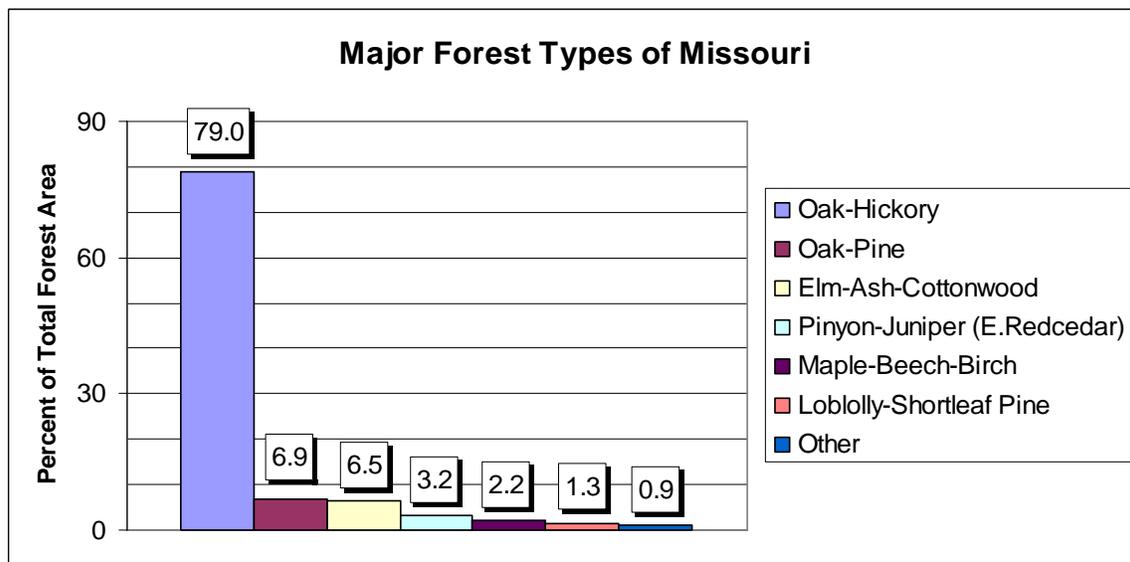


Missouri Forest Health 2006 Highlights

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 2000-2004 forest inventory estimated that nearly four-fifths of the forest land 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 Activity - Winter desiccation left many conifers in poor shape in the spring of 2006 with many white pines exhibiting uniform browning throughout. Abnormally high temperatures in January also contributed to maple shoot dieback, especially on Japanese maples, as many trees produced necrotic symptoms on newly formed leaves and branches. The MDC Forest Health Laboratory also received a number of reports from walnut growers suspecting *Fusarium* canker on high value main stems. *Fusarium* was not found on any samples examined. The canker-like cracks associated with these samples were most likely caused by abiotic stress such as that associated with early season frost. Sporulating fusiform rust caused by

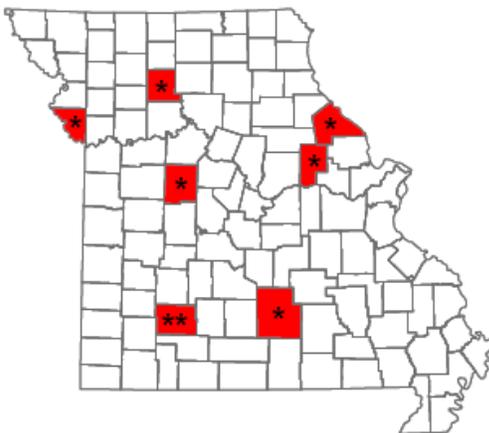
Cronartium fusiforme was verified on pines grown at a golf course near Branson, Missouri. These trees likely were infected in the nursery prior to being brought into Missouri from Georgia. Severity to these trees was considered low since no main stem infections were observed.



