The Shortleaf Pine in Missouri

RESTORING A FORMER FOUNDATION OF THE OZARK FOREST

by Dan Dey

Shortleaf pines abound at Mark Twain National Forest.

PHOTOGRAPH BY NOPPADOL PAOTHONG

A LONE SHORTLEAF PINE STANDS NEARLY 100 FEET tall, rooted in the stony soils of a cliff, overlooking a valley. Protected by its thick bark, the pine has survived a long history of frequent fires set by Osage Indians and Scotch-Irish immigrants. It escaped the woodsman's axe by its remote location. Over its 350 years of life, it has seen dramatic changes from the days when the Osage people plied the waters of the river below in their canoes. It stood through the agricultural and industrial revolutions that swept through the Missouri Ozarks in the later 19th and early 20th centuries. Today, it stands witness to the tourists who drift upon this Ozark spring-fed stream in their canoes, kayaks, and tubes.

Missouri's Native Pine

Shortleaf pine is the most widely distributed of the southern pines (loblolly, longleaf, and slash pines) and is the only native pine species in Missouri. It has significant ecological and economic value and has played a major role in the history of Missouri. Shortleaf pine was a dominant tree species in savanna, woodland, and forest natural communities that once blanketed the Ozark landscape.

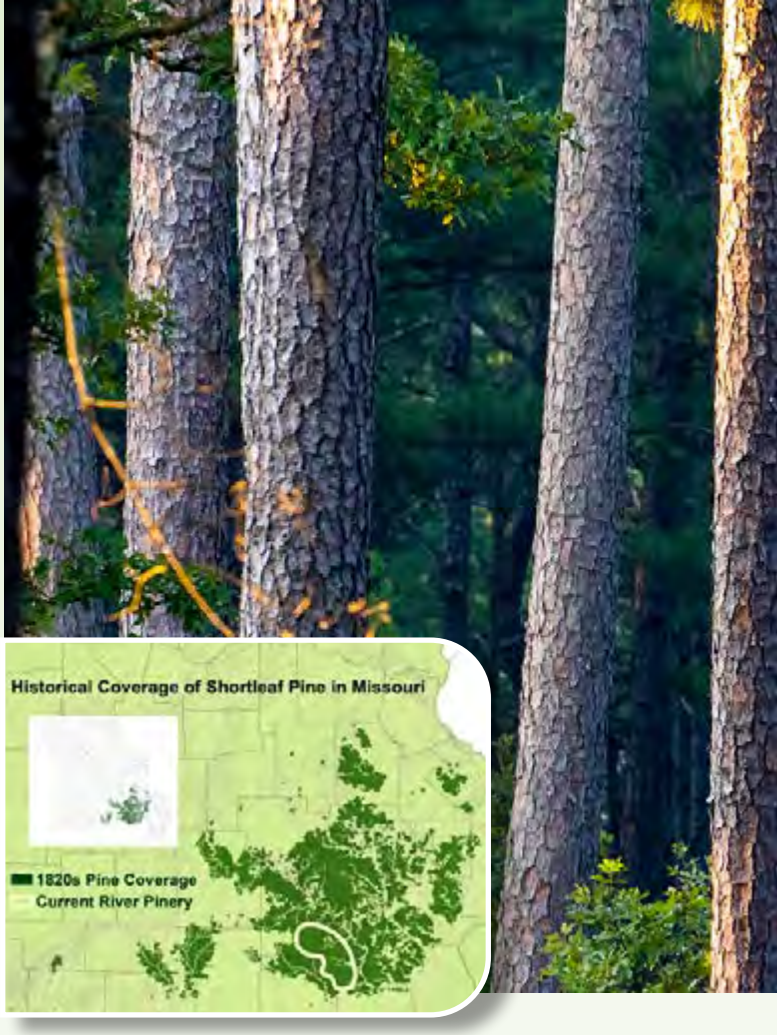
Pine-oak woodlands once covered an estimated 65 percent of the Ozark landscape, where they comingled with prairies, savannas, and forests. Once prominent savannas and woodlands are now some of the rarest natural communities in the Ozarks, but increasing efforts are being made by public agencies, conservation organizations, and private landowners to restore them with harvesting and prescribed fire.

