Analysis of Wood Charcoal from an Earth Lodge on Mound V at Moundville

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ABSTRACT: This paper presents the results from an analysis of carbonized wood remains found at Mound V, Moundville in the earth lodge and associated Structure 2 excavated by Vernon James Knight. The data are discussed in relation to three aspects: the local forest composition, the construction properties of the wood used, and a brief comparison to wood used in a comparable Mississippian structure, the Macon Earth Lodge in Georgia. Possible symbolic properties of the wood are also discussed with respect to red cedar.

INTRODUCTION

The Moundville polity, located in the Black Warrior River valley in Alabama, was one of the largest late prehistoric chiefdoms in the Native Southeast and has been the subject of considerable study (Knight and Steponaitis 1998; Peebles 1978). The Moundville polity was made up of several types of settlement: farmsteads, single mound sites, and the large center of Moundville itself (Bozeman 1982; Knight and Steponaitis 1998; Peebles 1978). The Moundville center incorporates at least 29 monumental mounds and platforms situated around a large central plaza. Mound V is located adjacent to and opposite the plaza from Mound B, the largest mound at Moundville and one with a long history of use.

Vernon James Knight of the University of Alabama directed excavations at Mound V at Moundville from 1999 through 2002. Knight's excavations revealed two structures. Structure 1 was an earth lodge in the South Appalachian style with a destruction and rebuilding episode (the first of the earth lodge episodes is referred to as Structure 1a, the second Structure 1b). No other structures built in a similar fashion have been found at Moundville. Structure 2 is a rectangular building without an earth embankment. These Mound V structures probably were initially built in the early 1400s AD. based on radiocarbon dates, which places them in the Moundville III phase (Knight, this volume).

This paper presents the results of an analysis of carbonized wood remains from the structures found at Mound V. I will first describe the composition of the taxa found in the features representing the structures and their relationship to the structures. I will then discuss the suitability of the building materials and their availability in the landscape. Finally, I will briefly compare the construction materials to those used in another excavated Mississippian earth lodge located at Ocmulgee National Monument, Georgia.

METHODS

I identified to genus up to 20 pieces of carbonized wood larger than 2.0 mm from each of 55 samples. The samples come from specific structural features which are roughly representative of the various structural components making up the earth lodge (Structures 1a, 1b) and the adjacent structure (Structure 2). Generally, in Eastern Woodlands contexts it is considered necessary to have a minimum of twenty pieces of wood to adequately

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represent the wood taxa in a feature (Asch et al. 1972:3). However, as this analysis is not aimed at landscape reconstruction but rather an architectural analysis, I considered samples with fewer than 20 pieces to be adequate for my purposes.

Each wood fragment was examined under a low-power microscope (40×). At this magnification, wood can usually be identified to genus level. The features of a tree species' vascular system, the pores, the presence of material in the pores called traecema, the rays, the growth pattern (early versus late wood characteristics), and the texture can all be used to identify wood to a low taxonomic level (Hoadly 1990). Using these various diagnostic features, each piece of wood was identified to the lowest possible taxonomic category.

If hard wood is not ring porous (i.e., laying down distinctive early versus latewood patterns), the wood is considered "diffuse porous." Diffuse porous woods are difficult to identify to the genus level at the low magnification available to me, so occasionally I used the "diffuse porous" category to describe wood when no further determination could be made. Only a few features, mostly in Structure 2, contained diffuse porous wood, hence this limitation did not seriously affect my analysis.

Sometimes it was not possible to make a definitive identification. If an identification to genus or to a higher taxonomic group was not possible, I assigned the wood to an "unidentifiable" category.

RESULTS

Before describing the results of my analysis, I will describe the primary wooden components of the Structure 1 earth lodge, as presently understood. The earth lodge contained the following wood components: (a) four main center posts, (b) a log cribwork over the center posts, (c) roof rafters radiating from the center cribwork, (d) main wall support posts, (e) auxiliary exterior wall posts which lean on the wall of the main posts, (f) a long entrance way, and (g) small poles placed on the outermost sides to hold sod in place over the structure. The main walls were lathed with whole cane bundles and were plastered with clay (Sherard, this volume). Earth lodges in the South Appalachian tradition generally share many of these features.

The majority of the wood samples were from post hole features. Because the samples from post hole features contained multiple species of wood, it can be assumed that wood from multiple structural elements was present in the postholes. This situation makes for challenging interpretation. The excavator (personal communication) has provided interpretations of the features and data which assume that the earth lodge was a carefully planned and constructed structure, suggesting that it is unlikely that wood was haphazardly selected and used. This assumption entails the idea that the different wood components of the structure, such as the roof rafters and the cribwork, each were deliberately made of a selected wood type or perhaps a range of types.

