

# **2014 Missouri Forest Health Highlights**

**Missouri Department of Conservation, Forest Health Program**

## **Emerald Ash Borer**

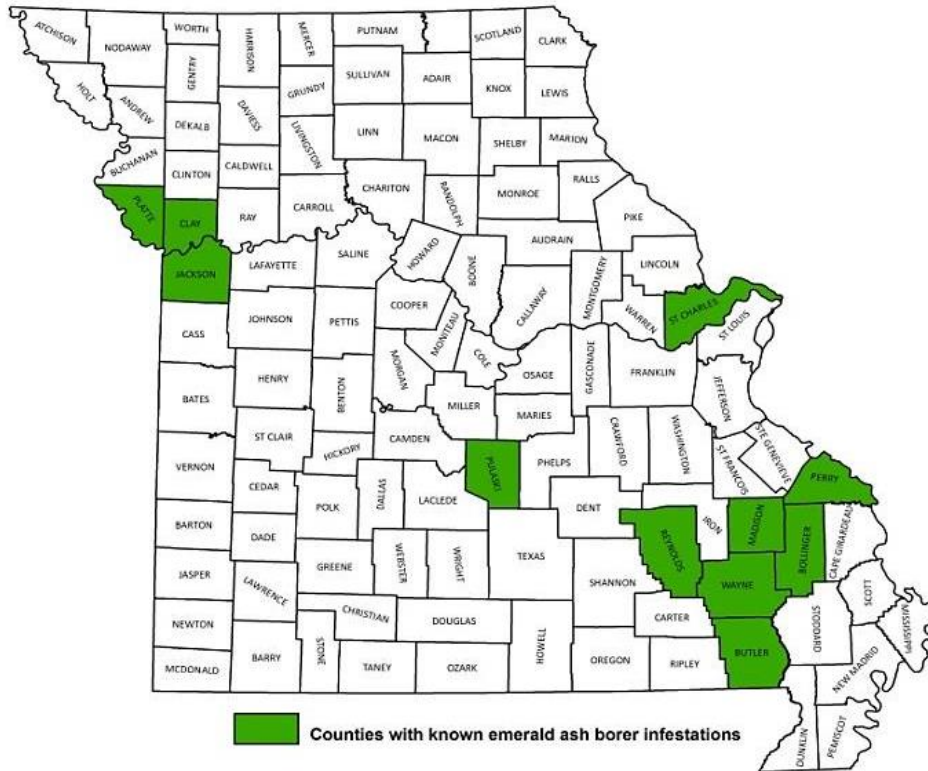
The emerald ash borer (EAB), *Agrilus planipennis*, is a non-native forest pest causing widespread mortality of ash trees in North America. By the end of 2014, it had been detected in 24 US states stretching from Colorado to the East Coast and in Ontario and Quebec, Canada.



**UGA2106098** *Emerald ash borer adult. (David Cappaert, Michigan State University, Bugwood.org)*

EAB had been detected in nine Missouri counties by the end of 2013: seven in south central and southeastern Missouri (Bollinger, Butler, Madison, Perry, Pulaski, Reynolds, and Wayne) and two (Jackson and Platte) in the Kansas City area.

Two more counties were added to the list in 2014. EAB populations were detected in Clay County, confirming the spread of EAB into all three Kansas City counties. The first known EAB infestation in the St. Louis area was reported in May by an alert citizen who observed EAB signs on an ash tree in Lake St. Louis (St. Charles County). The find was quickly confirmed by state and federal officials. The Lake St. Louis population was also detected later in the summer with the standard sticky traps used in the annual EAB detection survey.



***Known EAB-infested counties***

***in Missouri as of December 2014.***

Over 110 EAB traps were monitored in 2014 in the St. Louis area (St. Charles, St. Louis and Jefferson counties) and in mid-Missouri (Boone and Cole counties) by the Missouri Department of Agriculture. An additional nine traps were placed on the University of Missouri-Columbia campus by MU landscape staff. The Missouri Department of Conservation monitored 10 traps in the St. Joseph area, just north of the known EAB infestations in Kansas City. See [www.eab.missouri.edu](http://www.eab.missouri.edu) for more information about EAB in Missouri.