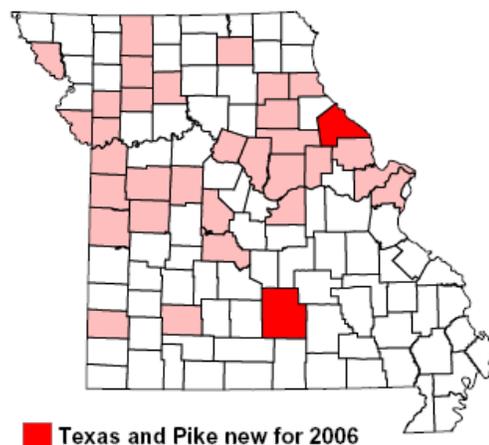
Fusiform Rust on Pine

Oak Wilt - Missouri oak wilt positives were taken from seven counties, Greene, Livingston, Montgomery, Pettis, Pike, Platte, and Texas in 2006. New reports for Texas and Pike were noted. Species testing positive included pin oak, northern red oak, and shingle oak. Oak wilt tests done on 18 other oaks returned no oak wilt positives, and thus were considered false negatives since oak wilt may have been present just not recovered from samples sent to the lab. Symptoms in many late season samples were most likely due to abiotic drought scorch. Bacterial leaf scorch caused by *Xylella fastidiosa* was reported on pin oaks in the St. Louis metro area. This disease is likely under-reported for the area as symptomology is nearly identical to that seen for oak wilt. The difference is that oak wilt typically expresses in May and June, whereas bacterial leaf scorch occurs later in the growing season throughout July and August.

Oak Wilt 2006



Oak Wilt 2001-2006



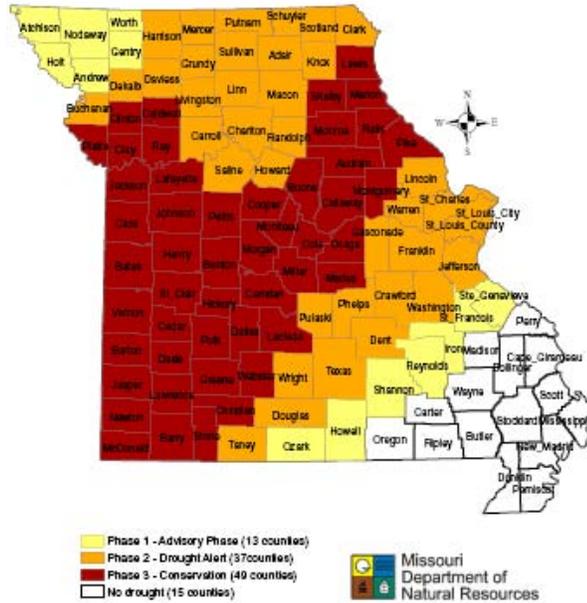
Drought Scorch - Ongoing drought conditions persisted throughout much of the west central region and into the southwest corner of Missouri. Samples exhibiting diagnostic scorch symptoms were taken from a variety of tree species such as pin oak, bur oak, maple, dogwood, mulberry, and elm in late July through August 2006. Precipitation was running three inches below normal for the northeast, west Ozarks, and southeast portions of the state. West central Missouri precipitation was roughly seven inches below average. A late season winter storm (Nov 30- Dec 1) may have helped ease the drought situation as much of the central portion of the state received record snowfalls; the most seen in more than a decade. The eastern Ozarks and

the Bootheel portions of the state had near normal precipitation reported for the year. Moisture conditions are not expected to reduce further decline of red oaks in susceptible sites throughout the Ozarks.



Scorch Damage on Dogwood

Drought Conditions 2006



Storm Damage - Eastern Missouri experienced major damaging weather events on July 19 and Nov 30, 2006. Straight line winds from a significant summer thunderstorm complex produced widespread tree damage from central Illinois across the St. Louis metropolitan area and into the eastern Ozarks. It was estimated that the storm had sustained winds nearing 90 mph. During the

late season storm, accumulations of freezing rain and ice in excess of two inches were common across eastern Missouri and western Illinois. The combination of accumulated ice on trees and power lines and gusty northwest winds produced widespread tree breakage knocking out power to many residents in the area.



Wind Damage July 17, 2006



Ice Damage November 30, 2006

Sudden Oak Death - All surveys done in Missouri for Sudden Oak Death (SOD) in either nursery or surrounding environs had no positives for *Phytophthora ramorum*. These results have been consistent since extensive surveys were started in 2004. Many oaks were again suspected of having SOD, though as was the case last season, the cause of bleeding on oak was *Armillaria* root rot. A 2006 SOD detection on *Viburnum* in an Indiana retail outlet contributed to a high volume of information requests from the public.

