SIUE 2010 ARCHAEOLOGICAL FIELD SCHOOL INVESTAGATIONS AT THE GEHRING SITE (11MS99)

Interim Report

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Abstract

The Southern Illinois University (SIUE) 2010 archaeological field school was conducted at the Gehring site (11MS99) on the campus of SIUE. Investigations included surface collection, topographic mapping, a magnetic gradiometry survey, soil coring, and excavation of 12 test units. The test units combined total an area of 46 square meters. A total of 53 features were excavated, the majority of which were possible post molds. Four pits dating to Middle Woodland to Emergent Mississippian time periods were also excavated, as well as one apparent Mississippian period house that appears to have been burnt. Time-diagnostic artifacts at the site indicate occupations spanning from Archaic to Historic time periods, with the majority of prehistoric artifacts dating to Middle Woodland and Emergent Mississippian times. Geoarchaeological investigations indicate that the site has experienced severe erosion in historic times, and likely experienced at least some erosion in prehistoric times. Paleoethnobotanical investigations show the presence of maize, at least some of which may date to Middle Woodland time periods. This research adds to 2009 investigations, and will be continued by SIUE archaeological field schools for several more years.

Acknowledgments

This field school, conducted on the campus of SIUE, was greatly supported by SIUE administration, particularly Vice Chancellor Kenn Neher, College of Arts and Sciences Dean Aldemaro Romero, Director of Facilities Management Bob Washburn, and Director of Administrative Services Bob Vanzo. This institutional support is greatly appreciated. Thanks to SIUE Department of Anthropology Chair Julie Holt who provided a great deal of personal and institutional support to the project, offered aid and advice throughout the summer, and set a high standard at the Gehring site during 2009 field school investigations. Thanks to Keith Probst who continues to share memories and information from his long association with the site; F. Terry Norris who also shared information from his previous work at the site; Henry Holt for logistical support; and the SIUE campus police department for doing their best to keep the looters at bay. Thanks to Duane Simpson and Ryan Peterson for providing their great technical expertise in conducting the magnetic gradiometer survey on the first day of the year to register over 100 degrees Fahrenheit. Thanks to John Kelly of Washington University in St. Louis for helping with pottery identification. Thanks also to Steven Greenleaf for helping to edit and put this document together. And, the greatest thanks go to the field crew who toiled with unbegrudging vigor through all of the heat and humidity an American Bottom summer has to offer.

2010 Field School Personnel:

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Technical consultants:	Duane Simpson, Ryan Peterson
Students:	Dan Blodgett, Bryan Clemons, Joe Dietrich, Steven Greenleaf, Johanna Guthrie, Jolene Hedger, Luke Leady, Kris Morgan, Shannon Murphy, Rose Serio, Vikki Weaver

Figure 1: The field crew.

Introduction and Background

This interim report outlines the fieldwork and initial results of the 2010 archaeological field school conducted by the Department of Anthropology at Southern Illinois University Edwardsville (SIUE). This field school is an annual offering at SIUE with the goals of teaching students field and laboratory methods in archaeology, generating datasets for students to employ in senior research projects and other classes, and furthering our overall understanding of American Bottom archaeology.

The field school was conducted at the Gehring site (11MS99) on SIUE's campus between May 17 and July 9 of 2010. Fieldwork included surface collection, the excavation of 12 test units (for a total of 46 sq. m), soil cores, and magnetic gradiometry surveying. The 2009 field school (Holt and Belknap 2010) concentrated on the southern portion of the Gehring site, while the 2010 work primarily focused on the northern portion of the site (Figure 2). This report presents an overview of the 2010 excavations and initial interpretations. Included in this report are separate sections concerning geoarchaeology (by Shannon Murphy), and paleoethnobotany (by Johanna Guthrie), drawn from studies conducted by these field school students as SIUE senior projects.

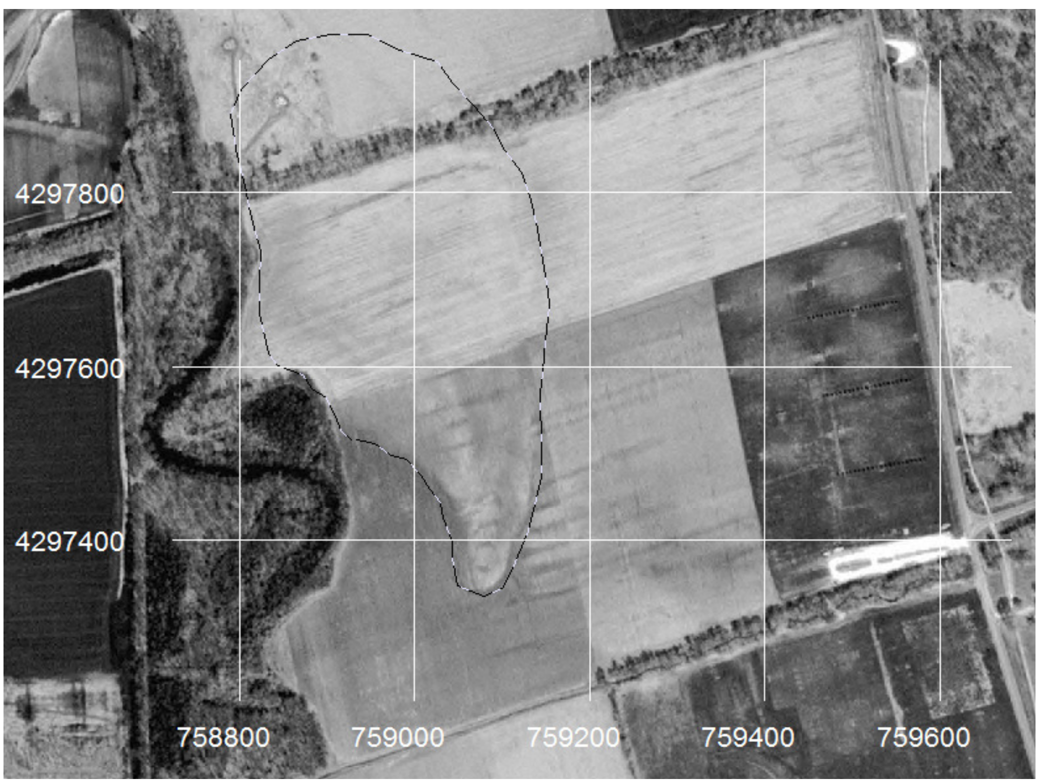

Figure 2. Aerial photograph overview of site area, north to the top. White grid lines are UTM coordinates (Zone 15, NAD83) at 200 m intervals. Black-and-white dashed line represents the general outline of the Gehring site, on a sandy terrace remnant. In this report, the "northern

portion" and "southern portion" of the site are divided approximately by UTM 4297600 N. A field road and tree line separates a portion of the site from approximately UTM 4297800 N.

In brief, Gehring is a multi-component occupation site with substantial Middle Woodland and Emergent Mississippian components. A small number of Archaic points have also been found on the site, and a historic component is also present, but these have not been the focus of research to date. The site is situated on a late Pleistocene/early Holocene sandy terrace remnant of the Mississippi River system within the American Bottom (Figure 3). The elevation of the terrace, three to four meters above the floodplain proper, would have protected it from all but the highest floods of the Mississippi River and nearby Cahokia Creek, making this an ideal location for habitation. The site was the subject of SIUE archaeological field schools in the early 1970s, but unfortunately most of the artifacts and records from these efforts have been lost. General background on the physical setting and previous research at the Gehring site has already been outlined in Zimmerman Holt and Belknap (2010:10-14).

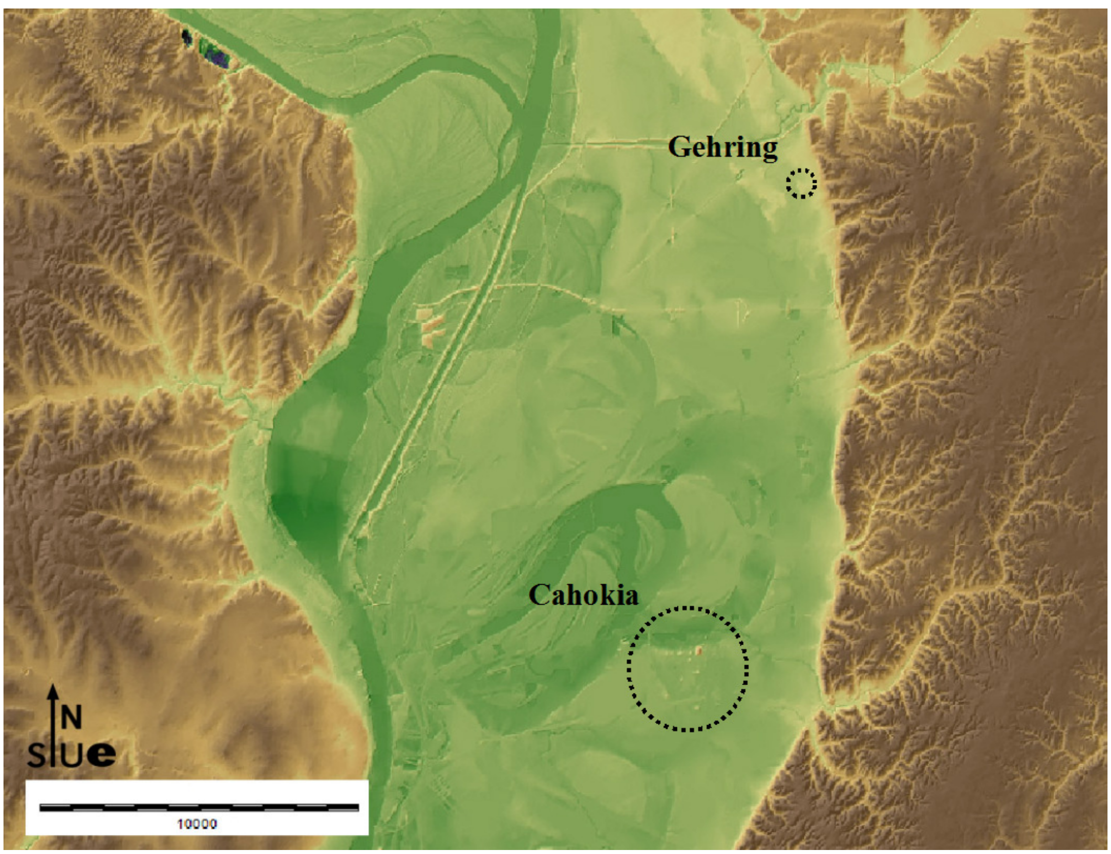

Figure 3. Shaded relief overview of Gehring in relation to the American Bottom and central Cahokia.

Surface Collection

A surface collection conduced as part of the 2009 SIUE field school at Gehring recovered nearly 40,000 artifacts (Holt and Belknap 2010:19-23). A much more limited program of surface collection was conducted in 2010, generally following the methods of Zimmerman Holt and Belknap. Surveyors walked transects across portions of the field, approximately 2.5 m apart. Artifact locations were noted with GPS coordinates and bagged individually. In 2010, the entire field south of the field road and tree line noted in Figure 2 was surface collected in this way. Because of the large number of artifacts, groups of artifacts were combined every 3 to 4 meters. In the "core" of the site (outlined by the dashed line in Figure 2), only diagnostic artifacts were collected. All artifacts were collected from the rest of the field. Locations of surface collection finds from both 2009 and 2010 are shown in Figure 4. Table 1 presents artifact tabulations from the 2010 surface collection.

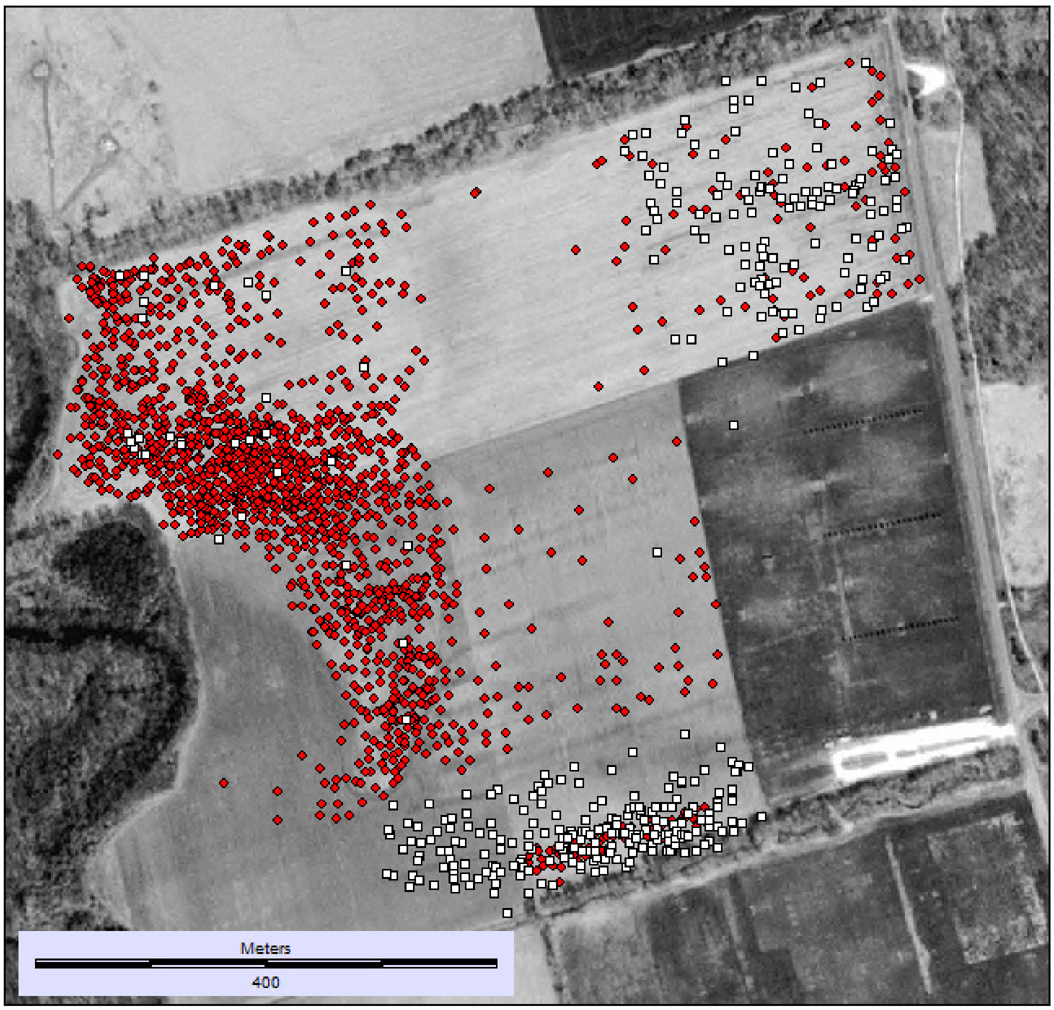

Figure 4. Aerial photograph of the Gehring site with locations of surface finds. Red circles are finds from 2009; white squares are finds from 2010. North is to the top. Note that during the 2010 surface collection, only diagnostic artifacts were collected from the "core" area of the site (primarily the western 1/3 of the field).

Table 1. Artifact tabulations from the 2010 surface collection.

Artifact type	Total count	Total weight (g)
Chert	420	1390
Sherds	116	456
Fire-cracked rock	88	2653
Historic*	34	397
Bone	8	30
Ground stone tool (fragments)	4	1202
Shell	4	3
Burned earth	2	0.9
Diagnostic: blade/blade fragment	4	
Diagnostic: decorated / rim sherds	3	
Diagnostic: biface	2	
Diagnostic: shell bead	1	
Diagnostic: chrinoid column bead	1	
Diagnostic: hoe flake	1	

* Historic artifacts are undifferentiated here. They consisted primarily of glass, ceramics, and metal.

The 2010 surface collection recovered 688 artifacts, primarily from the northeastern and southern portion of the site. This surface collection generally reinforces patterns revealed by the 2009 collection. A gap in artifact concentrations near the northern portion of the site, just east of the core site area, represents a low area of the field partially covered in standing water in both 2009 and 2010. Surface collection was not conducted in this area. The concentration of artifacts near the northeastern portion of the field are on the mid- and toe-slope of an alluvial fan developed at the base of the bluff line. These likely represent an archaeological site either related to or unrelated to components at the Gehring site. Alluvial fans are typical locations for sits in this region, and because of their geomorphic position deeply buried sites are possible. A separate concentration of artifacts is located at the southern portion of the field, generally paralleling a drainage canal. It is possible that this concentration of artifacts represents artifacts from a buried site, dredged onto the surface during the construction or maintenance of the canal. Further analysis and mapping of artifacts by type from 2009, 2010, and possible subsequent surface collections will likely yield a richer pattern of overall site structure.

Geophysical Remote Sensing

A magnetic gradiometer survey was conducted by Duane Simpson and Ryan Peterson of AMEC, Inc. over portions of both the southern and northern portion of the site (Figure 5). Only the northern survey is outlined here. Magnetic gradiometry surveys map the strength of the earth's magnetic field just above the ground surface. The magnetic field is affected by many different factors, including alteration and movement of soil in prehistoric times. For example, all soils have magnetic particles, which are generally randomly oriented. When these particles are heated to a high temperature, they lose their native orientation, and align with the earth's magnetic inclination and declination when they cool. Thus a fire hearth can create a mild magnetic "dipole" field, which can be detected by magnetic gradiometry as distinct from the background magnetism. Organic soil is generally more magnetic than non-organic soil, so features with organically enriched soil (as is common in many prehistoric pits) are more magnetic than the surrounding matrix, which may also be detected by magnetic gradiometry. The strength of magnetic fields is measured in nanoteslas. Figure 6 is a nanotesla value map of the northern portion of the site that was surveyed with magnetic gradiometry.

Figure 5. Location of magnetic gradiometer surveys.

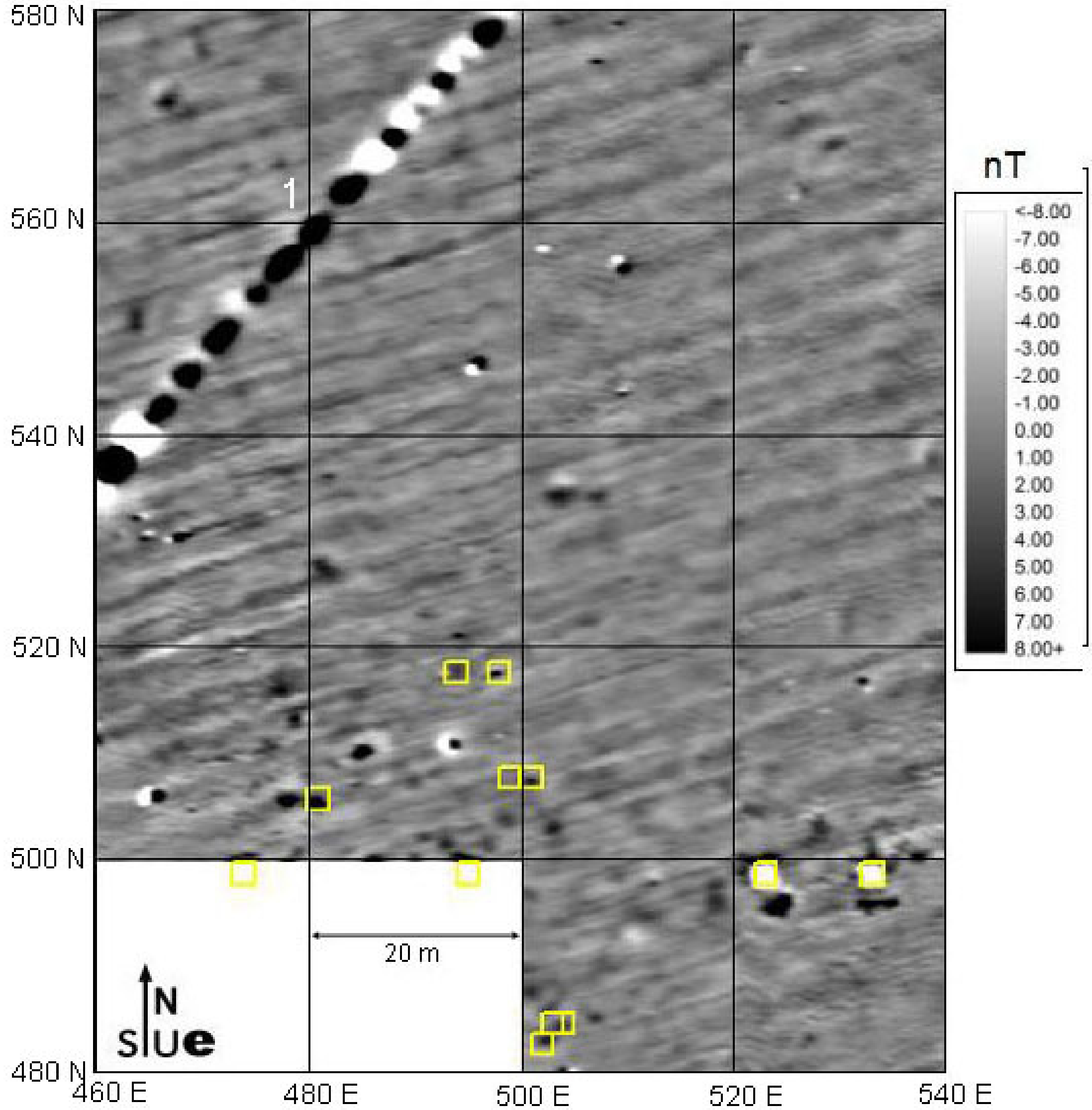

Figure 6. Magnetic gradiometry map from the northern portion of the Gehring site. Yellow squares are test unit locations.

While numerous patterns and anomalies are revealed in this gradiometer survey, only the clearest and most relevant to the 2010 excavations are discussed in this report. Full results from the survey and the ground testing of anomalies in 2010 and beyond will be published elsewhere. Anomalies that relate to 2010 excavations are discussed for each excavation area in the section below.