EAB populations are growing in the Kansas City area and are especially high in Platte County. The City of Kansas City MO manages an aggressive response to the invader (<http://kcparks.org/services/emerald-ash-borer/>). A large number of ash trees are being preserved by treating them with an injectable systemic insecticide every two to three years. Many ash trees that are not well-suited for treatment are purposely stressed to create “trap trees” used for monitoring EAB populations. Unhealthy ash trees that are removed are replaced with a variety of other tree species.

Due to the scattered distribution of EAB across Missouri, state and federal quarantines are in effect for the entire state. Transporting any untreated hardwood firewood or any ash wood or trees outside of Missouri is prohibited. Within Missouri, we should all adopt the practice of getting firewood near where we are going to burn it. Many forest pests, in addition to EAB, can hitchhike in firewood. For more information, see: [www.dontmovefirewood.org](http://www.dontmovefirewood.org)

Efforts continued this year to establish biological controls for EAB. Three species of stingless parasitic wasps that specifically attack EAB have been released in at least 19 states since 2007. The Missouri Dept. of Agriculture, in cooperation with the U.S. Dept. of Agriculture, released these wasp species in

2014 in some EAB-infested areas of Platte County. Releases also occurred in 2012 and 2013 in Wayne County in southeastern Missouri. More information about EAB biological control is available at: [www.emeraldashborer.info](http://www.emeraldashborer.info).

## Thousand Cankers Disease

Black walnut is ecologically and economically important to Missouri, and thousand cankers disease (TCD) represents a serious threat to this resource. TCD occurs when the walnut twig beetle (WTB), *Pityophthorus juglandis*, attacks walnut trees, spreading the fungus *Geosmithia morbida* which causes small cankers in the phloem tissue under the tree bark, eventually causing tree decline and mortality.

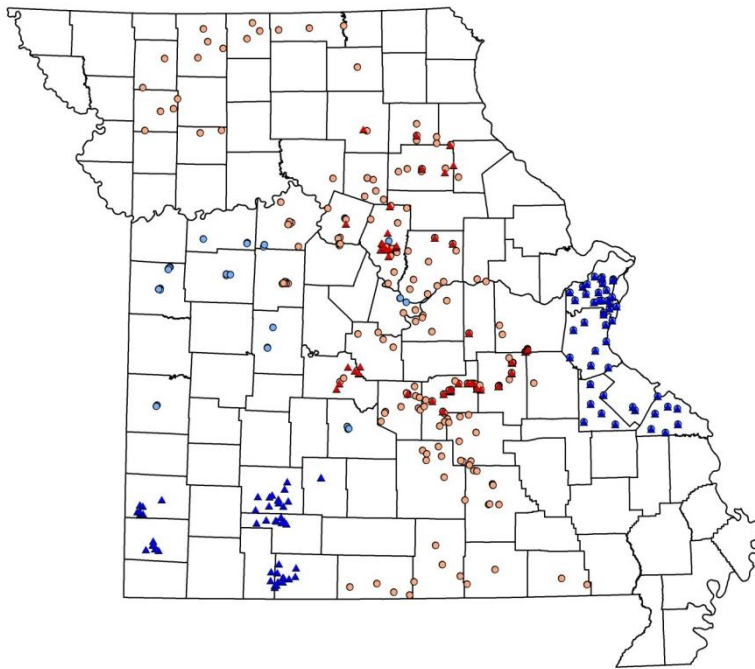
TCD has not been detected in Missouri; however there is concern that undetected TCD infestations could be present, or that spread may occur from western states or Indiana, Maryland, North Carolina, Ohio, Pennsylvania, Tennessee and Virginia where *G. morbida* or TCD has been detected. Potential long-distance spread of TCD through movement of infected walnut materials enhances this threat. Existing survey technology is not very sensitive, and TCD is unlikely to be detected until several years after introduction. Detection of well-established infestations makes eradication efforts difficult. It is important to conduct detection surveys for TCD, as well as inform citizens about the disease and the risk of wood movement from areas with known infestations.



