Historical Reflections on the Arkansas Cross Timbers

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Abstract

Küchler's original map of potential natural vegetation suggested that the eastern-most extension of the "Cross Timbers" oak-dominated woodland reached into extreme western Arkansas. Recent investigations have found possible old-growth Cross Timber communities in narrow strips along steep, rocky sandstone and shale ridges near Fort Chaffee and Hackett. However, many decades of Euroamerican intervention have altered vegetation composition and structure in west-central Arkansas, making field evaluation difficult. Fortunately, historical accounts of the area provide considerable supporting documentation. General Land Office surveyors, for instance, traversed this portion of western Arkansas before 1850. They reported many ridges and slopes dominated by grassy, stunted oak woodlands, with extensive prairies and richer bottomland terraces. Early explorers, missionaries, and botanists also found similar conditions. For example, both the botanist Thomas Nuttall (in 1819) and the Reverend William Graham (in 1845) mentioned abundant oak woodlands interspersed with glades and grasslands on the stony hills south of Fort Smith. These historical accounts help show that, though far more restricted in their extent than comparable stands in Oklahoma or Texas, Cross Timber communities are possible in Arkansas.

Introduction

The "Cross Timbers" covers millions of hectares from southeastern Kansas through Oklahoma into northeastern Texas (Figure 1). These woodlands are characterized by open forests of post oak (*Quercus stellata* Wang.), often with a large component of blackjack oak (*Quercus marilandica* Muenchh.) and occasionally other tree species like hickories (*Carya* spp.), eastern redcedar (*Juniperus virginiana* L.), and, more rarely, shortleaf pine (*Pinus echinata* Mill.). Understory vegetation is usually dominated by prairie-type grasses (e.g., *Andropogon* spp.), forbs like *Agrimonia* spp., woody shrubs (e.g., *Vaccinium* spp.), and scattered tree seedlings (Bruner, 1931). The Cross Timbers lies at the ecotone between the eastern deciduous forest and the Great Plains and is thought to reflect a climatic and edaphic zone in which there is sufficient soil moisture to support hardy tree species (with *Quercus stellata* and *Quercus marilandica* considered climax), generally at low density (Bruner, 1931; Dyksterhuis, 1948; Rice and Penfound, 1959). Old-growth examples of these woodlands are dominated by stunted (< 20 m tall) post oaks, most of which are gnarled, hollow, and often quite ancient (Therrell and Stahle, 1998).

Though the Cross Timbers region has traditionally been thought to occur primarily in Oklahoma and Texas, we are uncertain as to how far east this association reaches. Bruner (1931) extended his oak-hickory savannah type from central Oklahoma along the Arkansas River Valley to at least the Arkansas state line. Küchler's map of potential natural vegetation for the coterminous United States suggested that the Cross Timbers extended into extreme western Arkansas (Küchler, 1964). Since his map was based on inferences from site factors like slope, aspect, parent materials, and other large-scale geographic information, fine-scale community representation within a given region could differ substantially. Hence, the actual presence of the Cross Timbers in Arkansas is uncertain. Recent investigations by the author and Dr. David Stahle of the University of Arkansas have found old-growth communities similar to the Cross Timbers in narrow strips along steep, rocky sandstone and shale ridges near Fort Chaffee and Hackett (Figure 2). These remnants could provide confirmation of the Arkansas Cross Timbers as suggested by Küchler's map.

The difficult access, low site productivity, and poor commercial quality of the trees in the Cross Timbers has resulted in the preservation of surprisingly large areas of old-growth (Therrell and Stahle, 1998). However, many decades of grazing, logging, agricultural clearing, herbicide application, military training, and residential development have altered the composition and structure of remnant stands, making field evaluation of the potential examples of the Arkansas Cross Timbers difficult. Fortunately, historical accounts of the area have provided considerable supporting information. This paper reviews some of the key ecological descriptions included in this historical documentation and relates these accounts to the current knowledge of the Cross Timbers community type.