The southwest to northeast trending lines of alternating high and low nanotesla values represent plow scars. This plowing orientation is visible in aerial photographs of the site dating to the 1940s. The alternating high and low nanotesla values along these lines represent parallel rows of highly magnetic topsoil being mixed with less magnetic subsoil. In the northwest corner of the site a southwest to northeast trending line of alternating very high and very low nanotesla value anomalies (marked #1 in Figure 6) represents a buried metal pipeline, from which numerous magnetic dipoles are formed at the intersections of segments. Before excavations began, Illinois' JULIE, Inc. (Joint Utility Locating Information for Excavators) was notified to flag buried utilities within the entire field, but none were flagged. This buried pipeline may therefore represent an older, forgotten line, perhaps associated with a historic house that once stood within the field.

Test Units and Features

Excavation methods followed those of Zimmerman Holt and Belknap (2010). In general, 2 x 2 m units were excavated as a block through the plow zone, and in 10 cm deep, 1 x 1 m quarters below the plow zone. Features were generally bisected, one half excavated, and a profile drawn before the second half was excavated. A minimum of 10 L flotation sample was collected from each feature. Test unit and feature naming conventions were continued from the 2009 season, with the exception that 100 was added to feature numbers, thus the last feature numbered in 2009 was Feature 9, and the first numbered feature in 2010 was 110. Test Units J, K, L, and M were initially located on an east-to-west line across a rise in the field, near the densest accumulation of surface finds, prior to the magnetic gradiometry survey. Subsequent test units were placed to test specific anomalies from the magnetic gradiometry survey. Test unit and feature summaries are presented in Tables 2 and 3. Overall site layout and the locations of test units and features are shown in Figures 7 and 8. Discussions below focus on specific excavation areas (individual test units or test unit blocks and their associated features).

Table 2 Test unit summaries.

Test Unit	SW Grid N	SW Grid E	Size (m)
J	498	494	2 x 2
K	498	473	2 x 2
L	498	522	2 x 2
M	498	532	2 x 2
N	507	500	2 x 2
O	517	497	2 x 2
P	517	493	2 x 2
Q	505	480	2 x 2
R	484	502	2 x 2
S	482	501	2 x 2
T	507	498	2 x 2
U	484	504	1 x 2

Possible Post Molds

Numerous 5 – 10 cm diameter dark, circular stains were encountered and treated as "possible post molds". Most of these originated at or shortly below the plow zone, and extended a few centimeters to more than 20 cm deep. These were assigned a feature number and bisected without flotation sampling. Some of these were later determined to be krotovina (old root traces or rodent holes filled with darker soil). A few were determined to be clear post molds. Most, however, remain ambiguous – they are either krotovina or post holes, some of which may have been truncated by the plow zone. Only two of these features are discussed in this report, as representative examples. As excavations continue in subsequent years and a greater area is exposed through excavation, patterns in these features may emerge to indicate whether they are natural or cultural.

Table 3. Feature summaries.

Feature	Test Unit	Feature	Site X (E)	Site Y (N)	total depth (cm)	Diameter (cm)
110	L	Modern trench	522.3	499	12	
111	M	Pit	532.4	498.7	62	100
112	J	Possible post mold	494.78	499.6	3	3
113	J	Possible post mold	495.09	499.7	18	6
114	J	Possible post mold	494.95	498.69	3	7
115	J	Possible post mold	495.62	498.55	18	16
116	J	Possible post mold	494.29	498.3	2	4
117	J	Tap root	495.35	499.18	20	4
118	L	Possible post mold	522.45	499.55	4	5.5
119	J	Possible post mold	495.6	499.4	10	7
120	J	Possible post mold	495.8	499.88	8	5
121	L	Possible post mold	522.5	499.5	3	4.5
122	L	Possible post mold	522.65	499	4	7
123	L	Possible post mold	523	499.75	4	7
124	L	Possible post mold	523	499.15	2	6
125	L	Possible post mold	523.5	499.78	10	6
126	L	Possible post mold	523.75	499.4	1.5	5.5
127	J	Possible post mold	495.89	498.1	7	7
128	J	Possible post mold	495.9	499.2	22	10
129	J	Possible post mold	494.6	499.64	8	7
130	J	Possible post mold	495.65	499.63	13	11
131	J	Possible post mold	494.6	498.24	1	8
132	M	Possible post mold	532.2	498.1	3	8
133	M	Possible post mold	533.78	498.4	2	5
134	M	Possible post mold	533.3	498.32	3	6
135	M	Possible post mold	533.75	498.25	3	4
136	M	Pit	533.4	499.95		*
137	M	Pit	533.95	499.5		*
138	Q	Pit	480.9	505.55	75	110
139	Q	Big post (?)	480.65	506.35	30	6
140	Q	Possible post mold	481.95	505.11	5	6
141	Q	Possible post mold	481.79	505.25	6	5
142	Q	Possible post mold	481.8	505.5	5	7
143	Q	Possible post mold	481.35	506.4	10	14
144	Q	Possible post mold	481.8	505.85	5	6
145	Q	Possible post mold	481.5	505.89	6	7
146	Q	Possible post mold	481.15	506.08	5	8
147	Q	Possible post mold	481.14	506.15	6	4
148	Q	Possible post mold	480.25	506.02	4	5
149	Q	Possible post mold	480.18	506.02	6	5
150	Q	Possible post mold	480.38	505.9	5	5
151	Q	Possible post mold	480.15	505.9	9	6

Table 3 continued.

Feature	Test Unit	Feature	Site X (E)	Site Y (N)	total depth (cm)	Diameter (cm)
152	Q	Possible post mold	480.3	505.1	5	10
153	J	Possible post mold	495.65	499.52	8	5
154	J	Possible post mold	495.75	498.9	10	16
155	R	Possible post mold	502.3	485.9	6	6
156	R	Possible post mold	502.55	485.9	6	6
157	R	Possible post mold	503.45	484.35	10	10
158	R	Pit	504	503	61	100
160	S	Pit	502.5	483.6	50	94
161	N	House basin	500	507.4	18	*
162	N	Post mold	501.4	507.75	22	20
163	N	Pit	501.2	508.79	5	50

* = Only partially excavated; diameter unknown.

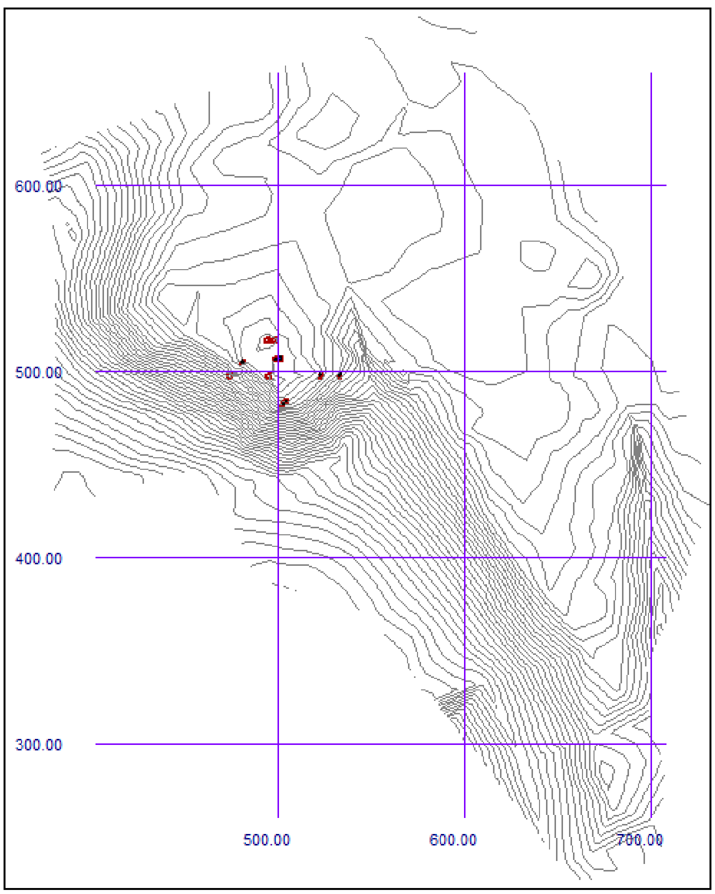

Figure 7. Contour map of northern site area with site grid. Red squares are test units. Contours are 10 cm arbitrary intervals.

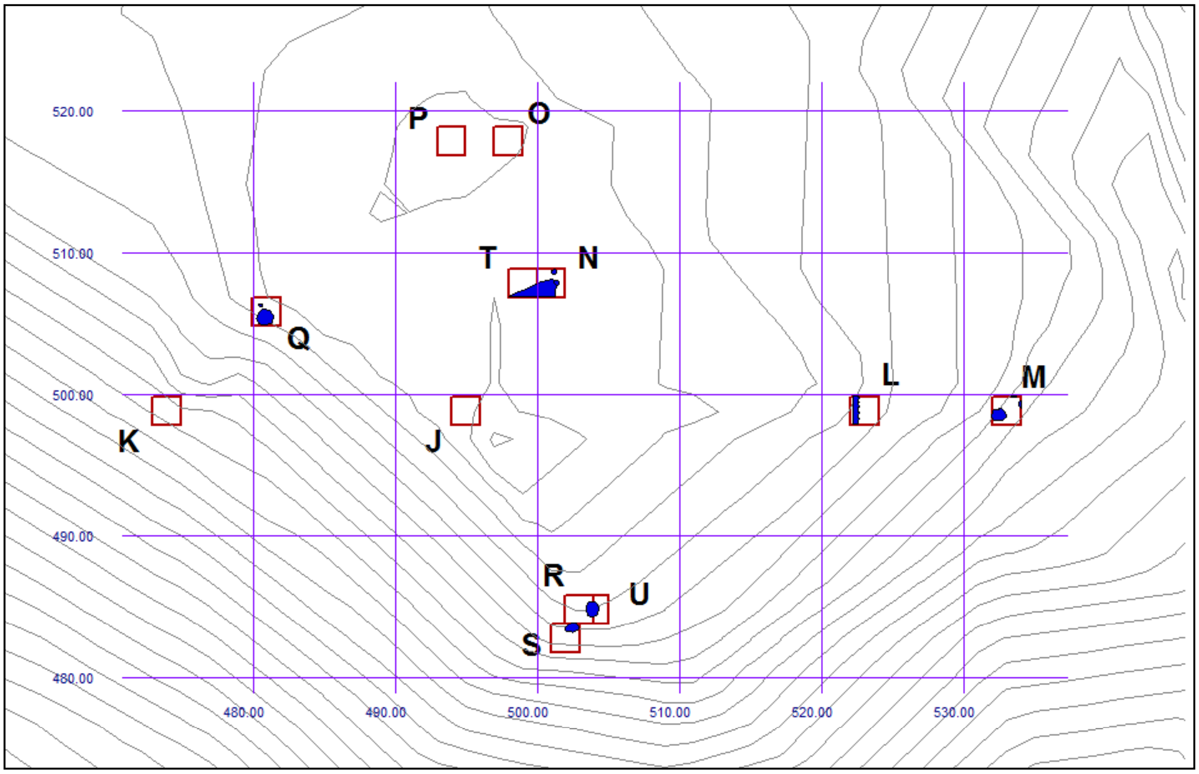

Figure 8. 2010 excavations showing test units (outlined in red), feature locations (in blue), and site grid. Contours are 10 cm arbitrary intervals.

Test Unit J

Test Unit J was located near the highest portion of the site (Figure 8), and partially excavated prior to the magnetic gradiometry survey. Numerous possible post molds were found within this test unit (Figure 9), but no clear pattern is apparent. A bulk density column and soil column were excavated from the eastern wall of this test unit (discussed in the geoarchaeology section below). The east wall profile of this unit, representative of the unit as a whole, is shown in Figure 10.

No other features were encountered in this test unit. Time-diagnostic artifacts recovered include a blade, and both Woodland and Mississippian non-rim sherds. The majority of artifacts were recovered in the plow zone and the first two 10-cm levels below the plow zone. This unit was excavated to a maximum depth of 73 cm below ground surface. The soil profile exhibited in this test unit is typical for the site, with potentially less erosion at this location because it is higher in elevation and on less of a slope than the rest of the site. The dark color and high organic content in the plow zone indicate that it incorporates a portion of an earlier pre-plowing A horizon, but the clear transition to a lighter colored clay-rich Bt horizon indicates significant erosion. Just how much erosion the site has experienced, and how the landform has changed, is the subject of on-going research at this site. This issue is addressed in the geoarchaeology section of this report below.

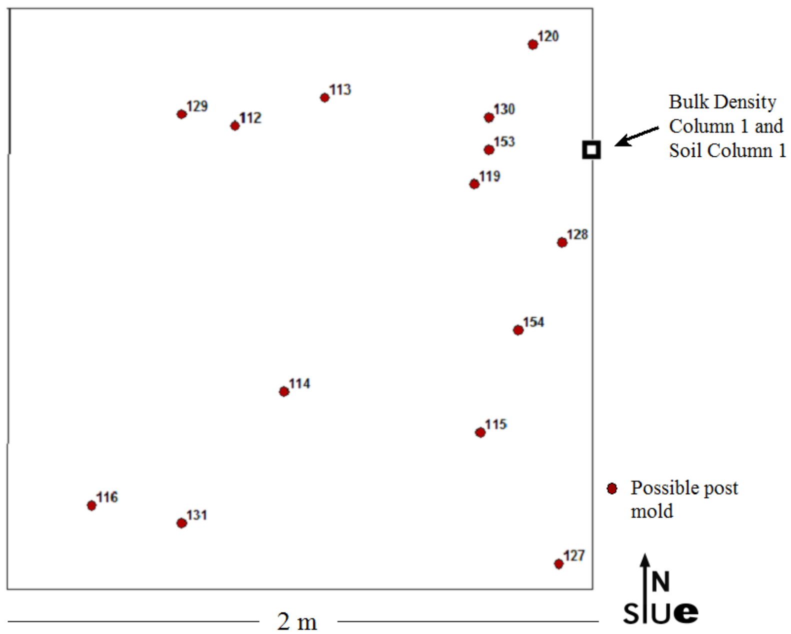

Figure 9. Test Unit J, location of bulk density and soil columns, and possible post molds.

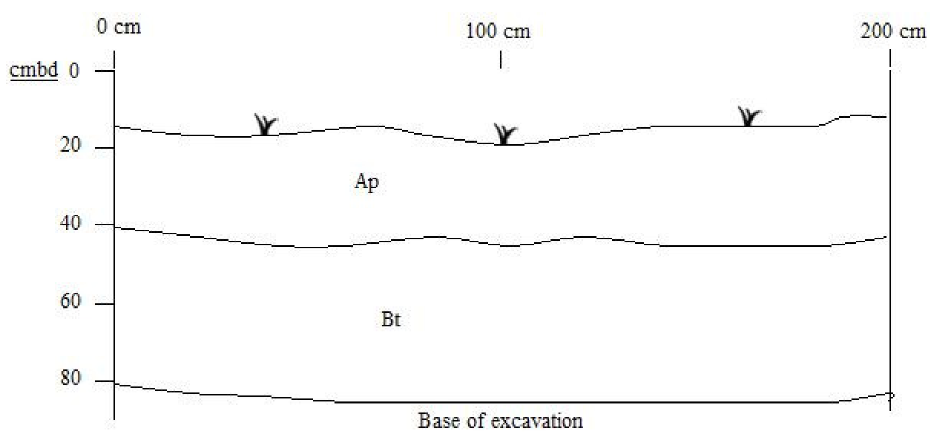

Figure 10. Test Unit J, east wall.

Soil Description:

Ap: Dark Grayish Brown (10YR3/2) silty clay loam; weak medium to coarse blocky structure; common fine roots and biopores; clear irregular boundary.

Bt: Brown (10YR4/4) silty clay loam, clay content increasing with depth; common fine roots and biopores; clear discontinuous ped linings of 10YR4/2; boundary not observed.

Test Unit K

Test Unit K was the westernmost unit excavated in 2010. This unit was located and excavations began prior to the magnetic gradiometer survey. No features and no formal prehistoric artifacts were encountered in this unit. One glass button was recovered from below the plow zone. Of the test units at the site, Test Unit K was lowest in elevation and located in an area with the greatest apparent amount of erosion. Because of this, the eastern half of this test unit was extended in order to expose the deepest stratigraphy. The western half of the unit was excavated to a depth of 48 cm beneath ground surface, and the eastern half was excavated to a depth of 130 cm beneath ground surface.

The stratigraphy of this unit (shown in Figures 11 and 12) reveals far more erosion than Test Unit J. A lighter-colored plow zone with little organic content overlies a shallowly buried, bedded deposit of medium to coarse sands. A soil core excavated in the floor of this unit, to the maximum depth allowable by the field equipment (280 cm) recovered laminated sands the entire depth. This massive sand deposit represents a likely late Pleistocene/early Holocene glacial outwash terrace, discussed in more detail in the geoarchaeology section below.

Figure 11. Test Unit K, east wall profile.

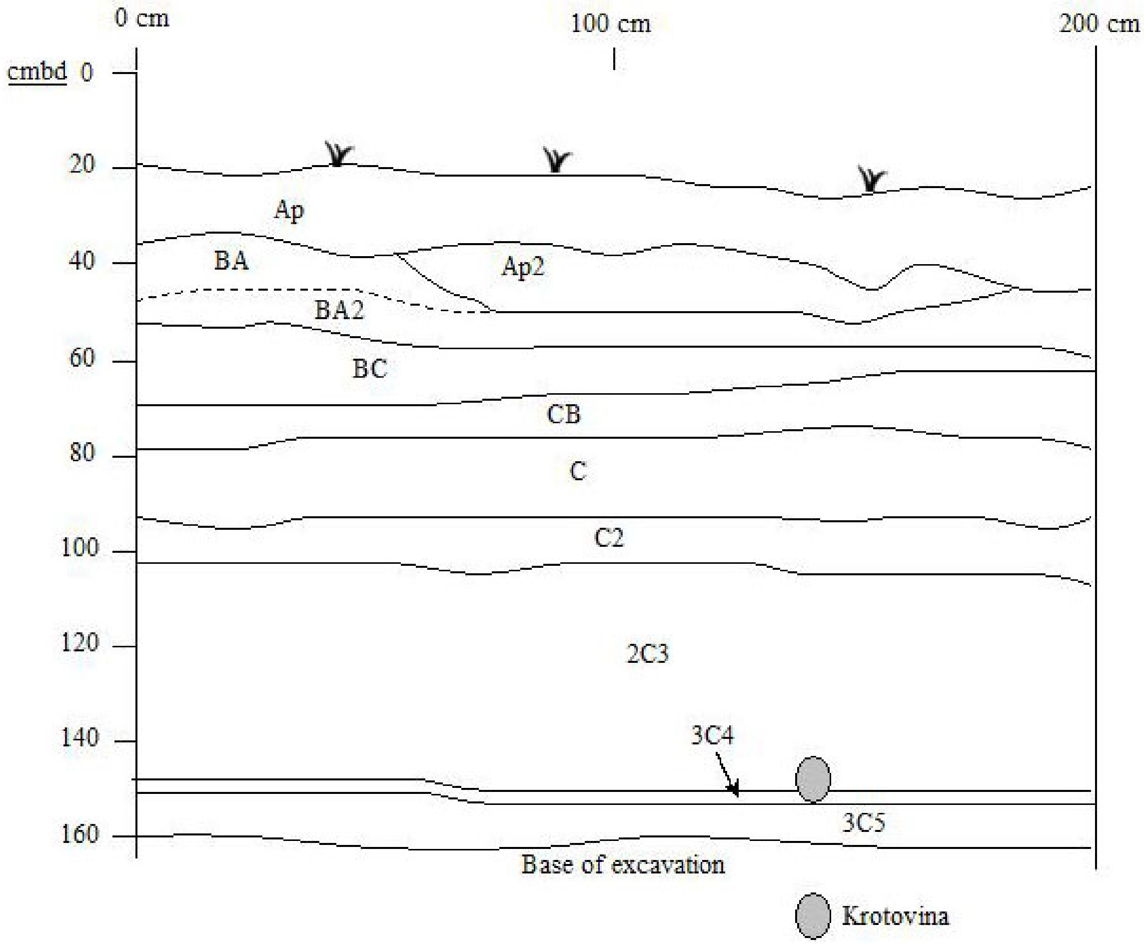

Figure 12. Test Unit K, east wall.

Soil Description:

Ap: Dark yellowish brown (10YR4/3) silty clay loam; weak coarse to medium blocky structure; common fine roots and biopores; clear, uneven boundary.

Ap2: Irregular mix of Ap and BA.

BA: Yellowish brown (10YR5/2) silty clay loam (less clay than above); moderate to medium blocky structure; few fine roots and common fine biopores; common discontinuous ped linings of 10YR4/3; few fine redox concentrations following biopores of 2.5YR4/6; clear to gradual boundary.

BA2: Irregular mix of BA and BC.

BC: Dark yellowish brown (10YR4/4) silt loam; weak to medium blocky structure; few fine roots and common fine biopores; common fine redox concentrations following biopores of 2.5YR4/6; clear boundary.

CB: Yellowish brown (10YR5/6) silt loam (less clay than above); very weak to medium blocky structure; few fine roots and common fine biopores; common fine redox concentrations following biopores (2.5YR4/6); clear boundary.

C: As above with fine distinct laminations; primarily loamy silt; massive structure; few slightly darker colored fine sand deposits; clear boundary.

C2: Primarily light reddish brown (2.5Y7/3) fine sand with many fine laminations of 10YR6/6 and slightly darker; massive structure; clear boundary.

2C3: Primarily very pale brown (10YR7/3) fine sand with common cross-bedded laminations of 10YR5/4; massive structure; abrupt boundary.

3C4: Primarily yellowish brown (10YR5/4) loamy sand with many fine cross-bedded laminations of various colors; massive structure; abrupt boundary.