***Black walnut trees with TCD symptoms in Tennessee (Diane Warwick, TN Division of Forestry).***

In 2014, both the Missouri Department of Conservation (MDC) and the Missouri Department of Agriculture (MDA) conducted surveys for TCD using USDA Forest Service and USDA Farm Bill funding respectively. MDC placed 76 WTB pheromone-baited Lindgren funnel traps at high-risk locations with declining walnut trees (urban areas, campgrounds, sawmills) in central and south central Missouri. MDA placed 103 WTB traps in the St Louis and southwest Missouri metro areas. Visual surveys were conducted by both agencies in high-risk areas to identify potentially infested trees. Branches were examined from suspect trees. When suspicious symptoms were observed under the bark, sample branch sections were triple-bagged, placed in a cooler with ice and transported to diagnostic facilities for evaluation and culturing as needed.

Thousand Cankers Disease Survey  
2014 Survey

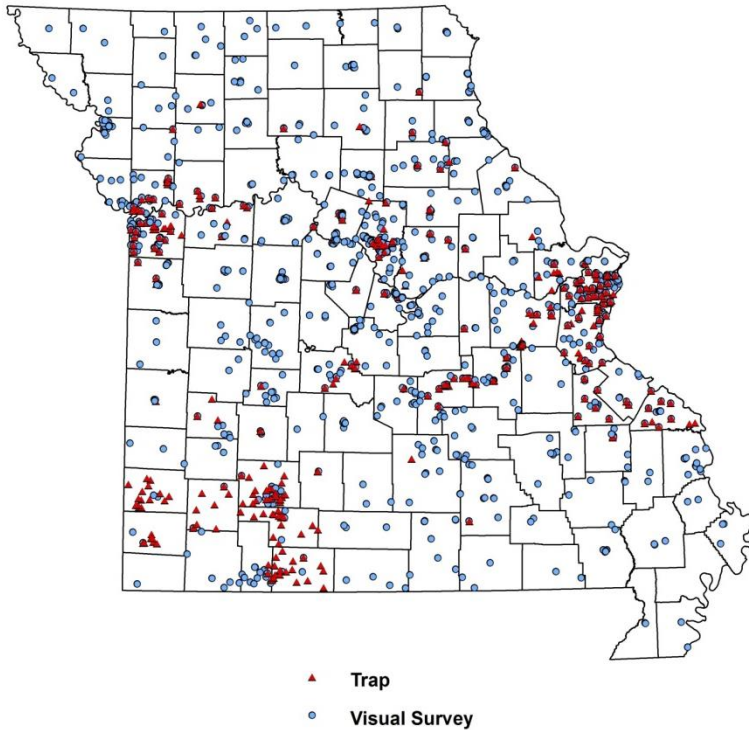


- ▲ MDC Trap
- MDC Visual Survey
- ▲ MDA Trap
- MDA Visual Survey

(Sept. 2014) **2014 TCD Survey Map.**

Survey efforts are rotated to different areas each year; 58 counties were surveyed in 2014. Since 2010, 1158 locations have been surveyed visually and 434 WTB traps deployed. No evidence of WTB or TCD has been detected in Missouri. Common walnut problems detected during surveys included drought stress, site-related issues, and infestation by several other wood-boring insects (primarily roundheaded and flatheaded borer larvae and ambrosia beetles).

Thousand Cankers Disease Survey  
2011-2014 Surveys



***Map of all TCD surveys from 2011-2014.***


Outreach efforts were continued to raise public awareness about TCD. Messages included the potential impact of TCD, the threat posed by movement of infected walnut materials, and identification of suspect trees. Several state agencies and institutions including MDC and MDA as well as stakeholder groups were involved in outreach.

Efforts in 2014 included media interviews, presentations, trainings, and displays at a variety of public and green industry meetings. Several brochures and other materials were provided to citizens to raise awareness of TCD. A TCD awareness ad ran in *Rural Missouri* and *Missouri Ruralist* magazines. A targeted internet ad campaign placed TCD awareness ads on 1,278,856 Missouri computer screens based on user interest in conservation, the environment, gardening, outdoor activities, or woodworking. A TCD awareness poster targeted for woodworkers and campers was developed for Missouri welcome centers, campgrounds, and stores catering to woodworkers and chainsaw users. A “hands-on” workshop to evaluate declining walnut trees and branch damage at a state park campground provided additional training on what staff from the Department of Conservation, Department of Natural Resources, University of Missouri Extension, and USDA FS Mark Twain National Forest should look for when examining declining walnut trees, and how they can assist with outreach efforts.




