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## THE PROMINENCE OF PINE IN THE UPPER WEST GULF COASTAL PLAIN DURING HISTORICAL TIMES

Don C. Bragg

Research Forester, USDA Forest Service, Southern Research Station,  
P.O. Box 3516 UAM, Monticello, AR 71656  
Phone: (870) 367-3464 ext. 18, Fax: (870) 367-1164  
E-mail: dbragg@fs.fed.us

### INTRODUCTION

The millions of hectares of virtually uncharted territory added by the Louisiana Purchase held great promise for the United States. However, without better information on the potential resources of this vast landscape, the benefits of this acquisition from the French might go unrealized. Recognizing this need, President Thomas Jefferson sent a number of parties to explore the vast new realm, and their narratives helped to usher in an age of discovery while paving the way for exploitation and settlement. However, when surveyor Thomas Freeman, naturalist Peter Custis, and the rest of their expedition departed from Natchez, Mississippi in the spring of 1806 to explore the southern reaches of this acquisition, they had no inkling of the environmental legacy of their journey.

President Jefferson had learned from the first explorations of the Louisiana Purchase that a trained naturalist was of immense value, and thus he specifically employed an eager if not particularly experienced Custis to act in this capacity (Flores 2002). Though frequently misguided by his textbooks and somewhat naïve about the biology of the region, Custis provided an account of the flora and fauna immediately adjacent to the Red River (MacRoberts et al. 1997, Flores 2002).

Even with the detail of their reports along the river, we have very little concrete information on the composition and structure of the upland forests along their route. In fact, only a handful of explorer journals (including those kept by Freeman and Custis), surveyor reports, historical

photographs, and other fragments of documentation prior to 1900 remain to describe the forested uplands. This uncertainty has led to questions about the nature of the landscapes across the Upper West Gulf Coastal Plain (UWGCP) during this period. The UWGCP is generally considered to include the higher ground of southern Arkansas, northern Louisiana, extreme southeastern Oklahoma, and northeastern Texas, typically north of the longleaf pine (*Pinus palustris* Mill.) forests of the Gulf Coast, east of the Cross Timbers, south of the Ouachita Mountains, and west of the Mississippi River Alluvial Plain.

One of the most intriguing questions on the UWGCP relates to the abundance of pine (primarily loblolly (*Pinus taeda* L.) and shortleaf (*Pinus echinata* Mill.)) relative to hardwoods in the virgin upland forests. Conventional wisdom suggests that pine was the primary historical component of many UWGCP forests, although probably not as dominant as it is today (Chapman 1942, Platt 1999, Bragg 2002a). Pine must have been quite prominent in the region for it to earn the moniker "Piney Woods." Nevertheless, the degree of pine dominance during presettlement times has begun to be challenged (e.g., Quarterman and Keever 1962, Phillips 1994). This leads to the key issues addressed by this paper: what descriptions of the presettlement forests of the UWGCP are available, and what do they suggest about pine abundance?

### METHODS

#### A Problem of Definitions

Determining the beginning and end of the "presettlement" period in American natural history is a contentious yet compelling debate. In part, this dispute is a matter of semantics—people largely agree that it occurred before the widespread commercial, agricultural, and residential development of the landscapes by Euroamerican settlers. Some (though a limited few) insist on conditions prior to the appearance of prehistoric humans, while others prefer the Pre-Columbian period (prior to first contact, so more on the order of the 1540s in the UWGCP). Still others allow for beginnings of permanent Euroamerican settlement (perhaps the mid- to late-1700s in the UWGCP), while others hold that presettlement forests could be still found up until extensive commercial exploitation (roughly 1900 to 1930).

All of these arguments have merit, and all have flaws. For the purposes of this discussion, I will take the most expansionist course (forest conditions up to the early 1900s), because the question of pine dominance in the UWGCP requires a quantitative aspect not available in the earliest sources of information. Another problematic definition commonly found in the literature is the seemingly unambiguous term "pure." While most may assume the word implies a truly homogeneous condition or state, in forestry terms, a "pure" stand implies one comprised of at least 80% of a single taxa using any of a number of conventional metrics (e.g., stocking, basal area, or volume) (Helms 1998). Concurrently, this means up to 20% of the stand may be one or more other species. We have no way of knowing if historical data sources also applied a similar definition of pure, but this seems likely.

#### Pine and the Virgin Forests of the UWGCP

There can be little doubt that pine was one of the most dominant species in this region during presettlement times. Shortleaf pine appears to have been abundant across the entire UWGCP, from the longleaf pine-dominated Lower West Gulf Coastal Plain into the Ozark Highlands of southern

Missouri, and from the Mississippi River Alluvial Plain (including the outliers on Crowley's Ridge (Call 1887-1889)) to the prairie fringe of Texas and Oklahoma. During this same period and covering almost as much territory (though rarely found north of the Arkansas River), loblolly pine was most common in minor bottomland and flatwood sites before extensive logging or land clearing (Chapman 1942, Bragg 2002a). Loblolly pine also intermixed with shortleaf and hardwoods across most of its range. Hardwoods dominated large portions of the UWGCP, usually intermingled with pines in the uplands and baldcypress (*Taxodium distichum* (L.) Rich) in wetter bottomlands.

#### Literature Review

Very few detailed accounts of the forests of the UWGCP exist prior to 1800, regardless of the source. Modern interpretations of parts of the UWGCP noted by the Freeman and Custis expedition (e.g., Flores 1984, MacRoberts et al. 1997) are limited by the extent of travel away from the river made by these explorers. Therefore, this paper will focus on describing the relative pine dominance of the forests in the UWGCP from a multitude of sources. When possible, I assigned modern species labels to those mentioned in the historical accounts to as fine of a taxonomic resolution as possible (often to species, but sometimes only to genera).

Implicitly, a review spanning at least 400 years also must recognize the potential for changes to the environment, both natural and human-mediated, during this period. In addition to climate change, disturbance regimes fluctuated during this period. Four centuries are easily enough time to experience multiple generations of the predominant pine species (loblolly and shortleaf) in the UWGCP. This is especially true given dramatic alterations to native societies that occupied these lands. In other words, the vegetation patterns experienced and recorded by De Soto's scribes will not be identical to those witnessed by Peter Custis.

#### Explorers and Settler Accounts

Bragg:

## Pine in the Upper West Gulf Coastal Plain

The first European exploration of the UWGCP was conducted by Hernando De Soto and his army in 1541-1542, followed by a few Spanish and French explorers and missionaries. The earliest of these expeditions had almost nothing to say about the vegetation, but this is not surprising since very little botanical work had been completed in North America before 1700. Over time, as people learned more about the flora and fauna of the lands they traveled, their accounts of the biota became more informative. For instance, the observations of du Pratz in the early 1700s are much more detailed, even if still focused on species of economic interest.

After du Pratz, the Sibley (circa 1803), Dunbar and Hunter (1804-1805) and Freeman and Custis expeditions (1806) were perhaps the earliest journeys that specifically attempted to document regional landscapes. Unfortunately, most travelers to the UWGCP followed the easiest travel corridors of the time, i.e., rivers and large streams. Therefore, few of the most skilled observers spent time in the rolling hills and flatwoods of the UWGCP where pine was most prominent. Thomas Nuttall, for example, traveled along the Mississippi and Arkansas rivers in 1819 and wandered the Cross Timbers of Oklahoma, but his major side-trip to the Red River in southeastern Oklahoma passed too far west to encounter the UWGCP (Nuttall 1999).

Permanent settlement by individuals who recorded their experiences in the UWGCP occurred sporadically until after Native American removals between 1810 and 1830. Settlers like Henry Bry, N.O. Crescent, and David Boyd tended to write non-technical accounts that lacked botanical detail of more formal scientific expeditions, yet their contributions help to describe the forested landscapes of the region. Other settlers, including former soldier and early geographer Samuel H. Lockett, wrote more detailed treatises on the environmental and socioeconomic conditions of the region based on their years of experience (e.g., Lockett 1969).