Table 1 groups the samples by proveniences arranged by architectural component. The majority of the wood in the samples was pine; 65 percent of the total wood in all the samples was pine. It is likely that the majority of the large structural elements in the earth lodge were of pine. After the larger structural elements burned, the abundant charred wood from them probably found its way into many post hole features.

The majority of samples examined were from Structures 1a and 1b, the earth lodge. Of these, the majority come from the second phase of construction, Structure 1b. This is because the first version of the structure was carefully dismantled, and unlike the second version of the earth lodge, did not burn. Therefore the preservation of samples for analysis from Structure 1a is low. There were only three features representing Structure 2 in the study sample, so this structure will only be considered briefly.

Structure 2, a rectilinear building which is not an earth lodge, is represented by wood samples from Features 11, 12, and 14, all "dugouts" associated with post holes in the structure's west wall (Knight, this volume). The majority of the wood found in these features is pine, although there was a significant amount of both diffuse porous and cedar wood in these samples as well. The northwest corner post of Structure 2 may have been cedar, based on the prevalence of cedar in a large and especially deep post hole within Feature 14.

As stated earlier, the majority of the earth lodge structure, including both the original and the rebuilt version (Structures 1a and 1b), appears to have been constructed of pine. Sixty-five percent of the total wood in these samples was pine. The pines found in the Black Warrior River Valley are of the southern pine group, which is also called the yellow or hard pine group. Species in the southern pine group that are present in Alabama include shortleaf pine (*Pinus echinata*), longleaf pine (*Pinus palustris*), and loblolly pine (*Pinus taeda*). The southern pines species have very similar wood characteristics and morphological features.

The large roof support posts of the earth lodge in both construction phases were pine (Figure 1). The wood pieces from Feature 36, a roof support post from Structure 1b, exhibited very small growth rings, which is characteristic of shortleaf pine (*Pinus echinata*). However, given the uniform nature of pine and the southern pine group in particular, it is difficult to definitively identify the species. The support posts were quite large, 65 cm in diameter in one case (Feature 49b, Structure 1a) and 51 cm in diameter in the other (Feature 36, Structure 1b) (Knight, this volume). The largest wood component of the roof itself, the cribwork, was probably homogenously pine as well.

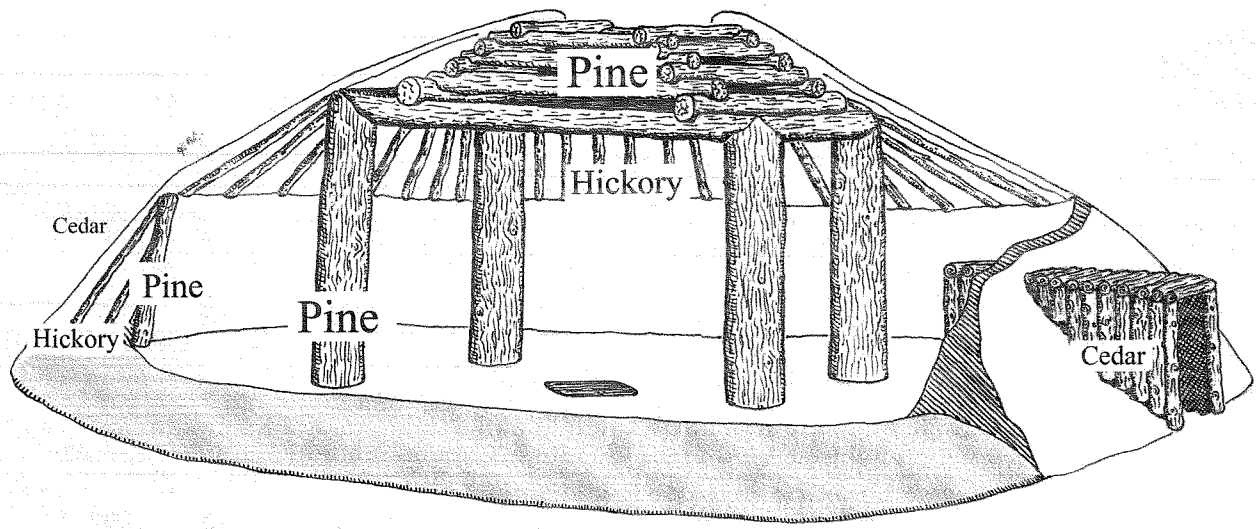

Figure 1. Cutaway drawing of earth lodge Structure 1b, showing wood components identified for structural elements

The majority of the radiating-rafter components of the roof were probably hickory, based on the predominance of that wood type in the rafter samples studied from the outer roof area. If the rafters were homogeneously hickory, the appearance of pine among these samples may be intrusive either from the adjacent wall or from the central cribwork.

