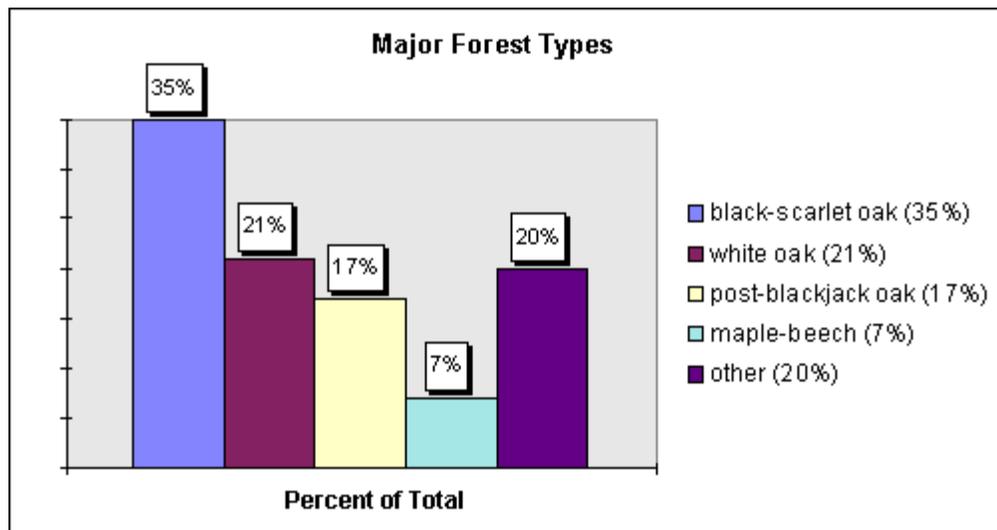


The Resource

Missouri is about one third forested. There are over 14 million acres of forest land, an increase of 5% since 1989. Missouri is well known for its oak-hickory forests. The 2000 forest inventory estimated that almost 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, the latest statistics indicate the value of forest products produced annually exceeds \$4 billion. There are over 2,000 firms employing more than 30,000 people with a payroll of over \$520 million per year. In 2000, over 700 million board feet were cut, 90% was oak, with a stumpage value of over \$110 million.



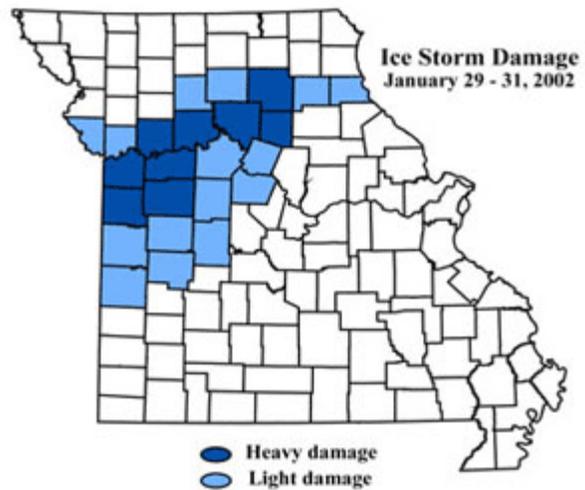
Special Issues

Stress from climatological factors played major roles in forest health concerns in Missouri in 2002. Weather patterns were a study in contrasts with one of the most damaging ice storms on record and a very wet spring with tornado and hail damage in the first half of the year, followed by moderate to severe drought in half of the state in the latter half of the year.

