# FIELD EVALUATION OF TWO SUBSURFACE AUGERING METHODS AT MOUNDVILLE

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*This study explores the efficacy of two methods of mechanical augering in determining the extent of residential areas and middens at Moundville. A gasoline-powered screw auger and a hand-held tube sampler were each used to systematically auger two hectares within the site's boundaries. Both methods proved to be quick and effective at locating middens. The preliminary results suggest, as expected, that the highest density of occupational debris is distributed in a band between the plaza and the palisade.*

Moundville, located along the Black Warrior River in west-central Alabama, is one of the largest civic-ceremonial centers built by Mississippian peoples. The site's core consists of at least 20 mounds arranged around a large, rectangular plaza (Figure 1). At one time, this mound-plaza complex was surrounded by an extensive system of fortifications, including a palisade and an embankment (Peebles 1979; Steponaitis 1983b; Vogel and Allan 1985). Residential areas have been encountered in excavations both inside and outside the fortifications (Scarry 1998). In all, the site covers some 75 ha (Knight and Steponaitis 1998).

Previous research has established that the site was principally occupied during the centuries between A.D. 1000 and 1600 (Steponaitis 1983a). Current evidence suggests that the site's population peaked between A.D. 1200 and 1300 (Knight and Steponaitis 1998; Steponaitis 1992, 1998; Welch 1989), but the absolute size of this population is still an unresolved issue. Archaeologists have proposed figures ranging from 1,000 to 3,000 individuals (e.g., Peebles 1983:190; Steponaitis 1998), but these estimates have been based on very limited data and must be regarded as little more than educated guesses. Similarly, it has generally been assumed that the plaza was mostly ''clean'' and that most of the site's occupation was concentrated in a band between the plaza and the palisade. This assumption has never been fully tested.

Placing Moundville's demographic history on a firmer footing will require a long-term program of field research in which residential areas are systematically located, mapped, and dated.[1] Yet because Moundville is covered with grass and trees, residential areas cannot be reliably located by simply inspecting the ground surface; rather, subsurface testing or remote sensing techniques must be used. This is a familiar problem in the Eastern Woodlands.

Here we report on a limited study at Moundville designed to evaluate two such methods for locating middens and features in areas covered by grass or other vegetation. Neither of these methods is new, but using them in tandem on the same site provides an opportunity to assess their relative advantages and effectiveness. The field work was carried out by the authors and one assistant over a period of three days in March 1993. In the sections that follow, we describe the methods, present the results, and discuss the implications for future research and current interpretations.

## Methods

The two methods we evaluated entail different forms of mechanical augering. The first, which we call *hand augering*, employs a hand-held coring device that can quickly retrieve a soil profile 40–80 cm deep and approximately 2 cm wide. The second, which we call *power augering*, involves using a gasoline-powered screw auger to dig test holes 50 cm deep and about 30 cm wide. Both augering methods were used to retrieve soil samples from points deployed systematically over the areas tested. The basic unit for testing was a square measuring 100 m on each side, aligned with the site's master grid. We refer to these 1-ha units as *blocks*. The corners of each block were located using conventional surveying techniques. The grid of points within the block was then laid out using survey flags and 100-m tapes. As described below, we used a different spacing of points with each method.

### *Hand Augering*

Our hand-augering procedure was originally developed by Ward and Davis on sites in North Carolina (Davis and Ward 1987; Ward and Davis 1993:319, Figure 12.2). The basic tool is an Oakfield Tube Sampler with a 45-cm tube mounted on the end of a 60-cm-long, T-shaped handle (Figure 2). When the tube is pushed into the ground and withdrawn, it brings up a cylindrical sample of soil 40 cm long and 2 cm in diameter. This sample can be shaved with a trowel while still in the tube and examined for characteristics

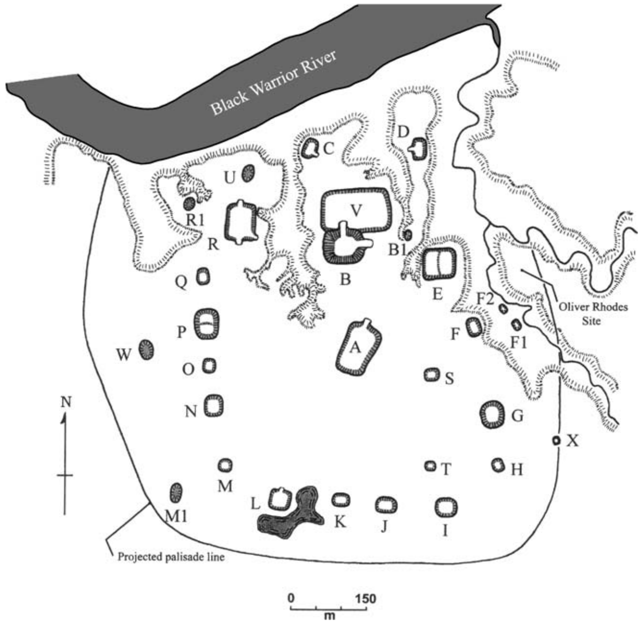


Figure 1. Schematic map of the Moundville site (after Knight and Steponaitis 1998:Figure 1).