Materials and Methods

Study Region.--The region in Arkansas identified as Cross Timbers by Küchler's 1964 map includes Sebastian County and portions of southern Franklin, western Logan, and extreme northern Scott counties (Figures 2). In general,

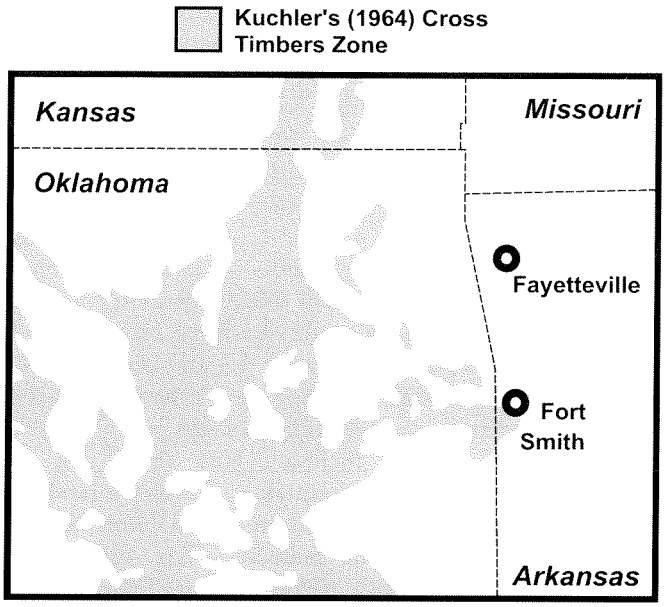

Fig. 1. An enlarged portion of Küchler's original map of the Cross Timbers ecosystem, showing an extension into Arkansas (adapted from Küchler, 1964).

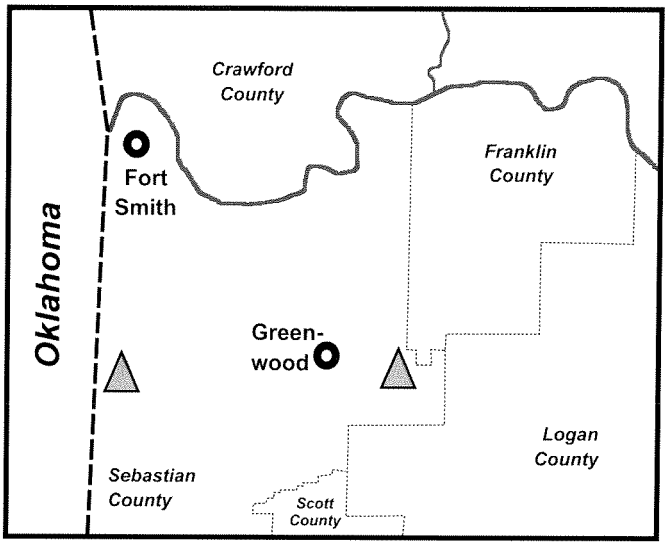

Fig. 2. Western Arkansas, with probable Cross Timbers old-growth locations (triangles) found in preliminary investigations in 2004.

the area is bounded to the south by the main spurs of the Ouachita Mountains and to the north by the Arkansas River floodplain. Within this region, sandstone- and shale-dominated ridges were of particular interest, especially those with Mountainburg sandy loams and associated soil complexes. These soils are shallow, droughty, often stony and frequently found on steep slopes (Cox et al., 1975).

Vegetation also helped to define the region of interest. Cox et al. (1975) described likely Cross Timber sites in Sebastian County as poorly suited for cultivation but acceptable range lands, with "scrubby" oak- and hickory-dominated overstories and grassy understories. Slow growing and shade intolerant, both post and blackjack oak fare poorly on sites where more tolerant species can establish and overtake them. Thus, under mesic conditions, post and blackjack oak are considered transitional, typically replaced by white and red oaks, hickories, gums, and pine. Bottomland forests (such as those along the Arkansas River) and better quality sites found in the Ouachita Mountains limit the extent of Cross Timbers in Arkansas. Areas with extremely stony, clayey, or very shallow soils in the Cross Timbers often experience extreme growing season droughts, and are commonly occupied by grassy openings.

