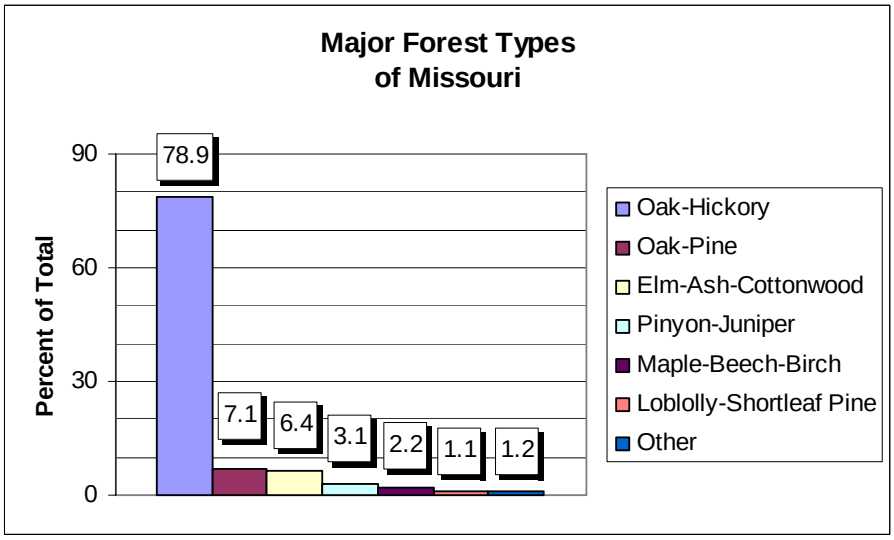
Missouri Forest Health 2005 Highlights

The Resource

Missouri is about one-third forested. There are over 14.6 million acres of forest land, an increase of 4% since 1989. Missouri is well known for its oak-hickory forests. The 2003 forest inventory estimated that over three-fourths of the timberland in Missouri is dominated by oaks, hickories and associated species.



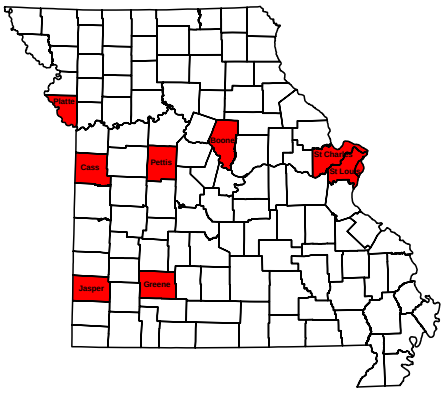
In addition to the recreation and wildlife benefits these forests provide, a recent analysis by the Missouri Department of Conservation (MDC) showed that the forest products industry contributed $4.43 billion annually to the Missouri economy in 2005 dollars. The industry supports over 32,250 jobs at a payroll of about $1.1 billion and is responsible for over $360 million in taxes, including $54 million in state sales tax.

Special Issues

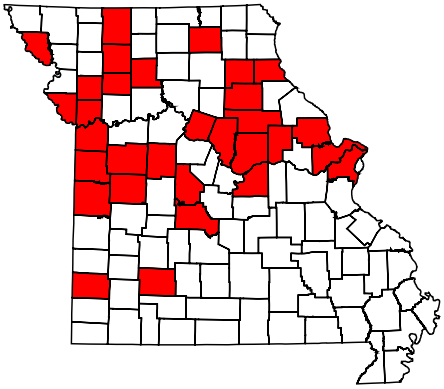
General Forest Disease Activities - Many samples and calls regarding **ash, maple, and sycamore anthracnose** were received by the MDC forest health diagnostic lab throughout the summer. On white pine, several samples of **brown spot** caused by *Mycosphaerella dearnessii* were diagnosed in late spring to early summer. White pine also had an abnormal late season needle discolorization not associated with leaf abscission in a couple of nursery operations in Gasconade and Montgomery Counties. These sites were localized to low-lying areas and had experienced a similar event in 2004 during the same time frame in October. Nursery owners were concerned a new pest or pathogen was at work, but it was generally concluded that abiotic stress unique to these sites was most likely the cause. Red maple continues to be impacted with

***Verticillium* wilt** in many urban locations across the state. Several samples were received from southern Missouri.

Oak Wilt – Seventeen cases of oak wilt caused by *Ceratocystis fagacearum* were confirmed out of 40 samples submitted to the MDC forest health diagnostic lab for testing. Positives for 2005 were detected from Boone, Cass, Platte, Greene, Jasper, Pettis, St. Charles, and St. Louis Counties. One white oak sample sent in from Pettis County tested positive, marking the second such occurrence for this host species and the first oak wilt positive from this county over five years. Positives were collected from pin oak (11), shingle oak (4), northern red oak (1), and white oak (1), respectively.