## General Land Office (GLO) Notes and Plats

Public land surveys commenced in the region by 1815, and were completed over the next few decades. These property-based accounts have been used for many years to describe presettlement forest conditions (see reviews in Bourdo (1956) and Whitney and DeCant (2001)), although there are some concerns about the quality of their information (e.g., Noss 1985, Whitney and DeCant 2001, Bragg 2002b, Mladenoff et al. 2002). Most GLO-based studies have used the witness and line tree descriptions to derive attributes like species composition, stand density, and size-class distributions, and some incorporate the plat maps and surveyor comments in the GLO notes to further elaborate on vegetative conditions. Though this source of historical data should not be viewed as strictly quantitative and unquestionably reliable, considerable information on presettlement forests can be gathered from the notes and maps left by GLO surveyors.

## Other Historical Resource Surveys

Government-sponsored surveys were also used to scientifically describe the UWGCP. One of the earliest to reach the area was that of George W. Featherstonhaugh, employed by the U.S. Government to conduct a preliminary geological survey of the region in 1834 and 1835 (Featherstonhaugh 1844). In the late 1850s, David Dale Owen and his staff visited many sites across the state of Arkansas (Owen et al. 1860). Other geology-based reports mentioning forest attributes were released over the next several decades (e.g., Hilgard 1873, Hill 1888, Branner 1891a,b, Call 1891, Coville 1891). During this period, the first large-scale assessments of the forests of North America were completed (Sargent 1884), soon followed by more detailed reports on the commercial southern pines that also included descriptions of the forests of the UWGCP (e.g., Mohr 1897, Olmsted 1902, Zon 1905, Foster 1912). Even the first soil and agricultural surveys completed in the region contained prominent

descriptions of some UWGCP forests (e.g., Hilgard 1884, Vanatta et al. 1916).

#### Promotional Accounts and Trade Publications

In the 19<sup>th</sup> and early 20<sup>th</sup> centuries, large parcels of forested land in the UWGCP were acquired by land speculators, local and state governments, and railroad companies. During this period, many landowners issued promotional booklets and articles to help settle the region. Though notoriously filled with boosterism, these sources sometimes contain material on the virgin forests, and some were even written by individuals considered to be forest experts. As an example, Samuel J. Record, the first forest supervisor of the Arkansas (now Ouachita) National Forest and eventually the dean of the Yale Forestry School, published such a booklet on the forests of Arkansas (Record 1910). Most promotional accounts (e.g., Lungtree 1867, Anonymous 1890, 1892a, Kay 1900, Hutchins 1915), however, tell little beyond the types and estimated volume of trees.

Trade publications from this period also functioned to promote lumber companies. For instance, it was not unusual for these publications to tout unexploited forest areas (e.g., Anonymous 1904a) or existing operations (Anonymous 1903, 1904b, 1905, 1906, 1909a) by reporting on the timber cruise estimates or by providing photographs of "trophy" trees and stands (see next section).

#### Historical Maps and Photographs

Cartography in the UWGCP prior to the Louisiana Purchase expeditions only poorly approximated features of the region, especially the upper reaches of the major rivers and their tributaries. Detailed maps were not available until after the GLO surveyors drafted their plats, but even these can be of limited accuracy. Furthermore, GLO plat maps, with the exception of two major coverts (baldcypress-dominated areas and prairies), lack vegetation information. Later, the Confederate government produced maps of the

region based on updated versions of the GLO plats. These wartime maps included brief descriptions of the forest cover found along roads, information that undoubtedly helped Confederate commanders at the expense of their Union counterparts.

By the latter half of the 1800s, federal agencies concerned about "timber famines" in the eastern United States conducted large-scale assessments of timberlands and logging practices, later published in a series of reports (e.g., Sargent 1884, Mohr 1897) that also included region-wide coverted maps. Though highly imprecise, these representations approximated timber abundance of the major commercial species (especially pine) in the UWGCP. Photography also evolved in the latter half of the 19<sup>th</sup> Century, with most forest-based images came after 1900. Good pictures of the UWGCP are scarce, but the few that exist can illuminate details of forested conditions (Bragg 2004a), especially those published by the trade journal *American Lumberman* between 1900 and 1910.

#### Scientific and Technical Assessments

Contemporary vegetation research based on historical accounts has been published for portions of the UWGCP (e.g., Flores 1984, MacRoberts et al. 1997, Platt 1999, Bragg 2002a). Most consist of a mixture of historical and modern information on the virgin forests, with some containing field work in contemporary old-growth remnants. Other papers were written by individuals who lived long enough ago to have scientifically observed the last vestiges of presettlement forests (e.g., Chapman 1942, Eldredge 1952, Reynolds 1980).

#### RESULTS

The following synopsis of references on the prominence of pine in the UWGCP, though lengthy, contains only a fraction of the published materials that report on at least some aspect of this topic. It is simply not possible to include every reference. Rather, I focused on the primary sources of information, with an emphasis on the most

historically significant, detailed, and accessible work.

#### Explorer Journals and Settler Accounts

Explorers, especially the earliest ones, did not view the UWGCP landscapes in the same fashion as settlers arriving later. Thus, low-return resources like timber were not of great interest, and received little attention. Rather, the first explorers looked to their immediate material needs (e.g., sources of food, shelter, cordage, fuelwood) and focused on those species that could satisfy these requirements. Later explorers and settlers elaborated more, as their economic motivations were considerably broader, and their experience with the species encountered was typically greater.

#### De Soto and du Pratz

There is very little on the forest conditions of the UWGCP in the "Gentleman of Elvas" account of Hernando De Soto's expedition. With the exception of a few food- or fiber-related species (e.g., walnut (probably *Juglans nigra* L.), persimmon (*Diospyros virginiana* L.), mulberry (probably *Morus rubra* L.)), most references (such as this one made near present-day Hope, Arkansas) to forests were uninformative: "...at mid-day, along a clump of luxuriant woods, the camp was seated" (Lewis 1907, p. 239). The Gentleman of Elvas dedicated three pages at the end of his narrative to the natural environment of the area they traversed, and the small section on plants focused largely on trees that produced edible fruits.

After De Soto, no Europeans entered the general area until the 1600s, and these were mostly concentrated along the Mississippi River to the east of the study area. European settlers encroached upon the region from the north and the south in the 1700s, engaging in crude resource (minerals, salt, pelts, bear oil, etc.) extraction. Between 1718 and 1734, Antoine Simon Le Page du Pratz lived in various parts of the lower Mississippi Valley, and made periodic excursions to the UWGCP (du Pratz 1774, du Pratz 1975). The journal of his travels in

the region (du Pratz 1774) contain precious little detail on most of the tree species of the region, once again focusing on the trees that produced edible fruits.

However, in his book on the natural history of Louisiana, du Pratz detailed plant and animal species of economic importance to the region, especially those that provided food, clothing, lumber, chemicals, and other commercial goods (du Pratz 1975). Although du Pratz explored many parts of the UWGCP, his description of pines is limited to the longleaf-dominated portions of the Louisiana coast (du Pratz 1975, p. 239). Other French and Spanish missionaries, explorers, and settlers—like Jean-Baptiste Renard de la Harpe—visited this region prior to 1800, with growing numbers of Americans following the Revolutionary War. Unfortunately, very few of them provided any substantive discussion of the forests of the region.

#### Louisiana Purchase Expeditions

Dr. John Sibley, a physician that had lived in Massachusetts and North Carolina, moved to the Natchitoches, Louisiana area in 1802. Following the American acquisition of the Louisiana territory, Sibley wrote President Jefferson of his experiences in the region, including limited descriptions of the environmental conditions. For instance, Sibley described the countryside around the settlement of the Caddo Indians 120 miles northwest of Natchitoches as "...a mixture of oak, hickory, and pine, interspersed with prairies..." (Sibley 1806, p. 49). Sibley's information on the Native Americans of the region helped Jefferson determine the nature of the expeditions he would soon send to the southern portion of the Louisiana Purchase.

In 1804, William Dunbar and Dr. George Hunter departed Natchez, Mississippi on one of the first expeditions commissioned by President Jefferson to explore the Louisiana Purchase. Dunbar and Hunter traveled the Mississippi River to the Red River in Louisiana, and navigated the Ouachita River in central Louisiana bound for what

would eventually become Hot Springs, Arkansas. During this trip, the expedition rarely left the riverways, so their description of the forest cover of this portion of the UWGCP is limited. As an example, along the bottomlands near present-day Monroe, Louisiana, Dr. Hunter recorded (McDermott 1963, pp. 91, 93):

The woods here besides many sorts of trees of unknown names, consist of Hickory [*Carya* spp.] Oak [*Quercus* spp.] Cypress, Dogwood [*Cornus* spp.], Persimon [sic] many sorts of grape vines [*Vitis* spp.], but no pines in these drowned lands.

and later:

White or long leaved pines [here, *Pinus taeda*] are now very common along the banks & Cypress, Oaks, Hickory Persommon [sic], gum [*Liquidambar styraciflua* L. or *Nyssa* spp.], & cc with Willow [*Salix* spp.] & Chenier to the waters edge.