# ALERT!

## Thousand Cankers Disease (TCD) KILLS Black Walnut Trees




The twig beetle is the size of the letter "i" on a dime.



**Woodworkers**

Woodworkers can accidentally spread TCD.




**Campers**

A single piece of infested walnut firewood spreads TCD.

**What is TCD?**

*Thousand cankers disease (TCD) is fatal to black walnut trees. It's caused by the walnut twig beetle and an associated fungus. The name 'thousand cankers' is due to the numerous cankers surrounding multiple beetle entry points on branches and main stems.*



**TAKE PRECAUTIONS NOW!**  
Help prevent the spread of this KILLER to Missouri.

- Don't move walnut trees or untreated walnut wood into Missouri.
- Don't move fire, hobby or woodworking wood.
- Investigate possible TCD infestations.
- Take action! If you believe your walnut tree has TCD, contact your local Missouri Department of Conservation forester.
- There is no need to adjust walnut management in Missouri at this time.

Look for multiple walnut trees with upper crown dieback and vigorous sprouts below.

TCD has not been detected within nut hulls or meat, nor does it affect the value of the wood.

In partnership with the Missouri Department of Conservation and the U.S. Forest Service, the USDA is an equal opportunity provider and employer.

**For more information: [www.mdc.mo.gov/thousand-cankers](http://www.mdc.mo.gov/thousand-cankers)**

*A TCD awareness poster with key messages.*

University of Missouri Extension and the Missouri Invasive Forest Pest Council developed a new public TCD webpage with information on what symptoms to look for and how to report a suspect tree, <http://extension.missouri.edu/treepests/thousandcankers.aspx>. MDC also maintains a website for more information on TCD, [www.mdc.mo.gov/thousand-cankers](http://www.mdc.mo.gov/thousand-cankers). Missourians are encouraged to report suspect trees via the online reporting form which can be found linked to the TCD websites. Photos of suspect trees can also be emailed to [forest.health@mdc.mo.gov](mailto:forest.health@mdc.mo.gov) as a first step in determining what trees should be visited by trained personnel.

## Rapid White Oak Mortality (RWOM)

White oak is important in Missouri due to its longevity, mast production for wildlife and total saw timber value (2 billion dollars). Since 2011, MDC has received numerous reports of white oak mortality in southeast, central, and east central Missouri. Unlike other common oak decline patterns in Missouri, mortality appears to be rapid and affects white oak on high quality sites. Consequently, the phenomenon has been described as rapid white oak mortality (RWOM) to separate it from other oak decline patterns. As of summer 2014, RWOM reports were received from 43 Missouri counties and 2.6 million board feet of affected timber had been salvaged from lands managed by the Missouri

Department of Conservation and the privately held Pioneer Forest in southeast Missouri. Many more affected trees are too small, in areas too remote for salvage, or were salvaged on private land without MDC involvement. RWOM is also occurring on Mark Twain National Forest lands.



*RWOM pocket at Pea Ridge Conservation Area in east central Missouri. (Missouri Dept. of Conservation)*

Depending on the location, white oak has been subjected to many stressors in recent years. Several extreme weather events include a severe freeze in early April 2007, the wettest back-to-back years in state history during 2008-2009, and drought in 2010, 2011, and 2012. Extensive defoliation has not been reported for more than a decade; however a jumping oak gall infestation turned many white oak canopies brown in 2010. Limited tree ring analysis suggests some trees may have been affected by various stressors over several decades.

A team of University of Missouri researchers, including Dr. Sharon Reed, Dr. Jim English, Dr. Rose-Marie Muzika, and Dr. John Kabrick (USDA-Forest Service) received USDA-Forest Service Forest Health Protection Evaluation Monitoring and MDC funding for a 1 year study to describe the regional extent of the mortality and associated pathogens and insects. A survey was completed by professional foresters and landowners in Missouri, Iowa and Arkansas at 87 locations.