2005 Oak Wilt Positives



2001-2005 Oak Wilt

Mimosa Wilt – In 2005, there were a number of reports of branch flagging or yellowing as well as frothing and bleeding trunk symptoms occurring on Mimosa trees. This disease is caused by *Fusarium oxysporium var. perniciosum*. The fungus will typically enter through wounds, but may also directly penetrate roots or plants weakened by abiotic stress. Infected Mimosa trees ooze a frothy liquid from cracks and growth sprouts on trunks (see below). Fungal spores produced on the exterior of the tree are easily washed off by rain splash and can be moved long distances in surface water runoff. Since this disease is soil-borne, the best recommendation is to plant other species of trees not susceptible to this fungus.

Frothing Ooze on Mimosa

Branch Chlorosis on Mimosa

Armillaria / Sudden Oak Death Concerns – A number of concerned residents in the St. Louis area claimed to have Sudden Oak Death occurring on pin oak during 2005. Many arborists and tree landscapers had seen bulletins, articles, and press releases on the subject of Sudden Oak Death and were very concerned it may have spread to Missouri. Upon closer inspection, samples were taken and the bark cut away and in all instances was determined to be caused by *Armillaria* root rot. Characteristic white mycelial fans were revealed near the tree base and later cultured for verification. The increased public awareness about Sudden Oak Death is expected to generate more inquiries.

Main stem ooze **Water-soaked wood** **Main stem bleeding** **White mycelial fan**

Arborvitae Issues – *Armillaria* was also found to be causing widespread mortality in several *Arborvitae* landscape plantings in Kansas City, St. Louis, and Springfield, MO. *Armillaria* root rot was identified from fans of white fungal mycelium found under the bark at the base of dead trees and in the roots. There is no cure for *Armillaria*. The best advice is to remove and replace with a resistant species. Since *Arborvitae*, or white-cedar, is not native to Missouri, predisposing abiotic stressors may also be at work making the plantings more susceptible to this fungus. The University of Missouri Extension Plant Diagnostic Clinic also reported similar findings: http://agebb.missouri.edu/hort/meg/archives/v11n9/meg6.htm

White Pine Issues – Decline of white pine was reported across the state in late August. It's common for older white pines in Missouri to exhibit wilting/chlorotic needles after prolonged periods of high heat indices. Bark on these trees has a sunken appearance, pinkish in color, intermixed with healthy green bark. It is thought that this collapse of water-conducting tissue

reduces the available moisture, or that the tree may not be able to meet the water demands, resulting in wilt symptoms. Mortality has been reported in some cases. However, there are many other problems associated with white pines in Missouri, such as planting too deep or in low-lying areas where moisture collects, and *Leptographium procera* root rot. White pine is not native to Missouri, so it may be predisposed to other abiotic stressors as well.

Declining White Pine

Sunken Pinkish Bark

Wood Borers and Oak Decline – Wood borer activity was at relatively normal levels in 2005. No large increases in wood borers have yet been observed in northwestern Missouri where prolonged drought conditions existed from 2002 to early 2004. Oak decline is an ongoing phenomenon in red oak stands across much of Missouri. Decline has also been observed occurring in white oak stands in a few locations.

Ambrosia Beetles - The **granulate ambrosia beetle** (*Xylosandrus crassiusculus*, also known as the Asian ambrosia beetle) and the **black stem borer** (*X. germanus*) are exotic species of ambrosia beetles established in the eastern U.S. that attack a variety of deciduous host trees. The presence of "frass toothpicks" (stick-like accumulations of excrement and wood particles) protruding from bark is an indicator of attacks by these insects. Both of these species are rather aggressive and will attack healthy, as well as stressed trees. These insects create branched tunnels in the sapwood. Damage to hosts can be severe and sometimes fatal.

Reports of attacks by these beetles in Missouri have become more common in recent years. The granulate ambrosia beetle was identified as infesting black walnut trees in a southwest Missouri plantation in May 2005. This may be one of the first reports of this insect attacking walnut. During 2002-2005, "frass toothpicks" have been observed in Missouri on American elm, sugar maple, red maple, Japanese maple, yellow poplar, northern red oak, goldenrain tree and Chinese chestnut (reports received by MDC). Identities of the specific ambrosia beetles involved were not determined in these instances.