Figure 2. The Oakfield Tube Sampler in use. The grid is quickly laid out by setting pins along the edges of the block with a 100-m tape and then stretching the same tape between corresponding pins to form transects.

indicative of past human occupation or disturbance. Middens and midden-filled pits show up clearly as layers of dark soil below the plow zone. Even in the absence of well-developed midden, occupation can be evidenced by pieces of charcoal, daub, or other artifacts brought up in the tube. Fill deposits can be indicated by pronounced mottling; this signature is often associated with ancient mound construction or recent backfilling of excavations. For present purposes, we typically obtained at least one and sometimes two samples from each hole, thereby examining the soil profile to a depth of 40–80 cm.

Each block was hand-augered using a 10-m interval, including points placed on the block's corners and boundaries. Thus the sampled points comprised an 11-by-11 grid, for a total of 121 points spaced evenly over a hectare. In general, three crew members augered while the fourth had the task of recording the data. For the sake of efficiency, soil profiles were not mapped in detail. Rather, we simply recorded the location and nature of each ''hit,'' which was construed to mean any indication of past occupation or soil disturbance. Among the indications we recorded were midden soils, lenses of burned earth, sherds, daub fragments, and flecks of charcoal. Once the corners of a block were located, the total time spent in laying out the grid, augering, and recording data within the block was about two hours.

*Power Augering*

Our power-augering technique was modeled after the one developed by Shapiro (1987:32–34) at San Luis de Talimali. The augering was accomplished using a gasoline-powered, Tanaka screw auger with a 30-cm (12-in) diameter bit. This machine was used in conjunction with a homemade plywood box designed to gather the soil thrown up by the bit; this box was 60 cm (24 in) square and 25 cm (10 in) high, had an open top, and had a bottom with a circular hole in the center, 33 cm (13 in) in diameter, large enough to accommodate the auger's bit (Figure 3). The other tools we employed were a round-nosed shovel, several galvanized wash tubs, and a four-legged sifter with 1.3-cm (0.5-in) screen.

Our standard procedure was simple (Figure 4). First, a divot of turf, roughly the diameter of the auger bit, was removed with the shovel and set aside. The plywood box was placed over the patch of bare soil, and the auger was used to drill a hole through this patch to a depth of about 50 cm. The excavated soil, now mostly in the box, was dumped into one of the wash tubs. Then the box was moved aside, a sifter was set up directly over the hole, and the soil in the wash tub was passed through the sifter and back into the hole. Finally, the loose soil was compacted in the hole and the divot was replaced. To save time, profiles were

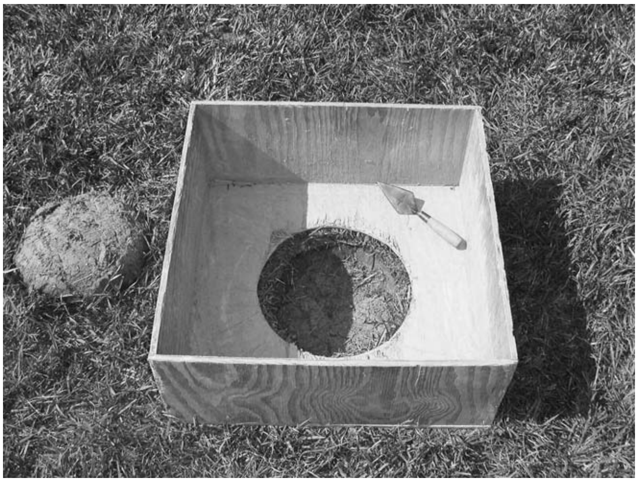

Figure 3. Detail of the plywood box that gathers the soil thrown up by the auger bit. A divot of turf has been removed just prior to augering.

not drawn, but any unusual (and obvious) characteristics visible in the profile–such as the presence of burned earth or midden–were noted.

This procedure was put into practice most efficiently by splitting our crew into two teams, each with two people. One team cut the divots and drilled the holes, while the other team followed sifting the soil, refilling the holes, replacing the divots, and bagging the artifacts. A wash tub was used to contain the soil from each hole between the time the first team left and the second team arrived. Each block was tested with 25 holes, spaced 20 m apart in a 5-by-5 grid that was offset 10 m from the block's boundaries. As with the hand augering, it took approximately two hours, working quickly, to complete a block once the corners had been located.