3C5: Primarily grayish brown amber (2.5Y6/4) fine sand with abundant very fine cross-bedded laminations of 10YR5/6; massive structure; boundary not observed.

Test Unit L

Excavation of Test Unit L began prior to the magnetic gradiometer survey. A dark, north-to-south trending feature was encountered immediately below the plow zone (Figure 13). The sharply defined edges of this feature (Feature 110), as well as a cigarette butt within the fill, indicate that this feature was a modern trench, likely created within the last few decades in order to increase drainage from this portion of the farm field. Seven possible post molds were excavated from this unit, but no other prehistoric features were encountered. One Middle Woodland sherd (Identified by John Kelly) was recovered from near the base of this unit clearly within a krotovina. This unit was excavated to a maximum depth of 65 cm beneath ground surface.

Figure 13. Test Unit L, base of level 1, facing north. Feature 110 is a historic trench in the western half of the unit, oriented north to south.

Test Unit M

Test Unit M is the easternmost unit of the 2010 excavations, located and partially excavated before the magnetic gradiometry survey. This unit was located near a dense concentration of flakes and sherds at the surface, which indicated a potential feature that was recently disturbed by plowing. Feature 111 (Figure 14) was encountered immediately below the plow zone, and is the likely source of these surface artifacts. Plow scars at the top of Feature 111 extended to the west and east, and the plow had clearly dragged dark feature fill and artifacts in these directions. Figure 14 shows the layout of Test Unit M, and the features found within it. Features 132, 133, 134, and 135 were possible post molds. Features 136 and 137 were encountered immediately below the plow zone. Because these extend only partially into the test unit it is currently unclear of their full extent. These may be pit features that extend only partially into Test Unit M, or they may be deeper plow scars that dragged artifacts from another feature. The portions of these features within Test Unit M were excavated as features, although no diagnostic artifacts were recovered from them. The bulk of these features may lie outside of the test unit. Profiles of these features are shown in Figures 16 and 17. These will be exposed and excavated during subsequent field school excavations.

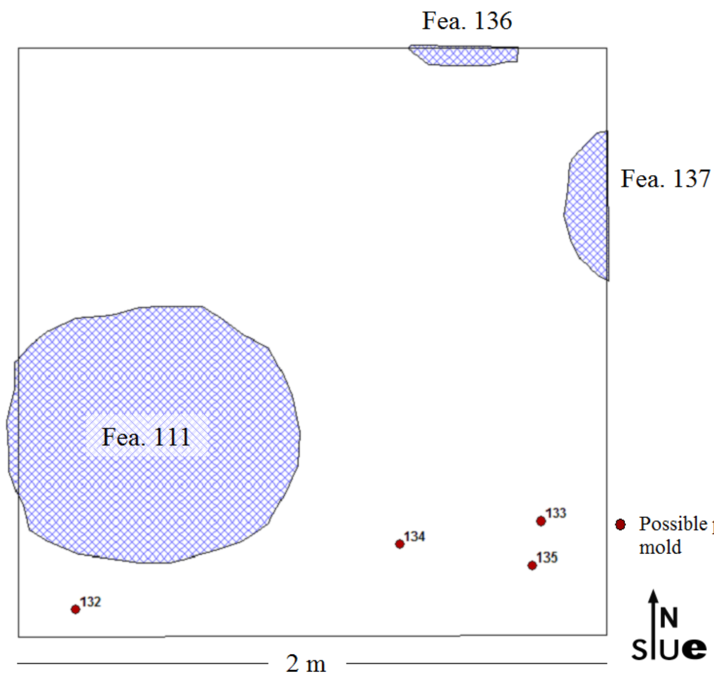

Figure 14. Test Unit M and associated features.

Feature 111 at first appeared to extend well beyond the western wall of the test unit, so the line of bisection for this feature was set at the western wall of Test Unit M. Excavation of the feature showed that the feature was primarily within the test unit. Therefore, the northern portion of the feature was also left as a straight wall for profiling. Figure 15 shows the feature partially excavated, with artifacts left on pedestals, and the western and northern portions left for profiling. Flotation samples were taken from both of these sections. The small portion of Feature 111 that extended west of the test unit was excavated from the wall. The majority of

Test Unit M was excavated to a depth of 40 cm beneath ground surface. A small window was excavated in the western wall to better define the edges of Feature 111.

Figure 15. Test Unit M, Feature 111 profile, facing north. The pit has been partially excavated with unexcavated portions remaining in the west wall and north 1/2 of test unit M. Diagnostic artifacts are left on pedestals.

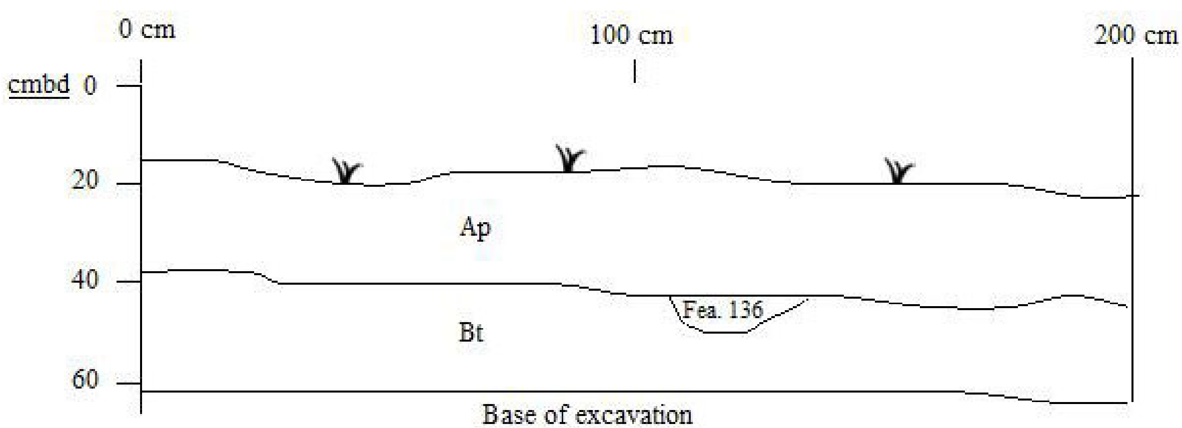

Figure 16. Test Unit M, north wall, and Feature 136. See Figure 17 for soil descriptions.

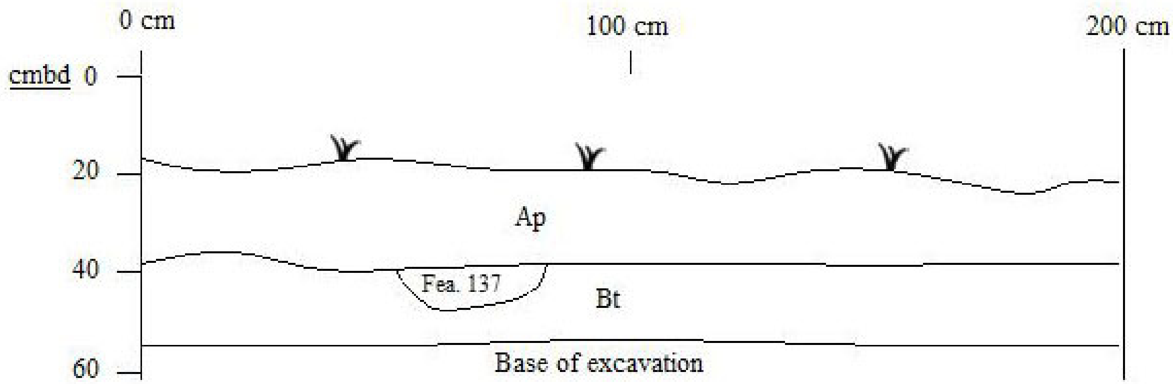

Figure 17. Test Unit M, east wall, and Feature 137. See Figure 17 for soil descriptions.

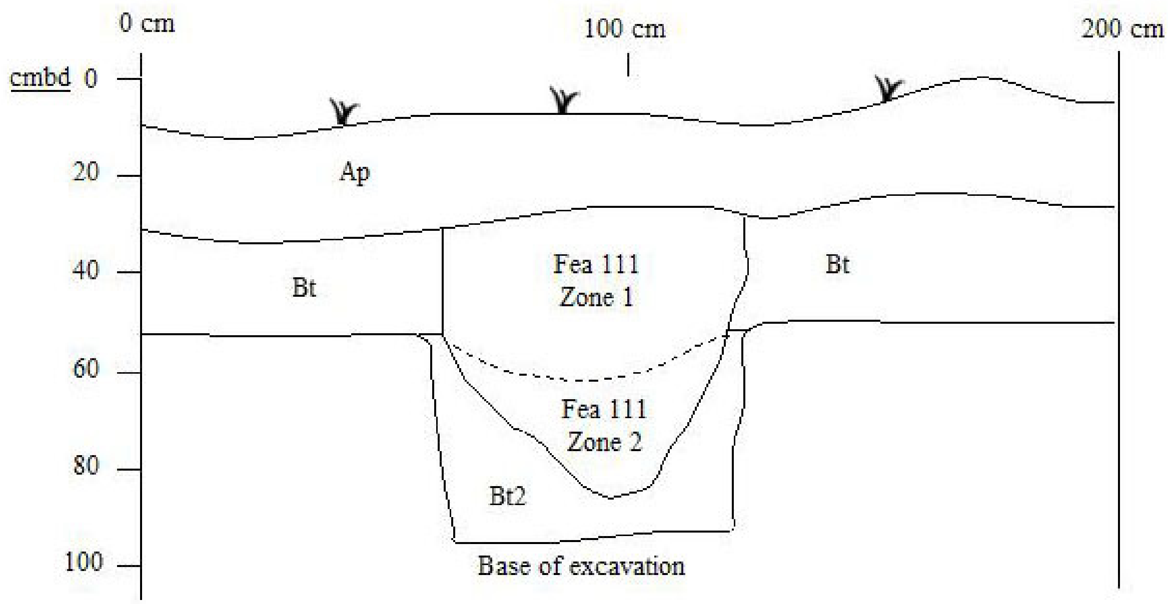

Figure 18. Test Unit M, west wall, and Feature 111.

Soil Description:

Ap: Very dark grayish brown (10YR3/2) silty loam; very weak coarse blocky structure; common fine roots and biopores; clear irregular boundary.

Bt: Dark yellowish brown (10YR4/3.5) silty clay loam; moderate medium angular blocky structure; common fine roots and biopores; gradual boundary.

Bt2: Predominantly brown (10YR4/3) silty clay loam; weak angular blocky structure; common discontinuous ped linings of 10YR3/2; common fine roots and biopores; boundary not observed. Ped linings may be more pronounced in this location because the sample is immediately below an organic rich feature.

Feature 111 Zone 1: Very dark grayish brown (10YR3/2) silty clay loam; weak fine angular blocky structure; gradual boundary.

Feature 111 Zone 2: As above but slightly lighter in color.

Feature 136: Dark brown (10YR3/3) clay loam; weak coarse blocky structure; clear boundary.

Feature 137: Dark brown (10YR3/3) clay loam; weak coarse blocky structure; clear boundary.

Feature 111 contained two distinct zones, with an upper, darker zone that contained the majority of artifacts, and a slightly lighter, more homogenous lower zone (Figure 18). The lower zone may represent leaching of organic-rich material into non-feature soil, or an initial filling episode of the feature that contained few artifacts, or a combination of both from slumping before the feature was completely filled.

Artifacts recovered from Feature 111 include a small (ca. 5 cm long) chert adze or scraper, one piece of hematite (not modified in any identifiable way), and 23 sherds that included a mix of Marion Thick and Havana types (identified by John Kelly). Artifacts recovered from the plow zone of Test Unit M, and likely associated with Feature 111, include a scraper, a blade fragment, two biface fragments, and a very small (ca. 1.5 cm long) arrow point. Charcoal and burned earth were common in the upper zone of the feature, and several samples from good context (near the center of the feature, away from any visible krotovina) were recovered for possible dating.

Test Units O and P

Test Units O and P were placed to investigate two anomalies within the magnetic gradiometer survey (Figure 19). Each of these anomalies is a dipole, consisting of a couplet of high and low magnetic values. These can indicate historic metal, with a magnetic field strong enough to create a dipole similar to a magnet with a north and south pole. Weak dipole anomalies can also be created by prehistoric fire hearths that are heated to a high temperature, and are not greatly disturbed after use. In the case of both Test Units O and P, the anomalies were created by historic pieces of metal.

Figure 20 is a profile of the north wall of Test Unit P, which is nearly identical to the profile or Test Unit O. Three distinct zones of soil mixing were visible, to a depth of 44 cm beneath the ground surface – far deeper than any other plow zone identified at the site so far. Beneath the plow zone was a natural BA soil horizon. Tractor-tire marks were visible at the base of AP3 (Figure 21). It is possible that this disturbance is from Sid Denny's 1970s excavations at the site, during which several large areas were exposed with heavy equipment (See Holt and Belknap 2010). It is also possible that one or more historic structures at the site were removed and covered with the aid of a tractor in order to clear a portion of the field for plowing.

Mixed historic and prehistoric artifacts were found throughout test Units O and P, including a Hardin Barbed point. A metal harrow tine was found in Test Unit P, clearly the source of the dipole anomaly in that unit. Several small-to-medium pieces of rusted metal were recovered from Test Unit O. Given the highly disturbed nature of these deposits, all artifacts recovered from these units should be considered to have general site provenience only. It is possible that intact prehistoric features or artifacts are left below this zone of disturbance, but time precluded deeper excavations in these locations in 2010.

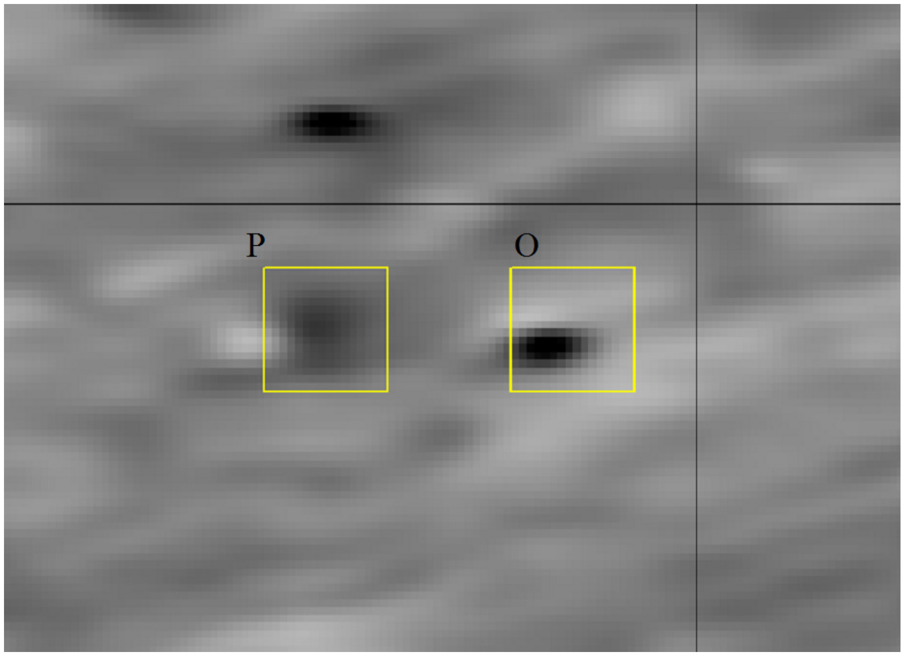

Figure 19. Magnetic gradiometry survey showing the locations of Test Units O and P in relation to weak dipole anomalies.

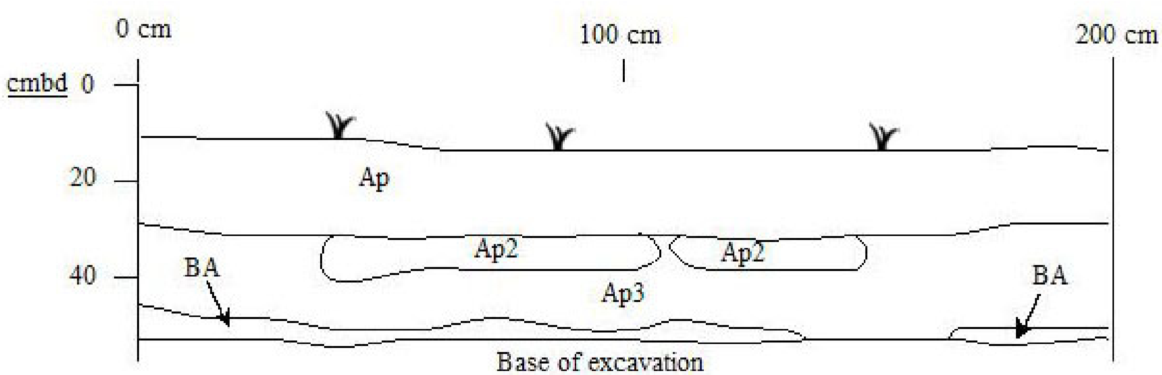

Figure 20. Test Unit P, north wall.

Soil Description:

Ap: Dark brown (10YR3/3) silty clay loam; cloddy and weak blocky structure; clear boundary.

Ap2: Very dark grayish brown (10YR3/2) silty clay loam; weak medium blocky structure; clear boundary.

Ap3: Very dark grayish brown (10YR3/2.5) silty clay loam; weak medium blocky structure; clear boundary. Clear tractor tire marks at the base of Ap3.

BA: Very dark gray (10YR3/1) silty clay loam; moderate fine to medium angular blocky structure; boundary not observed.

Figure 21. Test Unit P, base of level 3, facing north. Tractor tire marks are visible as dark bands running Southwest to northeast.

Test Unit Q

Test Unit Q was located to test a strong, well-defined magnetic anomaly (Figure 22). Immediately below the plow zone two dark, well-defined features were observed (Figure 23). The larger of the two was designated Feature 138 and is clearly the source of the magnetic anomaly. The smaller feature was designated 139. This may be too small to generate a well-defined magnetic anomaly, or its magnetic field may be overwhelmed by that of the larger feature. Twelve possible post molds were also observed in this test unit. The locations of all features within Test Unit Q are shown in Figure 24.

The possible post molds were excavated first, followed by Features 138 and 139. Each of these was bisected and profiled, discussed separately below. Mixed historic and prehistoric artifacts were recovered from the plow zone, including a hoe flake and large (ca. 12 cm diameter) piece of stumpware. The stumpware was recovered in the plow scar immediately above Feature 139 and is most likely associated directly with this feature.

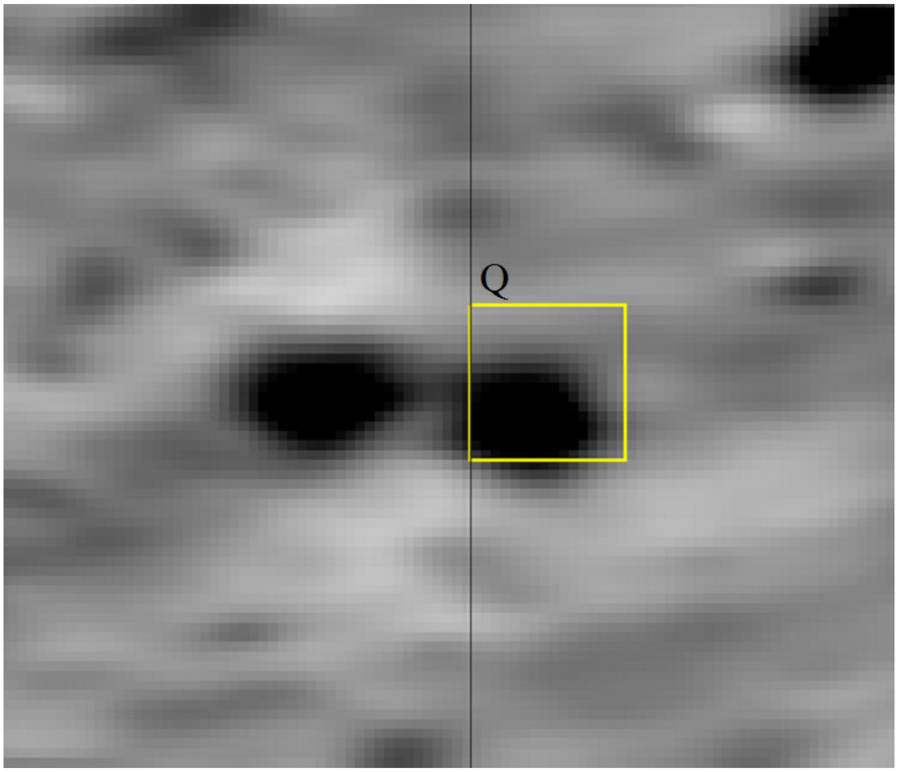

Figure 22. Test Unit Q in relation to the magnetic anomaly it was designed to test.

Figure 23. Test Unit Q and Features 138 and 139 at the base of the plow zone, facing east. Note prominent plow scars running the full length of the test unit.

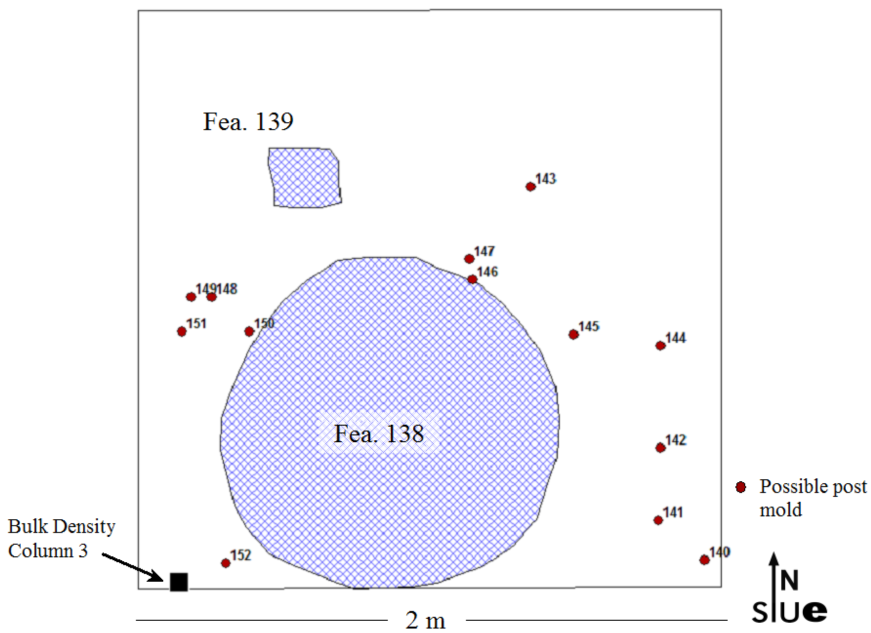

Figure 24. Test Unit Q features and location of bulk density column.