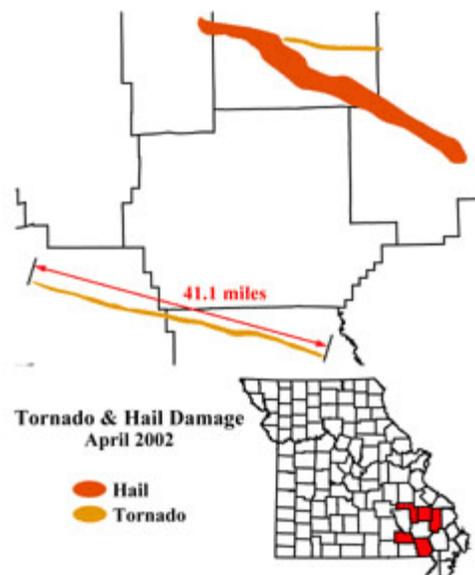
Floods and Drought - The impacts of recent severe droughts, particularly in 1999 and 2000, continue to affect the health of Missouri's forests. Drought-stressed trees are undergoing increased attacks from wood-boring insects, and oak decline is an increasing problem in much of southern Missouri. Weather patterns of 2002 did little to improve these conditions. Precipitation was near or above normal in many areas during the first half of the year, but drought conditions returned to the western half of the state later in 2002. Precipitation amounts in April and May were above normal for much of the state. May was the second wettest May on record with many locations reporting 150-200% of normal precipitation. The greatest precipitation amounts that month occurred in southern Missouri where localized flooding was common, and the lowest amounts occurred in northwestern Missouri. Weather patterns then turned drier than normal for the rest of the year. Moderate to severe drought conditions were present in northwestern and extreme west central Missouri by July, and covered the western half of the state by November. From June to November, St. Joseph, Kansas City and Nevada, Missouri received only 45%, 43%, and 51%, respectively, of their average precipitation. Northwestern Missouri was particularly hard hit by drought with precipitation averaging below normal for most of the year.

Ice Storm Damage - A major winter storm on Jan 29-31, 2002 brought heavy snow to northwest Missouri and severe ice damage

extending from western Missouri northeastward to the north central and northeastern parts of the state. Freezing rain and sleet deposited 1 to 3 inches of ice causing breakage of millions of trees and utility poles, and leaving hundreds of thousands of people without electricity. It was the worst ice storm in Kansas City's history. The heaviest damage occurred in an area stretching from Kansas City northeast to Macon. Heavy tree damage occurred most often in urban and riparian areas. Tree species known for their susceptibility to ice damage were hardest hit. The worst damage occurred on Siberian elm, ornamental pears, silver maple, and other soft maples. Other species receiving significant damage were pin oak, ashes, willows, river birch, hackberry, cottonwood and sycamore.



Tornado and Hail Damage - A severe weather outbreak in southeastern Missouri on April 24, 2002 caused extensive damage to oak and oak-pine forests due to tornado and hail damage. An F4 tornado traveled on the ground for over 41 miles across mostly forested land in Carter and Butler Counties covering 15,332 acres. A second tornado (F2) moved across Madison County for 13.6 miles covering 5,365 acres, damaging woodlands and destroying half the small town of Marquand. Fortunately, no deaths were reported. On that same date, a nearby hail event damaged 67,208 acres of forest land in an area 41 miles long and 2.5 to 3.0 miles wide extending through Iron, Madison and Bollinger Counties. Hail sizes of up to one inch were reported at the time.

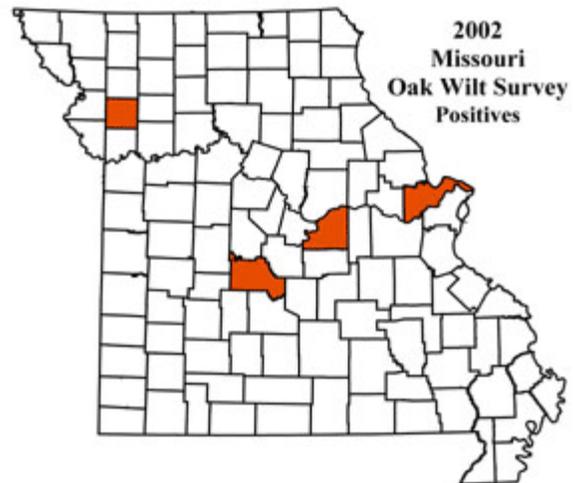


Oak Decline - The ongoing decline and mortality of oaks in southern Missouri continues to increase. Oak decline is a complex phenomenon involving primarily red oaks of advanced age that are growing on sites where competition for resources is severe, for example in shallow, rocky soils, often on upper slopes and broad ridges. The drought conditions of recent years have accelerated oak decline conditions and led to increased attacks by fungal pathogens and wood-boring insects. *Armillaria* root rot and *Hypoxylon* canker are commonly associated with these stands. Increased activity has been observed for several wood borers including the red oak borer (*Enaphalodes rufulus*), carpenterworms (*Prionoxystus* sp.), twolined chestnut borer (*Agilus bilineatus*), and a variety of other borers (Cerambycidae, Buprestidae, and Brentidae). Increasing levels of oak mortality have been reported on state, federal and private land. Some reports are beginning to come in of sites with high mortality among white oaks, as well as red oaks.