## Results

The methods just described were applied to two blocks in different parts of the site. One was located on the eastern edge of the plaza, between Mounds G and T; its southwest corner was at N1700 E1200 on the site's master grid. The second block was located in the baseball field south of Mound I, with the southwest corner at N1430 E1150.

The results from each block are presented in a series of maps, one showing the distribution of hits encountered during hand augering, the others showing the density of shell-tempered pottery, expressed in both counts and weights, recovered during power augering. Contours on the density maps were smoothed using a distance-weighted least squares algorithm (Wilkinson 1990:275).

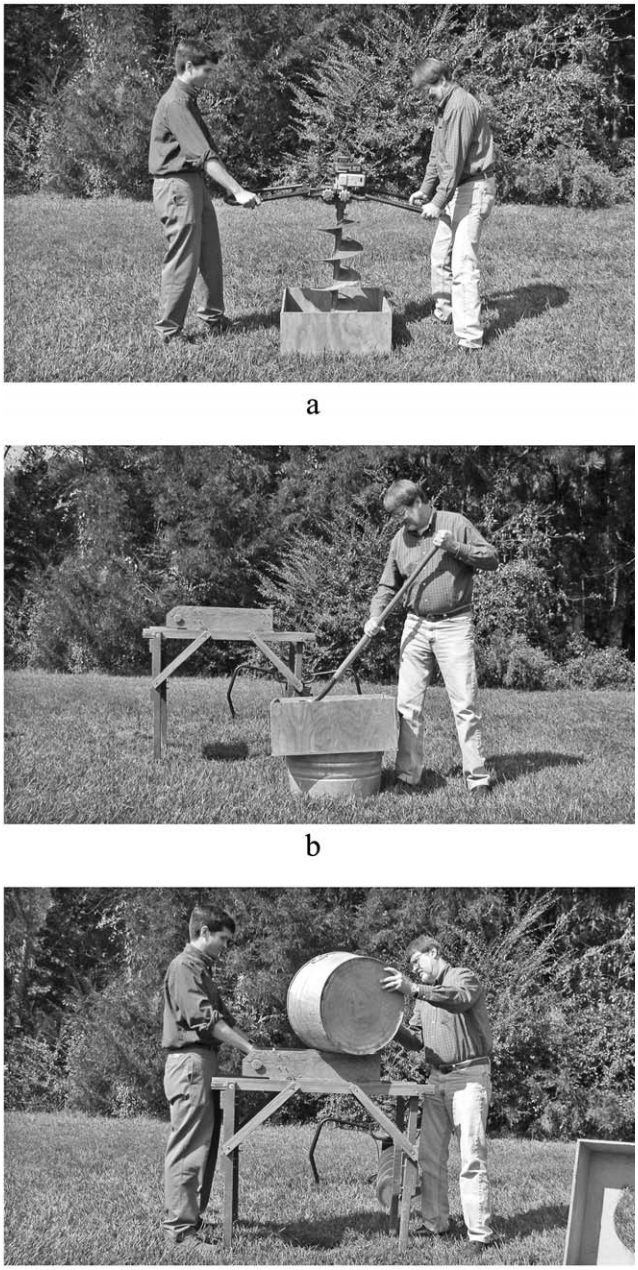

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Figure 4. The steps in power augering: (a) drilling the hole, (b) transferring the soil from the plywood box to the wash tub, and (c) pouring the soil from the wash tub to the sifter, which is positioned directly over the hole from which the soil was drilled.

### *Block N1700 E1200*

This hectare was chosen for testing largely because of the variety of depositional contexts it contained: areas adjacent to mounds G and T, portions of the central plaza, and some of the Depression era excavations southwest of Mound G (Figure 5). Our hope was that differences among these contexts would be detected by one or both methods of augering.