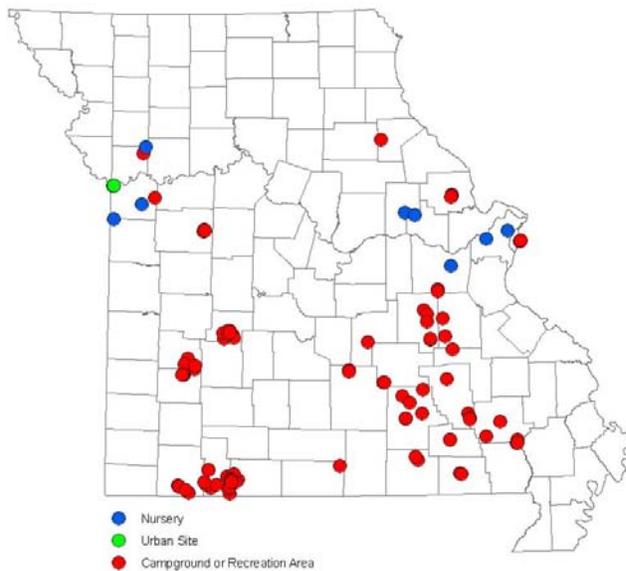
Emerald Ash Borer – The emerald ash borer (EAB), *Agrilus planipennis*, was detected in many new locations in nearby states during 2006. Infestations are present in Illinois, Indiana, Michigan, Ohio, Maryland, and Ontario. This exotic beetle has killed many million ash trees in the core infestation area in Michigan. All species of ash are susceptible. Missouri has a significant ash component at risk for attack by EAB. Ash species comprise about 3% of Missouri rural forest trees, but a much higher percentage in the urban forest, where ash trees average about 10% overall and as much as 30% or more of park or street trees in some locations.



Emerald Ash Borer Adult

Missouri's response to this invasive species threat has focused on detection and education efforts. Visual detection surveys are conducted annually through a combined effort of MDC, Missouri Department of Agriculture (MDA), and USDA Forest Service. The primary pathways

**Missouri Emerald Ash Borer Survey
2006 Survey Sites**



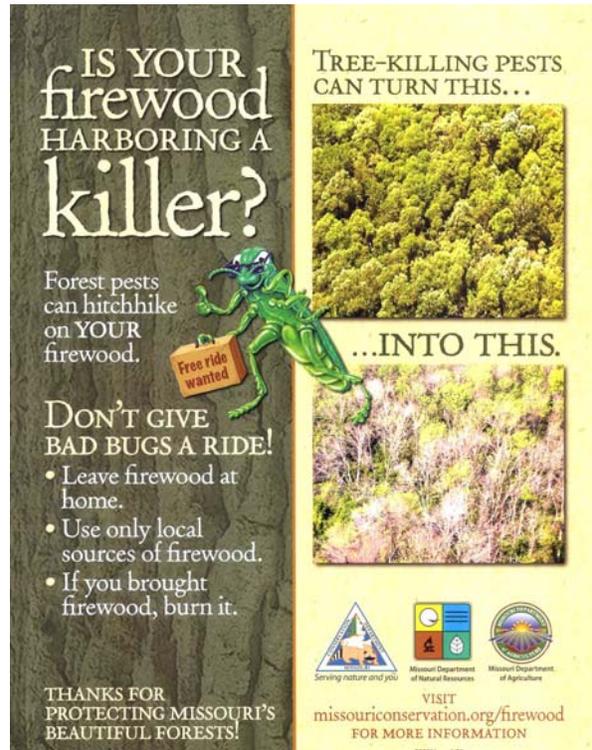
by which EAB is introduced into new areas are through the movement of infested ash firewood, nursery stock or other raw wood products. A total of 106 sites (defined as up to 15 declining ash trees per site) were surveyed in 2006 at 75 public and private campgrounds, recreation areas, and urban locations. Additionally, MDA Plant Protection Specialists examined ash nursery stock (over 22,000 trees) during routine nursery inspections at eight of the state's largest growers. No evidence of the emerald ash borer has been detected so far in Missouri.