In southern Arkansas, the expedition camped along the shore and Hunter reported "...Beach [sic] [*Fagus grandifolia* var. *caroliniana* (Loud.) Fern. and Rehd.], Maple [*Acer* spp.], very large Hollys [*Ilex opaca* Ait.] oak Hickory & Pines..." (McDermott 1963, p. 94).

Though neither man was a trained botanist or naturalist, they properly recognized many species. Dunbar, a resident of the Natchez area for many years, was the more observant of the two. For instance, he distinguishes between the two pine species in extreme southern Arkansas (Rowland 1930, p. 243):

Saw a great quantity of the long-leaf pine, which is frequently found in rich & even inundated lands as is the case here; the short leaf or pitch pine on the contrary is always found upon arid lands & generally in sandy & lofty situations...

Given their location, Dunbar described *Pinus taeda* and *Pinus echinata*, not what are now known

as longleaf or pitch (*Pinus rigida* Mill.) pines. The explorers referred to one spot along the Ouachita River as "La Piniere" (the pine forest) and mentioned other places where pines were common. For instance, nearing the mouth of Bayou Bartholomew in northern Louisiana, Dunbar mentions "...the appearance of the lands along the river is not very inviting, much pine woods upon a thin poor soil..." and soon thereafter "...beyond [the Ouachita River bottomlands] which there is high land clothed chiefly with pines" (Rowland 1930, pp. 239-240). Most descriptions by Dunbar and Hunter of the upland inevitably contained mention of hardwoods, but rarely provide much detail on forest conditions.

The Freeman and Custis expedition, unlike the Dunbar and Hunter party, actually employed a trained naturalist (Peter Custis) to identify the species and environmental conditions encountered (Flores 1984, Flores 2002). Unfortunately for this paper, Freeman and Custis rarely ventured from the hardwood and cypress forests of the Red River alluvial plain, and thus only infrequently mentioned pine. Longleaf pine savanna and woodland covered much of the South during this period (e.g., Claiborne 1906, Lockett 1969, Frost 1993, Earley 2004), and Custis described such an open forest near the Rapide Settlement (present-day Alexandria) in central Louisiana (Flores (1984), see also Lockett (1969)). Above the Coashatta village in northwestern Louisiana, Freeman wrote of the UWGCP (Flores 2002, p. 177):

This [Red River] valley is bounded by high land, with an undulating and varied surface, generally 100 feet higher than the plains below. The soil on this upland is said to be rich, and very productive, when in cultivation. It is clothed [sic] with White [*Quercus alba* L.] and black Oak [probably *Quercus velutina* Lam., *Quercus falcata* Michx., and *Quercus pagoda* Raf.], Hickory, and Pine [*Pinus taeda* and *Pinus echinata*], without much undergrowth.

The open understory reported by Freeman is likely indicative of frequent burning by Native Americans. It is almost certain that the pine mentioned by Freeman included only loblolly and shortleaf, since the historical range of longleaf pine did not reach much above the Coashatta village along the Red River (Frost 1993).

Later, in his catalog of the biota encountered upstream of the Coashatta village, Custis (Flores 2002, p. 253) wrote: "...Pines (*Pinus Sylvestris* & *Taeda*) the *Taeda* is in great abundance and of very large size." The identification of Scot's pine (*Pinus sylvestris* L.), a European species not yet introduced to the valley of the Red River, is an obvious error. Flores (2002) reinterpreted this identification as longleaf pine, although this area is likely too far to the northwest of longleaf's historical distribution to be a viable option, especially since Scot's pine appears more similar to shortleaf pine (a possibility suggested by Morton (1967) and MacRoberts et al. (1997)). Loblolly pine would have been more plentiful than shortleaf in moister, richer locations (such as those found along the rivers and streams of the UWGCP), and reached truly imposing size under such conditions (Record 1907, Bragg 2002a).

#### Nuttall, James, and Other Trained Naturalists

By the late 1810s, a wave of naturalists started probing the more accessible portions of North America. As with most early expeditions to the region, few of these trained naturalists ventured into the upland forests of the UWGCP, but rather kept to the navigable rivers or explored the Interior Highlands to the north. The most famous of these was the botanist Thomas Nuttall, who journeyed along the Mississippi and Arkansas rivers in 1819 and penetrated as far inland as east-central Oklahoma. Nuttall did take an overland side-trip to the Red River in southeastern Oklahoma, but unfortunately he passed too far west to encounter the pine-dominated UWGCP (Nuttall 1999). Around the same time, Edwin James, a doctor and botanist with Major Stephen H. Long's expedition, toured the lands along the Arkansas River as far

east as what would become Fort Smith, Arkansas but never reached the UWGCP. Other seasoned botanists like George Englemann roamed the mountains of northern Arkansas or the bottomland along the Mississippi River plain without entering the UWGCP.

*Henry Bry*.—Judge Henry Bry, an early farmer and amateur naturalist who settled in the Monroe, Louisiana area, wrote a series of articles on the characteristics of the region. Bry (1847a, p. 226) described much of the land between the Ouachita and Red rivers in Louisiana as:

...good second-rate land; the natural growth not exclusively Pine, many [of the hills] are covered with hickory, dogwood [probably *Cornus florida* L.], different kinds of oak, sassafras [*Sassafras albidum* (Nutt.) Nees.], sweet gum, and even black walnut and cherry [probably *Prunus serotina* Ehrh.].

However, on the highest hills with the poorest soils "...two species of [p]ine constitute nearly the whole of the forest which covers them—those trees acquire a great size and height in many instances..." (Bry 1847a, p. 226). Given his location, these pines were almost undoubtedly loblolly and shortleaf. Furthermore, Bry associated pine with poor quality soils, a common notion of many early observers.

An addendum to one of Bry's accounts (Bry 1847b, p. 230) attributed by the editor to a "Judge Martin" described the land above the town of Monroe as "...not very inviting, the soil being poor and covered with pine wood." Bry later recounted an 1847 trip from Monroe to the Hot Springs, Arkansas area. The landscapes leading up to El Dorado, Arkansas were described as "...pine hills, tolerably productive, and well watered by good springs: the growth of timber, principally red oak [*Quercus falcata*, *Quercus pagoda*, and perhaps *Quercus velutina*], hickory and dogwood..." (Bry 1848, p. 69).

*Samuel H. Lockett*.—Samuel Lockett was a

former Confederate colonel and engineer who wrote about the state of Louisiana following the Civil War. His vegetation observations, though never particularly detailed, provide further insights into the lands along the Red River and other portions of the UWGCP in northern Louisiana. The forests of his "Good Uplands" section (basically, all of the northern third of Louisiana above the Mississippi and Red River floodplains) were hardwood dominated, with a significant component of "shortleaf" pine. For example, Lockett wrote that the hilly country between the Red River and Cypress Bayou had a "...mixed growth of oaks, hickories, dogwoods, and shortleaf pines..." (Lockett 1969, p. 60). Given that he makes no mention of loblolly pine even though it would have been as common in northern Louisiana as it was in southern Arkansas, I assume that Lockett lumped shortleaf and loblolly together to distinguish from longleaf pine.

Most of Lockett's descriptions of pine-dominated landscapes were in reference to areas covered by longleaf pine. As described by Lockett (1969, p. 47), relatively pure longleaf pine forests and woodlands were common across much of central Louisiana along the Red River to the northern extent of its range: "[t]he forest growth, almost to the exclusion of every other tree, is the longleaf pine and scrub blackjack oak." This description is for a portion of a subdivision Lockett termed "the Pine Hills" because of the dominance of pine (primarily longleaf, with lesser amounts of shortleaf and loblolly likely). There were some locations in parishes in northern Louisiana (e.g., Morehouse, Saline, Webster), however, that had only shortleaf pine mentioned on "poor and sandy" sites—a condition Lockett associated with more sterile sites.