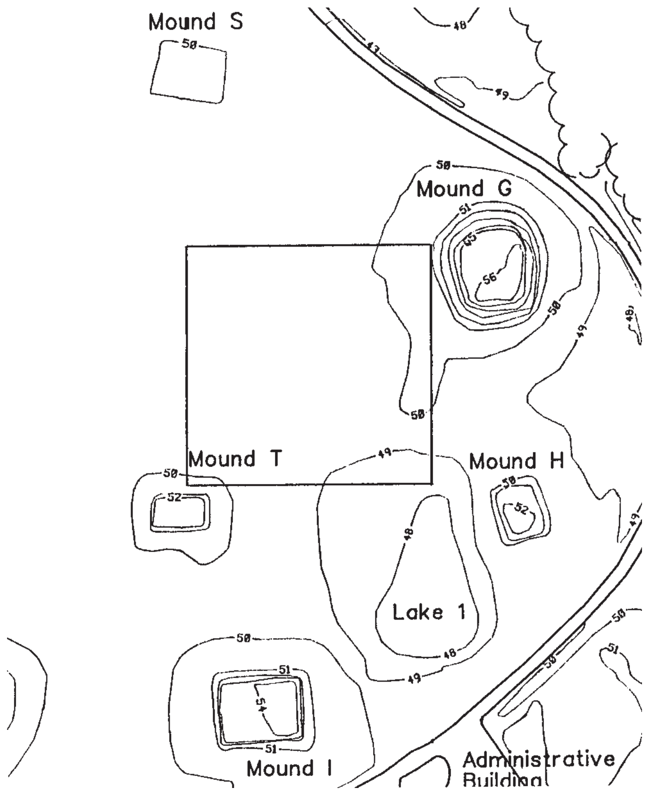


Figure 5. Current topography in the vicinity of Block N1700 E1200. The block itself, measuring 100 m on each side, is indicated by the square near the center of the map.

Hand augering revealed a clear-cut pattern in the distribution of hits (Figure 6a). Almost all the occurrences of charcoal, daub, dark soil, and artifacts were observed in the eastern and southern portions of the block; the northwestern portion was virtually devoid of such traces. This pattern reflects the distinction between the plaza's eastern periphery (which contained mounds, buildings, and associated middens) and the plaza itself (which may have been largely empty).

The hand augering also uncovered evidence of highly mottled fill deposits in four spots near the center of the block's eastern boundary (Figure 6a). This is believed to be the location of the Depression era excavations southwest of Mound G, designated by the acronym SWG (Peebles 1979).

The abundance of shell-tempered pottery recovered by power augering essentially mirrors the periphery versus plaza dichotomy seen in the hand-augering results (Figure 6b–c). The lowest densities of pottery, by both count and weight, were found in the northwestern corner of the block; the highest densities occurred along the eastern and southern boundaries of the block, particularly in the areas south of Mound G and adjacent to Mound T.

The power augering yielded 195 sherds, of which 187 were shell tempered. Decorated sherds were not plentiful. The sample included one example of Moundville Incised, *var. Moundville*, one of Carthage Incised, *var. unspecified* (possibly *Summerville* or *Carthage*), one of Moundville Engraved, *var. unspecified* from a slender ovoid bottle, and one of Mound Place Incised (presumably nonlocal) (Table 1). Of four rims from shell-tempered jars, one was folded and another was folded-flattened (Table 2). All in all, the assemblage suggests that the refuse here was mainly deposited during Moundville I or early Moundville II times (Steponaitis 1983a).

Some additional finds are worthy of special note. At N1780 E1270, hand augering revealed a layer of burned clay, perhaps a hearth or burned floor, just below the plow zone. At N1730 E1270, the power auger brought up a crude ceramic figurine with human features, similar to others that have been found at Moundville previously (e.g., Moore 1905:190, Fig. 91; Knight 2002:125–127; 2004). And nearby, at N1710 E1290, we found a piece of gray micaceous sandstone with a nicely finished, flat surface, probably from a palette.

### *Block N1430 E1150*

This locality (Figure 7), just south of the mound-plaza complex, was of interest for several reasons. First, a test unit excavated along the northern edge of this block in 1979 yielded considerable domestic refuse (Scarry 1981, 1986:161). Second, it has long been suspected that Moundville's southern palisade line was situated near the center of this block, oriented roughly in an east-west direction (cf. Peebles 1979; Steponaitis 1983b). And third, the Alabama Museum of Natural History was considering the possibility of building a new interpretive center on this spot, and so it was important to learn something about the nature of the archaeological deposits that might lay in the path of construction.

The hand augering was completed according to the standard protocol, except that no samples were obtained from N1480 E1150 and N1510 E1180, where a high density of gravel (possibly from an old road) prevented the auger from penetrating the soil.

As expected, the greatest concentration of hits was in the northern half of the hectare, inside the presumed location of the palisade (Figure 8a). Two distinct hits–both of which may have been pit features–were also encountered in the southern half. The disturbed soil from one of these hits, at N1460 E1180, contained a sherd of shell-tempered pottery.

Our power augering also deviated from the standard protocol in several respects. Tree roots prevented us from obtaining a sample from N1520 E1160. They also interfered with the auger at N1520 E1180, allowing it to penetrate only 10 cm below the surface. To compensate