Pine predominates heavily among the primary wall posts, suggesting that the majority of the wall posts were of this wood type. It is possible that the wall posts were homogeneously pine, in which case the presence of hickory and some oak among these samples may be intrusive from roof rafter or leaner post remains falling in on the wall post features.

Leaner posts stood outside the primary wall at the base of the surrounding clay berm, providing a base for embanking sod. The leaner post components were represented by shallow features, and the wood samples contained in them may have become intermixed with wood from nearby interior post remains. It is likely that the majority of these leaner posts were hickory, but the small number of samples representing the leaner posts makes it difficult to say for certain.

External poles were probably placed around the earth lodge in order to keep the sod in place, a practice typical of Plains earth lodges. Wood from these poles was found in soils overlying the interior side of the clay berm, between it and the wall line (Knight, personal communication). Much of the wood from these samples is cedar, although hickory is also well represented.

The only other component of the earth lodge where much of the wood identified is cedar is the tunnel entranceway. It is possible that the entranceway was made entirely of cedar, or of a combination of cedar and pine.

DISCUSSION

I will now discuss the data in relation to three aspects: the composition of the local forest, the construction properties of the wood used, and a brief comparison to wood used in a comparable structure at another Mississippian site, the Macon Earth Lodge at Ocmulgee National Monument, Georgia. Possible symbolic properties of the woods used will be briefly mentioned with regard to red cedar.

Forest Composition

The Black Warrior River Valley crosses the boundary between the upland Cumberland Plateau region and the Coastal Plain (Peebles 1978:392-393). Boundaries between ecosystems frequently are characterized by a high diversity of plant and animal species and ecological communities. The Black Warrior Valley is no exception to this rule of boundary diversity. Moreover, this diversity was probably even higher in the past, before severe logging and other stressors on diversity (including chestnut blight) impacted the region.

Scarry (1986:67-113) recaptured knowledge of some of this pre-industrial diversity in the Black Warrior Valley in her forest reconstruction based on Government Land Office (GLO) survey data. This technique utilizes the records surveyors took of "witness trees;" trees they marked indicating the corners of range and section lines. Despite possible biases towards preferred trees and poor identifications on the part of surveyors, which were accounted for statistically within the reconstruction, the information provided by the early nineteenth-century surveys was effectively used by Scarry to create a picture of the forest communities near the Moundville polity. It must be noted, however, that these forests had been undisturbed for several centuries when the surveys were conducted, which was not the case during the Moundville III phase.

Table 1. Identified wood samples from structure proveniences.

Provenience	No. of Samples	Pine	Hickory	Cane	Diffuse porous	Cedar	White Oak	Red Oak	UID
Structure 2, wall area									
Feature 11	3	17	4	0	5	12	7	4	1
Feature 12	1	8	2	0	10	0	0	0	0
Feature 14	2	20	4	0	5	16	2	4	2
Structure 1a, 1b, major roof support posts									
Feature 36	13	180	0	0	0	0	0	0	5
Feature 49B	3	49	0	0	0	0	0	0	0
Structure 1b, roof components/rafters									
Unit 81R125, cut	3	0	15	0	0	0	0	0	0
Unit 81R125, cut	3	0	19	0	0	0	0	0	0
Unit 79R127, cut	3	0	0	0	12	0	0	0	0
Structure 1a, 1b, primary wall posts									
Feature 37C	1	9	3	0	0	0	2	3	0
Feature 38	2	16	11	6	1	0	7	1	3
Feature 38A	1	9	2	1	0	0	1	0	1
Feature 44	1	5	10	1	0	0	0	0	0
Feature 51	1	8	0	0	0	0	0	0	0
Feature 52B	1	19	0	0	1	0	0	0	0
Feature 53	1	14	0	1	2	0	3	0	1
Feature 54	1	16	2	2	0	0	0	0	0
Feature 57	1	18	2	0	0	0	0	0	0
Structure 1a, 1b, leaner posts									
Feature 32A	1	11	0	0	0	0	0	0	0
Feature 32F	1	0	16	0	0	0	0	0	4
Feature 32H	1	3	1	0	1	1	0	0	2
Structure 1b, external poles (?)									
Unit 75R129,cut	2	3	7	0	0	9	1	0	0
Unit 79R129,cut	2	8	1	3	0	5	0	2	0
Unit 79R125,cut	2	20	0	0	0	0	0	0	2
Unit 83R125,cut	2	7	7	0	2	3	0	0	1
Unit 83R125,cut	2	0	8	0	0	5	0	0	0
Unit 73R129,cut	3	2	1	0	0	0	0	0	0
Structure 1b, entranceway									
Feature 26	1	9	0	0	0	9	0	0	2
Structure 1b, auxiliary interior posts									
Feature 30	2	40	0	0	0	0	0	0	0
Feature 33	1	15	0	0	0	0	0	0	1
Feature 35	1	20	0	0	0	0	0	0	0
Feature 40	1	9	0	0	0	0	0	0	0
Totals		535	115	14	39	60	23	14	25