*Other brief accounts.*—There are many other tantalizing yet ultimately unfulfilling descriptions of the pine-dominated forests of the UWGCP. In 1850, a writer to *The Living Age* decried the lack of a naval stores industry to exploit the "...immense region of pine, extending from the Ouachita [River]

to the Sabine [River]..." (Crescent 1850a, p. 413), an area in central Louisiana that had an abundance of longleaf pine at this time (Lockett 1969), and likely a considerable component of shortleaf and loblolly pine. No mention of other hardwoods or conifers is made, but it was not unusual during this period for observers to focus on the taxa of greatest commercial value (in this case, pine). Crescent also promoted lands near Monroe, Louisiana, describing the uplands between Bayou de Siard and Bayou Boeuf as dominated by pine and oak, with scattered gum, hickory, and walnut (Crescent 1850b).

David French Boyd, a Virginian employed as a mathematics teacher in Homer, Louisiana recorded his observations of the countryside of northwestern Louisiana and southwestern Arkansas on a rambling journey in 1858 (Boyd 1971). His accounts of the vegetation are brief but informative. He reported primarily pine, "red sport oak," chinkapin (*Castanea pumila* (L.) Mill.), sweetgum with some black oaks (possibly *Quercus velutina*, *Quercus falcata*, *Quercus pagoda*, and/or other *Quercus*) and thick undergrowth. He termed the Arkansas lands "...more flat & sandy, not so well watered..." and eventually passed through "considerable" forests of blackjack oak (*Quercus marilandica* Muenchh.) (Boyd 1971, p. 162-163). As Boyd approached the village of Washington, Arkansas, he reported scattered prairies and hardwood forests dominated by hickory, white oak, and walnut (probably *Juglans nigra*). Further westward travel towards Sevier County, Arkansas found more prairie and blackjack oak.

Near the southwestern corner of the UWGCP in Tyler County, Texas, an anonymous traveler described the "Pine-woods" as follows (Anonymous 1892, p. 399):

The sandy land is principally occupied by *Pinus mitis* [now *Pinus echinata*] and *P. taeda*. Pine-forests are pleasant, but weird places withal to visit. Their tall columnar trunks, needle-like leaves, the peculiar souging of the winds in their tops, such as heard in no other

forests, and their dislike for other forms of vegetable life, fill the visitor with an awe amounting almost to reverence.

The writer also described more hardwood-dominated forests, including those along the many streams flowing through the area. The allusion to "dislike for other forms of vegetable life" seems to paint a rather barren picture of these piney woods, but the author later describes a multitude of herbaceous and woody plants associated with these pine stands.

Maxwell and Martin (1970) credited William Goodrich Jones, a banker with some botanical training, with leading the charge to improve logging practices and implement forestry in eastern Texas during the late 1800s. Jones wrote a paper in 1900 (reprinted in Maxwell and Martin (1970)) on the timber resources of Texas. According to this account, northeastern Texas had been predominantly covered with shortleaf pine, although most of this forest, being close to the railroads, had already been cleared and converted to agriculture. Jones reported that "...Short leaf grows on richer soil adaptable for farming & mixed in with it are a great variety of hard woods..." (Maxwell and Martin 1970, p. 51). Hardwoods, however, "...do not run in large bodies, are scattering & expensive to handle, yet they will come into prominence in a few years when the pines are gone..." (Maxwell and Martin 1970, p. 52-53).

#### General Land Office Surveys

Public land survey information comes from two distinct but related sources: the actual survey records themselves, and modern interpretations of these reports in scientific journals. The former source contains the surveyors' record of property corners and boundaries, while the latter includes the interpretation(s) of the composition and structure of historical vegetation conditions by the researcher. Both are valid sources of data, and both are subject to uncertainty. Since the GLO note references to forest conditions are highly scattered, this review

will focus on the modern interpretations.

Interpretation is especially important if trying to distinguish loblolly from shortleaf pine in the GLO record, since neither of these are identified in the Arkansas GLO notes. Delcourt (1976) examined the GLO notes for the portion of Louisiana north of the Red River. Outside of the minor bottomlands in this region, Delcourt (1976) labeled the upland cover type as "shortleaf pine-oak-hickory," or a mixture of shortleaf pine and some loblolly pine with numerous hardwood species. Delcourt also interpreted greater distance between survey corners and pines (when compared to hardwoods) in her "pine-oak flatwood community" as possibly indicative of "...relatively open [loblolly] pine savanna and closed deciduous forest..." while drier locations on the terraces may have had "savanna-like" stands of longleaf pine (Delcourt 1976, p. 129).

Archeologists also use the GLO notes to derive historical vegetation conditions near their excavations in the UWGCP. At the Hardman Site near Arkadelphia, Arkansas, Williams (1993) reconstructed the predominant cover types for the surrounding region. A large pine-dominated area just east of the study site emerged from the analysis, and Williams (1993) speculated that it may have arisen from fuelwood collection by Native Americans engaged in saltmaking (see also Fritz (1993)). However, my closer examination of the GLO notes in this area did not suggest pine was uniquely abundant at this site compared to other areas in the UWGCP.

Bragg (2003) studied the GLO notes of the Ashley County, Arkansas area and reported scattered pine (almost certainly loblolly) mixed with hardwoods in some of the minor stream bottoms, and an extensive area of pines in the Ouachita River flatwoods (mostly loblolly, with limited shortleaf). Pines were mentioned frequently on upland sites, although only rarely without hardwoods. In addition, some open pine or pine-hardwood woodlands adjacent to the terrace

prairies were also noted. Pines constituted only 17% of witness trees county-wide, suggesting that either pines were deliberately "undersampled" (avoided) by the GLO surveyors, or that pine was not as dominant as previously assumed. Extensive hardwood-dominated forests were apparent in the GLO notes of Ashley County, typically with a variable pine component. Only a handful of locations seemed to be entirely pine or exclusively hardwood, although it is impossible to confirm this, given the limited sample of witness trees for any specific area.

There is a pocket of loblolly pine-dominated forest in the low braided terraces of the ancestral Arkansas River in east-central Arkansas. This outlier of pine is not a product of post-settlement planting or recent afforestation (Bragg 2005), as it is mentioned in the GLO notes and other historical references (e.g., American Land Company 1844, Harper 1914). Loblolly pine, interspersed with bottomland hardwoods, oak openings, and small prairies, thrive in this otherwise unfavorable location due to a combination of soil properties, fire regimes, and even genetic adaptation (Bragg 2005). The GLO surveyors described some portions of this part of Monroe County as "pine woods" or "pine lands" even though a considerable hardwood component was present in virtually all instances.

#### Other Historical Resource Surveys

*Geological surveys.*—In 1834 and 1835, George William Featherstonhaugh evaluated the countryside along the old Military Road from northeastern Arkansas to the extreme northeastern tip of what would become Texas. Descending out of the Ouachita Mountains near Arkadelphia, Arkansas, Featherstonhaugh crossed the UWGCP towards Old Washington, Arkansas and eventually to the Red River. Between rambling commentaries on bear hunting, government land sales, the origin of American grasslands, and the expansion of slavery across the South, Featherstonhaugh described forested landscapes mixed generously with prairies of varying size. Both hardwood and

pines were encountered, although Featherstonhaugh (1844, p. 122) seemed more impressed with the pines:

As we advanced, lofty pines mixed with oaks covered the ridge...we threaded the mazes of the pines that now assumed an astonishing height and diameter, such as I had never before seen out of Canada. We seemed to be buried in an interminable forest...[i]n the midst of a forest of pine trees, few of them less than three feet in diameter, a clearing of a few acres had been effected...[there] were huge piles of logs from the pine trees which had been cut down, and which had been rolled into large heaps to dry before they could be burnt up.

Many of these stands were open and grassy, features attributed by Featherstonhaugh (1844, p. 120) to Indian-set fires, which in places where the Indians "abandoned" the area, the "...undergrowth is rapidly occupying them again."