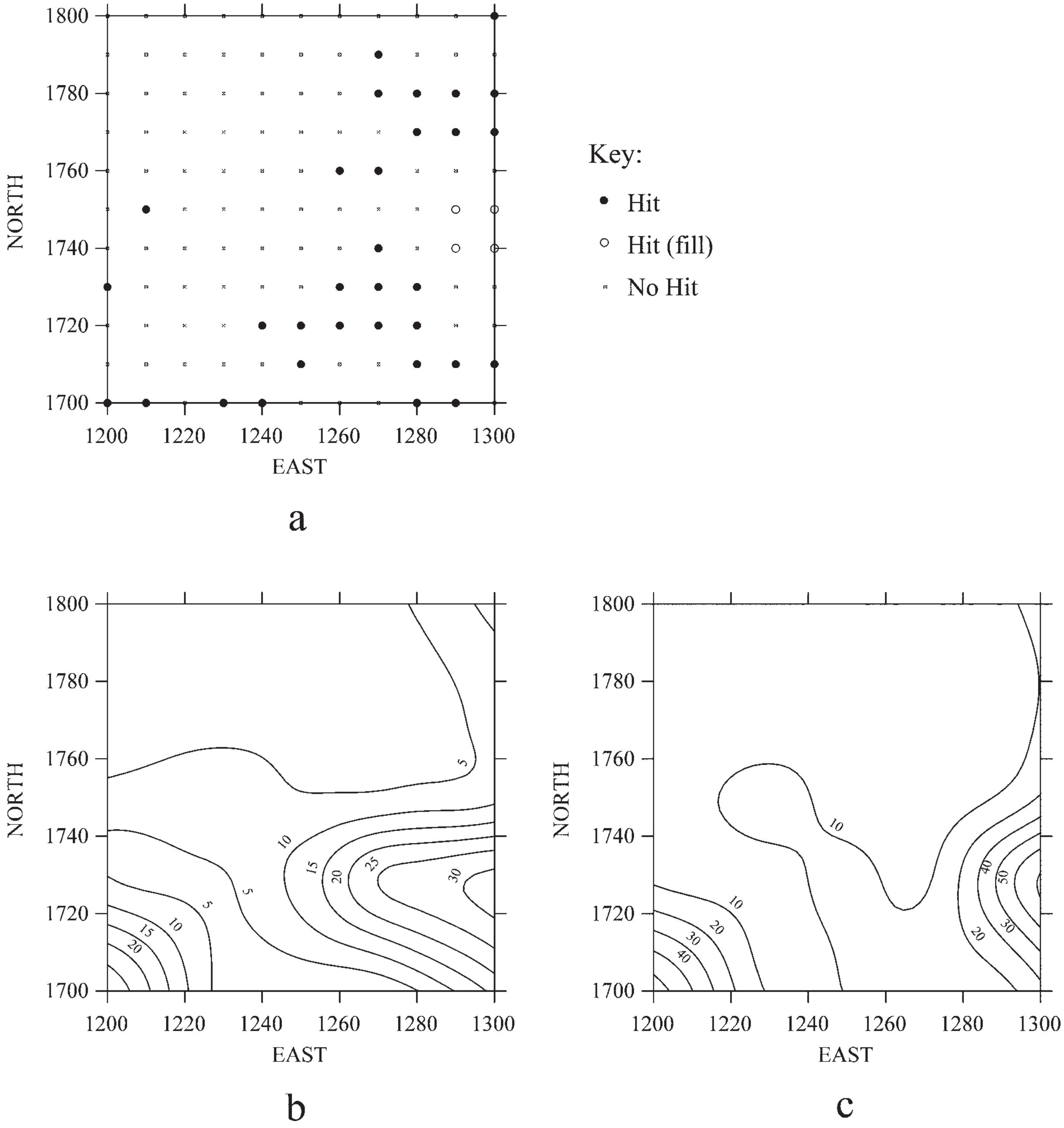


Figure 6. Results of subsurface testing in Block N1700 E1200: (a) distribution of hits (evidence of cultural activity) found by hand augering, (b) counts of shell-tempered pottery recovered by power augering, (c) weights (in grams) of shell-tempered pottery recovered by power augering. Contours in maps *b* and *c* were drawn after smoothing with a distance-weighted least-squares algorithm.

for these lost samples, an additional hole was dug at N1530 E1170, where roots were less of a problem. An extra sample was also obtained at N1530 E1220, close to Scarry's 1979 test unit (about which more will be said presently).

The highest densities of shell-tempered pottery occurred in the northern half of the block, with two or three smaller, localized concentrations in the southern half (Figure 8b–c). The profile of the auger hole at N1460 E1180 suggested that it may have intruded into a pit feature. Overall, the pattern of sherd density mirrors closely the distribution of hits discovered by hand augering.