Black walnut attacked by the granulate ambrosia beetle.

Granulate ambrosia beetle tunneling in black walnut branch.

Reducing stress on recently-planted or nursery trees is important in reducing attacks by the granulate ambrosia beetle. This insect has multiple generations per year. Heavily attacked branches or whole trees should be removed and destroyed to prevent infestations of nearby trees.

Defoliators – Damage from defoliating insects was observed in isolated locations in 2005. No widespread defoliation events occurred. Defoliation by various spring **loopers** was reported in the St. Louis area. A few isolated pockets of defoliation by the **loblolly pine sawfly** were observed, primarily in east central Missouri where it had been observed in recent years. **Walkingsticks** heavily defoliated oaks at the Union Ridge Conservation Area near Kirksville, Missouri in late summer and fall. A greater number of reports than usual were received of **Japanese beetles** damaging ornamental plants in the St. Louis area. Damage by Japanese beetles also appeared in Columbia where very little damage has been reported in the past.

Oak Galls and a Gall Midge Predator – The **jumping oak gall wasp** (*Neuroterus sp.*) is capable of causing leaf browning and early leaf drop on white oaks, when wasp populations are high. No widespread visible damage by this insect occurred in 2005, although heavy damage was reported for a few sites in Bollinger and Franklin Counties on the east side of the state where jumping oak gall wasp populations have been high in past years. Unusually high numbers of **Phylloxera galls** were observed on hickory and pecan in several locations across the state in June.

The exotic species of **predatory itch mite** (*Pyemotes herfsi*) discovered in the Midwest in 2004 was evident again this year in western Missouri and the east edge of the state in the St. Louis area. These mites are predaceous on gall midge larvae, particularly **marginal fold galls** on pin oaks, but will also readily bite humans causing severe itching. Many people reported being bitten in September. Dispersal of itch mites from tree canopies at that time may be due in part to reduced available prey as midge larvae drop from oak leaves to overwintering sites in late

summer. Reports of bites continued at somewhat lower levels through October and November.

Emerald Ash Borer – The emerald ash borer (*Agrilus planipennis*), a metallic green beetle native to Asia, is killing millions of ash trees where it has become established in Michigan, Ohio, Indiana, and southern Ontario. Emerald ash borer larvae feed under the bark in the phloem and outer sapwood disrupting the flow of water and nutrients. All species of ash appear to be susceptible. Both healthy and stressed trees are attacked and killed.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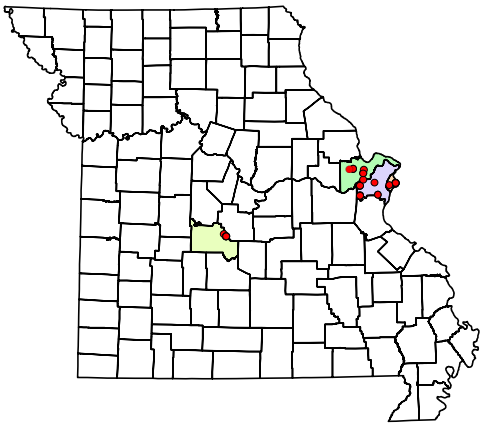
The primary pathways by which the emerald ash borer might be introduced into other areas are through the movement of infested ash firewood, nursery stock or other raw wood products. Quarantines prohibiting the movement of ash materials from infested areas have been implemented to reduce the likelihood of this insect's spread. In Missouri, areas at greatest risk are campgrounds and other locations receiving firewood from outside Missouri or new commercial and residential areas where ash nursery stock was planted within the last 5 to 10 years.



2005 Emerald Ash Borer Survey Sites

A visual detection survey for the emerald ash borer was conducted at 31 sites during July-August 2005 by the Missouri Department of Agriculture and Missouri Department of Conservation. No evidence of emerald ash borers was found. The survey concentrated on high-use recreational sites and recent commercial and residential developments, particularly in the St. Louis area. Popular recreational sites such as the St. Louis Gateway Arch, Babler State Park, Lake of the Ozarks State Park and commercial campgrounds near Six Flags Amusement Park were included in the survey. Survey crews searched for declining and dead ash trees and visually examined them for evidence of emerald ash borer attacks.

Missouri has a significant ash resource that would be at risk if emerald ash borers became established in the state. Ash trees (all species) comprise 3.1% of forest trees in Missouri, according to USDA Forest Service statewide inventory data collected primarily in rural stands. But ash comprises a much larger component of the urban forest, where it makes up an average of about 10% overall and as much 25% to 30% of park or street trees in some locations.