The David Dale Owen reconnaissance of Arkansas, though focused on the geology, included a trained botanist (M. Leo Lesquereux) who noted many plant species. Across much of southern Arkansas, pine was usually reported in a mixture with hardwoods, although there were occasional mentions of just pine. For example, in Union County, one area was described as "[w]hite crawfish clay land, flat pine, or glady pine land" and another was referred to as "glady pine flats on Camp Creek" (Owen et al. 1860, p. 136). In another example (Owen et al. 1860, p. 343), Lesquereux wrote:

The yellow sandy uplands, mostly derived from tertiary or cretaceous sandstone, are characterized by the Loblolly Pine, which, with the Yellow [shortleaf] Pine, grows also upon the alluvial sandy deposits of the rivers, and even descends to their swampy banks. With these trees are seen, upon all the dry uplands and recent formations, the White, the Black, the Spanish Oaks [*Quercus falcata*

and/or *Quercus pagoda*] in abundance and of beautiful growth. more rarely, the Shellbark Hickory [*Carya laciniosa* (Michx. f.) Loud.], the Black Jack and the Post Oak [*Quercus stellata* Wang.], with the Holly.

Although their expedition covered only a portion of southern Arkansas, Owen et al. (1860) believed their descriptions were consistent for this part of the state.

Eugene W. Hilgard was a professor at various institutions during the 1870s and 1880s, as he wrote several agricultural and geological reports during his tenure. Hilgard's geology reports are similar to the work of Owen et al. in that they focus on soils and rocks, with occasional mention of the vegetation covering different landforms. For instance, Hilgard (1873, p. 28) described the upland forests near the Red River location of Couthatta Landing as:

"...timbered with short-leaved Pine, Post, and some Spanish Oaks, and scrubby Black-jack—a poor and whitish soil in the lower portions, where *Phlox glaberrima* [L., the smooth phlox] and Candle-berry [probably *Myrica cerifera* L.] appear; but pretty good where the Spanish Oaks are large."

Throughout this account, Hilgard makes no mention of loblolly pine, even though it should have been abundant. Longleaf pine was frequently reported in the more southern portions of the trip described in Hilgard (1873).

Hilgard also wrote a lengthy report on the cotton industry in Louisiana, including evaluations of the forest cover in most portions of the state (Hilgard 1884). A general statement made early in this report concludes (Hilgard 1884, p. 11):

The timber tree prevailing almost altogether in the middle and southern portion of western Louisiana, as well as in eastern Louisiana, is the long-leaf pine; while the northwestern parishes (north of a line laid through Manny, Sabine parish, and Bastrop, Morehouse

parish), form a region of rolling oak uplands, whose varying fertility is indicated by a greater or lesser admixture of the short-leaf pine on the one hand, and of hickory on the other.

As with his earlier work, only "shortleaf" pine is mentioned, which I take to also include loblolly pine. Several locations in the UWGCP described by Hilgard contained shortleaf pine and "scrub" oaks, but little in the way of pure pine stands are described. The most notable exception to this is the "pine flats" subtype in his oak uplands region near the Red River and extending up some of the river valleys as far as the Arkansas border, which Hilgard (1884, p. 32) described as:

In ill-drained tracts... "pine flat soil" is about the least esteemed in this region: even its timber growth being rather indifferent, and often quite stunted... [m]uch of it is sandy or ashy pine land, some heavier and "crawfishy", with a white clay subsoil.

This description fits the loblolly pine-dominated flatwoods type of the region nicely (e.g., Owens et al. 1860), and would not likely have had a large component of shortleaf pine due to the frequency of extended inundation in these wetter sites (see also Mohr (1897)).

Few of the other geological publications issued during the late 19<sup>th</sup> Century contained the detail of the Owen and Hilgard reports, especially regarding pine prominence. For instance, Hill (1888, p. 56-57) presented much less detail on the extent and nature of forests in southwestern Arkansas, except to mention:

The most striking superficial characteristic of this [tertiary arenaceous] sandy formation, whereby it can be distinguished from the cretaceous sands, is the presence of pine timber... the cretaceous sands are calcareous and glauconitic, and hence favorable to the growth of hardwoods, while the tertiary sands are not so rich in that material, and hence soils

derived from them are occupied by the pines.

According to Hill's account, the distinct segregation of the dominant tree species in southwestern Arkansas arose from soil-related differences. Around this time, Professor F.V. Coville was conducting botanical surveys in other parts of Arkansas, and made passing mention of "pine barrens" south of Little Rock (Coville 1891, p. 248) and Professor R.E. Call briefly described the shortleaf pine forests of Crowley's Ridge in eastern Arkansas, many of which had been at least partially logged by 1889 (Call 1891).

*First forestry reports.*—The first comprehensive report on the forests of the United States was published in the Tenth Census (Sargent 1884). Harvard botanist Charles S. Sargent coordinated the effort using reports from special field agents like Dr. Charles Mohr and Professor F.L. Harvey, early experts on southern plants. Mohr's accounts of Louisiana and Texas are cited verbatim in this report and generally described upland forests of the UWGCP as a mixture of pines (predominantly shortleaf) and hardwoods (primarily oak), with more loblolly pine in the moister areas and some longleaf pine along the southern fringes of the region (Sargent 1884). In northern Louisiana, pine often dominated the forest, but rarely was mentioned exclusively. In the Texas portion of the UWGCP, Mohr emphasized the importance of shortleaf pine (Sargent 1884, p. 542):

...the soil is lighter, more porous, and favorable to the growth of the short-leaved pine, which soon becomes the prevailing forest tree in the woods extending towards the west...[t]hese forests of short-leaved pine, more or less interspersed with oaks, extend to the northern boundary of the state, and southward with an easterly trend to the confines of the region of the long-leaved pine.

In a later paper, Zon (1905, p. 9) mentioned pure groups of loblolly pine associated with "the so-called prairies" and adjacent sandy soils in southeastern Texas near the Gulf of Mexico, but

over most of the rest of eastern Texas, loblolly was associated with mixed hardwoods. Both Sargent (1884) and Zon (1905) noted pure second-growth loblolly pine stands on old field sites in this region. Professor F.L. Harvey of the Arkansas Industrial College probably submitted the material for Arkansas in the Tenth Census report, stating (Sargent 1884, p. 544):

The southwestern part of the state south of the Arkansas River and west of the broad, level plain of the Mississippi is covered outside the river-bottom lands with an almost continuous forest of pine, in which the short-leaved species occupies the high, dry ridges and the loblolly the moist soil above the bottoms.

Indian Territory (now Oklahoma) barely received any treatment in Sargent's report, although scattered tracts of pine are mentioned in the southeastern portion of the territory.

Dr. Mohr later provided some of the best semi-quantitative information on pine-dominated forest structure and composition in the UWGCP. Using his own experiences and reports by others, Mohr described many areas across the study region, and even provided examples of the stands of timber. For example, he described parts of the region as (Mohr 1897, p. 96):

It is in these Western [mostly the UWGCP, but including the Ouachita and Ozark mountains] forests that the Shortleaf Pine finds its best development, and forms pure forests, extending over many hundreds of square miles with but little interruption...Along the northern extent of the Louisiana and Texas State line [shortleaf] pine forms pure forests, and also prevails in many localities on the upland along the border of Arkansas...On the uplands [of Arkansas] of yellow loam south of the hills the tree predominates, especially on the low ridges of gravel and loam, the hardwoods encroaching where the soil conditions become more favorable...The low ridges

rising above the Loblolly Pine forests of the flood plain of the Ouachita and Little Missouri rivers are covered with open forests almost exclusively of Shortleaf Pine, interspersed with a few White Oaks, Post and Spanish Oaks, rarely above medium size.

Mohr (1897, p. 96) then described an acre of such timber under "average conditions" near Gurdon, Arkansas as containing:

...22 Shortleaf Pines have been counted from 12 to 25 inches in diameter, with no pines of smaller growth among the scattered undergrowth of dogwood, huckleberries [*Laccinium* spp.], scrubby oaks, Black Gum [*Nyssa sylvatica* Marsh.], and hickories.

With the exception of along the railroad lines and in a few other locations, most of these landscapes were still dominated by virgin forest. In northeastern Texas, Mohr (1897, p. 97) reported that shortleaf pine "...forms compact forests over many hundreds of square miles..." and that in some places, shortleaf pines rose over a scattering of stunted blackjack, Spanish, and post oaks. Consistent with other historical reports of loblolly pine, Mohr (1897) reported that most of its distribution in the UWGCP was mixed with shortleaf pine and other deciduous species. Loblolly pine was the predominant tree cover in flatwoods on poor, sandy, and "undrained" soils in Louisiana north of the longleaf pine zone. Likewise, loblolly pine was the primary species in the flatwoods of southeastern Arkansas. Mohr also reported abundant loblolly pine along the "lower levels" of the rolling uplands in other portions of southern Arkansas.