Screening the soil excavated with the power auger yielded 110 sherds (Tables 1–2). Of these, 103 were shell tempered. Judging from the diagnostics, this area was occupied both early and late in Moundville's history. A Moundville I or early Moundville II component was indicated by sherds from a Moundville Incised, *var. Moundville* jar and a Carthage Incised, *var.*

Table 1. Artifact counts and weights.

| Category<br>Subcategory | N1700 E1200 (n) | N1700 E1200 (g) | N1430 E1150 (n) | N1430 E1150 (g) |
|---|---|---|---|---|
| Shell-tempered pottery | | | | |
| Carthage Incised, *var. Moon Lake* | - | - | 1 | - |
| Carthage Incised, *var. unspecified* | 1 | - | - | - |
| Moundville Engraved, *var. Hemphill* | - | - | 1 | - |
| Moundville Engraved, *var. unspecified* | 1 | - | - | - |
| Moundville Incised, *var. Moundville* | 1 | - | 1 | - |
| Mound Place Incised, *var. unspecified* | 1 | - | - | - |
| Unclassified incised | - | - | 1 | - |
| Bell Plain, *var. Hale* | 42 | - | 14 | - |
| Bell Plain, *var. Hale* (red filmed) | 1 | - | - | - |
| Miss. Plain, *var. Warrior* | 138 | - | 85 | - |
| Miss. Plain, *var. Warrior* (red filmed) | 2 | - | - | - |
| Total | 187 | 227.2 | 103 | 194.7 |
| Other pottery | | | | |
| Unclassified punctated (sand) | - | - | 1 | - |
| Baytown Plain, *var. Roper* | 5 | - | 1 | - |
| Baytown Plain, *var. Tishomingo* | 1 | - | - | - |
| Baytown Plain, *var. unspecified* | - | - | 1 | - |
| Baldwin Plain, *var. unspecified* | 1 | - | 3 | - |
| Unclassified plain (untempered) | 1 | - | 1 | - |
| Total | 8 | 23.1 | 7 | 15.8 |
| Ceramic figurine | 1 | 19.5 | - | - |
| Daub | 65 | 163.4 | 15 | 30.8 |
| Unfired clay | - | - | 10 | 14.5 |
| Flake | - | - | 1 | 1.0 |
| Sandstone palette | 1 | 9.7 | - | - |
| Micaceous sandstone | 1 | 1.4 | - | - |
| Other sandstone | 34 | 313.7 | 30 | 126.2 |
| Gravel | 132 | 735.1 | 17 | 55.8 |
| Cobble | 1 | 120.2 | - | - |
| Charcoal | 20 | 9.8 | - | - |
| Mussel shell | - | - | 1 | 18.9 |

*Note:* Shell-tempered pottery was classified according to the standard Moundville typology (Steponaitis 1983a). Our small sample of grog- and sand-tempered sherds largely falls into the types Baytown Plain and Baldwin Plain as defined by Jenkins (1981).

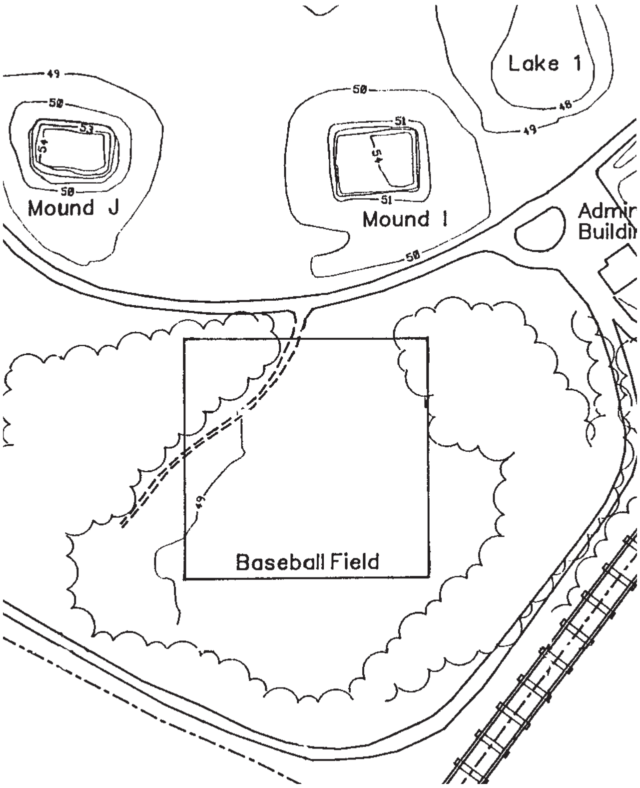


Figure 7. Current topography in the vicinity of Block N1430 E1150. The block itself, measuring 100 m on each side, is indicated by the square near the center of the map.

*Moon Lake* shallow flaring-rim bowl. A late Moundville II or Moundville III component was marked by Hemphill Engraved, *var. Hemphill* and a Bell Plain, *var. Hale* beaded rim (Steponaitis 1983a).

A special effort was made to find Scarry's 1979 test unit, which had been backfilled with clean sand. This was successfully accomplished by exploring the general area with a hand auger. The old excavation was located 1 m northeast of N1530 E1220.