Data Sources.--Information on historical vegetation patterns in western Arkansas were derived from multiple sources, including General Land Office (GLO) surveys from the mid 1820s to the early 1840s (Daniels, 2000). These records, although not originally intended to describe ecological features, have shown considerable promise for interpreting presettlement vegetation in Arkansas (e.g., Foti and Glenn, 1991; Foti, 2001; Bragg, 2003). The description of dominant trees, forests, and landform types along the traverses are particularly useful information provided by the GLO notes. As an example, GLO surveyors listed most Arkansas tree species, even though some taxa are undeniably vague and a few were misidentified (Bragg, 2002).

Early explorers, botanists, and missionaries sometimes recorded their travels through western Arkansas. Their narratives provide many qualitative descriptions of presettlement landscapes and have contributed greatly to our knowledge of presettlement forests in Arkansas, including possible Cross Timber communities. For example, both the renowned botanist Thomas Nuttall and Major Stephen H. Long conducted expeditions through the area of interest in 1819-1820, and each left detailed records of the vegetation he encountered.

Results and Discussion

The GLO surveyors in western Arkansas reported many ridges and slopes dominated by grassy, stunted post oak woodlands with extensive prairies and richer bottomland terraces (Daniels, 2000). For instance, deputy surveyor William Clarkson described much of the landscape as "poor" or "thin," often rocky, and rarely fit for cultivation. On February 21-22, 1827, Clarkson repeatedly passed between small prairies interspersed with "...grove[s] of small Post Oak & Black Jacks," which he also called "woodlands." Blackjack oak dominated some ridges, with

occasional references to black oak (probably *Quercus velutina* Lam. and several other species of *Quercus*) and unspecified hickories (*Carya* spp.).

Other early visitors to the area witnessed similar environmental conditions. In 1819 Thomas Nuttall collected plants in the lands south of present-day Fort Smith. Even though Nuttall made scarce mention of dominant trees, his other vegetation descriptions are revealing:

> Like an immense meadow, the expanse was now covered with a luxuriant herbage, and beautifully decorated with flowers, amongst which I was pleased to see the Painted Cup of the eastern states, accompanied by occasional clusters of a white flowered *Dodecatheon* or American primrose. The numerous rounded elevations which chequer [sic] this verdant plain, are so many partial attempts at shrubby and arborescent vegetation, which nature has repeatedly made, and which have only been subdued by the reiterated operation of annual burning, employed by the natives, for the purpose of hunting with more facility, and of affording a tender pasturage for the game (Nuttall, 1980, p. 158-159).

The use of fire to keep prairies and woodlands open was common practice in the territory (Key, 2000). The presence of large numbers of white-tailed deer (*Odocoileus virginianus* Zimm.), bison (*Bison bison* L.), and elk (*Cervus elaphus* L.) also appeared in Nuttall's and other explorers' reports of the Arkansas Cross Timbers region.

Following a rambling expedition to the Rocky Mountains, Major Stephen H. Long and his company passed through the Cross Timbers of Oklahoma into extreme western Arkansas by the late summer of 1820. Long was accompanied by a physician, Edwin James, who later wrote a detailed account of their travels (Thwaites, 1905). Dr. James' knowledge of botany and geology produced insightful commentaries on the Cross Timbers, including this observation along the Canadian River in eastern Oklahoma:

> The sandstone which appears in the beds of the streams, and the sides of the hills, is coarse and hard, of a dark gray colour, and a horizontally laminated structure. It is deeply covered with a soil of considerable fertility, sustaining heavy forests of oak. Among these trees the upland white oak is common, but is of rather diminutive size, and often hollow. In a tree of this description we observed, as we passed, the habitation of a swarm of bees... (Thwaites, 1905, p. 162).

James appeared to confuse post oak with true white oak (*Quercus alba* L.). His positive appraisal of the fertility of the hillslope soils belied the stunted ("diminutive") stature of the oaks, but given that they had just crossed the hot, dry, treeless Great Plains, any type of forest may have seemed exceptionally productive. Long's expedition continued along the Canadian River to its confluence with the Arkansas River, which they then followed to the Fort Smith area. While they primarily followed river bottoms, occasionally the party scaled the uplands, traveling through oak woodlands and pockets of prairie as they entered the Arkansas Territory.