Nonetheless, given the lack of palynological data, they constitute the best data set available.

As Scarry describes the landscape surrounding Moundville, it can be divided into two broad areas above and below the Fall Line, that are further subdivided into various ecological zones based primarily on elevation and soil type. In the Moundville area, there are five terrain groups: Fall Line Hills, terrace, bottomland, swamp, and riverbank.

The Fall Line Hills' rugged slopes and poor soils make them unattractive for farming. The forests on these hills were characterized by mixed hardwoods and pine. There were eight dominant taxa, with red oak and pine being the overwhelming majority; hickory, various oak taxa, chestnut, and black gum comprised the rest.

The terrace zones are Plio-Pleistocene stream terraces that parallel the Black Warrior River and separate the flood plain from the Fall Line Hills. The Moundville site is located on a particularly high terrace that overlooks the river. The soils of the terraces are suitable for cultivation. The forests of this zone were very similar to those in the Fall Line Hills except that hickory was somewhat less abundant, while pine was somewhat more frequent.

The bottomlands below the Fall Line have alluvial soils that are generally good for cultivation. Within the bottomlands, differences in elevation and drainage capability result in variability in both agricultural potential and plant communities. There were a wide variety of tree species in the bottomlands, some of the most prominent being holly, sweet gum, white oak, beech, and pine.

The tree taxa found in swamps differed significantly from those in other zones. Water tolerant species were obviously more significant, and the hickories found in these forests were mostly those bearing inedible nuts (bitternut and water hickory). Sweet gum, holly, maple, willow, white oak, and beech comprised the majority of tree taxa found in the swamps. It is also the only zone where cypress is found relatively frequently.

River bank communities below the fall line were quite distinct from the other area forest communities. Oaks were not prominent species. Dominant species of the river bank zone included maple, ash, hackberry, and sycamore.

With Scarry's GLO reconstruction in mind, placing the wood data from the Mound V structures in relationship to the landscape is possible. Most taxa found in the samples were found in varying abundance in all nearby forest communities; this is especially true of the two most common taxa in the assemblages, pine and hickory. However, the areas where those two species are most common are the terraces and Fall Line Hills. Linking wood taxa found in the samples to zones in which they are common is in no way a definitive answer to the question of where the Mound V builders were obtaining their construction materials. Most areas had probably undergone some anthropogenic disturbance, and most taxa found are fairly ubiquitous throughout the zones adjacent to Moundville. What is relevant is that the builders of the earth lodge and the adjacent structure probably did not go to any great effort to collect specific species of wood from great distances. Their choices of wood were consistent with what was available conveniently, and as I will discuss next, appropriate functionally.

Construction And Symbolic Properties

There are many different species of pine, and they have slightly different qualities. It is worth mentioning that the common perception of pine as being '"soft" wood and hence inferior to the majority of hardwoods is somewhat misleading. The hardest softwood is comparable in durability to a mid-range hardwood.

Softwoods may also have other advantages that some hardwoods lack, including vertical strength and a decreased susceptibility to rot. In regard to rot resistance, it is worth noting that the only other structures at Moundville for which there is wood identification are the palisades, which were constructed of pine poles. These palisade poles are assumed to have been in place for 10-20 years, given the rot resistance of pine (Pashin and de Zeeuw 1970:458-459). Pines also have the advantage of being ready-made straight poles, with little processing required before they can be effective building components.