Table 2. Rim sherds and handles from all proveniences.

| Block<br>Provenience | Type, Variety | Basic Shape | Secondary Shape Feature |
|---|---|---|---|
| N1700 E1200 | | | |
| N1710 E1290 | Mississippi Plain, *var. Warrior* | Jar | Unmodified rim |
| N1730 E1230 | Baytown Plain, *var. Roper* | Jar | Flattened lip |
| N1730 E1290 | Mississippi Plain, *var. Warrior* | Jar | Unmodified rim |
| N1730 E1290 | Mississippi Plain, *var. Warrior* | Jar | Triangular handle |
| N1730 E1290 | Bell Plain, *var. Hale* | Bowl | Rim |
| N1750 E1210 | Mississippi Plain, *var. Warrior* | Jar | Folded-flattened rim |
| N1750 E1230 | Mississippi Plain, *var. Warrior* | Jar | Folded rim |
| N1750 E1250 | Mound Place Incised | Beaker | Rim with notched lip |
| N1430 E1150 | | | |
| N1440 E1220 | Bell Plain, *var. Hale* | Burnished jar? | Rim |
| N1480 E1240 | Carthage Incised, *var. Moon Lake* | Flaring-rim bowl | Rim |
| N1500 E1180 | Unclassified punctated (sand) | Short-neck bowl? | Rim |
| N1500 E1240 | Grog-tempered plain | Carinated bowl | Rim |
| N1520 E1200 | Mississippi Plain, *var. Warrior* | Jar | Folded rim? |
| N1520 E1200 | Mississippi Plain, *var. Warrior* | Jar | Unmodified rim |
| N1520 E1200 | Mississippi Plain, *var. Warrior* | Jar | Ridged strap handle |
| N1520 E1200 | Mississippi Plain, *var. Warrior* | Jar | Strap handle |
| N1530 E1220 | Bell Plain, *var. Hale* | Bowl | Beaded rim |
| N1530 E1220 | Unclassified incised (shell) | Bowl | Rim |