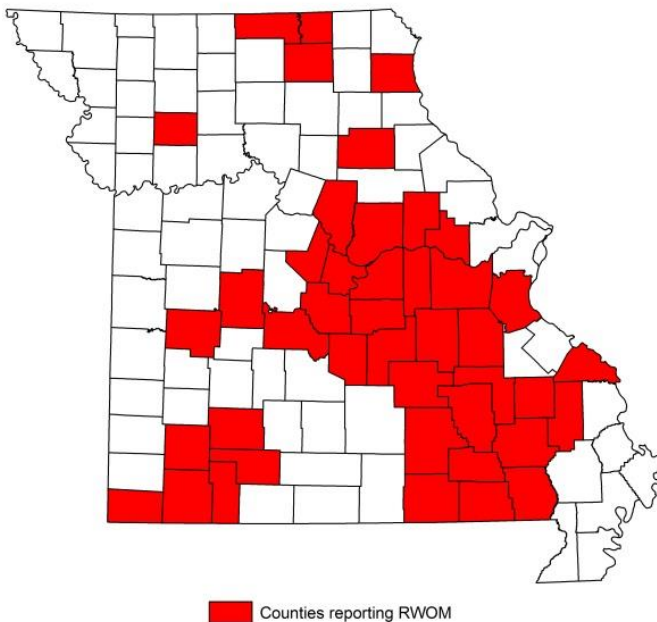
Survey results indicate white oak mortality consistent with RWOM is occurring in pockets in central, east central and southeast Missouri. More limited pockets of mortality are also occurring in northeast Missouri and southeast Iowa. Mortality in north central Arkansas is consistent with traditional oak decline patterns. Mortality in Missouri is occurring on state, federal and private lands with and without active management. Tree mortality is most frequent on lower slopes of all aspects and next to ephemeral or seasonal drainages. Large overstory white oaks are affected most often, but other sizes, crown positions, and species including post oak and some species in the red oak group are also affected. Some healthy white oak remains in most affected stands.





*RWOM pocket at Huzzah Conservation Area, Crawford County Missouri. (Missouri Dept. of Conservation)*

Rapid White Oak Mortality  
2011-2014



*Counties in Missouri reporting RWOM since 2011.*

A detailed investigation of pathogens and insects associated with RWOM at two research sites in the Missouri Ozarks is ongoing. So far, scientists have detected the following pathogens and insects thought to contribute to mortality: *Armillaria*, *Biscogniauxia (Hypoxylon)*, *Phytophthora cinnamomi*, two-lined chestnut borer and a wood boring ambrosia beetle *Xyleborinus gracilis*. All except *P. cinnamomi* and *X. gracilis* are commonly associated with oak decline in Missouri. *P. cinnamomi* is a root rotting organism that has been associated with oak decline in Europe and similar white oak mortality



patterns in Ohio (Nagle *et al.*, 2010). *P. cinnamomi* causes plant diseases world-wide, was introduced into the southeast US in the late 1700's or early 1800's and disproportionately affects susceptible species on lower slopes and along drainages.

Additional research may help determine RWOM risk and improve forest management. If funding is available, researchers will further examine site and stand characteristics, the influence of extreme weather events, and the role of insects and diseases associated with RWOM and similar patterns of mortality in Missouri and other eastern states.

Nagle, A. M., Long, R. P., Madden, L. V., and Bonello, P. 2010. Association of *Phytophthora cinnamomi* with white oak decline in southern Ohio. *Plant Dis.* 94:1026-1034.

## Gypsy Moth

The multi-agency Missouri Cooperative Gypsy Moth Program conducted its annual survey to detect the presence of gypsy moths (*Lymantria dispar*) by placing and monitoring over 7,700 traps in 62 counties during 2014.

Delimit areas of intensive trapping were established around five sites where gypsy moths were captured in 2013 (one moth each in Clay, Greene, and Madison counties, and two moths in St. Louis County).

Four male moths were captured statewide this year: one in Camden County and three in St. Louis County (separate locations). All were confirmed to be European gypsy moths. No moths were captured in delimit areas. No reproducing populations of gypsy moths have yet been detected in Missouri, but the gypsy moth invasion front continues to advance from northeastern Iowa and Illinois.



***2014 Gypsy Moth Survey Positive Trap Locations.***

## Fire Blight

MDC received many reports of fire blight from across the state in spring 2014. A majority of reports were ornamental pears in landscape settings. Reports of ornamental crabapple, apple and pear damage were also received. Extensive spur blight and shoot mortality was most frequently reported, however some reports indicated girdling cankers and tree mortality.