All the pines in the southern pine group have fairly comparable structural properties. The species of the southern pine group cannot be easily distinguished from one another based on wood structure, and in fact they are usually sorted by density in lumberyards (Pashin and de Zeeuw 1970:458). All of the southern pines are used in modern construction, especially shortleaf and longleaf pine (Petrides and Wehr 1988:159-160). The general standard in lumberyards for structural grade wood among the southern pines is an average of 6 growth rings per inch. The central roof support post in Structure 1a on Mound V has double this number of rings per inch. In other words, besides being very large, the central posts were certainly made of structurally sound wood (Pashin and de Zeeuw 1970:457).

Hickory is a remarkably durable hardwood with a high all-around strength. It makes sense, given the strength of hickory, that it would be desirable as a rafter component whereby it would support large portion of the roof.

Another species selected for its construction features may have been cedar, used in a few components of both the earth lodge and adjacent Structure 2. While cedar is known to have ritual importance among the Southeastern Indians, it also has a relatively high rot resistance compared to other available wood types. The proveniences in the earth lodge where cedar was prominent were in the areas where wood was found from poles on the outside of the lodge, probably serving to hold down sod, and also at

at the entrance tunnel. Both of these features may have been more exposed to the elements than the other building components, hence rot resistance would have been an asset.

There may be a symbolic component to the use of red cedar as well. It has been shown by Mary Simon that in the American Bottom of the Mississippi River Valley, red cedar was more often used in elite or ritual-related Mississippian structures than in other contexts, especially during the Stirling (1100-1200 A.D.) and Moorehead (1200-1275 A.D.) phases (Simon 2002:296-98). These phases are chronologically earlier than the Mound V structures. Also, Simon (2002:298) identifies a trend in later Mississippian domestic, non-elite architecture to incorporate red cedar in construction, perhaps as protection from the supernatural as documented in ethnographic accounts.

It is noteworthy that all of the red cedar in the earth lodge is in areas of the structure that may have been visible from the outside. Red cedar may have served as a marker of the earth lodge's elite or ritual status, in addition to its prominent location on Mound V. The placement of red cedar components is also consistent with the later uses in the American Bottom as a spiritually protective element. There may also be ritual significance in the placement of cedar at the tunnel entranceway, where one would have to "pass through" the cedar to gain entry.

However, it is difficult to conclude anything from the presence of red cedar in this context due to the fact that there are no other structures from the Moundville polity for which wood remains have been analyzed. Without non-elite or other comparison structures, it is not possible to show differential use of red cedar in elite or ritual structures that would demonstrate the symbolic value of red cedar in this context.

Comparisons With The Macon Earth Lodge

As noted earlier, the earth lodge structure on Mound V is unique at Moundville. Thus intra-site comparisons are not possible. One of the few structures in the Southeast of similar size and character to the Mound V earth lodge is the Macon Earth Lodge at Ocmulgee National Monument in central Georgia. Fortunately a wood analysis was conducted on some of its structural elements. Excavations led by A. R. Kelly in 1938 revealed a circular structure constructed in a fashion generally akin to the Mound V structure (Fairbanks 1946:94). Volney H. Jones conducted the wood analysis of the structural features of the Macon Earth Lodge. Jones described only a few components of the lodge (Fairbanks 1946:97). Rafters (roof beams) were species of the southern pine group. The large vertical roof support posts were white oak (*Quercus alba*) and post oak (*Quercus stellata*).

The wood used in the Macon Earth Lodge is obviously different from the comparable components of the Mound V structures, in which the roof supports were pine and the rafters probably hickory. The lack of significant oak in the Moundville earth lodge is of interest.

The landscape around the Macon Plateau is not radically different from the area surrounding Moundville. Species of trees and their ubiquity in the landscape should be similar in the two areas. There is no clear explanation for the difference in the two structures. It may be that food trees in the form of oak and hickory were valuable enough that only minor harvesting was acceptable, rather than the destruction of older trees for construction. However, given the ubiquity of oak and hickory in the landscape, and the prominence of corn versus nuts in the diet during this time period at Moundville (Scarry 1986; Scarry and Welch 1995), conservation for food seems like an unlikely explanation for the lack of oak in construction.

CONCLUSION

The structures on Mound V were constructed rationally, out of structurally sound materials which were collected locally. There may also have been symbolic elements in the selection of wood for these structures, especially with regard to red cedar. However, without comparable evidence from other Moundville structures it is difficult to interpret such symbolism with any certainty. Perhaps future excavations will reveal other structures that will allow for the comparisons necessary to reach conclusions regarding symbolic properties in construction materials at Moundville.

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