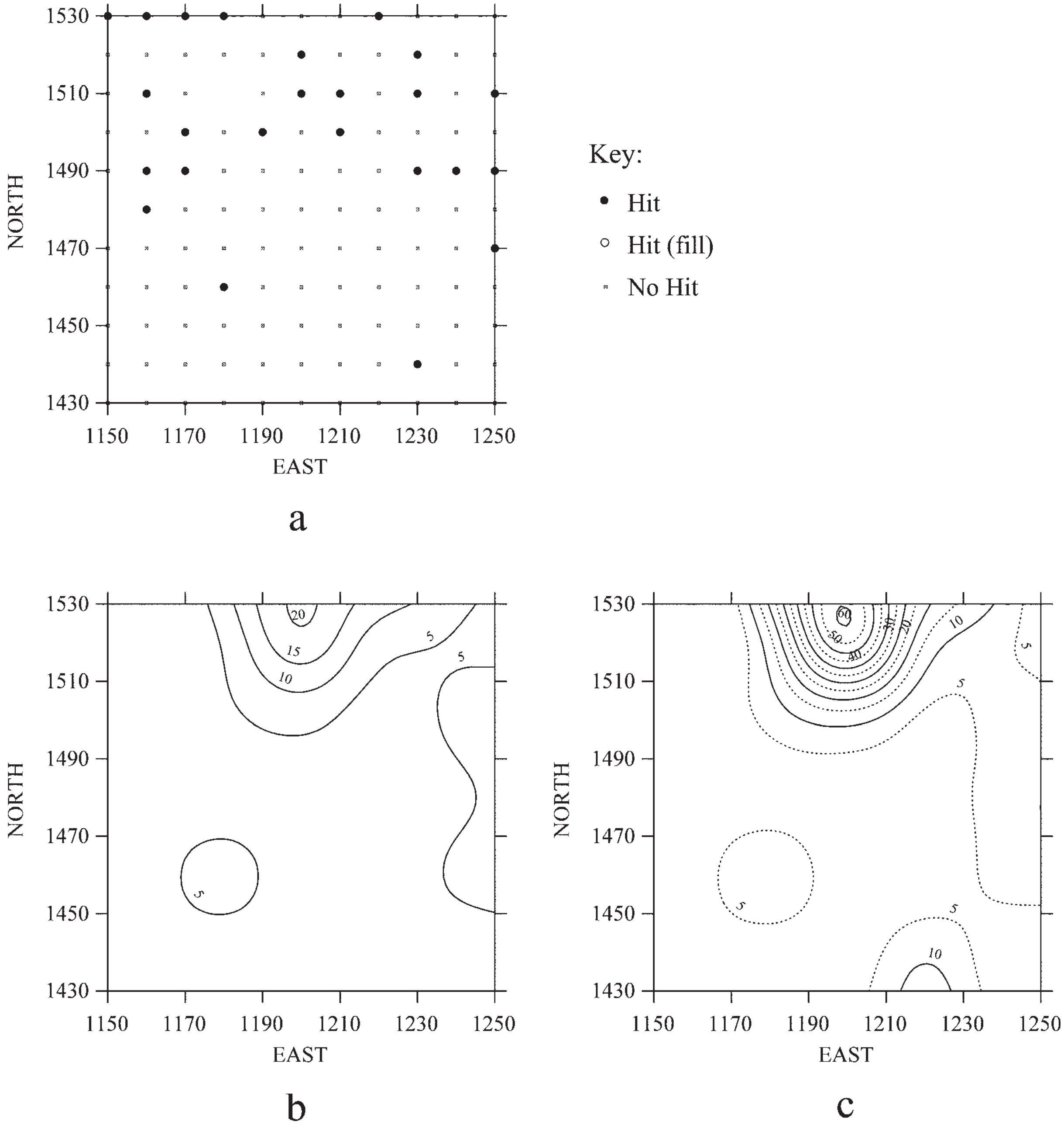


Figure 8. Results of subsurface testing in Block N1430 E1150: (a) distribution of hits (evidence of cultural activity) found by hand augering, (b) counts of shell-tempered pottery recovered by power augering, (c) weights (in grams) of shell-tempered pottery recovered by power augering. Contours in maps *b* and *c* were drawn after smoothing with a distance-weighted least-squares algorithm.

**Discussion**

Our methods produced comparable results in locating residential areas within the blocks we tested. In Block N1700 E1200, both methods clearly revealed a distinction between the plaza's periphery, which was rich in residential debris, and the plaza itself, which was virtually sterile. In Block N1430 E1150, both methods picked up a clear distinction between the northern half, which was rich in residential debris, and the southern half, where such debris was more sporadic. This distinction probably corresponds, respectively, with areas inside and outside the palisade which is believed to have once cut across the center of this block.

Yet although the results were consistent, each method was observed to have certain strengths and weaknesses. Among the advantages of hand augering are its speed and simplicity. The augering tool is operated by a single person, and no time is spent screening the recovered soil. For our purposes, this greater speed was translated into higher spatial resolution: In the eight person-hours spent on each hectare, we were able to sample 121 points on a 10-m interval with hand augering, as opposed to only 25 points on a 20-m interval with power augering. Other advantages of the hand auger are its utility in identifying fill deposits, and also the minimal damage it does to the archaeological record. These characteristics, coupled with its speed, make it an ideal tool for locating old excavations and mapping their boundaries.

Power augering, although much slower and somewhat more damaging to archaeological deposits, has the great advantage of yielding artifacts as well as soil profiles. Although the number of artifacts recovered from a typical auger hole is not large, each block we tested did produce, in aggregate, enough diagnostic artifacts to get at least a preliminary sense of when these areas were occupied.

Another important difference between the two methods lies in the physical constraints on their use. Hand augering can only be done when the soil is relatively moist. Thus for all practical purposes, effective use of this method is limited to the cool, wet months from December through May. Except in moist forests or cultivated fields, by June most soils in the southeastern states become too dry and hard for the auger to penetrate. The hand auger is also useless in soils with a high density of gravel or shell.

The power auger can dig through drier soil, so in many places it can be used year-round. However, it is effectively stopped by tree roots, particularly when they are large or dense. This is why we were forced to modify our regular sampling protocol in the northwest corner of Block N1430 E1150.

Based on these considerations and the results of our pilot study, a program to map residential areas at Moundville or any similar site might proceed as follows. Open portions of the site (i.e., areas not overgrown with trees) could be effectively tested with either method, the choice depending on whether minimal impact or artifact sampling was deemed more important. Forested areas could be systematically explored with a hand auger, supplemented with occasional shovel tests (which are about the same size as the holes dug by the power auger but not as susceptible to being stopped by roots). The hand auger could also be used selectively throughout the site to locate and map the extent of old excavations.

Of course, neither of the augering methods discussed here is inconsistent with electromagnetic remote-sensing techniques, such as magnetometry or ground-penetrating radar. Indeed, augering and remote sensing tend to produce complementary data. The former methods provide artifact samples as well as direct, visual evidence of soil types. The latter methods provide more continuous coverage and can detect specific features that can easily be missed by the ‘‘pin-prick’’ auger samples. Each set of methods can thus reveal different things, and each can provide a check on the other.

This small pilot study has also confirmed a pattern long suspected at Moundville, that the greatest density of residential debris occurs in a ring between the plaza and palisade. The midden hits and artifact density of artifacts and middens in the N1700 E1200 block showed a clear drop as we moved into the plaza. Similarly, the densities in the N1430 E1150 block also dropped as we moved outside the general location of the palisade. This result illustrates how much can be learned from these techniques at relatively little cost.

## Notes

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[1] Just such a project is currently underway, directed by John Blitz and Claire Thompson at the University of Alabama.

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