Public awareness efforts concerning the EAB increased in 2006 through a combined effort of MDC, MDA, and the Missouri Department of Natural Resources. A web site was established to provide information on potential pests

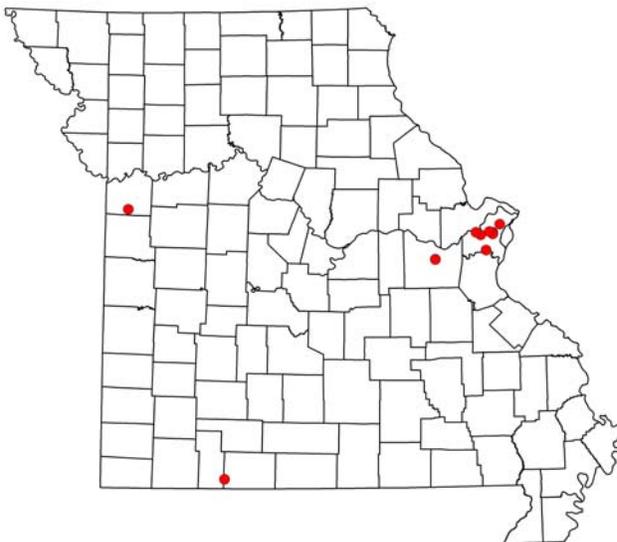
hitchhiking in firewood (www.mdc.mo.gov/forest/features/firewood.htm). A poster titled “Is your firewood harboring a killer?” (available at above web site) was developed and distributed to campgrounds and other recreation sites throughout Missouri. Training about the EAB threat has been presented in workshops for arborists, nursery managers, urban foresters, Master Gardeners, State Park hosts, and other groups, and a variety of media releases and articles have been distributed.

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 9,600 traps across the state in 2006. Seventeen moths were captured statewide. One was caught in the Kansas City area (Jackson County), one from Table Rock State Park (Taney County), two from Franklin County just west of St. Louis, and 13 came from the St. Louis metropolitan area (St. Louis County).

In 2005, no gypsy moths were caught in the St. Louis metro area for the first time since 1979. Subsequent analyses of trap lure batches indicate that lures used in St. Louis last year were probably ineffective. Trap catches in St. Louis rebounded in 2006 to average levels.



**Missouri Gypsy Moth Survey
2006 Positive Trap Catches**



There are no known populations of gypsy moths in Missouri at this time. Sites where gypsy moths have been captured are surveyed with a higher 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. One exception is an area of St. Louis County where a few gypsy moths per year have been caught in six of the last seven years. This area will be examined closely for possible establishment of a gypsy moth population, and statewide gypsy moth monitoring efforts will continue annually in Missouri.

Exotic Bark Beetle and Wood Borer Surveys - MDA and USDA-APHIS continued detection surveys of exotic bark beetles and wood borers in 2006. The banded elm bark beetle (*Scolytus schevyrewi*), a native of central and eastern Asia capable of attacking and killing elms, was previously found in several widespread locations in Missouri, as well as over 20 states across the U.S. In 2006 surveys, this beetle was found for the first time in Boone and Gasconade Counties in central Missouri.

Wood Borers and Oak Decline – Native wood borer activity was at relatively normal levels again in 2006. Oak decline is an ongoing phenomenon in stressed red oak stands across much of Missouri. Red oak borers are among the complex of agents contributing to oak decline. Their numbers have declined after the huge increases of a few years ago, but still may be significant on individual oak decline sites. Reports of various borers in ash trees (e.g., ash-lilac borer, banded ash clearwing) increased this year, primarily as a function of more media attention on the emerald ash borer story. A few reports were received of flatheaded borer damage on stressed river birch, a tree species typically considered resistant to the bronze birch borer, a flatheaded borer that causes heavy damage to white-barked birches.

Defoliators – Damage from defoliating insects was generally at low levels statewide in 2006, but a few chronic defoliators caused damage in familiar places. Walkingsticks once again heavily defoliated oaks at the Union Ridge Conservation Area and adjacent private land near Kirksville for a third consecutive year. Japanese beetle activity remains high at some St. Louis and Springfield locations.

Galls, Girdlers, and Mites – Jumping oak gall (*Neuroterus sp.*) populations have decreased dramatically from the high levels that caused severe leaf discoloration on white oaks in eastern Missouri a few years ago. Only isolated damage was reported in 2006. The cotton ball-like wool sower gall was frequently reported on white oak twigs, although its presence does not affect tree health. Fallen branches caused by twig girdler activity were observed on oaks, hickories and other hardwoods over several widespread locations. The “itch mite” or oak leaf gall mite (*Pyemotes herfsi*), a predator of oak leaf gall insects, is an exotic species established in the Midwest that became a nuisance during 2004 and 2005 because of large populations that were biting humans. Itch mite activity was very low in 2006, perhaps due to dry climatic conditions affecting their survival or survival of leaf gall insects, their preferred prey.

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