The impact of the high precipitation levels in April and May on red oak borer larval survival is not yet known. The current generation of red oak borers hatched and entered tree stems in late summer of 2001, and will complete their development and emerge as adults in June and July of 2003. Many red oak borer attacks were observed to be aborted by early summer 2002, perhaps partly due to the better defensive capabilities of trees during the heavy spring rains. However, preliminary indications of the percentage of larvae that are surviving appear to be near normal levels when compared to historical records for red oak borers. Significant numbers of adults are still expected to emerge in 2003. And more importantly,

many trees are still quite vulnerable to attack due to continuing drought conditions.

Oak Wilt - There were 11 confirmed cases of oak wilt caused by *Ceratocystis fagacearum*. Three new counties, Camden, Clinton, and Osage had positive oak wilt confirmed in addition to Platt, Clay, Jackson, Howard, Boone, Audrain, Callaway, Marion, Montgomery, Lincoln, St. Charles, and St. Louis counties that had positives in 2001. There were seven positives recovered from black/scarlet oak, three from shingle oak, and one pin oak.



Fire Blight - Fire blight reports were prevalent again in 2002, up from 2001 and widespread across much of Missouri. Tip dieback on peripheral branches on various *Prunus* and *Malus* sp. was the recurrent symptom on diseased trees. There were no confirmed main stem cankers reported.

Dutch Elm Disease - Two samples from St. Louis and Camden counties tested positive for Dutch elm disease. In addition, numerous elms along shelterbelts and edges of fields were reported to have increased mortality.

Foliar Diseases - Due to an increase in spring moisture, numerous foliar diseases such as oak and sycamore anthracnose and various leaf blotches were observed throughout most of Missouri.

Wood Borers - In addition to wood borers associated with oak decline, there was a general increase in reports during 2002 of other wood boring insect species. Unidentified borers were observed in St. Louis and Livingston Counties attacking the lower one meter of bole on pin oaks and often just above the soil line. Attacks consisted of a large tunnel (about 3/8" diam) extending directly through the bark into the sapwood, and then turning upward. Some tunnel entrances were covered with a thin, frass plug when examined in September. Attacks were similar to those of oak clearwing borers (*Paranthrene* spp.), but positive identification of these insects has not yet been made.

A few reports were received in 2002 of attacks on various hosts by ambrosia beetles (*Xylosandrus* spp.) that form toothpick-like frass accumulations extending from attack sites. Both the granulate ambrosia beetle (*Xylosandrus crassiusculus*), which is present in the southern U. S., and the black stem borer (*Xylosandrus germanus*), which is present in northeastern and north-central U.S., form "frass toothpicks." These exotic beetle species attack apparently vigorous, as well as stressed or dying trees.

Defoliators - Activity of oak defoliators was scattered and relatively low compared to recent years. Some minor defoliation on oaks by the common oak moth (*Phoberia atomaria*), a Noctuid "looper," was reported from late April to June at various locations across the southern one-third of the state. Populations generally appeared to decline during the heavy rain storms of May. Scattered defoliation by grasshoppers was reported again this year in southeastern Missouri. No reports were received of defoliation by the variable oakleaf caterpillar (*Lochmaeus manteo*).

Gall-forming Insects - No significant damage was observed in 2002 for the jumping oak gall wasp (*Neuroterus* sp.), which caused widespread foliar damage to white oaks in eastern Missouri during 1998-2000. No new reports were received of heavy activity by the horned oak gall wasp (*Callirhytis cornigera*) and the gouty oak gall wasp (*C. quercuspunctata*) beyond the large number of reports received previously in 2001.

Gypsy Moth - The Missouri Cooperative Gypsy Moth Survey continued its annual effort to

detect the presence of gypsy moths by placing and monitoring more than 11,400 traps throughout the state in 2002. A total of four moths were captured statewide, all of them in the St. Louis metropolitan area (three in St. Louis County and one in St. Charles County). This is the first year since 1991 that no moths have been captured in Stone or Taney Counties in southwestern Missouri near the popular recreation areas of Branson and Table Rock Lake. Large volumes of interstate traffic traveling to major urban and recreation areas provide opportunities for gypsy moths to repeatedly hitchhike into the state.



In spite of repeated moth captures in some areas, 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.

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