

# THE PINEKNOT PROJECT: RESTORATION OF A MISSOURI OZARK PINERY

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## EXTENDED ABSTRACT

Pine dominated more than 4 million acres of the Missouri Ozarks prior to European settlement. These pineries supported a diverse array of plants and animals, including several taxa no longer present in the state (e.g., *Desmodium ochroleucum*, *Picoides borealis*, *Sitta pusilla*). Intensive logging activity and subsequent land management practices at the close of the 19th century resulted in a complete loss of functional pinery systems, although shortleaf pines continue to be a common component of mixed woodlands in the region.

Prior to European settlement, these pineries consisted of relatively uniform pine or pine-oak dominated canopies over large expanses of well-drained rolling to dissected uplands, with minimal subcanopy and shrub development. As is the case with structurally similar hardwood systems in the Ozarks, and many pine woodlands elsewhere in the New World, we postulate that most of the vegetational diversity in these systems existed in the ground layer. This ground layer consisted of a diverse assemblage characterized by perennial herbaceous forbs and a smaller number of graminoid species that were disproportionately prevalent and shaped the fuel characteristics of the system. These pineries require frequent, low-intensity, prevailing dormant-season fire events to maintain the open structure and facilitate canopy replacement dynamics.

In 1998, the U.S. Forest Service and The Nature Conservancy initiated a partnership to restore a functional pinery system within a landscape producing both ecological and economic outputs, and capable of eventually sustaining viable populations of the full array of indigenous pineland biodiversity. Initial phases of the work have consisted of: (1) identification of historically appropriate sites of suitable scale and continuity; (2) rapid ecological assessment of candidate sites and the resulting area delineation of the Pineknott Pine Restoration Project; (3) presettlement vegetation analysis and detailed baseline assessment of current vegetation; (4) derivation of an ecological model for Ozark pinery vegetation; (5) development and implementation of silvicultural and fire management treatments; and (6) initial post-treatment vegetation assessment and data analysis.

The Pineknott site consists of 12,419 acres in southwestern Carter County, on a rolling upland plain with moderate topographic relief. Soils are derived from clay and chert residuum, and are xeric, acidic, and nutrient limited. Vegetation monitoring was established using 100 permanent points randomized within area-proportional representation for each of the four landform classes at the site. These selections were stratified to ensure area-proportional representation of even-aged stands <15 years old, and buffered to exclude roads, ponds, and other anthropogenic attributes. Canopy vegetation was sampled for the first 50 points using 0.1-acre square macroplots. Each of the 100 points was sampled for ground cover vegetation using fifty 0.25-m<sup>2</sup> square quadrats randomized within intervals along radial line transects.

Presettlement vegetation analysis indicates a heavily pine-dominated woodland in the region, with an open canopy of moderately large trees. At the Pineknott site, most of the landscape in 1821 had a canopy cover of 40-80 percent, with a mean stocking rate of 45 trees per acre and an average distance of 27 feet from a survey point to a witness tree. Shortleaf pine comprised 76 percent of the witness trees, with a mean DBH of 17 inches. Virtually all the other witness trees in the site were various upland oak species, with slightly smaller mean DBH.

This situation contrasts dramatically with the pretreatment condition of abundant, smaller, more closely spaced trees, increased canopy cover, and a dominant hardwood component. In contrast to 1821, when the site composition was entirely pine types, less than half the site is currently classified as pine, with the remainder consisting of oak-dominated hardwoods. Although current canopy patterns suggest a relationship between topographic position and hardwood composition and abundance, none of these stand trends, such as greater hardwood component on northeast-facing or bottom stands, was evident in 1821. As contrasted with the open woodland structure in 1821, pre-treatment site vegetation consisted of more abundant, closed canopy with more trees and a much higher proportion of hardwoods.

Floristic models indicate that Missouri Ozark pineries were composed of a diverse but relatively consistent assemblage of about 300 predominantly perennial upland herbaceous vascular taxa, including several conservative species with high local fidelities to pineland systems. Mean per-unit area ground cover diversity in intact Ozark pineries probably exceeded 10 (perhaps approaching 15) native taxa per 0.25 m<sup>2</sup>; pretreatment baseline data reveal 2.2 taxa per 0.25 m<sup>2</sup>.

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Most of the conservative floristic cohort of these pineries (C values  $\geq 6$ ) are associated with relatively high light intensities and are currently absent or sparse over the Pineknott site. Analysis of vegetation monitoring data reveals that initial, largely fire-based site treatments have increased native ground cover diversity (2.2 to 3.1), floristic quality (6.0 to 7.4), and abundance (11,245 to 15,503).

These increases have been attenuated by remaining high hardwood cover and consequent shading levels through most of the site. A compelling need is indicated for increased intensity of silvicultural treatments and hardwood sprout reduction to advance restoration goals from current condition towards a compositional and structural state more evocative of the vegetation model. Restoration of a diverse, sustainable pinery community

will require: (1) adoption of intensive treatments to secure canopy cover and composition within the range of natural variation resembling General Land Office data; (2) restoration of a fire regime encompassing both the mean and extremes within the prevailing presettlement fire dynamics; and (3) recruitment or reintroduction of an abundant, diverse ground layer dominated by herbaceous perennials, including a prominent graminoid component and a high diversity and presence of a suite of conservative taxa.

Pinelands once occupied a substantial portion of the Missouri Ozarks. From the perspective of both global and local conservation value and irreplaceability, it is imperative that we actively restore functional examples of this legacy of our natural heritage, while sustaining the full array of biota characteristic of these systems.