Two possible post molds from this test unit (Features 140 and 141) are pictured in Figure 25 as representative of this type of feature throughout the site. These are small circular stains both originating immediately below the plow zone and each ending 5 to 6 cm below the plow zone with a gentle taper or flat base. When such features "turned an angle" at depth or included lateral extensions, they were interpreted as burrows. Mapping of these features after more extensive excavations may reveal patterns that suggest either cultural or natural origin for them.

Figure 25. Test Unit Q, base of level 1, facing east. Features 140 and 141, possible post molds

Feature 139 (profile shown in Figure 26) was a shallow, square dark feature extending 6 cm below the plow zone. The edges and base of this feature were clear, and a lower zone was highly gleyed. No artifacts were recovered from this feature. This is tentatively interpreted as the base of a large post hole or other feature possibly associated with Feature 138. This feature was likely truncated by plowing. Excavation of the anomaly immediately west of Feature 138 (Figure 21) may illuminate the nature of this feature if a similar structure is found in association with the likely Mississippian pit represented by this anomaly.

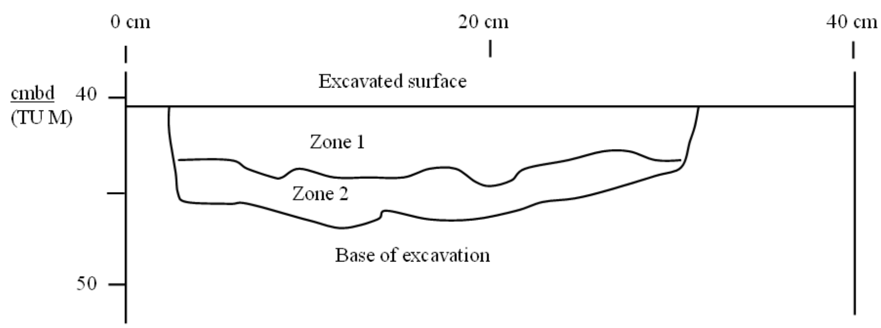

Figure 26. Feature 139 profile, facing south. Zone 1: Very dark brown (10YR2/2); Zone 2: Dark greenish gray (10Y4/1)

Feature 138 was a bell-shaped Mississippian pit, extending 75 cm beneath the plow zone. It had been at least partially truncated by the plow zone, as evidenced by stumpware and other large artifacts dragged by the plow along the top. This feature was bisected in the middle along the east-to-west axis and the east half excavated first. A small portion of the belled bottom of the feature extended beyond the south wall. Figures 27 and 28 show the profile of the bisected feature, and its extension into the southern wall of Test Unit Q.

No distinct zones of fill were noted. The feature contained abundant charcoal and ash throughout, as well as burned earth and fire cracked rock. Artifacts recovered from this feature include two hoe flakes, and abundant flakes and sherds, including the following types identified by John Kelly: Madison County Shale Bluff Jar, grog tempered notched rim Edelhardt, Emergent Mississippian shell tempered, Powel Plain burnished, Monk's Mound Red, and mixed grit and grog tempered Emergent Mississippian.

A "companion" magnetic anomaly, virtually identical to the Feature 138 anomaly in size, shape, and nanotesla value, lies immediately to the west. This will be excavated in subsequent years to test for its similarity and difference to Feature 138.

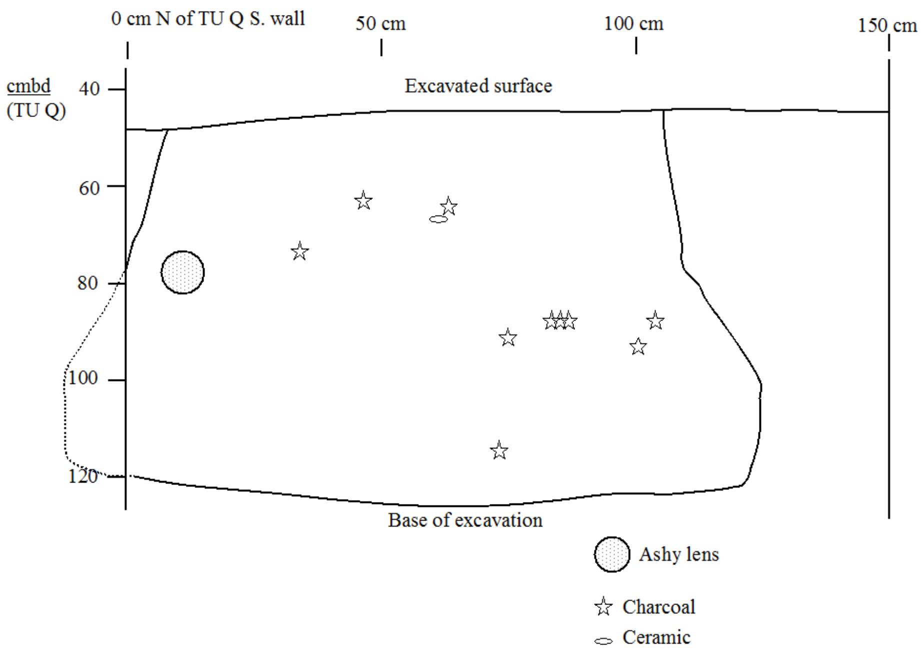

Figure 27. Feature 138 profile, facing west.

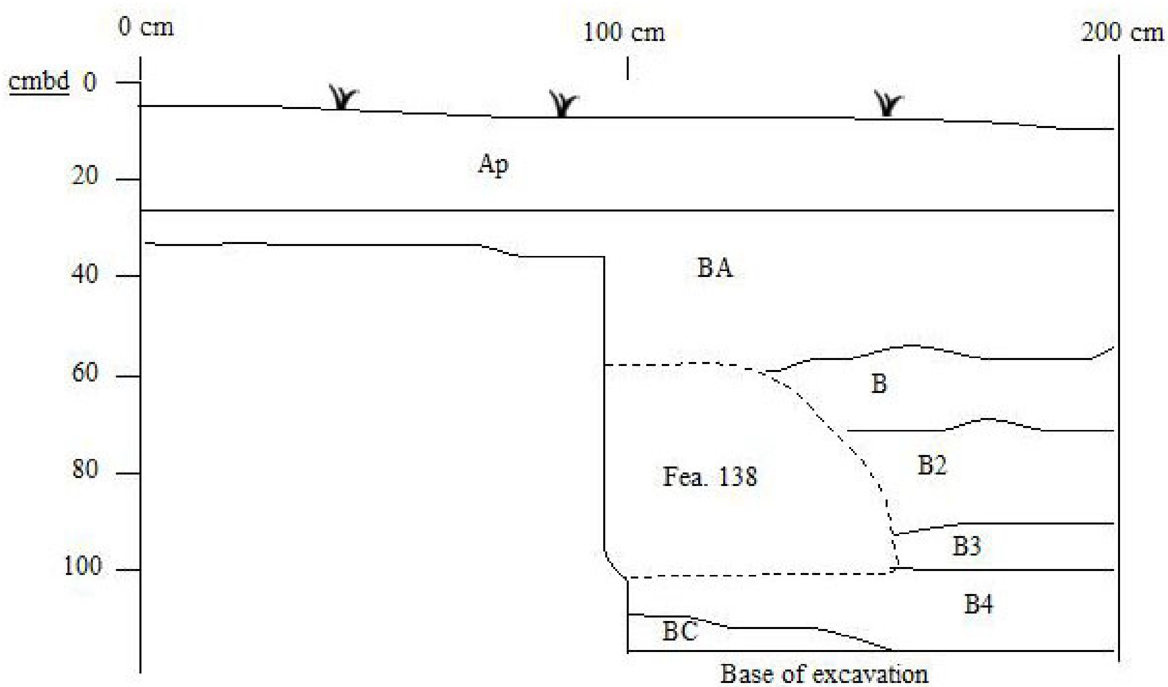

Figure 28. Test Unit Q, south wall.

Soil Descriptions:

Ap: Dark grayish brown (10YR4/2) silty clay loam; weak coarse blocky structure; clear boundary.

BA: Brown (10YR4/3) clay loam; strong fine angular blocky structure; common fine roots and biopores; weak discontinuous cutans slightly darker than matrix; clear boundary.

B: Dark yellowish brown (10YR4/4) clay loam; moderate fine angular blocky structure; common fine roots and biopores; discontinuous cutans slightly darker than matrix; gradual boundary.

B2: Brown (10YR3.5/4) silty clay loam; few fine roots and common fine biopores; clear boundary.

B3: As above with discontinuous cutans of 10YR4/2.

B4: Brown (10YR5/3) silt loam; weak medium blocky structure; few fine roots and common fine biopores; few redox concentrations of 5YR5/6; clear boundary.

BC: Yellowish brown (10YR5/4) silty clay loam; very weak coarse blocky structure; common diffuse redox concentrations of 7.5YR5/4; common redox concentrations following biopores of 7.5Y5/6; boundary not observed.

Test Units R, S, and U

Test Units R and S were located to test two clear anomalies in the magnetic gradiometry data (Figures 29 and 30). Both anomalies were Middle Woodland period pits that appeared as dark, circular stains immediately below the plow zone. Because feature 158 within Test Unit R extended east of the test unit, another 1 x 2 meter unit (designated Test Unit U) was emplaced to expose the rest of the feature. Test Unit R contained three possible post molds. The pit features within these units are discussed below.

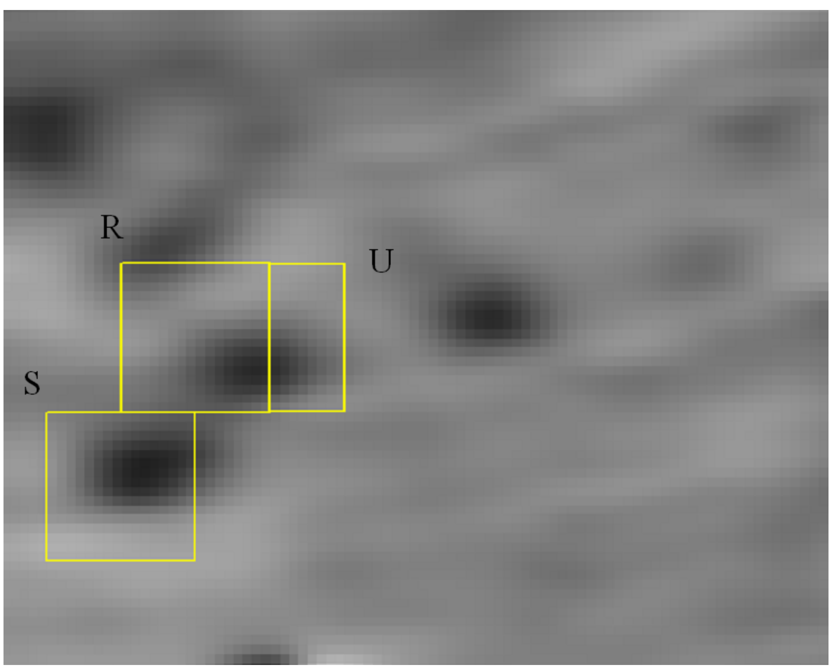

Figure 29. Test units R, S, and U in relation to magnetic anomalies.

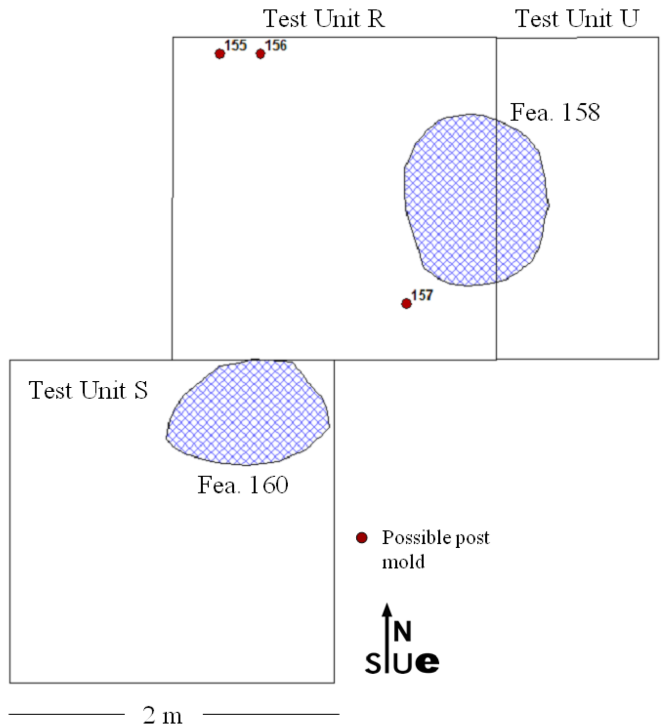

Figure 30. Test Units R, S, and U, and associated features.

Feature 158 was a circular, straight-sided basin within Test Units R and U. The western half of this feature was excavated within Test Unit R, and the eastern half was excavated after a profile was drawn (Figure 31). A blade fragment and grog tempered Naples Stamped sherd were recovered from just below the plow zone near this feature, and may have come from this feature. Charcoal was common throughout the feature, and several samples were recovered for potential dating. Two blades, a grog tempered Naples Stamped sherd, and a Hopewell Zoned Stamped sherd were recovered from within the feature itself. No distinct zones of fill were identified from this feature.

An interesting aspect of this feature are several weakly developed (but visually clear) Bt-horizon clay lamellae. Such lamellae form as clay and are translocated downward within a soil profile in coherent, distinct thin laminations. These most commonly occur in sandy soil, although the soil within this feature and the surrounding matrix are not dominated by sand. The timing of the formation of these features is poorly understood, and dating the formation of clay lamellae from this and other features at the site may aid in this topic of soils research.

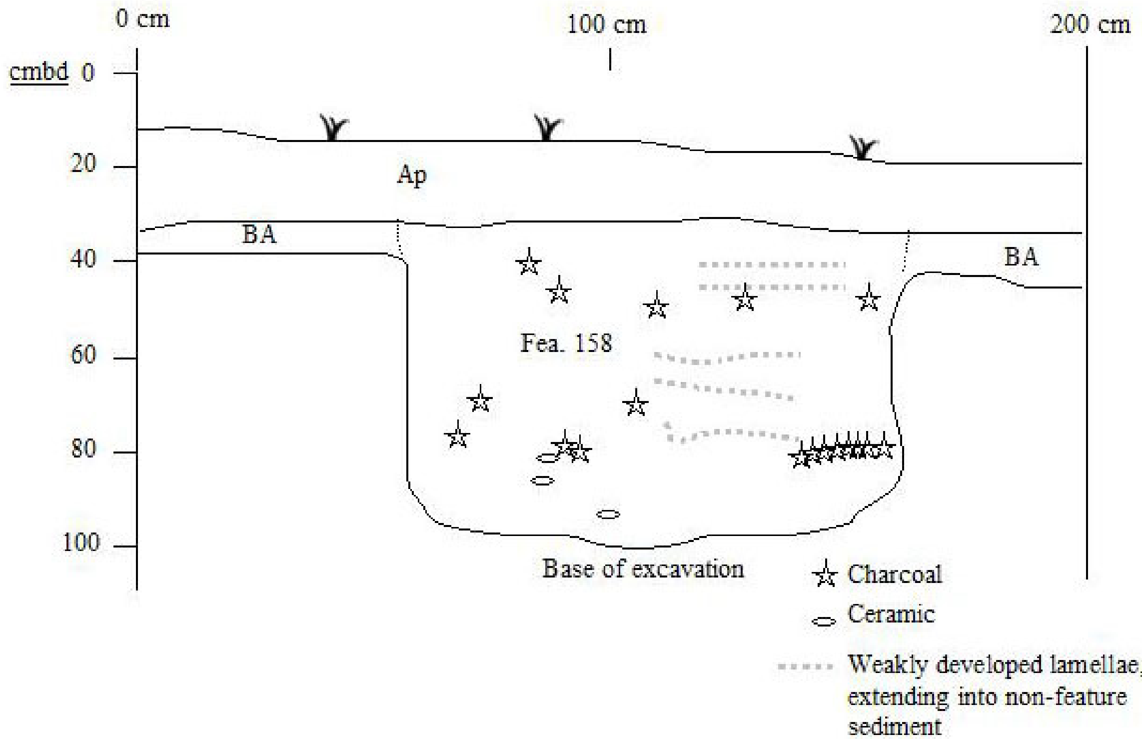

Figure 31. Test Unit R east wall and Feature 158.

Soil Descriptions:

Ap: Brown (10YR4/3) silt loam; cloddy structure; clear boundary.

BA: Yellowish brown (10YR5/6) silty clay loam; moderate medium angular blocky structure; common distinct ped linings of 10YR4/3; common fine roots and biopores; clear boundary.

Feature 158: Mixed dark yellowish brown (10YR4/4) and grayish brown (10YR5/2) silty clay loam; moderate medium blocky structure; few fine roots and biopores.

Feature 160 (Figures 32 and 33) was similar to Feature 158: a round, straight-sided basin with organic- and artifact-rich fill. Charcoal was found throughout the feature and sampled. A blade, as well as grog tempered cord marked sherds identified by John Kelly as Emergent Mississippian, and one shell-tempered red-slipped Mississippian sherd were found within this feature. Fragments of a burnt mud dauber wasp nest were also found within this feature, indicating the likely presence of a structure, although the preservation was too poor to identify the nature of the structure on which it had been built. Several distinct zones of feature fill were identified (Figure 33), although no consistent differences in artifact type was noted between them.

Figure 32. Feature 160 profile in Test Unit S, facing north.

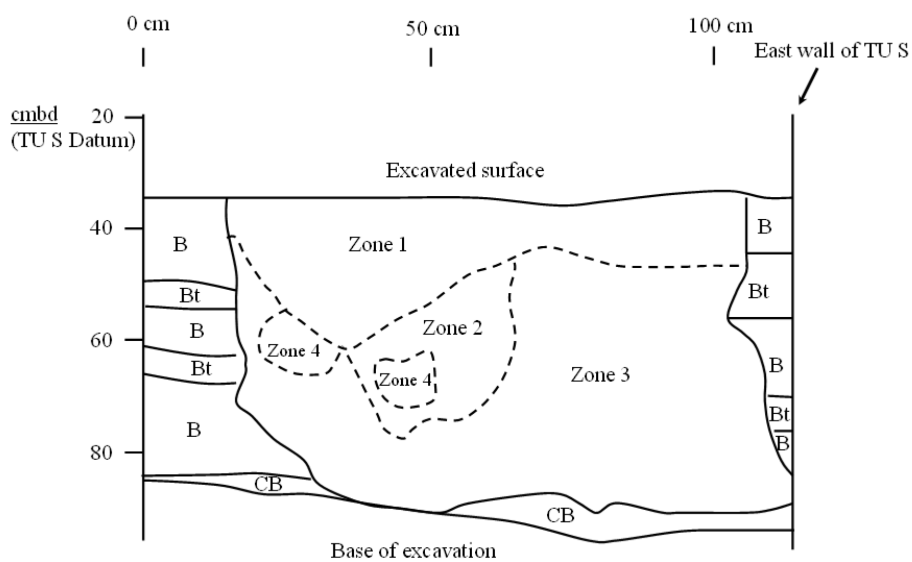

Figure 33. Feature 160, facing north.

Soil Descriptions:

B: Dark grayish brown (10YR4/4) silty clay loam; moderate medium angular blocky structure; clear boundary.

Bt: (clay lamellae) Dark yellowish brown (10YR4/6) silty clay loam; moderate medium angular blocky structure; clear boundary.

CB: Light yellowish brown (10YR6/4) silt loam; very weak medium angular blocky structure; boundary observed.

Feature Zone 1: Dark brown (10YR3/3) silty clay loam.

Feature Zone 2: Approx. 60% dark yellowish brown (10YR4/4) with 40% dark brown (10YR3/3) silty clay loam.

Feature Zone 3: Approx. 40% dark yellowish brown (10YR4/4) with 60% dark brown (10YR3/3) silty clay loam.

Feature Zone 4: Very dark grayish brown (10YR3/2) silty clay loam; charcoal more abundant than in rest of feature.

Test Units N and T

Test Unit N was located in order to test a specific magnetic anomaly (Figure 34). Below the plow zone a large, dark soil discoloration with abundant charcoal flecking was given the feature designation 161, and a large fragment of charcoal (ca. 12 cm diameter) and burnt limestone (Figure 35), was assigned feature number 162. Beneath the charcoal and burnt limestone of Feature 162 was a clear, round post hole 20 cm in diameter that extended 26 cm down. Feature 161 was a shallow basin extending laterally from Feature 162 to the south and southwest (Figure 36). These are interpreted as a house (Feature 161), and associated corner post with limestone chinking (Feature 162). Feature 163 (Figure 37) was a dark stain with common charcoal flecking that was only 1-2 cm in depth. No artifacts were found within this feature. This may be a slightly deeper portion of the plow zone, or a charcoal pile or other feature associated with Features 161 and/or 162.