In 1912, J.H. Foster published an assessment of the forests of Louisiana. This report, coming just after the peak of logging in the southern United States, found large areas of northern Louisiana had been cleared or were being logged. Foster (1912, p. 9-10) identified an area (primarily in the north) as "shortleaf-pine uplands," stating:

...[in this area] the dry ridges of the forest consists of pure stands of shortleaf pine; on the lower slopes and creek bottoms, of various oaks, red gum [*Liquidambar styraciflua*], ash [*Fraxinus* spp.], hickory, beech, maple, yellow poplar [*Liriodendron tulipifera* L.], sassafras, holly, magnolia [*Magnolia* spp.], and other species; and on intermediate lands of a mixture of these species with shortleaf and loblolly pine.

and later:

Fires are prevalent throughout the [shortleaf pine] region. These are set in most cases by boys and irresponsible hunters, rather than by the farmers. No other part of the State needs fire protection more than the shortleaf-pine uplands, and nowhere would the results of reproduction be more quickly apparent.

These observations are consistent with other claims of pine-dominated uplands in the UWGCP. For instance, Chambers (1934, p. 302) recalled "[w]hen American pioneers began to occupy this area [of northeastern Texas] it was clothed in a dense primeval forest. Almost pure stands of pine covered the uplands and slopes, while belts of deciduous forest extended along the valleys of rivers and their tributaries." Chambers (1930, 1934) also reported on the cutover uplands in the upper reaches of his "Northeast Texas Agricultural Region" or "Pine Woods Region" had been dominated by shortleaf pine (which probably included loblolly) in the uplands and a mixture of hardwoods on alluvial soils.

#### Promotional Accounts and Trade Publications

Nineteenth-century citizens often wrote to magazine editors extolling the virtues of their locality in the guise of reporting on the scientific or economic merits of the region. Some of these were placed by government officials charged with helping to encourage immigration to their state (e.g., Langtree 1867), while others were unsolicited from private citizens or simply company

propaganda. For instance, Dr. W.J. Goulding, in an article to the *Western Journal of Medicine and Surgery*, wrote of the "medical topography" of the Little Rock, Arkansas region around 1840. In this report (Goulding 1843, p. 323), he described the uplands as:

...always rolling, often hilly, with but little undergrowth save luxuriant grasses and flowering herbage; having forest chiefly of oak interspersed with hickory, its whole aspect, so open, park-like, and beautiful...

Goulding was no botanist (he later confused tupelo gum (*Nyssa aquatica* L.) and sweetgum), and his failure to mention pine in the general location of Little Rock on the very northern tip of the UWGCP seems notable.

More reliable are accounts by trained natural observers such as former surveyor Caleb Langtree (Langtree 1867) and forest supervisor Samuel Record. Record's reports on the forests of Arkansas provide relatively detailed accounts of conditions in this state prior to 1910. He associated the extent of pines in the southern part of Arkansas with topography, reporting that well-drained ridges were dominated by shortleaf pine, and "[i]n many places [shortleaf] is the only species, but is commonly in mixture with Spanish, post and black oaks." (Record 1910, p. 10). According to Record, the more poorly drained flats in the UWGCP were covered with a mixture of loblolly pine and hardwood species, though loblolly could form large groups in nearly pure stands.

Trade publications, particularly the periodical *American Lumberman*, also provide some written evidence of the abundance of pine in the UWGCP. The Arkansas Lumber Company of Warren, Arkansas, reportedly had hardwoods "interspersed with the pine in large quantities" in their "yellow pine" timberlands (Anonymous 1906). No pine volume estimates were given for their ownership (although they can be expected to be significantly higher than the hardwoods, as this was a pine operation), hardwoods of the "finest sort" were

estimated by an early timber cruiser to include at least 150 million board feet of timber. Of the commercially valuable hardwoods (and baldcypress) on the lands of the Arkansas Lumber Company, oak (mostly white and red oaks) comprised 35% of the total, followed by hickory (30%), gum (25%), and baldcypress (10%) (Anonymous 1906).

Unfortunately, not all *American Lumberman* reports were this detailed. The Union Sawmill in Huttig, Arkansas had an estimated 1 billion board feet of pine sawtimber and 400 to 500 million board feet of various commercial hardwoods on its property, although a fair amount of the hardwoods were probably in the bottomlands of the Ouachita River (Anonymous 1905). Numerous pictures that accompanied this article show pine dominated uplands with a noticeable hardwood component. In a different report, Anonymous (1909a) reported that hardwoods (including baldcypress) contributed twice as much volume to the holdings of two lumber companies in southeastern Arkansas, at least partially because of the aggressive logging of the pine-dominated uplands.

#### Historical Maps and Photographs

Civil War Maps.—Many Confederate military maps were updated from the GLO plats created in the years before the war (Figure 1). In addition to providing the locations of villages, homes, roads, bridges, fords, ferries, and other constructs, a considerable amount of information on natural features (especially those related to the conduct of military maneuvers) were incorporated on these maps. Although the writing is faint, the labels along the major routes portrayed in this map include "pine country," "flat pine & oak," "oak & gum," "flat country oak & gum," "undulating oak, gum, and hickory," and "rolling oak & gum." These labels only generally quantify the proportion of species groups (i.e., "pine & oak" implies that pine was more abundant than oak), but they can help identify the extent of major covertypes in these largely still virgin forested landscapes.

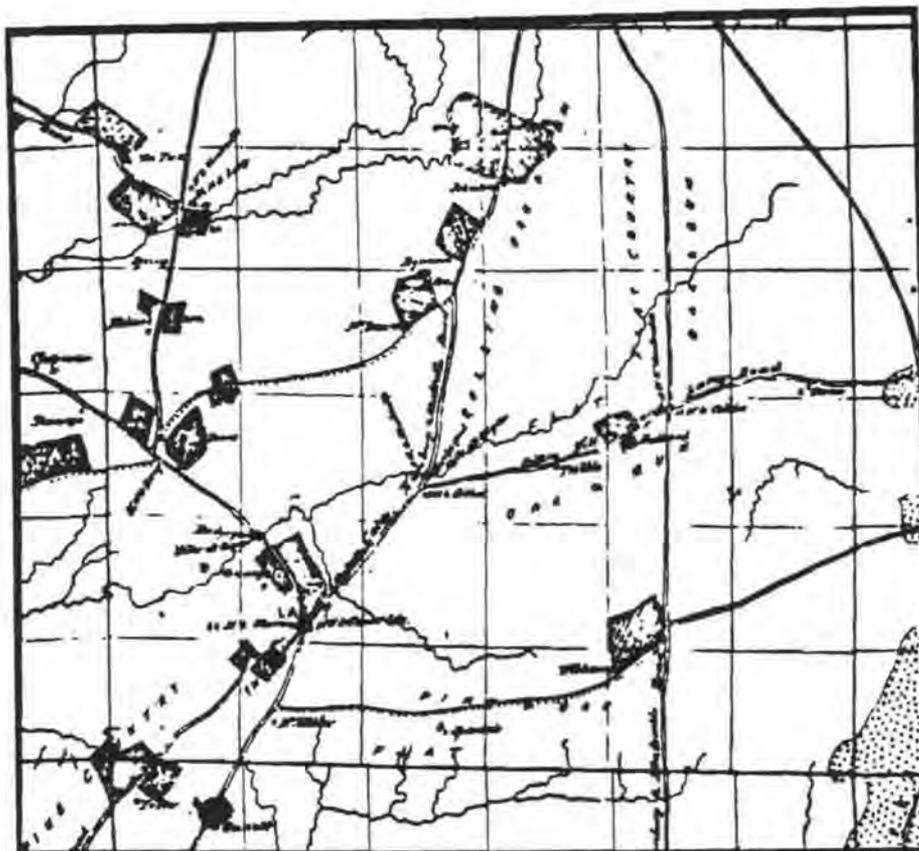


Figure 1 Civil War-era map of Drew County, Arkansas, showing details of vegetation descriptions present on many Confederate military maps.

Government Report Maps.—In his report on the characteristics of the major southern pine species, Charles Mohr also included maps of botanical distributions (Mohr 1897). These maps (Figure 2) approximate the dominance of loblolly and shortleaf pine across most of the UWGCP, although there is no way to know relative pine prominence since they lacked any information on hardwoods. Foster (1912) reproduced a similar if somewhat more detailed map for Louisiana, with a large area of the UWGCP labeled as “shortleaf pine uplands.” Once again, no detail on the relative abundance of hardwoods is available, limiting the utility of Foster’s map.