Pine-Oak Habitats and Diversity

Pine-oak savannas and woodlands produce high levels of plant diversity that, in turn, support a diversity and abundance of fauna. Several wildlife species require mature, large pine as part of their habitat, while many others prosper in more open savanna and woodland habitats.

The endangered red-cockaded woodpecker and brown-headed nuthatch have been lost from Missouri for at least 100 years due to loss of open mature pine habitat. Other pine obligates, such as Bachman's sparrow and pine warbler, are in decline. However, large scale restoration of pine woodlands on federal and state lands in Missouri over the past 20 years has made the restoration of the brown-headed nuthatch to the Ozarks possible.

Pine woodlands and savannas also provide quality habitat for important game species such as bobwhite quail, white-tailed deer, and eastern wild turkey. Elk once roamed the pine-oak woodlands of the Ozarks in the early 1800s but were hunted to extinction by the end of the century. Today, a viable elk herd has been returned to restored pine-oak woodlands on MDC's Peck Ranch Conservation Area.



Shortleaf pine once covered 6.6 million acres in the Missouri Ozarks (inset map). It occurred sometimes in dense pure stands of pine, but more often intermixed with oaks and other hardwoods in forests, woodlands, and savannas.

Quality Wood Leads to Overharvest

Shortleaf pine produces quality lumber and veneer, and it is also used for plywood, utility poles, fence posts, pilings, and pulp. It was the focal species desired by lumber barons and speculators, which led to the widespread exploitation of Missouri's Ozark forests from 1880 to 1920, dramatically transforming the Ozark landscape in ways never seen before. The Grandin Mill in Carter County was once the largest sawmill in Missouri and possibly the entire U.S. It consumed 70 acres of forest per day. In 1899, about 180,000 acres of pine forests were harvested to feed the large mills located in towns like Winona, Bunker, West Eminence, Greenville, Leeper, Birch Tree, and Grandin. The Grandin Mill may have been responsible for the liquidation of over 500,000 acres of pine forests over its 30-plus year history.

Today, 4 to 7 percent of the timber harvested in Missouri is shortleaf pine. There is substantial potential to increase the contribution of pine in the forest products industries and diversify the Ozark economy because 13 to 62 percent of the annual pine growth is harvested in any year in existing pine-oak forests. Increased efforts to restore pine-oak woodlands and forests would add to the pine timber supply.

In 1946, a statewide survey revealed that there were originally about 6.6 million acres of shortleaf pine-oak forests in Missouri. Today, there remains a mere 552,000 acres. This dramatic loss of pine in Missouri is due to novel changes in land use brought on by European immigration into the Ozarks. Throughout the 19th century, European settlers frequently

FOREST OF PINE-OAK: NOPPADOL PAOTHONG

The Missouri Lumber and Mining Company established operations about 1888 in Missouri to harvest the shortleaf pine. Their Grandin Mill was one of the largest in the country at the beginning of the 20th century. It closed about 1910.

burned the Ozarks every one to three years, too frequent for the survival of young pine regeneration and more frequent than their Native American predecessors. During the initial logging boom (1880–1920), mature pine trees were cut wherever a sawyer could get to them with horse, mule, oxen, wagon, or tramway. Shortleaf pine supplied the demand for construction timber and other forest products for booming populations in eastern cities. The loss of mature pine eliminated seed for natural regeneration. Removal of pine from large areas made natural regeneration impossible because pine seed can only disperse about 150 feet from a mother tree. After the logging, intense fires burned through the logging slash and annual fires were set by the locals to promote grass production for their open range grazing operations. Although shortleaf pine seedlings that are several years old can sprout after fire kills their shoots, these fires burned too frequently for young, small pine seedlings to survive. The oaks, however, are tenacious sprouters under frequent fire in open forests and can persist and grow large root systems.

Once fires were suppressed in the Ozarks in the 1930s to 1950s, oak sprouts bolted to dominance, suppressing any smaller pines that remained. In the absence of fire, leaf litter accumulated, which inhibited pine seed germination and seedling establishment. Over the past 70 years, our oak-dominated forests have been maturing to form dense closed canopies that cause low light levels in the understory where the shade intolerant shortleaf pine seedlings are unable to survive.