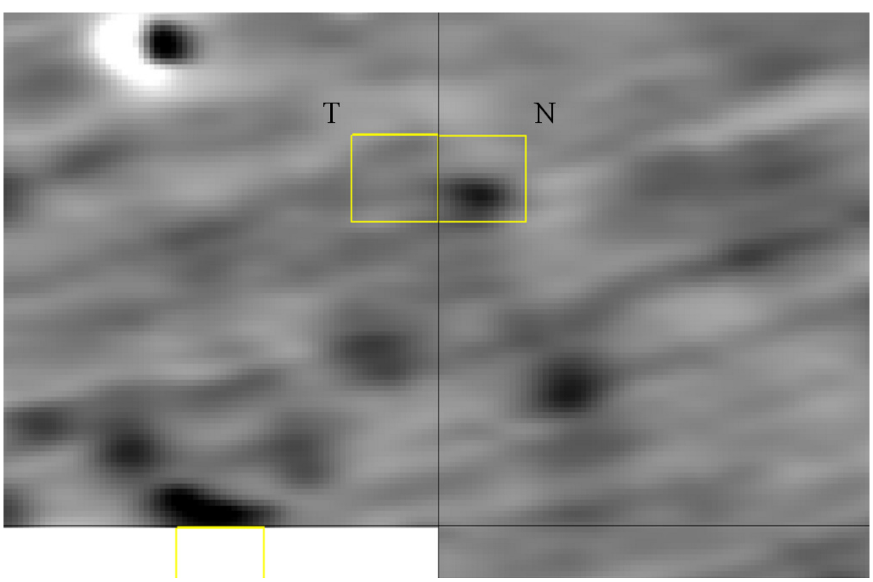

Figure 34. Test Units N and T and associated magnetic anomalies.

Figure 35. Top of Feature 162 (house corner post) in Test Unit N, facing east, showing charred post fragment and burnt limestone chinking.

Figure 36. Feature 162 (house corner post) partially excavated showing profile and circular stain at depth.

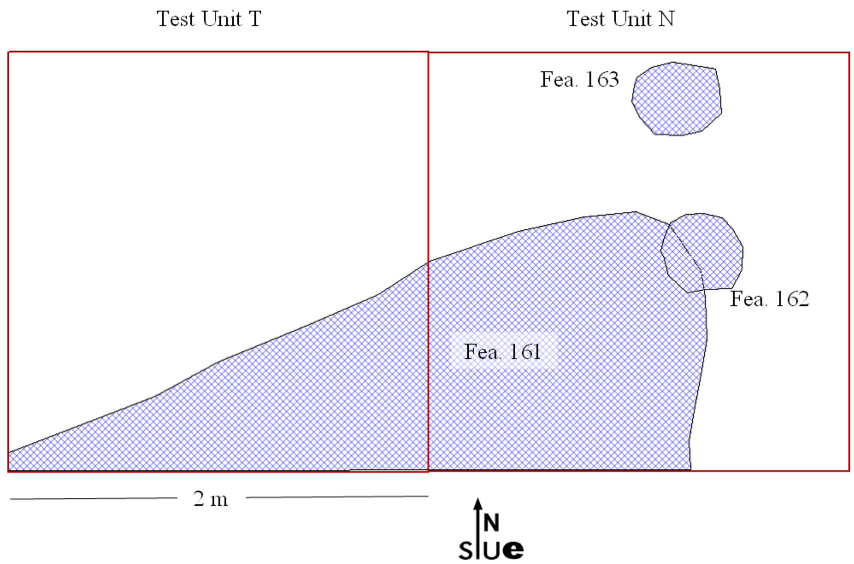

Figure 37. Test Units N, T, and associated features.

The house basin (Feature 161) was excavated within Test Unit N, and the profiles drawn on the south and west walls of this test unit. Test Unit T was later added to expose more of the house basin, and the southern profile drawn (see Figure 37 through 40). One sherd of grit tempered Marion Thick pottery was found mixed within the burnt limestone at the top of the corner post (Feature 162). A complete Cobden-Dongola stone hoe was found lying flat at the bottom of the house basin straddling the line between Test Units T and N. The hoe measures 23 cm long and has strong polishing along the working edge. One side of the hoe was broken, although it appears to be still usable or easily knapped back into working shape. No easily time-diagnostic ceramics were found from within the house basin itself.

Figure 38. Feature 161 (house basin) excavated in test units N and T, facing southwest.

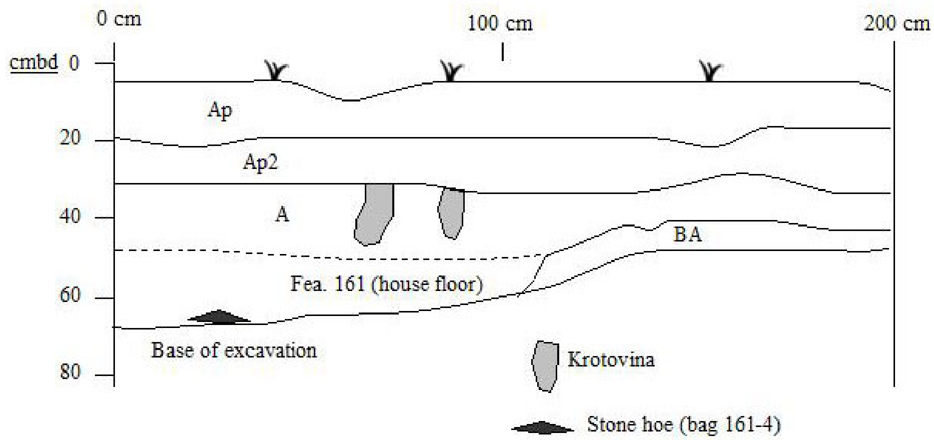

Figure 39. Test Unit N, west wall and Feature 161.

Soil Descriptions:

Ap: Brown (10YR4/3) with 5% 10YR5/2 silty clay loam; cloddy structure; clear boundary.

Ap2: Very dark grayish brown (10YR3/2) silty clay loam; very weak medium angular blocky structure; clear boundary.

A: Very dark grayish brown (10YR3/2) silty clay loam; moderate medium angular blocky structure; common fine roots and biopores; faint ped linings slightly darker than matrix; common small mottles of 10YR5/3. This horizon extends throughout the test unit and appears to be a mix of natural A horizon material and midden associated with the house.

BA: Brown (10YR4/3) clay loam; strong medium to coarse blocky structure; continuous cutans slightly darker than matrix; common fine roots and biopores; boundary not observed.

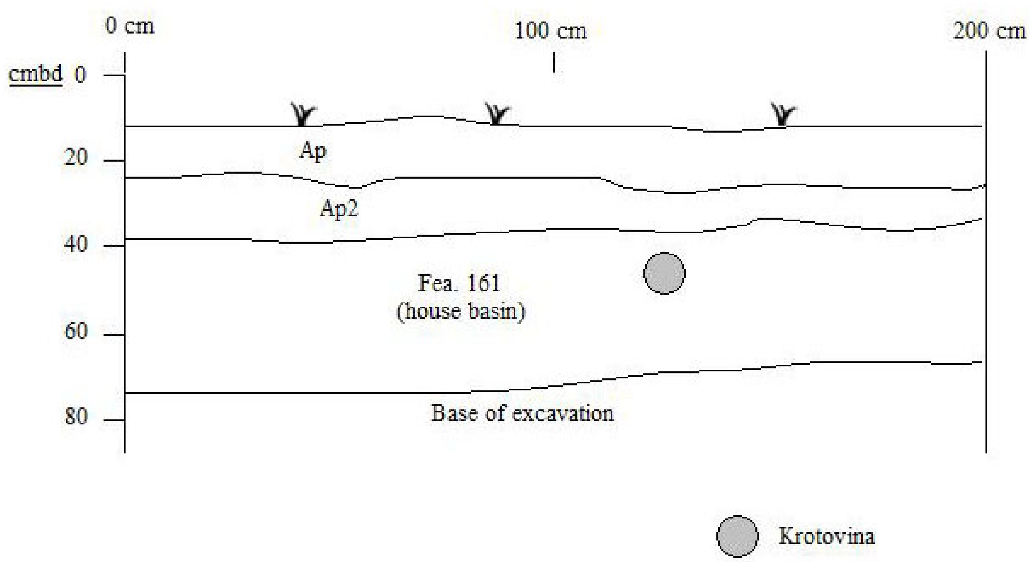

Figure 40. Test Unit T south wall. (See above for soil descriptions.)

The magnetic anomaly that Test Unit N was originally located to expose was undoubtedly the house corner post. Three other similar magnetic anomalies (Figure 41) may be the other three corner posts, considering their arrangement, and their similar size, shape, and nanotesla value. A larger magnetic anomaly located between these four may be a central post or other pit feature within the house. Subsequent excavations will expose these areas.

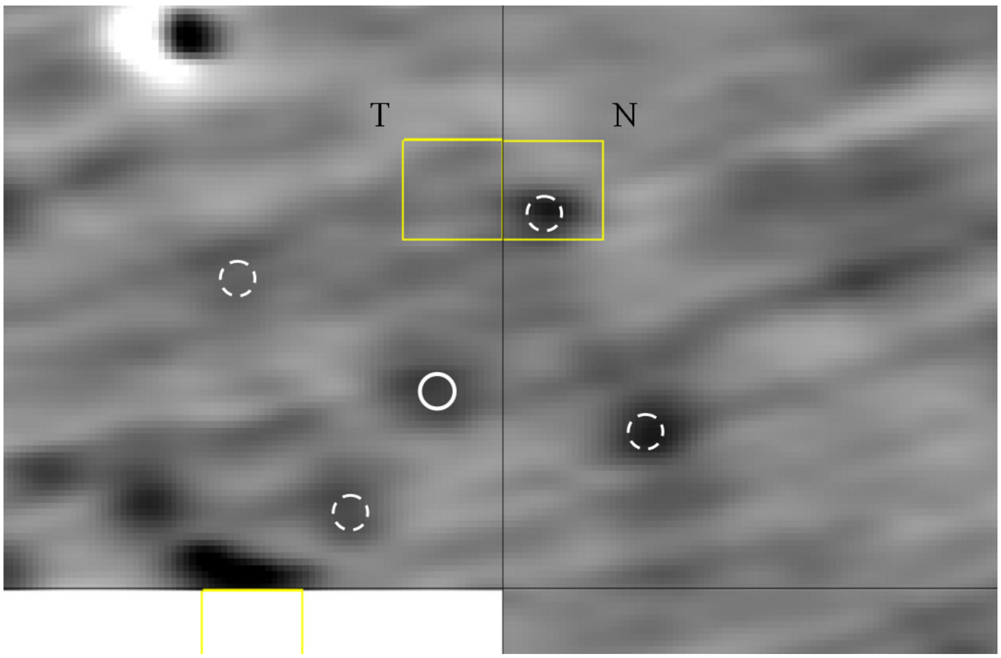

Figure 41. Magnetic anomalies that may be associated with the corner post and house basin (Features 161 and 162). Dashed white lines may be three more corner posts, solid white line may be an internal post or pit feature.

Geoarchaeology of the Gehring Site

By Shannon Murphy

Abstract

The Gehring Site (11MS99) has a long history of change: 10,000 years of soil deposition and erosion has altered the landform. During the last 10,000 years 200 cm of soil has been deposited and several areas of the site have seen severe erosion. Soil cores and feature locations have allowed for a partial reconstruction of the paleo-landscape during the last 10,000 years. Gehring is a multi-occupational site located on the SIUE campus with Archaic, Middle Woodland, Mississippian, and Historic components. During the Middle Woodland the edges of the site had already begun to erode. During the Emergent Mississippian the western portion of the site was located at a level elevation. Reconstructing past landforms allows for a study in how the inhabitants at the Gehring Site interacted with the landform.

Introduction

The Gehring site is located on the floodplain next to Cahokia Creek and a backwater lake 3.5 miles away. It is comprised of a sand bar that has been eroded by the meander of Cahokia Creek. Currently the landform is being used to farm corn and horseradish and it was also used for farming during the Middle Woodland and Emergent Mississippian periods. The excess crops produced during the Emergent Mississippian times may have been taken to Cahokia to feed the growing population. Fluvial, alluvial, and human interactions change the shape of a landform altering its shape and morphological properties throughout time. Therefore, the modern landform may not accurately represent ancient conditions.

By extracting soil samples across the Gehring site and analyzing the percent of sand, silt, and clay each contains, a representation of the prehistoric landform can be created. The field of geoarchaeology has begun to grow as archaeologists learn that it can help answer major questions concerning human development and culture. Geoarchaeology is a multidisciplinary approach to traditional archaeology that looks at soils on a site that may provide knowledge about past occupation or buried soils that may present evidence for an archaeological site. Many previously excavated sites are given a second look to see what contributions geoarchaeology can give (Goldberg and Macphail 2006).

Geoarchaeological research in the American Bottom and in the lower Illinois River Valley has made significant contributions to the understanding of archaeological sites and the past landforms of this area. Vicari (2009) discusses how the study of fluvial systems can provide information on the history of rivers. Large changes in the regime of a river can render the river valley inhospitable for human occupation. Understanding archaeological sites in a river valley requires an in-depth understanding of the river's history. Geological samples have shown that there are many different changes that affect the evolution and archaeological history of a landscape. River migration and backwater lake disappearance are just two of the fluvial alterations that can change the history of human occupation of an archaeological site. Fluvial processes are joined by alluvial processes in the study of the archaeological record. Alluvial processes play a large role in burying, mixing, altering, and destroying archaeological sites. It is vital that these processes be understood to develop strategies for sampling for past human activities and properly interpreting the archaeological record (Bettis et al 2008).

Geological survey of the Monks Mound Quadrangle (Grimley et al. 2007) revealed several sediment deposits underlying the entire area. The earliest deposits date to 12,000-10,000 radiocarbon years before present. Most of the sediments are medium and course sands which were laid down on top of bedrock and were deposited during floods. Silts and finer sands are found closer to the surface and were deposited when flood waters started to recede.

The Monks Mound Quadrangle is located 5 to 10 miles east of St. Louis. The Grimley et al. (2007) survey used soil surveys, field observations, soil cores, Illinois Department of Transportation (IDOT) borings, and water well logs. The results show sediments which indicate the presence of many glacial deposits in the uplands of the quadrangle. In the American Bottom evidence of flooding and the Mississippi meandering across the central and western portions of the valley has been recorded. The survey shows that at times the Mississippi River's meander was so great that it curved back onto itself abandoning its former path (Grimley et al. 2007). The resulting crescent shaped lake, known as an oxbow lake, would fill with water every time the Mississippi River flooded. By looking at the geomorphology of the soil around an oxbow lake archaeologist have been able to learn that sites at or around the lake often postdate its formation and can be buried in levee deposits or point bars (Goldberg and Macphil 2007).

Field Methods

Nine soil cores were extracted from the central part of the site (Figure 42). The cores were taken across the site with a minimum of 20 meters between each, in two roughly linear, perpendicular lines. These lines cross a relatively broad terrace close to Cahokia Creek that is the highest point of elevation at the site. The cores were taken with a hand operated auger. Samples at an interval of every 10 to 15 cm in depth were taken and recorded from the first core. The subsequent cores were selectively sampled based on field observations of soil characteristics. For each sample extracted the depth, Munsell color, and other soil properties were recorded. Soil samples were placed in plastic bags left open to allow the soil to dry.

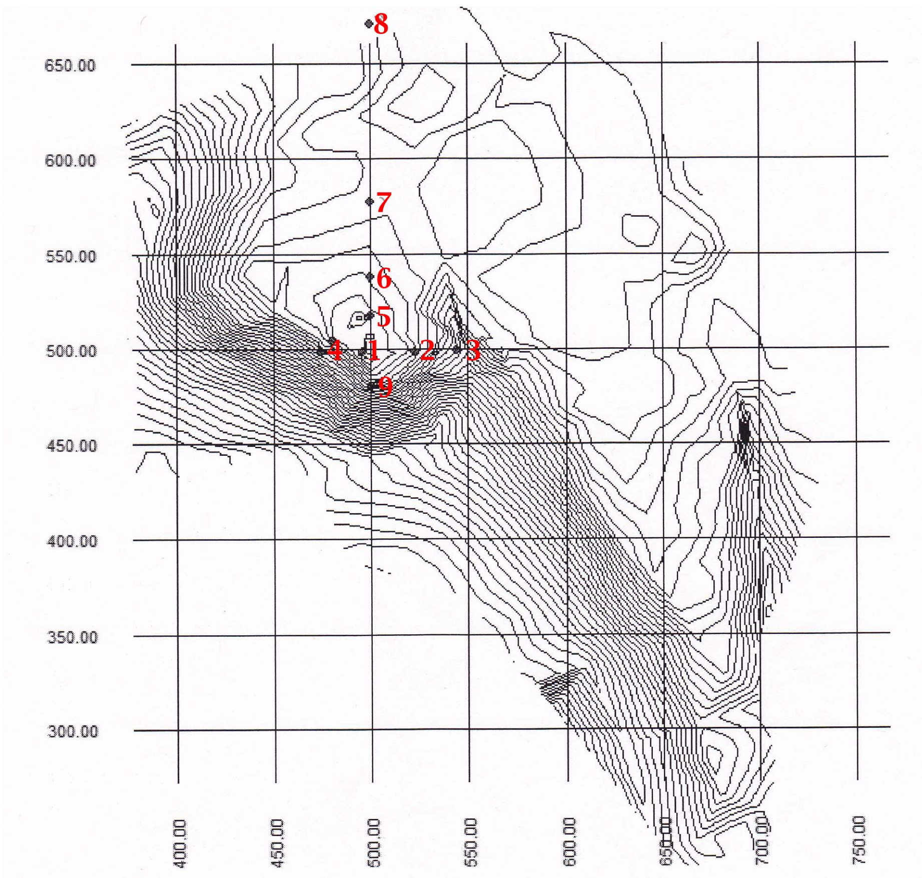

Figure 42. The location of the nine soil cores across the Gehring Site. Soil cores 1, 2, 3, and 4 are aligned east to west. Soil cores 1, 5, 6, 7, 8, and 9 are aligned north to south.

Laboratory Methods

Each sample was taken to the Anthropology Lab located on the SIUE campus for particle size analysis by the hydrometer method. Particle size analysis relies on the different settling velocities of sediment particles of different sizes in a liquid solution (Timpson and Foss 1992). The hydrometer reads different densities in a soil solution, as the heavier particles (sand) fall out first and the lighter particles (silt or clay) remain in suspension for longer. Solution density readings by a hydrometer are taken at predetermined intervals to determine how much of each particle size is contained in the sample.

Before tests can be run, the soil samples must be disaggregated. To accomplish this each sample is dried, ground, passed through a 2 mm screen to remove any pebbles, and combined with a dispersant (sodium hexametaphosphate) to separate the particles. The samples are placed in a mechanical shaker to further separate the particles. After 6 hours in the mechanical shaker the samples are emptied into a 1000 ml beaker, distilled water is added to the 1000 ml marker to complete the solution needed for particle size analysis tests to be performed. For the analysis, readings are taken at the 40 sec, 5 min, 1 hr, and 6 hr intervals. Along with the readings taken from the soil solutions, readings are recorded from a control solution which contains the dispersant but no soil.

Once the hydrometer readings are completed the samples are poured through a wet sieve to collect the sand particles. The sand is moved from the sieve to a piece of finger paint paper and left to dry overnight. The sand is collected from the paper and the resulting weight was recorded. The dried sand is then placed in a stack of sieves and shaken for ten minutes to determine the amount of different sized sand particles. Each size grade is weighed and recorded.

Feature Maps

By mapping the features found at the Gehring Site comparisons can be drawn between their locations on the landform and in relation to other features on the site. Once each feature's time period has been identified its location below the ground surface can be calculated and recorded on a graph. Two graphs are used that show the feature's locations and elevations in a north to south direction and an east to west direction. The features are color coded to make identification easier. Comparisons between features can give an estimate to the elevation and general landform of the site during the time period the features date to.

Results

One of the nine cores will be described in detail as representative of the other cores. Core 1 was chosen because it is located in the center of the site and is represented on both the north to south and east to west graphs. The samples provided a complete overview of the percent of sediments which are contained in the entire core.

Core 1

Core 1, taken from the middle portion of the northern part of the Gehring site, was extracted from the base of test unit J. The test unit extended 75 centimeters below ground surface (cmbgs) at the time the core was taken. To complete the soil core, samples were extracted from bulk density samples taken from the northern wall of the test unit. The excavation of test unit J revealed the base of the Ap soil horizon extended to a depth of 25 cmbgs. The Bt horizon extended past the base of the excavation unit.

A clay bulge (Figure 43) can be seen beginning in the Ap horizon and extending into the Bt horizon, the clay bulge has a clay percentage of 27. Around 100 cmbgs the clay bulge dissipates to around 5%, the rest of the core has very little clay in its composition. The clay composition essentially disappears around 200 cmbgs. This is the depth where large laminations of sand are first found. Due to the site's location in the American Bottom and its proximity to Cahokia Creek it is believed that the particles were deposited by fluvial systems. Mixed into the layers of sand are smaller laminations of silt. The changes between sand and silt laminations indicate that the rate of water movement that deposited the particles fluctuated. The top of the layers of sand and silt mark the top of the C horizon.