American Lumberman photographs.—*American Lumberman* provided some of the best historical images of forests of the UWGCP prior to logging (e.g., Anonymous 1903, Anonymous 1905, Anonymous 1906, Anonymous 1909b). Though usually taken of “trophy” trees or stands (and therefore not particularly representative), these images do allow for at least select glimpses of the virgin forest (Bragg 2004a). For example, the consolidation of a number of lumber companies in Arkansas and Louisiana into the “Crossett-Watzek-Gates Group” prompted an article describing the group’s land holdings and milling operations (Anonymous 1904b). Pictures of the timber near

Crossett, Eagle Mills, Fordyce, and Wilmar in Arkansas and at Selma, Louisiana are dominated by large pine trees. Hardwoods are present as scattered, small individuals under a towering pine canopy. None of the pine stands appear particularly dense, although this may reflect the photographer's choice for shooting pictures in better-lit forest conditions.

In another example, a feature on the Union Saw Mill Company of Huttig, Arkansas provided pictures of pine-dominated stands in southern Arkansas (Anonymous 1905). One image (on page 53 of the original article) shows a man standing amidst old-growth pines (labeled "shortleaf," but likely containing some loblolly pine) (Figure 3). This open pine stand continues well into the background. However, the stand is not entirely pine, as hardwoods can be seen in the canopy and the background. Likewise, a different "typical view" of timber on page 55 focuses on the large pines, but some hardwoods are visible. Other images of the Union Saw Mill Company's railroad and milling operations clearly show pine-dominated forests with significant hardwoods. A later article (Anonymous 1906), similarly shows open forests from Bradley County, Arkansas with many large pines and a few hardwoods (Figure 4).

Note that these limited samples cannot account for the true quantity of hardwoods in the stands being photographed. Many of these pictures have a limited field of vision. Others may have been taken to emphasize the pine component of the company's timber holdings, or perhaps may have had the hardwoods cut prior to the photograph being taken to deliberately accentuate the prominence of pine.

**Historic Postcards and Other Photographic Sources.**— Postcards of local landscapes were often used as promotional materials. Historical archives and published collections (e.g., Eagle Democrat 1991, Hanley and Hanley 1997) sometimes yield images of the virgin forest, often during logging, which can indicate the presence of hardwoods left behind. There are also occasional photographs

included in the early technical reports on forestry that show "unmanaged" examples of virgin forests (e.g., Olmsted 1902, Chapman 1913, Morbeck 1915). Any such image is subject to the same issues as those in the trade publications—namely, there is no way to determine how typical the trees and stands portrayed are for the region.



Figure 2. Mohr's maps of loblolly (a) and shortleaf pine (b) distributions in the CWGCP (adapted from Mohr 1897).

#### Scientific and Technical Assessments

**Soil Surveys.**—One of the first soil surveys (Martin and Carr 1904) completed in Arkansas was of Miller County, located in the extreme southwestern corner of the state along the route of Freeman and Custis. An abbreviated document when compared to today's surveys, this account

nevertheless provides information on the forests of Miller County, some of which would have been virgin timber. Of the five soil types described, only one (Orangeburg fine sandy loams) dominated the uplands. The "natural" forests of this soil type were pine, oak, hickory, and gum. However,

Martin and Carr (1904, p. 568) did identify areas of Orangeburg soils known locally as "pine flats," where the surface is only gently rolling and the drainage is poor. Sandy soils in Miller County away from the Red River bottoms also appear to have been pine dominated (Martin and Carr 1904).



Figure 3. Old-growth pine forest near Hittig, Arkansas circa 1900 (taken from *Arboreal Mecca* 1905).



Figure 4. Virgin pine forest in southern Bradley County, Arkansas circa 1900 (taken from Anonymous (1906)).

Vanatta et al. (1916) published a more detailed soil survey of Ashley County, Arkansas using field work conducted in 1912 (before most of the timber had been logged). Vanatta et al. (1916, p. 1187) described the Ashley County uplands as "...originally covered by an excellent growth of shortleaf yellow pine and various hardwoods, principally oak and hickory." Other references (e.g., Chapman 1913, Reynolds 1980) have also indicated that most of the Ashley County upland sites apparently supported a mixture of shortleaf and loblolly pine. However, note that Vanatta et al. (1916) mentioned no areas exclusively of pine, and refer only to shortleaf (no loblolly). Referring solely to shortleaf pine when both shortleaf and loblolly were present was commonplace, and done to help distinguish them commercially from longleaf pine (Mattoon 1915). For instance, Professor G.C. Morbeck failed to identify loblolly pines in his report on some Arkansas timberlands (Morbeck 1915), as did George Hunter, Eugene Hilgard, and Samuel Lockett for other parts of the UWGCP decades earlier (Hilgard 1873, 1884; McDermott 1963, Lockett 1969).

**Vegetation Assessments.**—Aside from expeditions by early naturalists such as Nuttall, Lesquereux, and Engelmann, Professor F.L. Harvey appears to be the first trained botanist to have

worked for an extended period in Arkansas, and published a number of reports on the trees and forests of the state. Harvey (1883, p. 456) made the following claim on the abundance and dominance of pine in Arkansas: "[t]he per cent of pine increases as you go South, but there are no forests exclusively of pine in the State."

The first technically-oriented forestry report in Arkansas was written by Frederick E. Olmsted of the USDA Bureau of Forestry. This "working plan" was developed to help the Sawyer and Austin Lumber Company of Pine Bluff, Arkansas manage their timberlands (Olmsted 1902). Part of this assessment was a description of the primary forest cover types, which Olmsted separated into three largely homogenous groups; pine ridges, pine flats, and hardwood bottoms (very few (<5%) of the trees in this last type were pine). Pine-dominated lands comprised about 85% of the Sawyer and Austin holdings. In the "pine ridge" type, the proportion of pine to hardwood was half pine (of which shortleaf was twice as abundant as loblolly) and half hardwood (Olmsted 1902). The species were not evenly distributed, however, with pines occurring most commonly as very small groups or scattered individuals. Pine comprised almost 55% of the stems in the pine flats type, and loblolly pine was considerably more abundant than shortleaf pine. In these flats, the groups of pine were noticeably larger, with areas of young growth often composed entirely of either pine or hardwood but rarely both (Olmsted 1902).

Olmsted's observations are consistent with the reports of Professor G.C. Morbeck of Iowa State College, who wrote about the lands and logging operations of the Fordyce Lumber Company in south-central Arkansas (Morbeck 1915). Morbeck split the frequency of pines and hardwoods about equally in the upland forests of this area, with pine constituting 60 to 85 percent of the total timber volume.

Other reports from Arkansas indicated that areas of "pure" pine forest could be found in the

UWGCP. Samuel Record published a brief article in *Forestry Quarterly* that broadly detailed the forests of Arkansas (Record 1907). Though this paper is not as informative as his later promotional report (Record 1910), it does make some interesting statements regarding pine dominance in the UWGCP. At one point, Record (1907, p. 298) states that shortleaf pine was in many places the "only" species (especially on poorer upland sites). Record (1907, p. 300) later described open pine stands in the Ouachita Mountains, but did not use this terminology for the UWGCP, suggesting that these pine sites were consistently better stocked. Roland Harper also noted "comparatively" open loblolly pine forests in Hot Spring and Saline counties in central Arkansas (Harper 1914).

Wilbur Mattoon published a definitive bulletin on the shortleaf pine (Mattoon 1915). On page 4 of this early silvics guide, he wrote the following:

...[shortleaf is] very well adapted for growth in pure stands, and it occurs extensively in this form of forest. The stands are not usually continuous over large areas, but are separated by mixed stands of pines and hardwoods. Stands of pure shortleaf pine once covered a much larger area than present...Mature shortleaf occurs over a large region centering in western Arkansas and northern Louisiana...the last extensive region of virgin shortleaf forest left...

Mattoon also mentioned that shortleaf pine was quite capable of forming pure stands in old fields, although this species does not have quite the same reputation for this behavior as loblolly pine.