Shortleaf pine-oak woodlands are being restored today using a combination of timber harvesting and prescribed fire.

Pines Preferred Conditions

Shortleaf pine is most tolerant of certain site conditions in the Ozarks. There they are more competitive and productive compared to hardwood species. The presence of pines is strongly related to soils derived from the Roubidoux formation, comprised of sandstone, dolomite, and chert that surfaces in the central and southeastern Ozarks. These sandy, rocky soils occur commonly on upper slope positions. They are dry with low water holding capacity. They are low in base saturation, acidic, and otherwise low in fertility.

A long history of fires set by humans has promoted the spread and dominance of shortleaf pine on other, more productive site types. For example, fires set by Osage Indians and other Native Americans burned on average every 10 years with variability in fire-free periods of two to 45 years from site to site during the 18th and early 19th centuries. With the removal of fire from the Ozark landscape, pine has retreated to its stronghold on the Roubidoux formation.

Fired Up for Pines

Fire is essential to the success and history of shortleaf pine in Missouri. Recurring fire, every three to five years, keeps leaf litter from building up, and provides a good environment for pine seed to contact soil, germinate, and develop into seedlings. New seedlings less than 3 years old are susceptible to fire and have high mortality if burned. During this stage of development, the pine seedlings develop a double "crook" where the roots and stem join. The crook is an area with an abundance of dormant buds that lie along or in the soil surface where they are better protected from the heat of surface fires. Should fire kill the shoot of an older pine seedling, it is able to sprout from the dormant buds and continue growing. If light is adequate, as it is in the understory of savannas and open woodlands, then pine seedling sprouts can persist over multiple fires, growing and waiting for a time when they can recruit into the overstory. In restoring pine-oak savannas and woodlands, overstories are often too dense and timber harvesting is used to thin the overstory in addition to prescribed burning.

Pine reproduction requires a fire-free period of about eight to 15 years to grow large enough in size (for example: greater than 0.5 inches diameter at breast height, greater than 5 feet tall) so that it can better resist shoot mortality from fire, and thus, continue growing into the overstory even if there were to be another fire. If pine reproduction can maintain dominance over its competition in the early years, it can grow more rapidly than hardwoods into the overstory. Additional fires during the early stages of pine recruitment into the overstory may be useful for controlling hardwood sprout competition to keep pine free to grow.

The double crook of a shortleaf pine seedling develops in the first few years of life (left). When fire burns the seedling, killing any stems above ground, new sprouts emerge from the crook (above).

PINE-OAK WOODLAND, SEEDLING, DOUBLE CROOK: DAN DEY; FOREST OF PINE-OAK: NOPPADOL PAOTHONG

Restoring Pines

Shortleaf pine savanna, woodland, and forest restoration is increasingly important for Missouri land managers and owners. Restoration of these once prominent natural communities would reverse the decades-long decline that continues today. Pine ecosystems have high biological diversity, and their restoration is key to native flora and fauna conservation. Pine ecosystems provide key habitat for endangered and declining populations of species of conservation concern, including plants, wildlife, and pollinators. They provide quality habitat for many of our valued game species such as deer, turkey, and quail. Shortleaf pine is highly adapted and compatible with future expected climates, which increases the resilience of our forests to respond well to future environmental threats and stresses. Shortleaf pine woodlands and forests provide valuable forest products and there is potential to diversify and grow our Ozark industries and economy. Shortleaf pine adds to the aesthetic and recreational values of our Ozark landscape. For more information on managing for shortleaf pine on your property, contact your local forester.

There is a shortleaf pine natural history and restoration management driving tour and podcast in the Current River Pinery, Mark Twain National Forest. For more information, visit **short.mdc.mo.gov/4q7**. ▲

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From about 1880 to 1920, much of the shortleaf pine was cut from the Missouri Ozarks. When the forests were cutover, the pine resource was greatly diminished and unable to regenerate under European settler land use practices of frequent fire and open range grazing.