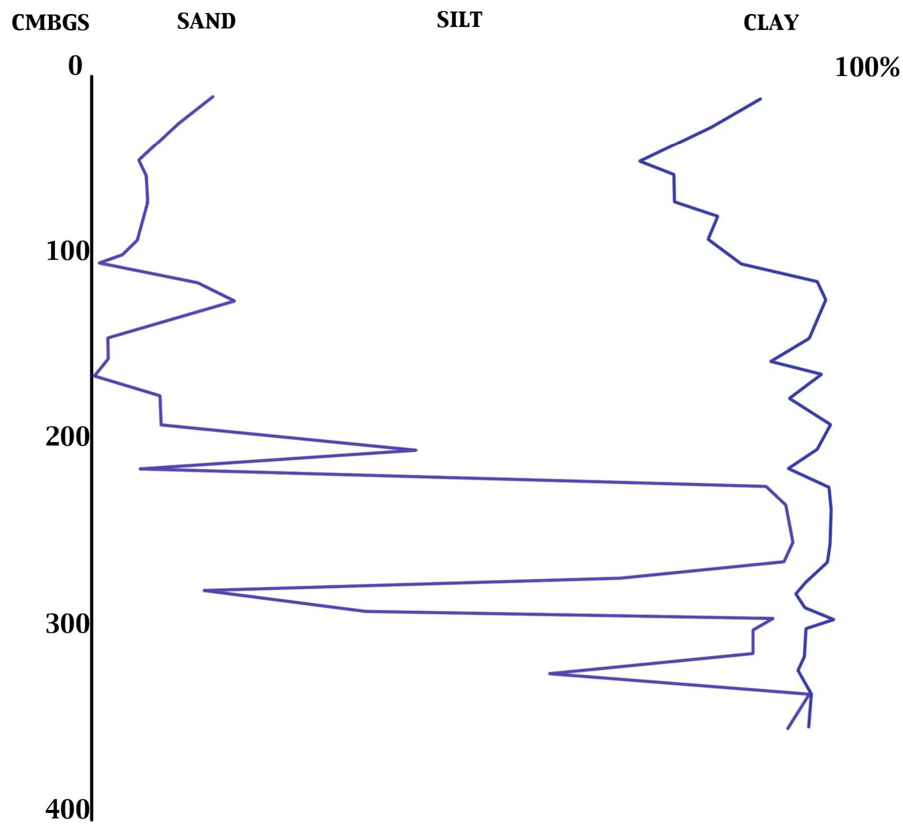

Figure 43. The line on the right represents the percentage of clay found at different depths in the soil. The farther to the left the line is the higher percentage of clay is at that depth. The line on the right represents the sand percentages, the farther to the right the line is the greater the percentage of sand found at that depth.

The sand found in core 1 makes up a little over 15% of the sample. The percentage of sand decreases with depth until 110 cmbgs where there is a small spike in the amount of sand found in two of the core samples. At 140 cmbgs the sand percents drop to 2% of the sample. The sand percents rise quickly when a depth of 200 cmbgs is reached before quickly dropping back to a little over 5%. At a depth of 220 cmbgs the sand percents climb to greater than 90% and continue to remain high for the remainder of the core. There is one drop in sand percent at 278 cmbgs but climbs once again into 90% (Figure 43).

The sands that are found in the soils are made up of different size ranges. The sand sizes are divided into very course, course, medium, fine, very fine, and less than very fine. Above 200 cmbgs the sand composition is made up of very fine sand grains. There is a spike in the very course and course sand at 140 cmbgs. At 220 cmbgs the sand was comprised of 80% fine sand with medium sand comprising a large percent of the remaining sand sample. From 220 cmbgs to the end of the core, with the exception of a small percent of very course sand at 278 cmbgs, there is no very course or course sand present in the remaining samples (Figure 43).

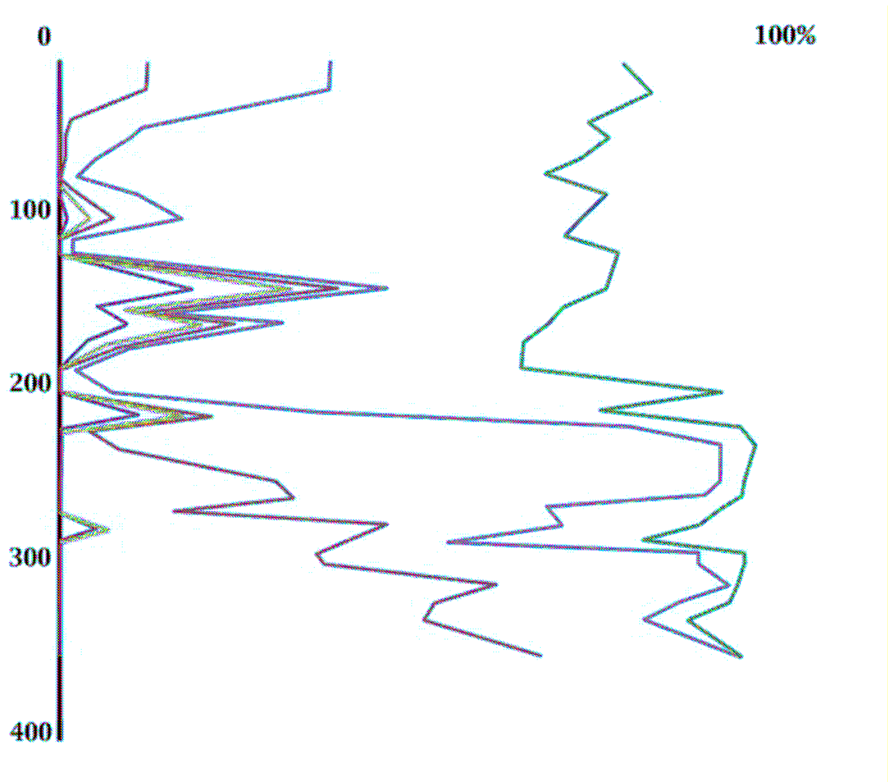

Figure 44. The different color lines represent the different sized sand particles. From left to right: very coarse, coarse, medium, fine, and very fine. The farther to the right the lines are the greater percent of that sized sand is found at that depth.

East to West

Four cores span the northern portion of the Gehring Site on an east to west alignment. Core 1 is located at the highest elevation with core 3 100 cm lower on the east side and core 4 70 cm lower on the west side. Core 2 is located between cores 1 and 3 at an elevation 30 cm lower than core 1. The four cores were graphed taking into account their approximate elevations on the site.

Clay

Three of the four cores show clay bulges that end at 120 cm below the highest point of the site. A clay bulge appears when clay particles are transported down through the soil where it accumulates. A clay bulge is an indication of a Bt horizon, a horizon with abundant deposits of clay, and indicates that this horizon is fairly old. The cores on the farthest east and west points of the site have a partial clay bulge. The top of the clay bulge that would usually be seen is missing, leaving the bottom portion, where the accumulation of clay starts to disappear. The core that does not match the other three is core 2. Core 2 has a clay bulge that is at its greatest peak when the other three clay bulges have already dissipated. Core 2's clay bulge continues for another 20 cm deeper before dissipating. After the clay bulge dissipates there is no great accumulation of clay in any of the cores.

Sand

In all four cores it can be seen that the percent of sand in the upper 100 cm is relatively small. There are small spikes in sand from 120 cm to 140 cm in cores 1 and 2 that drop. A large spike in sand percent is seen in all four cores at a depth from 180 cm to 220 cm. After the spike, the percent of sand seen in all cores drastically drops. From this point there is much variation in the sand contents of each core.

The western most core, core 4, has a large spike in sand that remains constant until the core ends. Core 1's sand content continues to fluctuate until the bottom of the core. Directly below the main increase in sand, is a large spike in sand percent that remains constant for 50 cm before dropping. 10 cm below the drop, the sand level once again rises and remains relatively constant. In core 2, after the sand spike, the sand amount slowly rises over 90 cm. At a depth of 310 cm the percentage of sand is over 90% and stays high until the bottom of the core. Core 3, located farthest to the east, has two more large spikes in sand. The first spike is located at a depth of 170 cm and slowly dissipates over 30 cm where it once more climes and continues to remain high until the end of the core is reached.

North to South

Six cores are located in a north to south alignment across the northern portion of the Gehring Site. Four of the six cores are found on the main body of the site, the other two are farther north. Core 1 is located on the highest part of the site with core 9 located to the south and cores 5 through 8 located to its north. The land to the north of core 1 has a gradual slope where the slope to the south of core 1 is more steep.

Clay

Unlike the cores located east to west there is no strait line that can be drawn connecting the clay bulges that can be seen once the cores have been graphed. The accumulation of clay seen in the cores appears to follow the landform they are located on. The cores north of core 1 all have a clay bulge that is around ten centimeters lower than the core to its south. Core 9 is located 70 cm in elevation lower than core 1 with the top most portion of its clay bulge missing. All the clay bulges are around 100 cm in depth and begin to increase with the first sample. After the clay bulge disappears in all the cores there is very little clay to be seen.

Sand

Cores 5 and 6 are located on the center of the landform where little, if any, erosion has occurred. These two cores have the most similar sand percentages compared to any of the other cores. Each of the two cores starts with very little sand comprising the samples. They have a spike in the sand compositions around the depth of 150 cm. After each spike in sand the percent shrinks. At a depth of 230 cm a final large spike in sand appears. This spike brings the sand percentage to over 90%.

Cores 1 and 9 share similarities with cores 5 and 6. Core 1 has a small spike in sand percentages that is also seen in cores 5 and 6. While the three cores have similarities they also have a few differences. Core 1 has a second small spike in the sand percentage before the large spike in sand percentage that corresponds with cores 5 and 6. In core 9 there is a small spike in sand that is 10 cm above the second spike in sand found in core 1. Like the other three cores, a large percentage of sand is seen at a depth of 230 cm.

Cores 7 and 8 do not correlate well with the other four cores. Core 7 has a 90% rise in sand, but it reaches its peak at 190 cm, stays constant for 20 cm, and then drops before any of the other cores have reached their peaks. Core 8 has a similar rise in sand that begins at a depth of 270 cm, 50 cm below any of the other sand increases.

Features Map

Historic: One historic feature was located during the 2010 SIUE field school. It was located in Test Unit L, and was determined to be a drainage ditch that might have been made more recently. The drainage ditch was located 30 cm below the surface of the ground and extended 10 cm deeper into the soil. The base of the plow zone touches the top section of the feature.

Emergent Mississippian: Five features were excavated that were believed to have been created during the Emergent Mississippian time period. Two of the features (161 and 138) were confirmed to be Emergent Mississippian. The remaining three are theorized to be from the same time period due to their proximity to the larger features. Features 138 and 139 were located 35 cm below the ground surface. Features 161, 162, and 163 were located 45 cm below the ground surface. Due to the difference in the surface elevation, when graphed the top of the five features are at the same elevation.

Middle Woodland: Five features were found that date to the Middle Woodland. Features 158 and 160 were located at the southern end of the landform at an elevation of 30 cm beneath ground surface. While both features were located in close proximity to each other they were also located in an area of the site with the greatest slope. This led to feature 158 starting 10 cm above feature 160. Features 111, 136, and 137 were located on the eastern portion of the site at a depth of 30 cm. Only feature 111 was confirmed to be from the Middle Woodland time period but due to the proximity of features 136 and 137 to feature 111 it is believed that they would have also been from the same time period.

Feature Location: Looking at the features mapped on a west to east axis it is possible to see that the Emergent Mississippian features are located in the western section of the site. In comparison, the Middle Woodland features are located on the eastern section of the site. When the features are mapped on a North to South axis the Middle Woodland features are found in the southern portion of the site that has the steepest slopes. The Emergent Mississippian features are located north of the Middle Woodland features on ground with less slope.

Plow Zone: The plow zone seen on the west to east axis shows that all but the historic feature is untouched by the plow. There is evidence on the eastern edge of the site which suggests that the plow might eventually start to disturb features in that location. The plow could also miss the features entirely.

Interpretation

There is more than one way sand could have been deposited at the Gehring Site by fluvial systems. Rivers are well known for changing their paths. A river such as the Mississippi can start out as a braided river with smaller channels split of from the main branch and change into a meandering stream (Grimley and Lepley 2005). As the water eroded sediments from the outer bank of the meandering river it is depositing sediments on the inner bank of the meander. The Mississippi river would have meandered several times across the American Bottom depositing sand and silt layers (Goldberg and Macphail 2006).

A river flooding its banks can cause large changes to the land. As a river floods its banks it deposits sediments that it has entrained in its flow. The Hjulström Diagram (Keylock 2004) demonstrates that the faster the water is flowing the larger the particles it can carry. As the water in the river slows, the larger (sand) particles are the first to be deposited leaving the smaller (silt and clay) particles entrained in the rivers flow. The smaller particles are carried until the water slows to a state that it no longer has the momentum to keep particles entrained. Flood plains are widespread and the most common fluvial system. They also provide an excellent location to look for archaeological sites. Floods can deposit meters of alluvium over a landform. The waters that would deposit the silts and clays are calm slow moving waters that would leave sites intact. This offers a great chance to view sites *in situ* (Goldberg and Macphail 2006).

The large floods that went through the American Bottom occurred during the Glaciations ten thousand years ago, before humans moved into the area. The large flood episodes provided information on how the site could have appeared before the large glacial outwash (Grimley and Lepley 2005).

The west to east sand profiles shows there are large accumulations in sands that begin at a slightly higher elevation in the west and gently slope to the east. This could be indicative of a natural levee created from floods that were a common occurrence in the area. The flood that deposited the sediments was most likely from a branch of the Mississippi, when it was still a braided river. The large floods on the Mississippi happened early in the evolution of humans and are located deep in the soil (Grimley et al. 2007). (Figure 45).

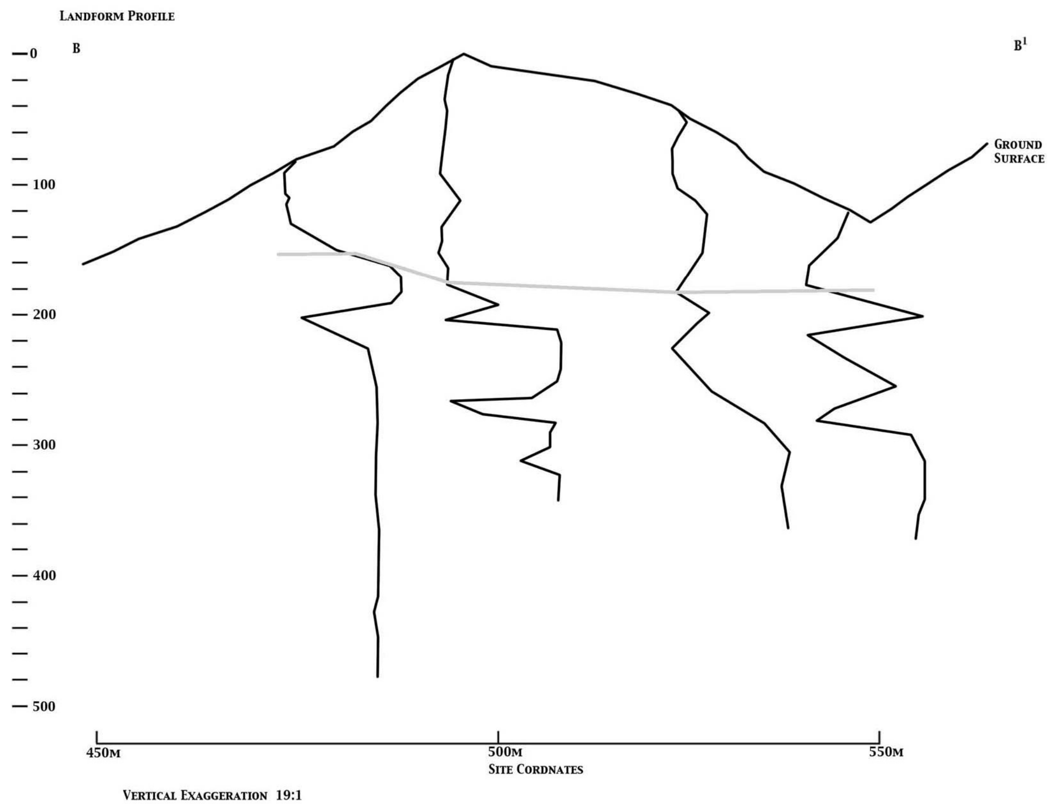

Figure 45. Profile of west to east cores. The vertical measurements are an arbitrary 20 cm. Horizontal measurements are at 50 m intervals and recorded as site coordinates. The light gray line shows the top of the sand packages. Each vertical line represents a single soil core. The farther to the right of each line the higher percentage of sand at that depth.

The north to south profile shows that most of the landform was relatively flat when the floods deposited their sediments. The north end of the site shows an irregularity when compared to the rest of the site. The sediment accumulation in the northern most core is 50 cm deeper than the sediment accumulations in the southern cores. This suggests that the main area of the site was relatively flat at the time the sediments were deposited while the northern portion of the site sloped down in elevation. (Figure 46).

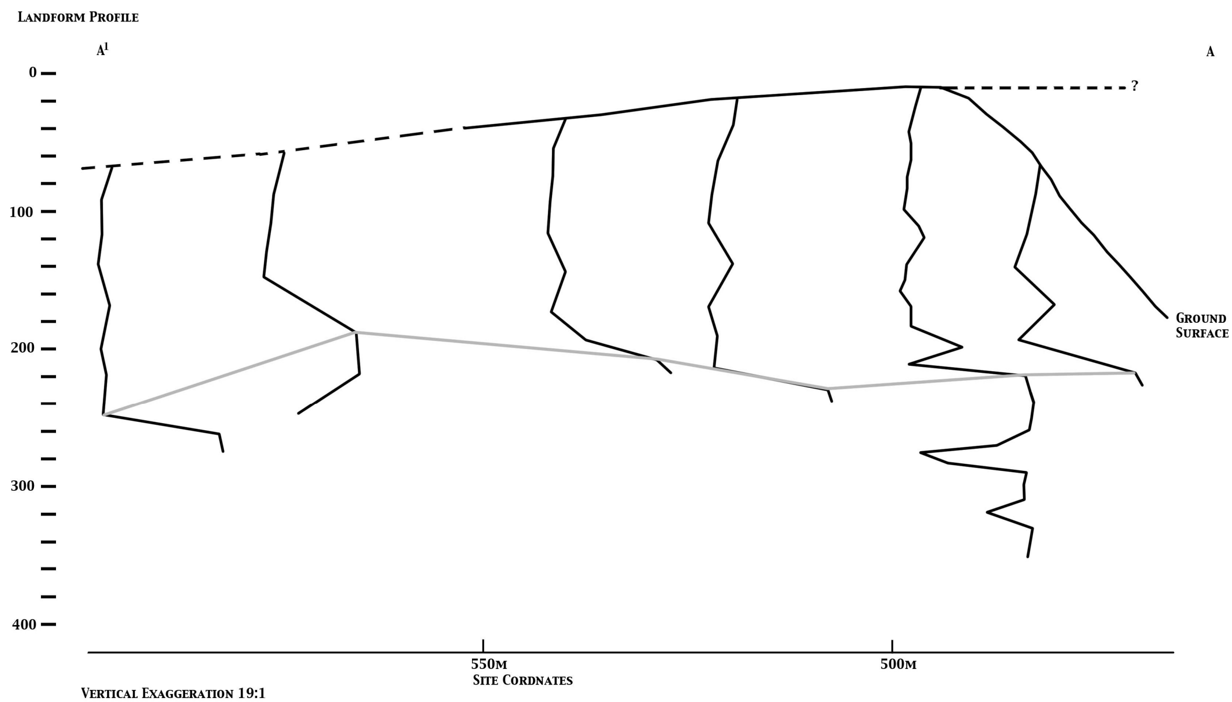

Figure 46. Profile of north to south cores. The vertical measurements are an arbitrary 20 cm. Horizontal measurements are at 50 m intervals and recorded as site coordinates. The light gray line shows the top of the sand packages. The dotted line represents an inferred elevation prior to modern erosion. The dotted line and question mark show a possible level for the landform. Each vertical line represents one sand core.

Graphing the change in sediments shows the change in landscape during the early Holocene. To learn more about the change in landscape during the times when the Gehring Site was occupied the locations of the features from those time periods must be studied. Two graphs were created that show the location of the different features in relation to the ground surface. There are three occupations at the Gehring site identified during the 2010 SIUE field school. The Middle Woodland occupation dates to 100 B.C., Emergent Mississippian occupation dates to A.D. 1000, and the Historic occupation dates to A.D. 1700 (Fortier et al. 2006).

The Middle Woodland features identified are located in the southern and eastern portions of the site. There is no uniform depth for the Middle Woodland features. The features found in the southern area of the site are 40 cm higher in elevation than the features in the eastern section of the site. The southern features show that the Gehring Site had already begun to erode during the Middle Woodland occupation. While the two features (158 and 160) were located less than 2 meters apart there was a 10 cm difference in elevation. The three features found in the east (111, 136, and 137) were close enough together that they all had the same elevation, leaving the rate of slope unknown. (Figures 7 and 8).

The Emergent Mississippian features are located in the northern and western portions of the site. The features (138, 139, 161, 162, and 163) are also located at the same elevation but not the same depth below the grounds surface (Fig 3). Since the features are at the same elevation it suggests that the ground surface in the western portion of the site was located at a level elevation during the Emergent Mississippian. The feature location can show what the ground surface looked like on the highest most level area of the site, but it can show nothing about what the edges of the site looked like. At this time there is no way to know if the site had the same slope as the Middle Woodland occupation, or if it had enough soils and sediment deposited to make it one large flat surface.

To determine the change in landscape during historical occupation aerial photos and clay accumulations are looked at. The clay accumulation is the second piece of information gained from the process of particle size analysis. As time passes clay is leached from the soil and is translocated deeper into the soil profile. Clay accumulation is seen as a clay bulge when graphed. It is impossible to determine how long it took for the clay to accumulate, but the depth of the clay bulges from across a site can be compared to determine what the landform looked like when the clay bulges were being formed (French 2003).