Native American land cessations opened the region to settlement after 1825, and waves of settlers soon followed. By the early 1840s, Indian missionaries and traveling preachers roamed the landscapes to minister to their dispersed congregations. In 1844, a Methodist preacher from Pennsylvania named William Graham was assigned a wide-ranging circuit that included Fort Smith and ran southward to the Ouachita Mountains. Reverend Graham, though trained in religious matters and not botany, frequently described natural features. For instance, he viewed the landscapes south of Fort Smith as follows:

> Some of the prairie lands are moderately productive, while others are slaty, hard, and barren. The upland is generally thin, and but poorly repays cultivation. The valleys are more fertile, and yet inferior in qualities of soil to most countries: besides, they are very narrow and irregular. The country is but thinly wooded with indifferent growths of black-jack and white-oak, and is everywhere covered with long grass and beautiful flowers of every hue. (Graham, 1863, p. 539).

Graham's "white-oak" was almost certainly post oak since the area in question was too harsh for *Quercus alba*. Typical of the hills were Blackjack Ridge (near the present-day village of Mansfield), for which Graham (1863, p. 540) described as "...covered in tall grass and the stunted species of oak called black-jack..." or the Sugar Loaf Mountains along the Arkansas-Oklahoma state line, which were covered with a "...stunted growth of timber...". An excerpt from Reverend Graham's autobiography further described the region:

> The general character of the country was that of open barrens, with but few dense forests, with but few tall large trees. The timber was mostly thinly scattered, light and scraggy with glades and openings, and the bare spaces covered with grass, and flecked with flowers. The soil is not very rich, except in the valleys and bottoms, and yet is not wholly unproductive. In the valleys and flats the hickory walnut and pecan grow larger, and where the soil is wet the Cyprus [sic] and cycamore [sic] abounds. Mostly, however, the timber is light and thin, and the country is easily cleared. Portions of it [are] rocky, but that is true only of the ridges, and hills. There are some pine forests...[in] the

mountain glens and bluffs grows the beautiful trim holley [sic]...[t]he whole country is beautiful and variegated, with wild flowers of every hue. (Parman, 1998, p. 327).

Graham also reported an abundance of hawks, vultures, and the now extinct Carolina parakeet (*Conuropsis carolinensis* L.), the latter of which he colorfully described as "...of beautiful plumage, but of horrid music..." (Parman, 1998, p. 328).

A reconnaissance spearheaded by geologist David D. Owen covered much of the state in 1859 and 1860 (Owen et al., 1860). Owen's work concentrated on the description of obvious geological characteristics of the region, especially the extensive coal beds and sedimentary formations that dominate Sebastian and Logan counties south of the Arkansas River floodplain. M. Leo Lesquereux, the botanist attached to the expedition, associated vegetation with the observed geology. He placed the grasslands of Sebastian and Franklin counties with "prairies of Carboniferous shales," calling them relatively sterile and difficult to cultivate but excellent for pasture (Owen et al., 1860). The "sandy, dry, and sterile" summits of the low hills and ridges surrounding these prairies were often treeless or covered by open oak-dominated woodlands. Lesquereux interpreted the lack of trees and the abundance of shrubs as evidence of frequent fire, although he made no specific mention of recently burned lands along their route.

Virtually all of the early visitors to the Arkansas Cross Timbers region commented on the extensive grasslands. Most recognized that these prairies arose from extreme soil conditions, although some (like Lesquereux) attributed their presence to frequent fire. Such openings are common throughout the Cross Timbers, as may be expected along the Great Plains/Eastern Woodland ecotone. The presence of *Andropogon* and other "prairie grasses" (as called by GLO surveyors) further supports the occurrence of the Cross Timber woodlands in western Arkansas.