Infection occurs initially during warm, wet spring weather when bacteria become active on trees that were infected the previous year. Many infections begin when insects carry bacteria to flowers, although infection can also occur through other natural openings and wounds. This year, even recommended foliar antibiotic applications prior to infection did not always provide complete protection. Extensive shoot and branch infection made sanitation by pruning below infected shoots and branches difficult. The infected tissues that remain allow the bacteria to overwinter and elevate the level of concern for additional infection next year under favorable conditions. Tree removal and replacement with native species resistant to fire blight is recommended where symptoms were severe.

For more information on fire blight, symptoms, and management see <http://extension.missouri.edu/p/g6020>



**UGA5265022** *Fire blight symptoms on ornamental pear. (Florida Division of Plant Industry Archive, Bugwood.org)*

## Spring Defoliators

Many defoliators were active on deciduous trees during the spring, particularly across the east-central and northeastern areas of Missouri. Significant defoliation, wandering caterpillars and the sound of falling frass were reported by the public and MDC foresters in both rural and urban locations. Several insect species were involved, including sawflies, cankerworms, cutworms, leaf rollers and loopers. The heaviest defoliation was noticed on white, black and northern red oaks, but other tree species, including ash, red maple, shagbark hickory, and walnut, were also damaged.



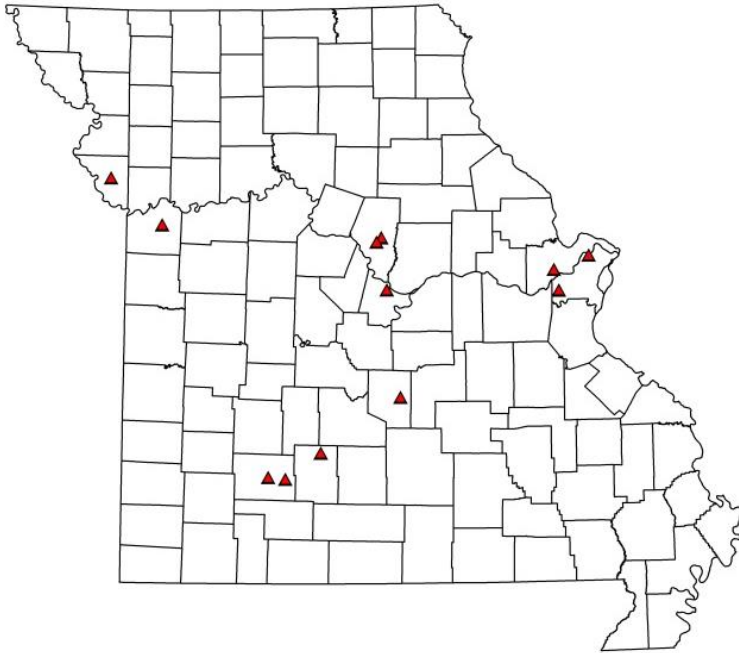
*Defoliator damage on post oak. (Missouri Dept. of Conservation)*

## **Early Detection, Rapid Response Survey**

“What is that?” was a common question received this past spring in reference to the long, black Lindgren funnel traps placed at 12 locations across the state. These insect traps were part of the Early Detection, Rapid Response survey conducted by the Missouri Department of Conservation and funded by the USDA Forest Service. The purpose of this survey is to detect and monitor populations of exotic bark and ambrosia beetle species, especially those with the potential to harm Missouri’s trees and forests. A total of 2,559 bark and ambrosia beetle specimens representing over 50 species were identified during this survey, including several exotic species. All of these species were previously known from Missouri. The most frequently captured exotic species was the Fruit-tree Pinhole Borer (*Xyleborinus saxesenii*), and the most frequently captured native species was the Yellow-banded Ambrosia Beetle (*Monarthrum fasciatum*).



*Lindgren funnel trap used in the 2014 Early Detection, Rapid Response Survey. (Missouri Dept. of Conservation)*



▲ 2014 EDRR Site (3 traps)

*Map of 2014 Early Detection, Rapid*

*Response Survey locations.*

*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.*