For more information about the emerald ash borer, please visit these web sites:

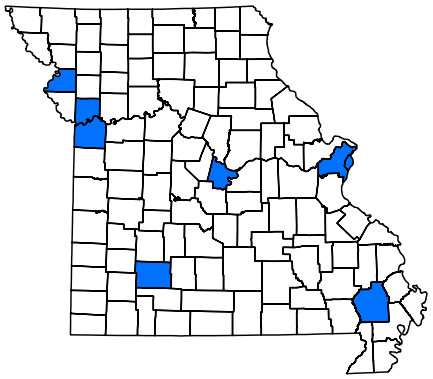
http://www.emeraldashborer.info/

http://na.fs.fed.us/fhp/eab/

Banded Elm Bark Beetle - The banded elm bark beetle (*Scolytus schevyrewi*), a native of

central and eastern Asia, was first detected in the U.S. in 2003, attacking and killing elms in Colorado and Utah. The beetle has since been found in over 20 states across the country, including Missouri. In Asia, it attacks elms, weeping willow, Russian olive, peashrub, various *Prunus* species, apple, almond, and others. Thus far, it has been observed attacking only four species of elms in the U.S. (*Ulmus americana*, *U. pumila*, *U. thomasii*, and *U. procera*).

The full impacts of this introduced species are unknown. It is apparently capable of directly attacking and killing mature, drought-stressed elms, although it is not clear if this beetle can also attack and kill healthy trees. Attacks on fruit trees (*Prunus* spp.) have not yet been reported in the U.S. Nursery and orchard workers should be alert for possible attacks by this new beetle species. The adult banded elm bark beetle is about 3-4 mm long and has a dark brown transverse band across a lighter brown upper surface.

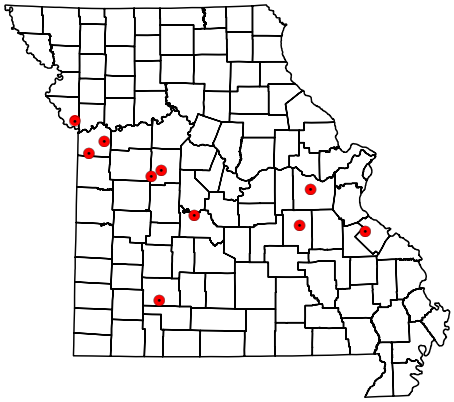


Banded Elm Bark Beetle

The banded elm bark beetle is closely related to the smaller European elm bark beetle (*S. multistriatus*) that vectors Dutch elm disease. Many questions remain about whether the banded elm bark beetle can also act as a Dutch elm disease vector, and how competitive interactions between the two beetle species might affect elm mortality.

The banded elm bark beetle has been found in widespread locations in Missouri. The beetle was collected in Buchanan, Clay, Jackson, Greene, Cole, St. Louis, and Stoddard Counties in 2004-2005 as part of the Exotic Bark Beetle and Wood Borer Survey conducted by USDA APHIS (Animal and Plant Health Inspection Service).

Gypsy Moth - The Missouri Cooperative Gypsy Moth Program continued its annual survey to detect the presence of gypsy moths by placing and monitoring more than 11,500 traps throughout the state in 2005. Three moths were captured in the Kansas City area (two in Jackson County and one in Clay County), two in Pettis County, and one each in Camden, Crawford, Franklin, Greene, and Ste. Genevieve Counties. This is the first year since 1979 that no moths were captured in the St. Louis metropolitan area.



2005 Gypsy Moth Positives

There are no known populations of gypsy moths in Missouri at this time. Sites where gypsy moths have been captured are surveyed with an increased trap density in the following year. In most cases, survey results in the vicinity of past captures have been negative within one or two years following the original capture. Despite these favorable past results, the risk of gypsy moths establishing in

Missouri continues to increase as infested areas in nearby states expand. Statewide gypsy moth monitoring efforts will continue annually in Missouri.

Mulch Stinkhorns – This year the diagnostic lab had a number of requests for mushroom identifications, particularly late-season arrivals on mulch piles in homeowners' yards. One interesting submission was identified as *Pseudocolus schellenbergiae* or the 'Stinky Squid'. As its name suggests, the smell or fetid odor was the one thing folks did not like. This fungus had three orange arms, arching outward and fused at tips, emerging from a short whitish stalk.

Stinky Squid Fungus *Pseudocolus schellenbergiae*

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