Conclusions

Repeated historical descriptions of open, grassy, dwarfed post and blackjack oak woodlands in western Arkansas are consistent with modern Oklahoman or Texan examples of Cross Timbers. The presence of these communities over sandstone and shale on many of the steep, rocky ridges in Sebastian and surrounding counties, coupled with their history of fire, a complex juxtaposition with prairie openings, and harsh site conditions suggest that these stands are indeed eastern extensions of the larger Cross Timbers ecosystem.

Unfortunately, most examples of the Cross Timbers type in Arkansas have been degraded by decades of cutting, pasturing, and invasion by eastern redcedar. Their transitional position on the ecotone between the Great Plains and eastern forests indicates that the Arkansas Cross Timbers may be particularly vulnerable to environmental change and conversion to other community types. Residential and industrial development also threatens the remaining examples. Further field work is needed to conclusively confirm the presence of Cross Timbers in Arkansas, and to suggest management and conservation options.

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Literature Cited

Bragg, D. C. 2002. Checklist of major plant species in Ashley County, Arkansas noted by General Land Office surveyors. J. Arkansas Acad. Sci. 56:32-41.

Bragg, D. C. 2003. Natural presettlement features of the Ashley County, Arkansas area. Am. Midl. Nat. 149:1-20.

Bruner, W. E. 1931. The vegetation of Oklahoma. Ecol. Monographs 1:100-188.

Cox, J. B., B. A. Garner, and F. M Vodrazka. 1975. Soil survey of Sebastian County, Arkansas. USDA Soil Conservation Service, USDA Forest Service, and Arkansas Ag. Exp. Sta. Gov. Printing Office, Washington, D.C. 66 pp.

Daniels, C. [commissioner]. 2000. Arkansas original General Land Office survey notes and plats. Ark. State Land Office, Little Rock, AR (16 compact disks).

Dyksterhuis, E. J. 1948. The vegetation of the Western Cross Timbers. Ecol. Monographs 18:326-376.

Foti, T. L. 2001. Presettlement forests of the Black Swamp area, Cache River, Woodruff County, Arkansas, from the notes of the first land survey. Pp. 7-15 *In* Bottomland hardwoods of the Mississippi Alluvial Valley: characteristics and management of natural function, structure, and composition (P.B. Hamel and T.L. Foti, eds.). USDA For. Serv. Gen. Tech. Rep. SRS-42.

Foti, T. L., and S. M. Glenn. 1991. The Ouachita Mountain landscape at the time of settlement. Pp. 49-65 *In* Restoration of old growth forests in the interior highlands of Arkansas and Oklahoma (D. Henderson and L.D. Hedrick, eds). Ouachita Nat'l. For. and Winrock Int'l. Inst. Agric. Develop., Morrilton, AR.

Graham, W. 1863. Frontier sketches: my first circuit. The Ladies' Repository 23:539-544.

Key, J. P. 2000. Indians and ecological conflict in territorial Arkansas. Ark. Hist. Quart. 51:30-53.

Küchler, A. W. 1964. Potential natural vegetation of the coterminous United States. Am. Geographical Soc. Special Pub. 36.

Nuttall, T. 1980. A journal of travels into the Arkansas Territory during the year 1819. S. Lottinville (ed). University of Oklahoma Press, Norman, OK. 361 pp.

Owen, D. D., R. Peter, M. L. Lesquereux, and E. Cox. 1860. Second report of a geological reconnoissance [sic] of the middle and southern counties of Arkansas made during the years 1859 and 1860. C. Sherman and Son, Philadelphia, PA. 433 pp.

Parman, D. L. 1998. Riding circuit in Arkansas, 1844-1845: an excerpt from the autobiography of Reverend William Graham. Ark. Hist. Quart. 62:309-339.

Rice, E. L., and W. T. Penfound. 1959. The upland forests of Oklahoma. Ecology 40:593-608.

Therrell, M. D., and D. W. Stahle. 1998. A predictive model to locate ancient forests in the Cross Timbers of Osage County, Oklahoma. J. Biogeography 25:847-854.

Thwaites, R. G. [editor]. 1905. Early western travels 1748-1846, volume XVI: Part III of James's account of S.H. Long's expedition, 1819-1820. Arthur H. Clark Company, Cleveland, OH. 291 pp.