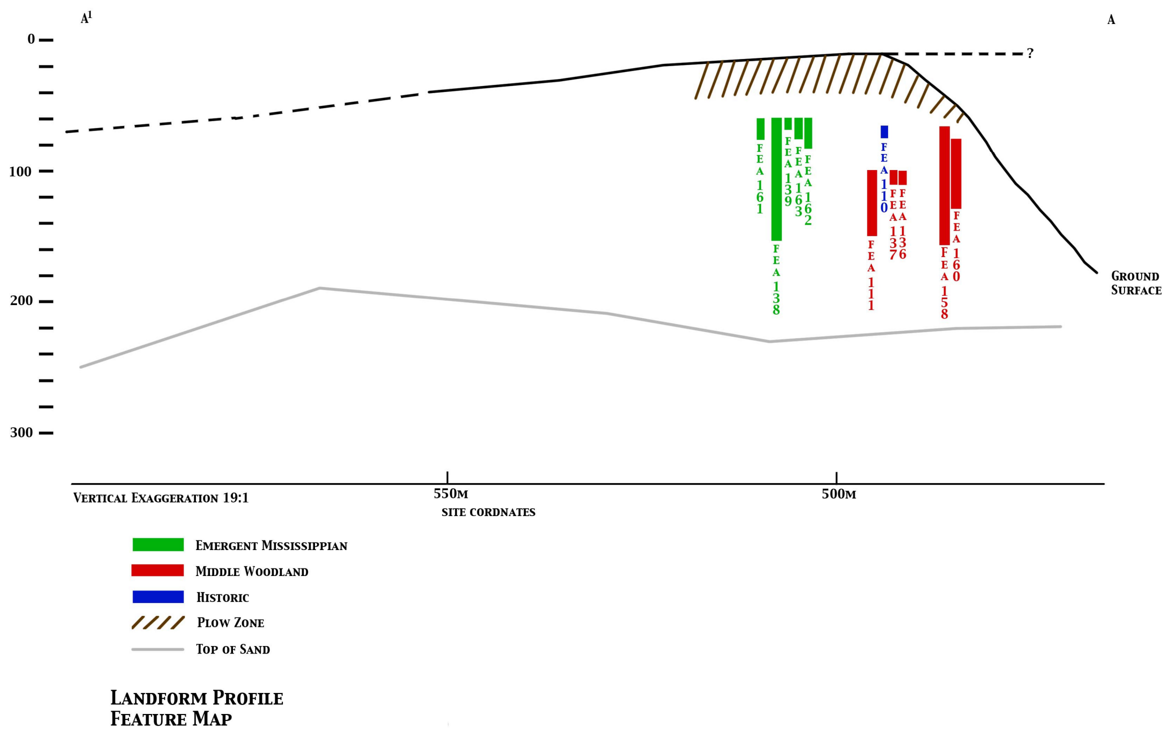

Figure 47. Features plotted by depth, north to south. The vertical measurements are an arbitrary 20 cm. Horizontal measurements are at 50m intervals and recorded as site coordinates. The light gray line shows the top of the sand packages. The dotted line on left represents an unknown distance. The dotted line on right and question mark show a possible level for the landform.

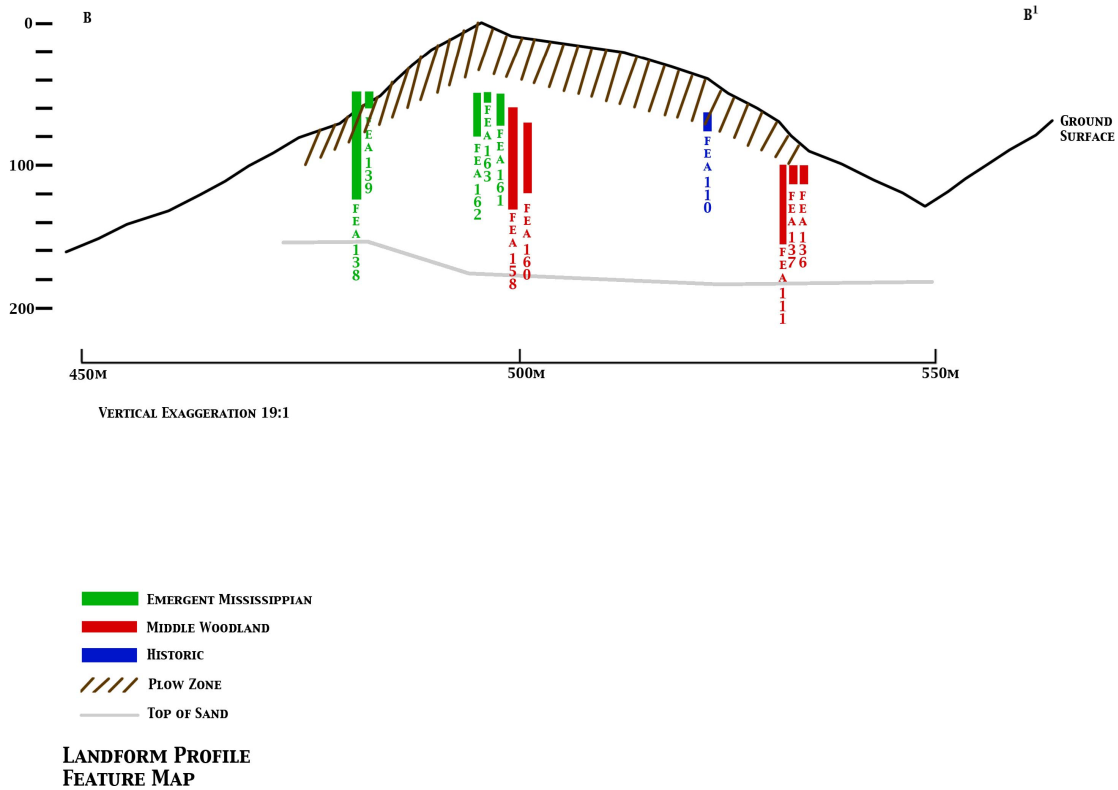

Figure 48. Features plotted by depth, east to west. The vertical measurements are an arbitrary 20 cm. Horizontal measurements are at 50m intervals and recorded as site coordinates. The light gray line shows the top of the sand packages. Features 138 and 139 are located 6 meters behind the profile line.

When the clay percents from across the site are compared it is seen that almost all of them possess a clay bulge that is located at a similar depth below the ground surface. There are areas in the eastern, western, and southern edges of the site where the top of the clay bulges are missing, indicating that a large amount of erosion has occurred. Taking into consideration the erosion at the edges of the site, the topography of the landform as the clay bulges were being formed was very similar to the topography of the site today (Figures 9 and 10).

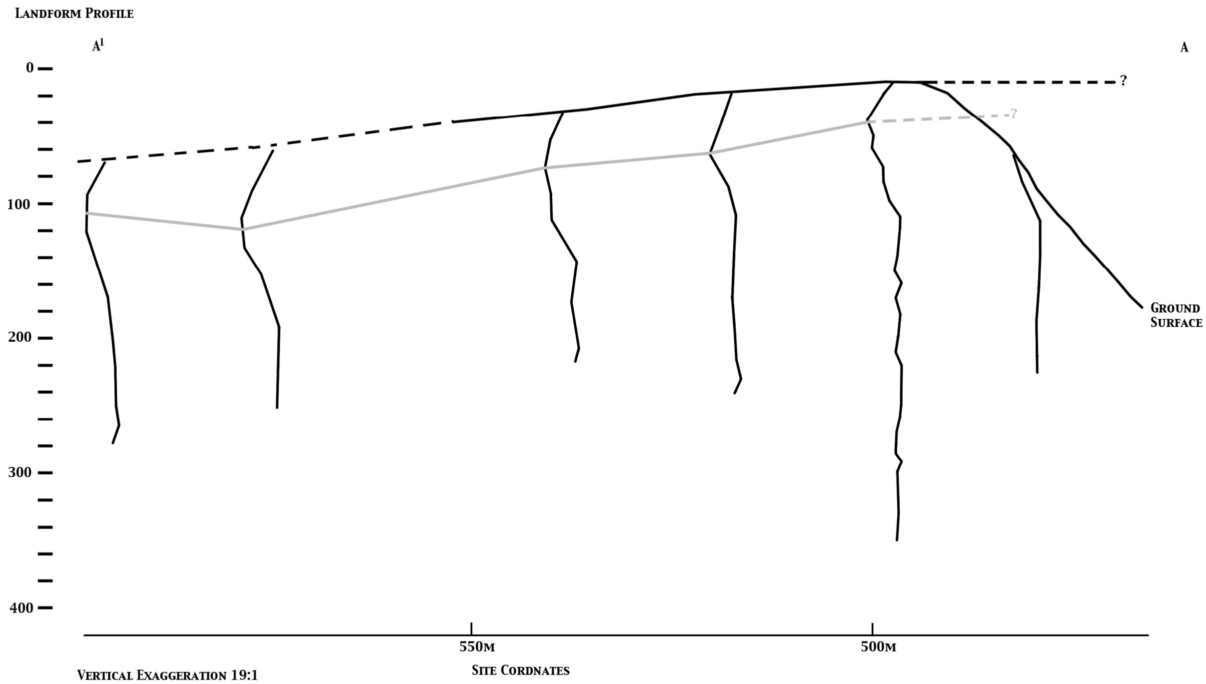

Figure 49. The vertical measurements are an arbitrary 20 cm. Horizontal measurements are at 50m intervals and recorded as site coordinates. The light gray line shows the largest accumulation of clay. The dotted black line represents an unknown distance. The dotted black line and question mark show a possible level for the landform. The dotted grey line shows the possible depth for the clay bulge before modern erosion. Each vertical line represents one soil core. The farther to the left the line is the greater percentage of clay.

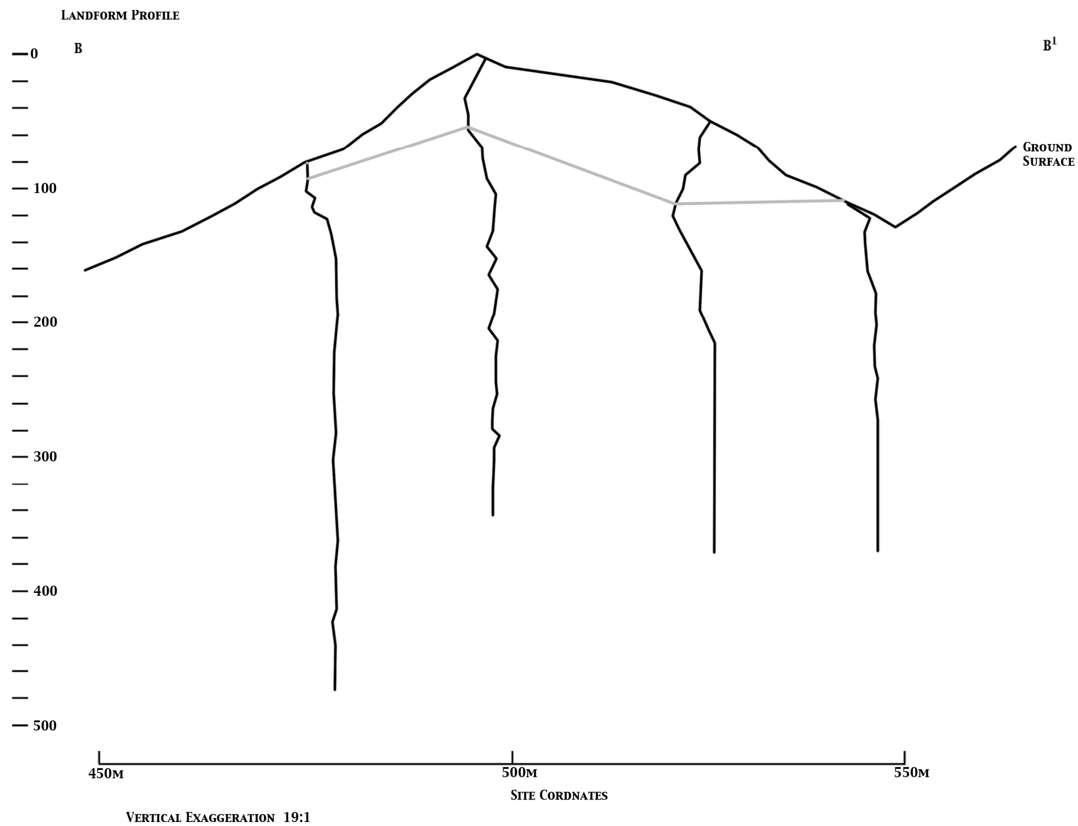

Figure 50. The vertical measurements are an arbitrary 20 cm. Horizontal measurements are at 50m intervals and recorded as site coordinates. The light gray line shows the largest accumulation of clay. Each vertical line represents one soil core. The farther to the left the line is the larger the percent of clay at that elevation.

Aerial Photos are a second tool to consult when trying to determine the evolution of a landform during Historic occupation. To determine the most modern change to a landform aerial photos can provide a decade by decade view of change. Aerial photos can also be used to determine the change in a rivers path or view the meander scares left by the river as its channel shifted. The number of archaeologist turning to aerial photos has risen as they learn the benefits of knowing where a possible site is located or how a landform has changed (Avery 1977).

The aerial photos taken of the Gehring Site show the landform's change in the last 70 years. By outlining the boundaries of the site in the picture from each year it is possible to see the extent of erosion on the landform. The western portion of the site shows the most change. A small drainage ditch has formed in the last 70 years that has eroded a sizable portion of the site. The boundaries all around the site show similar erosion that has decreased the size of the Gehring Site to what is seen today (Figure 11).

1941

2010

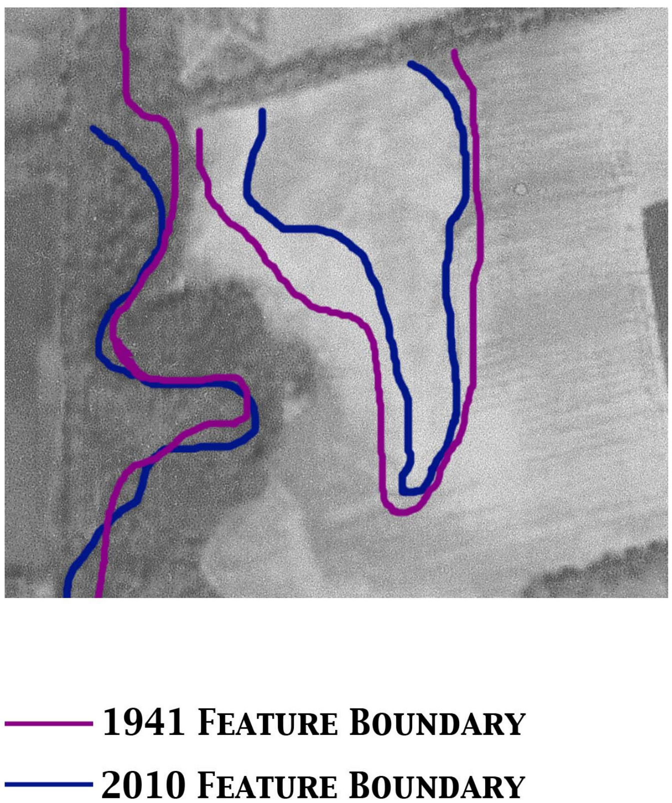

Figure 51. The outline of the landform of the Gehring site in 1941 is outlined in purple. The approximate location of Cahokia Creek from this time is also represented in purple. The outline of the Gehring Site and the course of Cahokia Creek in 2010 are represented in blue. The two outlines were superimposed to offer a view of the change due to weathering.

Conclusions

Several forms of information were gathered to learn how the Gehring Site evolved in the last 10,000 years. Particle size analysis was employed to gather information on the sand layers left by the flooding of the Mississippi during the early Holocene. This process determined that the ground surface was roughly 200 cm lower than the modern ground level and was a large flat surface.

Eight thousand years of over bank deposits from the Mississippi River or Cahokia Creek raised the ground surface by 140 cm. The Middle Woodland features found at the site give clues to the slope of the site. On the southern end of the site features 158 and 160 show the slop in that area is steep. The two features are less than two meters apart and have a 10 cm difference in elevation. The features found at the eastern end of the site are 40 cm lower in elevation than the features found in the southern end. This also represents the erosion the site was just starting to be subjected to. The rate of erosion on the eastern edge is unclear but it can be seen that the erosion is less severe.

Add another 1000 years of time and 10 cm of over bank deposits, the Emergent Mississippian brings new changes to the landform. It is unclear the exact extent of the change to the landscape. The features that could possibly be used to map the amount of erosion are located on a wide flat area of the site. Their location offers no clues to the change of the landscape other than during the Emergent Mississippian there was a wide flat area of land that can still be seen today.

Once the historic period is reached the two ways to determine the change in the landform is through graphing the clay bulges recorded during particle size analysis and studying aerial photos of the Gehring Site. The clay bulges appear as the soil weathers for a period of time transporting clay particles down through the soil. Most of the clay bulges are the same length and distance from the surface. This suggests that at the time of their formation the landform was shaped similar to the landform seen today. Several of the clay bulges, located on the edges of the site, show only a partial clay bulge. The partial clay bulges are due to recent erosion on the site.

To see the modern changes to the Gehring Site aerial photos from different years must be compared. By using a photo of the site taken in 1940 and comparing it to a photo taken in 2010, changes from erosion can be seen. Change in the over all shape of the site can be easily seen. The western section of the site is where the most change due to erosion can be seen. This is due to a drainage ditch that has recently appeared in the western area of the site.

The Gehring Site will continue to change as time passes. By studying the change in the landform geoarchaeologists can gain a better understanding of how fluvial and anthropogenic processes affect the land. If the landform's change is understood then the changes in human occupation over time will be better understood.

Paleoethnobotany at the Gehring Site

by Johanna Guthrie

Abstract

Underneath the developed highways and suburban sprawl of the St. Louis metro east, the American Bottom (the Mississippi River floodplain) contains a wealth of archaeological information. This area was home to a thriving population of Native Americans for thousands of years and, at one point, to the largest city north of Mexico. These Native Americans domesticated several native plant species, and also adopted maize agriculture. The evolution of plant species and the emergence of agriculture is a topic of great interest and study among both ecologists and archaeologists, particularly in the American Bottom and surrounding areas, given that it is a center for independent invention of agriculture. The continued excavation of the Gehring archaeological site (11MS99), located on the SIUE campus, allows for recovery of plant remains left during important cultural time periods of the Native Americans who once occupied the area. The goal of this study is to use the plant remains recovered to reconstruct the plant usage of the individuals who occupied the Gehring site. This has given insight into the ecological evolution of the local environment and cultural evolution of subsistence practices of the humans who inhabited it. This study has shown that there were populations of individuals cultivating the Gehring site as early as 800 B.C. and continuing cultivation and environmental manipulation at least through A.D. 1050.

Introduction

There have been oscillations of Native American populations occupying the major river valleys of this country – Duck Valley, Little Tennessee River Valley, Illinois River Valley, and Central Mississippi Valley – from 3000 B.C. through A.D. 1400 (Johannessen 1988; Smith 1992). During this time cultures flourished, including the emergence of the Cahokian metropolis which has been called the “largest city north of Mexico” (Hall 1980: 402).

Throughout this 4400 year period there were several expressions of cultural complexity. Robert Hall refers to cultural climax as “a focus of cultural intensity within a culture area” (Hall 1980:403). Hall insists that cultural climax within a specific culture is relative to other cultures geographically around it. While acknowledging that there are other viewpoints, given the relative proximity between cultures, Hall suggests that there were two main cultural climaxes within Illinois prehistory (Hall 1980). These are referred to as the Hopewellian Interaction Sphere (B.C. 800 - A.D. 600) (Hall 1980) and the Mississippian (A.D. 1000 – 1400) cultural events by modern scholars (Hall 1980; Smith 1992; Simon and Parker 2006; Fritz 1993). These cultural events have been the subject of much research interest for Illinois prehistorians. Of particular interest to many archaeologists is the subsistence of these dynamically evolving cultures and, more specifically, the development of horticulture and agriculture in these time periods and the environmental implications of these subsistence patterns.

In order to better understand the Hopewellian occupation of the American Bottom, Dr. Julie Zimmermann Holt directed an archaeological field excavation of the Gehring (11MS99) archaeological site on the SIUE campus in the summer of 2009 (Holt and Belknap 2010). In the summer of 2010, Dr. Gregory Vogel directed further excavations of this site. Both excavations revealed Middle Woodland (Hopewellian Interaction Sphere) period features; the 2010 excavation also revealed features dating to the Emergent Mississippian period. My research interest in this site will be focused on the floral (plant) remains recovered. I am interested in reconstructing the floral environment using paleoethnobotanical methods to understand the use of native plant species in subsistence practices by the Hopewellian and Mississippian occupants of the Gehring site.

Paleoethnobotany is the study of human-plant interactions with the purposes of understanding culture and environment (Popper and Hastorf 1988). It is a joint discipline of archaeology and botany with a focus on ecology. Such research can provide invaluable information about a site from both an archaeological and ecological perspective. In archaeology, regardless of the subfield, context is everything (Taylor 1948). Having the most accurate depiction of the context of cultural phenomena in its entirety is essential. Through this study, I acknowledge that the context of human existence and survival is not only sociocultural but largely environmental. While genetics and the evolution thereof are exceptionally important in the causation of human behavior, the environment in which an organism, human or plant, resides shapes the organism's survival. Understanding the environment in which humans reside, as well as how they interact with it, is essential to understanding the entire context of an archaeological site.

Literature Review

The American Bottom is located within a region recognized as one of the few locations around the world to be home to the independent invention and development of agriculture and plant domestication (Smith 1995). This makes this area and surrounding regions a very exciting center of research. Further, thanks largely to CRM excavations during the 1970s and 1980s (during which flotation sampling was standard), there are extensive paleoethnobotanical data corresponding to this area which give extensive ability to researchers to draw conclusions regarding the subsistence of the prehistoric inhabitants in this area. Johannesson's work provides an excellent starting point for analysis of human-plant interaction in this region (Johannesson 1993). Her work was revisited and revised in 2006 by Simon and Parker. They catalogue the plants used by Native Americans from the Late Archaic through the Oneota periods (B.C. 3000 - A.D. 1400) on archaeological sites in the American Bottom (Simon and Parker 2006). Simon and Parker not only focus on plants used as food sources, but also on the types of woody plants used for different purposes, such as kindling, domicile structures, ceremonial structures, and partitions. They chose to follow Scarry's terminology (as I do in my own work) as defined in the introduction to *Foraging and Farming in the Eastern Woodlands*:

> We use *plant husbandry* and *cultivation* to refer to activities such as tending, weeding, breaking the soil, or planting that enhance the natural productivity of plants. *Domestication* is reserved for genotypic changes that make cultivated plants dependent on humans for their continuation (Scarry 1993:6).

