 campgrounds in 2023. At each location, he looked for dead beetles around dusk to dawn lights and conducted a thorough check of up to 300 high risk host trees for possible signs of ALB. During each visit, Joel also provides forest pest outreach materials to campers and campground hosts.

Figure 26: Signs have been posted around dozens of public and private campgrounds asking campers to report ALB. Designed by the MDC Forest Health Program.

Fortunately, no ALB sightings have been recorded to date, but this pest could show up in Missouri at any time. Keep an eye out for ALB next time you take a walk or visit your favorite forest!

Spotted Lanternfly

Missouri has the right climate and habitat for spotted lanternfly, *Lycorma delicatula*, but this annoying pest is yet to establish a population in the state. Joel Critchlow, MDC's Forest Health Technician, has visited 191 businesses in the greater St. Louis area in the last two years, asking that they keep an eye out for this insect and its egg masses. Thanks to Joel, many businesses agreed to help in the search for this pest by posting lanternfly information for their employees. Joel has also conducted dozens of surveys of tree of heaven (the pest's main tree host) in high-risk shipping corridors. Report possible spotted lanternfly sightings to Forest.Health@mdc.mo.gov.

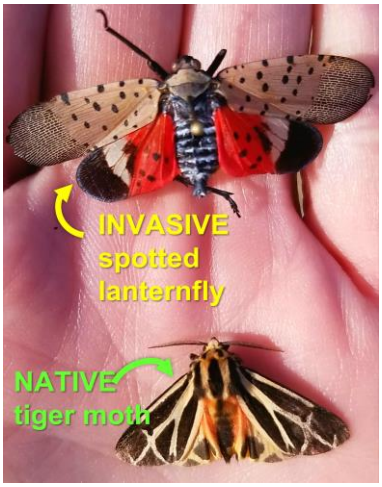


Figure 27: Spotted lanternflies are often mistaken for a native Missouri tiger moth species. Image: MDC.

Invasive Species Spotlight

Figure 28: A heavy infestation of Japanese maple scale on flowering dogwood. Image: Brian Kunkel, University of Delaware.

Japanese Maple Scale

Japanese maple scale, *Lopholeucaspis japonica*, is an invasive armored scale insect that is becoming increasingly common on nursery stock and urban tree plantings. Despite its common name, this species feeds on host plants in 16 different genera in 13 plant families, including red maple, Japanese maple, flowering dogwood, crabapple, and holly. Properly timed insecticidal treatments are generally needed to bring populations under control. For an accurate diagnosis of this pest and the most up-to-date recommendations on treatment timing and insecticide active ingredient, send samples to Dr. Peng Tian at the University of Missouri Plant Diagnostic Clinic.

Figure 29: A single tiny Japanese maple scale spotted on a silver maple. Image: Sam Sergent, MDA.

Figure 30: Unauthorized dumping, including yard waste, is a common sight on MDC areas. Image: MDC.

Early detection of this pest can be difficult when the population is low due to the small size of each scale and their camouflaged appearance. Fortunately, our partners at the Missouri Department of Agriculture (MDA) are well-trained in finding this pest, even at low levels. MDA nursery inspector Sam Sergent wowed us all in 2023 with his incredible find of a few dozen Japanese maple scale on silver maple growing at MDC's Hull Ford Access in Laclede County. This marked the first known find of this pest in a rural, natural forest setting in Missouri. A follow-up survey in November revealed scale were present on at least five silver maples in the area. We will continue to monitor the site each summer to see if the scale population is growing.

Initially, we were unable to determine how the scale could have arrived at this remote location, until we found a nearby yard waste dump pile. It's likely that this forest pest was brought here on infested plant material. Be on the lookout for this pest in 2024 and send photos of any potential Japanese maple scale infestations to Forest.Health@mdc.mo.gov.

Beetle Survey at Bellefontaine Cemetery

Starting in 2023, the MDC Forest Health Program partnered with Bellefontaine Cemetery in St. Louis to conduct a multi-year, wood-boring beetle survey. The goal of this survey is to detect and monitor populations of non-native, wood-boring beetle species, especially those with the potential to harm Missouri's trees and forests. Funding for this survey was provided through a grant from the USDA Forest Service.

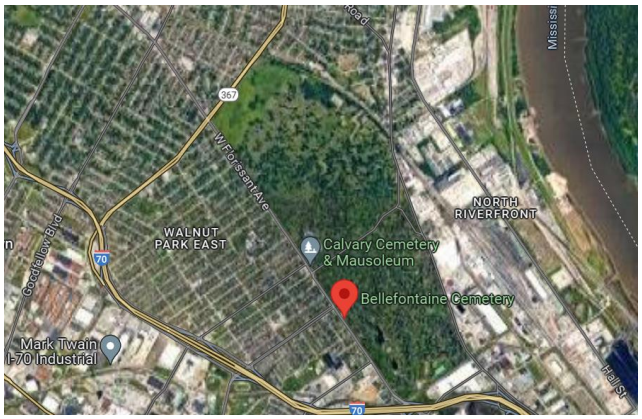
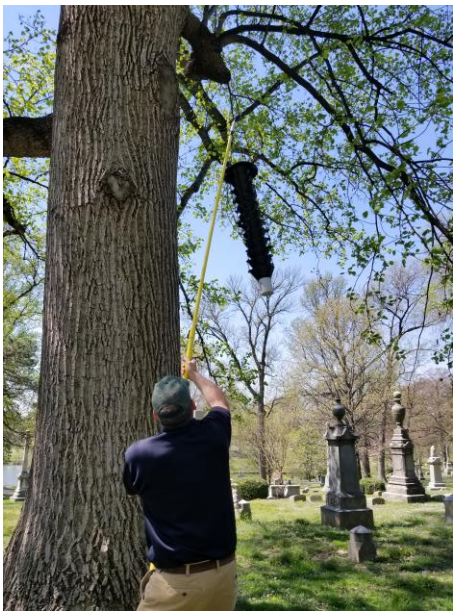


Figure 31: Bellefontaine Cemetery borders Calvary Cemetery, forming a 784-acre greenspace surrounded by urban and industrial lands. Image: Google Maps, 2024 TerraMetrics Map Data

With over 9,000 trees on site, Bellefontaine Cemetery is an ideal spot for wood-boring insect surveys. Situated less than five miles from downtown St. Louis, this beautiful 314-acre park was dedicated in 1850. It shares a border with another major landmark, the 470-acre Calvary Cemetery. Bellefontaine Cemetery is surrounded by decades-old industrial areas and located within a mile of the Mississippi River, a major trade channel with more than 500 million tons of shipped goods per year. The park has 525 tree and shrub species and has earned the status of Level III Accredited Arboretum, one of only 44 in the world. From a wood-boring insect perspective, this location is not only high-risk for introduction but also very host-rich.



Joel Critchlow, MDC's Forest Health Technician, placed 16 Lindgren funnel traps in large trees at Bellefontaine Cemetery in mid-April. These traps were baited with ultra-high release ethanol or a combination of ethanol and alpha-pinene, another known attractant for wood-boring beetles. The traps were checked every two weeks through September, when they were removed for the season. Trap catches are still being processed for the 2023 survey.

Figure 32: (left) Joel Critchlow hangs a Lindgren funnel trap in a tulip poplar at Bellefontaine Cemetery. 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 "What's in Your Firewood Brochure", brochure holders, magnet notepads, pens, and activity sheets for kids.

Figure 33: 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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Serving nature and you

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