Herman Haupt Chapman, a Yale forestry professor, published a number of early papers on the forest conditions in parts of southern Arkansas, central Louisiana, and eastern Texas (e.g., Chapman 1912, 1913). Chapman observed that pines in southern Arkansas and northern Louisiana were evenly split between loblolly and shortleaf, with hardwoods restricted to the bottoms or as scattered, stunted individuals amongst the pine

(Chapman 1913). In a later review paper on the management of loblolly pine Arkansas and Louisiana, Chapman reiterated the dominance of pine relative to the "subordinate" hardwoods in most of the presettlement upland forests of the region (Chapman 1942, p. 15). However, he also stated that under "...natural conditions loblolly pine, whether alone or in mixture with shortleaf pine, seldom grows in stands composed exclusively of pine. There is always present a certain admixture of upland hardwoods..." (Chapman 1942, p. 13).

Ernest Palmer of the Arnold Arboretum described the vegetation surrounding the Red River hamlet of Fulton, Arkansas (Palmer 1923). Palmer's more detailed account covers the same general region earlier described by Hill (1888). Although much of the area had been logged and cleared for agriculture, he found areas of old forest consistent with presettlement conditions. Palmer (1923, p. 13) described "...typical 'flat woods' composed of a mixed growth of Pine and deciduous trees." It is likely that the pine flatwoods reported by Palmer were dominated by loblolly pine, with lesser amounts of shortleaf. Palmer also reported small, pure stands of pine (especially loblolly), although these may have been old field or disturbed stands.

Garver and Miller (1933) provided the composition and stocking of two small old-growth tracts in eastern Texas. They noted evidence of fire and light logging some decades before, but considered the "average" condition of these parcels typical for virgin shortleaf stands. Shortleaf pine dominated the overstory in these "flatland" sites (less than 7.5% of the pine was loblolly), with the oldest shortleaf ranging from 150 to 275 years old. A mixture of poor quality gum, hickory, and oak were found in both stands, but comprised only a modest portion (perhaps one-third) of the stocking.

Finally, Lewis Turner evaluated the growth of pine in the UWGCP of Arkansas during the 1930s and reported on some of the remnants of old timber.

Regarding pine abundance in the presettlement forests of the UWGCP, Turner (1937, p. 7-8) claimed:

...remaining stands of virgin forest in the coastal plain region of the state indicate that the natural, undisturbed upland forest type is either pure hardwoods or mixed hardwood-pine. In opposition to this indication is the occurrence of old, pure or essentially pure pine stands that are usually referred to as virgin pine areas. However, a number of these stands were studied and it was found that they are essentially even aged.

Turner continued with a discussion of the age class structure of some of these pure even-aged pine stands, and concluded that they had arisen from severe windthrow events.

Contemporary Scientific Accounts.—Few modern-day researchers have presented data on the degree of historical pine dominance across the UWGCP. Reynolds et al. (1984) described the virgin upland forests of northern Louisiana and southern Arkansas as one-half loblolly pine, one-quarter shortleaf pine, and the rest in a mixture of hardwoods. Platt (1999) described the pine savannas in the southern US as common, covering 2 million or more square kilometers across the southeast. Though his work concentrated on the longleaf and slash pine (*Pinus elliottii* Engelm.)-dominated savannas, it also included some transitional regions between longleaf, loblolly, and shortleaf pine in the UWGCP (Platt 1999). The presettlement versions of UWGCP pine-dominated forests also appeared to have relatively low stand densities influenced by short fire return intervals (Bragg 2002a).

Contemporary surveys of old-growth remnants in the UWGCP are of little value when determining the historical prominence of pine. Virtually no upland forests left in the UWGCP still experience the primary disturbance regime of presettlement times (fire), and thus any remnants have noticeably departed over the last century from what they

would have been like during historical periods. This change can be witnessed by the almost universal tendency of older, pine-dominated stands to have dense under- and mid-stories of hardwoods, shrubs, and woody vines, with little pine regeneration. Studies in present-day UWGCP old-growth stands in eastern Texas (Glitzenstein et al. 1986), southern Arkansas (Cain and Shelton 1994, Heitzman et al. 2004, Bragg 2004b), and other observations in Louisiana (Quarterman and Kever 1962) have documented the gradual decline of pine abundance. Note that Quarterman and Kever (1962) believed that the pine-dominated forests of the South represented little more than a mid-severe condition of frequently perturbed landscapes inhibited from reaching their hardwood climax.

#### DISCUSSION

It would be a mistake to classify the entire UWGCP as any one covertype, whether all pine or all hardwood. Rather, the presettlement UWGCP was a complex mosaic of pines, mixed pine-hardwood or hardwood-pine stands, hardwoods, prairies, and riparian wetlands. Locally, pockets of stands or even small landscapes may have been monotypic, but there is no conclusive evidence of extensive areas of 100% pine forests in the UWGCP, as may have been the case with other forests in the South. Some natural historians, for example, have described an almost continuous cover of longleaf pine stretching from southeastern Virginia to southeastern Texas (Wiswall 1861, Claiborne 1906, Earley 2004). In many locations, longleaf pine was the only overstory tree, with sprinklings of scrub oaks or thin clusters of other tree species along wetlands.

Localized disturbance events like fire or wind (e.g., Mattoon 1915, Turner 1937) and unique soil conditions (e.g., Owens et al. 1860, Bragg 2005) may be the driving factors in the occurrence of the highest pine content stands in the UWGCP. However, the extensive logging history of the region clouds the assessment of pine prominence. Since pine was the preferred timber species over

most of the UWGCP for the last two centuries. stands of the highest pine content were undoubtedly some of the first to be logged. For instance, as early as the First World War, only 20 to 40% of the "pure type" of shortleaf pine forests remained uncut (Mattoon 1915). Undoubtedly, this heavy exploitation helped to limit the significance of pine in some historical descriptions of the upland forests of the UWGCP. Conversely, the invasion of abandoned agricultural fields and cutover lands by pine (especially loblolly) has helped exaggerate its abundance in modern-day landscapes.

Pine may indeed be more common than ever in the UWGCP. The predisposition of loblolly pine to occupy disturbed sites has contributed to a dramatic increase in loblolly at the expense of shortleaf pine and many hardwoods. Furthermore, the long-term exploitation of UWGCP forests to supply a pine-dominated industry has also discouraged the retention of other species. Some have even attributed past and present pine dominance of the region to the deliberate removal of hardwoods (Hall 1945, Etheridge 1959, Quarterman and Keever 1962). As Hall (1945, p. 637) stated in a report on pine dynamics in southern Arkansas:

Removal of such hardwoods not only aids the pines at present on the ground, it encourages pine reproduction which is likely to come with the first seed crop following the cutting. This treatment will greatly strengthen the pine component wherever a seed supply is available.

Additionally, the advent of intensively managed loblolly pine plantations and use of herbicides to control competing vegetation over the last few decades has displaced inherently more diverse stands of natural origin. The selective pressures of the historic past (primarily fire) have been replaced by present-day mechanisms (cutting on short rotations, planting, and herbicide application) at least as extensive and effective in promoting pine.

#### CONCLUSIONS

Pines have long been a dominant genus in many southern landscapes, with palynological and fossil evidence of this prominence spanning back thousands to millions of years (Platt 1999). It is probably safe to say that pine has been *the* dominant genera over most of this area for untold centuries. Any such assertion, however, should also recognize that much of the UWGCP contained extensive quantities of non-pine species, and the broad swath of "pure" pine forest and woodland described historically was actually a much more complex assemblage of pines, hardwoods, mixed pine-hardwoods, bottomlands, and prairies. The presettlement matrix, in addition to old-growth forests, also had considerable areas of younger, even-aged stands arising from natural and anthropogenic disturbances. Evidence further suggests that some of these perturbed areas may have been pure compositions of pine or hardwoods.

Would Thomas Freeman and Peter Custis recognize the landscapes they toiled in from the dominant tree species and forest types encountered at the beginning of the 21<sup>st</sup> Century? Broadly, yes, they would still see most of the species they were familiar with, generally occupying the same habitats as they did two hundred years earlier. However, the open pine forests dominated by massive virgin timber are long gone. Dramatic shifts in stand structure, tree density, overstory and groundcover community composition, and landscape pattern generated by centuries of commercial exploitation, settlement, and alteration to historical disturbance regimes have undoubtedly produced a substantially different vegetative environment in the UWGCP, and have noticeably affected the prominence of pine.

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