Paleoethnobotanical methods allow researchers to identify domesticated seeds from those used merely for cultivation based on seed anatomy and morphology. Using these methods, Simon and Parker suggest that different plants reached different evolutionary degrees on the gradient from cultivated wild plants to domesticated plants. It is clear that different plants were cultivated and domesticated at different rates depending on the location in the American Bottom (Simon and Parker 2006). Simon and Parker conclude that horticultural and agricultural practices begin to emerge in the American Bottom during the Early and Middle Woodland periods, and that most plants used were of native species (Simon and Parker 2006).

Initial domestication of native plants began in the central region of North America around 4500-3500 B.C. during the Late Archaic (Smith 1995; Yarnell 1993). Smith argues that special circumstances of this region as a floodplain pre-adapted certain plants, which were abundant and native to this area, to be easily domesticated by humans. Several native, weedy (competitive in disturbed soils) species were abundant in the floodplain disturbed soils. These plants were easily domesticated given that they would be responsive to anthropogenically disturbed soils and thus easily lend themselves to human management (Smith 1995). From these native plants was domesticated the American Bottom's native starchy seed complex: knotweed (*Polygonum erectum)*, sumpweed (*Iva annua)*, goosefoot (*Chenopodium* spp.), maygrass (*Phalaris carliniana)*, little barley (*Hordeum pusillum)* (Johannessen 1993, 1995; Rindos and Johannessen 2000; Smith 1995; Simon and Parker 2006; Yarnell 1993). There may be some arguments regarding the proper definition of farming, horticulture, and cultivation, but it is generally agreed that the archaeological record clearly shows that inhabitants in this region were actively managing and interacting with native plants in a direct way (Yarnell 1993; Smith 1992; Fritz 1993). Fritz interprets the finds of seed caches of chenopod found in rockshelters as indicative of storage with intent to cultivate. She also argues that these individuals "developed a unique mixed food- producing and foraging system in a temperate climate with abundant but unpredictable and seasonally restricted native plant resources" (Fritz 1993:). ppp

There is a relatively substantial amount of plant-based subsistence data provided by the FAI-270 and subsequent CRM projects. The Middle Woodland (150 B.C.E. – A.D. 300) time period, often associated with the Hopewellian Interaction Sphere, exhibited a decrease in nut usage and an increase in seeds. There is also a notable shift from floodplain wood species to upland oak and hickory, suggesting possible floodplain deforestation, migration to the uplands, cultural preference, or some amalgamation of the three (Simon and Parker 2006; Johannessen 1985). With the Late Woodland (A.D. 300– 800) and the end of the Hopewellian Interaction Sphere, the area showed yet another decrease in nutshell and increase in seed remains. Species of the native starchy complex were the dominant representatives of the seed assemblages, suggesting greater focus on cultigens and their storage. In the Emergent Mississippian (A.D. 800– 1050) and Mississippian (A.D. 1050 – 1350) periods there is the adoption of maize and increase in its prevalence (Johannesson 1993). The mechanism of maize adoption and the circumstances surrounding it have been a source of sharp controversy amongst archaeologists.

Smith suggests that many of the studies of the 1980s had led researchers to "equate [maize] with an agricultural economy in North America" (Smith 1992:203). The academic community then assumed there to be a dichotomy between a maize supported agricultural economy and non-maize non-agricultural settlements. He critiques the characterization of subsistence practices of these periods previously described strictly as either "agriculturalists" or "pre-maize…hunter gatherers" (Smith 1992:203) as an extreme oversimplification in need of revision. In 1994, a report was published in *American Antiquity* announcing that *Zea mays* had been found on the Middle Woodland period Holding Site (11MS118). Using accelerator mass spectrometry (AMS), the maize was dated to between 170 B.C. and A.D. 10. This is the earliest known date for maize to appear in the eastern United States and places maize in the early or middle phase of the Middle Woodland period (Riley et al. 1994). This suggests that maize was available throughout the entire Middle Woodland period. However, there is evidence that most groups of individuals during this time period used no maize, and for those who did, it made no major contribution to diet or economy (Fritz 1993; Yarnell 1993; Smith 1992). Initially, maize was merely added to an already horticultural-semi-agricultural community as just another starchy crop. Once its yield potential was realized, there was likely a focus on maize as a central agricultural product (Rindos and Johannessen 2000).

It has been suggested that maize was adopted in a "mosaic pattern" - from one individual or family to another - by late pre-contact farmers (Holt et al. 2010). The idea of a mosaic adoption pattern is supported by the idea of the Hopewellian Interaction as a "great tradition" rather than a complex social hierarchical structure (Hall 1980) in that it would have been culturally shared for any variety of reasons rather than economically mandated. The idea ofa mosaic adoption is also supported by the typical Middle Woodland dispersed settlement patterns consisting of several small immediate family clusters (Smith 1992), since farming units would not necessarily be closely integrated as a village. Also, since native plant domestication took place at different rates for different species in different communities (Simon and Parker 2006), it is likely that maize was adopted in a similar manner.

Goals and Hypothesis

The purpose of this research is to provide new data to form a cohesive, holistic view of the individuals who occupied the Gehring site as members of the local ecosystem. Observing humans from this viewpoint will give insight into how the environment has evolved and been altered. Understanding the factors which cause change or destruction is necessary for any attempt to restore and prevent further anthropogenic destruction. It is also important for current conservation efforts to have a full understanding of the context of the local environment. It is becoming more and more clear through paleoethnobotanical research that human land management has taken place in this region, and North America as a whole, long before Europeans arrived.

I expect to find plant remains representative of what is considered the 'typical' Hopewellian and Emergent Mississippian subsistence species as demonstrated by previous research and comparative collections (Smith 1992; Smith 1995; Fritz 1993; Johannesson 1984; Yarnell 1993; Scarry 1993; Simon and Parker 2006; Rindos and Johannesson 2000). It is expected that during the Hopewellian Interaction Sphere there will be some use of the native starchy seed complex, dominated by maygrass, accompanied with high levels of hazelnuts. During the Mississippian period, it is expected that nut use will decrease and seed abundance will increase, and maize will appear.

Methods

Flotation methods were used to recover the floral samples. Ten liters of dried sediment were sampled per stratum in each feature when possible. These samples were separated into light fractions and heavy fractions during the initial flotation procedure using a Flote Tech flotation machine. Light fractions were then refloated in a zinc chloride solution with a specific gravity of approximately 1.6. Light fractions were separated into size categories of >2mm and >0.5mm. Those smaller than 2mm were scanned for seed remains and wood. Those greater than 2mm were categorized as wood, seeds, stems, nutshell, squash, maize, or other miscellaneous plant materials. Identifications were made using the comparative collection at the Illinois State Museum under the direction of Marjorie Schroeder. Reference materials used for identification included Martin and Barkley (1961), Steyermark (1963), and Montgomery (1977). Samples have been identified to the lowest taxonomic level possible. Maize was counted in fractional pieces, not entire parts such as cupules, glumes, embryos or kernels. Also, some chenopod seeds were found split in half and each of these was counted individually.

Results

Flotation samples were taken from seven features. Features 111 (test unit M), 158 (test unit R and U), and 160 (test unit S) are grouped together as they are thought to represent a similar temporal range, the Middle Woodland period with Havana Hopewell influences. Features 138 (test unit Q), 161 (test unit T and N), and 162 (test unit N) have been grouped together as they are also thought to represent a similar temporal range, the Emergent Mississippian period. Though only one feature (138) contained artifacts designated to phase (the Edelhardt Phase of the Emergent Mississippian period) with certainty, there was a large Mill Creek lithic hoe recovered from the former structure basin (161), which would correlate with a similar temporal range. Therefore, the data from both of these features will be referred to as Edelhardt for this investigation. It is important to note that the ceramic analysis, which will be further delineated below, is preliminary and warrants further analysis. Features 139 (test unit Q) and 163 (test unit N) are small, indeterminate features with few or no remains recovered from the samples. They will therefore be disregarded in this preliminary analysis, though their data may later become important as their context is made less ambiguous.

Looking at anthropogenic change through time, it is important to highlight the major trends in each time period. For this purpose the most significant data from all samples in all features of each time period have been combined into totals for each time period. Table 1 demonstrates the nut composition of the two temporal assemblages, while figure 2 shows the seed counts. All counts have been standardized per 10L sample.

It should be noted that, while a large number of specimens were indeterminate in the form of either Juglandacea or the broader Juglandacea/*Corylus*, the percentages of hazelnuts and of hickory nuts during the Middle Woodland period are consistent both with the models suggested above and with the comparative data in this region presented by Simon and Parker (Simon and Parker 2006: 222). The relatively small amount of nutshell recovered from the Edelhardt Phase assemblage, as well as the dominance of hickory of those nuts which were recovered, is similarly consistent both with the above models and with data presented by Simon and Parker (Simon and Parker 2006).

Table 1. Nutshell specimens representative of each time period.

Nutshell Taxa	Middle Woodland	% MW	Edelhardt Phase	% EM
Carya spp. (thick-shelled hickory)	61	18.047337	40	40
Corylus americana(hazelnut)	115	34.023669	8	8
Juglandaceae (hickory or black walnut)	57	16.863905	24	24
Juglandaceae/*Corylus* (indeterminate shell type)	11	3.2544379	9	9
Juglans cinerea (butternut)	0	0	0	0
Juglans nigra(black walnut)	55	16.272189	19	19
Quercus spp. (oak acorn)	39	11.538462	0	0
Total nutshell count	338		100	100
Wood	380		867	
Wood:Nut Ratio	0.889473684		0.115340254	

Table 2. Seed specimens representative of each period

Seed Taxa	Middle Woodland	% MW	Edelhardt Phase	% EM
Chenopodium berlandieri (chenopod)	25	14.2045455	253	36.039886
Chenopodium or *Polygonum* (perisperm)	3	1.70454545	3	0.4273504
Galium spp. (bedstraw)	3	1.70454545	1	0.1424501
Hordeum pusillum (wild little barley)	4	2.27272727	2	0.2849003
Panicum sp.	0	0	2	0.2849003
Phalaris caroliniana (maygrass)	39	22.1590909	26	3.7037037
Poaceae (unidentified grass)	2	1.13636364	5	0.7122507
Polygonum erectum (knotweed)	15	8.52272727	92	13.105413
Portulaca oleraceae (purslane)	1	0.56818182	5	0.7122507
Solanum	0	0	10	1.4245014
Strophostyles	1	0.56818182	15	2.1367521
Rhus spp. (sumac)	2	1.13636364	1	0.1424501
Vitis spp. (grape)	0	0	1	0.1424501
Vitaceae (grape, fox grape, etc)	0	0	0	0
unidentifiable seed fragments	81	46.0227273	286	40.740741
Total Seed Count	176		702	
Seed taxa count	95		462	
Zea mays	42			523

Once again, it should be noted that the seed assemblage represented is consistent both with above models and previous data (Simon and Parker 2006). During the Middle Woodland, the Eastern Starchy Seed Complex is the primary representation with maygrass being the dominant species. Also, the Edelhardt Phase data demonstrate a rise in chenopod prevalence accompanied by an increase in seed prevalence overall.

Following are more detailed explanations of the individual features sampled.

Middle Woodland

Feature 111

Feature 111 was approximately 65 cm in width and 60-65 cm in depth. The south section was excavated as one level along the east-west midline of Test Unit M. The first flot was sample taken from the center of the south half (between 60-80 cm bd). The north section of the feature was excavated in 20 cm arbitrary levels. Three flot samples were taken from each level (55, 72, and 93 cm bd). There were two zones in the feature. The uppermost zone (zone 1) was a dark brown (7.5YR3/2) silty clay loam and spanned approximately 30-60 cmbd. The bottom zone (zone 2) was a dark brown (7.5YR3/2) silty clay which was mixed with subsoil and approximately 60-95 cm bd.

Due to the small counts and the manner of bisection, the sample data were combined to represent the entire feature. The first flot was taken from the center of the feature, while the remaining three were taken from along the edge of the feature. Major differences were noticed in the counts and abundance of the level four sample. This appears to be because the fourth level may have been excavated beyond the feature boundaries and into the surrounding non-feature subsoil.

Thick shelled hickory (*Carya* thick spp.) and hazelnut (*Corylus americana*.) and acorn (*Quercus* spp.) nutshells were dominant in the >2 mm fraction. *Carya* spp. (both thick and thin shelled hickory), *Corylus* spp., *Juglandaceae* (hickory or black walnut), *Juglandaceae-Corylus*, *Quercus* spp., *J. nigra,* wood, bark, and grass stems were all present in the 0.5-2 mm fraction of the flot samples. Maygrass and chenopod were the most dominant seeds, though knotweed was also well represented. *Zea mays* kernels and cupules were also present in both zones in the 0.5-2 mm fractions.

The feature yielded ceramic fragments which were designated as a mix of both Marion Thick and Havanna ware by Dr. John Kelly. Though ceramics and lithic artifacts yielded from the feature have yet to be fully analyzed and the ceramics were intermixed between the zones, feature 111 is designated as multi-use Early and Middle Woodland for the purpose of this paper.

Feature 158

Feature 158 was approximately 102 cm in diameter and 64 cm deep. The west half was excavated as one level and a flot sample was taken from the center this first level (approx. 40 cm bd). The east half was excavated in 20 cm arbitrary levels (three in total) , and flot samples were taken from center of each level (no precise cm bd was recorded for the final three samples). The feature did not exhibit stratification but was a uniform dark redish brown (5YR 4/2) clay.

The nutshells identified were dominated by hazelnuts, though thick shelled hickory nuts were also prominent. The identified seeds were dominated by maygrass, though little barley was also well represented. Thick shelled hickory, hazelnut, black walnut, and indeterminate nut types as well as wood and bark were present in the 0.5-2 mm fractions of the feature samples. No maize was recovered from this feature.

The ceramics recovered yielded a single grog tempered, Naples stamped sherd and a single Hopewellian zoned stamped sherd. The majority of the sherds were grog tempered and the pit has been preliminarily designated as Middle Woodland (possibly as late as Holding Phase) by Dr. John Kelly.

Feature 160

Feature 160 was approximately 112 cm in diameter and 60 cm deep. The feature was bisected and the south half was excavated as one level. Flot samples were taken from the top (50 cmbd) and bottom (73 cm bd) of the first level. The north half was excavated in 20 cm arbitrary levels. Flot samples were taken from the center of each level in the north half, three samples in total. The feature exhibited a mixing of four zones, the nature of which is indeterminate. The uppermost zone (zone 1) was a dark brown (10YR 3/3) silty clay loam; the middle zone (zone 2) was a silty clay loam with a mix of 40% dark brown (10YR 3/3) and 60% dark yellowish brown (10YR 4/4); there were two pocket zones (zone 4) which were very dark grayish brown (10YR 3/2) silty clay loam; the final and dominant zone (zone 3) was a silty clay loam with a mixture of 60% dark brown (10YR 3/3) and 40% dark yellowish brown (10YR 4/4).

The identified nutshells were mostly hazelnuts with some thick shelled hickory in the >2 mm fraction of the samples. Thick shelled hickory, hazelnut, black walnut, and indeterminate nut types as well as wood, bark, *Cucuritaceae, Strophostyles* and nutmeats were identified in the 0.5-2 mm fraction of the samples. The seeds recovered were dominated by maygrass, though both chenopod and knotweed were also well represented. Five *Zea mays* kernels, three cupules, and one glume were also present.

The ceramic artifacts recovered from this feature were a mix of grit and grog tempered, cord marked sherds. There was one shell tempered, red slip Mississippian sherd recovered. The feature has been preliminarily designated as mostly Middle Woodland mixed with Emergent Mississippian by Dr. John Kelly.

Emergent Mississippian

Feature 138

Feature 138 was approximately 144 cm in width at top, 140 cm in width at bottom, and 70 cm deep. The east half was excavated as one level and two flot samples were taken, one from 55 and one from 66 cm bd. The west half was excavated in 20 cm arbitrary levels. Flot samples were taken from the center each level of the west half, four in total. The feature was uniform and exhibited no stratification. No Munsell was recorded.

The identified nutshells >2mm were dominantly thick shelled hickory or either thick shelled hickory or black walnut. Thick shelled hickory, hazelnut, black walnut, and indeterminate nut types as well as wood, bark and grass stems were all present in the 0.5-2 mm fractions. Identified seeds were dominated by chenopod, though knotweed was also well represented. At least 365 *Zea mays* kernels were present in the feature, and an uncounted (due to extreme fragmentation) amount of glumes and cupules were also present.

The ceramic sample recovered from this feature was the largest and contained more diagnostics than any other features. Sherds included several grit and grog tempered Madison County shale sherds, grit and grog tempered smoothed over cord marked sherds, one Monk's Mound red sherd, several shell tempered sherds, and a red-slip inside shell tempered sherd. Dr. John Kelly classified the majority of the sherds as belonging to the Edelhardt Phase in the Emergent Mississippian period. Several hoe flakes were also recovered both from feature 138 and from test unit Q.

Feature 161

Feature 161 has been identified as the floor of some type of structure by Dr. Gregory Vogel. Only the north-east corner of the structure was excavated. The excavated portion was approximately 120 cm in length, while the side running north-west with a positive slope through test unit N and T was approximately 250 cm. The east half of the excavated portion was located in test unit N and was sampled arbitrarily from the excavated portion in the unit at approximately 66 cm bd. The second flot sample was taken from test unit T arbitrarily from approximately 66 cm bd as well. The feature was a uniform brown (10YR 4.5/3) with faint discontinuous ped linings of very dark grayish brown (10YR 3/2).

Of the nutshells identified from the >2 mm fraction, 26% were hazelnut while the majority were either indeterminate or either hickory or black walnut. There was also one *Vitis* sp. seed recovered from the >2 mm fraction of the second sample (bag 6) and recorded in the seed table. The seeds recovered from the 0.5-2 mm fractions were predominantly (93%) chenopod. One *Zea mays* kernel was present as well as one cupule and a large amount of uncounted (due to fragmentation) glume pieces.

Very few ceramic artifacts were recovered from this feature. However, they were preliminarily designated as Emergent Mississippian by Dr. John Kelly. Also, there was a Mill Creek stone hoe recovered from the feature, which is also diagnostic of the late Emergent Mississippian and early Mississippian Periods.

Feature 162

Feature 162 was a possible post hole, located at north-east corner of Feature 161. It was dark with large amounts of charcoal flecked throughout. A large chunk of wood (dimensions 10x10c2.5 cm) surrounded by limestone cobbles/pebbles was excavated at approximately 40-45 cm bd. A flot sample was taken directly above(41-47 cm bd) and directly below the wood chunk (47-52 cm bd). The piece of wood, while appearing well preserved on the exterior, was fully rotten through and appears to be at least two separate pieces. Further analysis is underway and proper curation is in progress.

No nutshells >2 mm were present. Hazelnut, black walnut, and indeterminate nut types as well as wood, and bark were present in the 0.5-2 mm fraction. Of the seeds identified, chenopod dominated, though little barley, maygrass, and bedstraw (*Gallium* sp.) were also present.

Though neither ceramic nor lithic artifacts were recovered from this feature, it is considered to be strongly linked to feature 161, particularly since it is likely that it is a post hole and the wood sample recovered was part of the structure. Therefore, this feature will likewise be regarded as Emergent Mississippian.

Undated Features

Feature 139

Feature 139 was a small feature, approximately 28 cm in diameter and 6 cm deep. A single flot sample was taken from the center of feature. It was a very dark brown (10YR 2/2), but no further soil description was given. This feature yielded one specimen of charred wood and two unidentified seeds. There were neither ceramic nor lithic artifacts recovered.

Feature 163

This feature was partially excavated along the east-west boundary of test unit N. It was approximately 24 cm in width and 26 cm in length. A single flot was taken from west half (50 cmbd). The feature fill was primarily yellowish dark brown (10YR ¾) mixed with light brownish gray (10YR 6/2).

Nutshells present were mostly thick shelled hickory. Thick shelled hickory, black walnut, and indeterminate nut types as well as wood and bark were present in the 0.5-2 mm fraction. Only knotweed and maygrass were present in the 0.5-2 mm fraction. No other artifacts were recovered from this feature and therefore it is temporally ambiguous.

I. Discussion

The overall trends of the data support all of the proposed models and are consistent with other data from this region (Simon and Parker 2006; Johannennson 1984). As expected, hazelnuts were prominent during the Middle Woodland (assumedly as an indication of Hopewell occupation) as were hickory nuts. Also, all four of the Eastern Starchy Seed Complex were present in the Middle Woodland features. The relative seed prevalence also was much higher in the Emergent Mississippian period as expected. Maize was found in Emergent Mississippian context, as expected, but also in Middle Woodland context, which will be further discussed below.

The percentage of hazelnuts present (34%) in the Middle Woodland period features suggests that the occupation of the site coincided with the Hopewellian Interaction Sphere (Simon and Parker 2006: 223). The 2009 excavation, which was dated to the Holding phase of the Middle Woodland, showed a slightly smaller prominence of hazelnut (17%), though this is not inconsistent in comparison with other assemblages. The nature of hazel as a shrubby plant which thrives in disturbed areas suggests that the areas around the Gehring site were disturbed in some manner. While the individuals using the site may have begun to clear the adjacent upland areas for the purpose of more cultivation grounds (Koldehoff and Galloy 2006), they may also have been conducting some type of scheduled burning (Simon and Parker 2006; Killburn and Brugam 2010). Hazelnuts grow well in open forest understory with low density tree populations, a vegetation community maintained by occasional burning. This implies, then, that burning occurred in these forest communities on a semi-regular basis. It may be possible that burning was conducted for the purposes of hunting and the growth of hazel and other shrubby plants may have merely been incidental. However, this seems unlikely. It would appear that if, during the Holding and subsequent phases of the Middle Woodland, populations were growing and continuously harvesting their resources (such as deforesting the adjacent uplands), then the hazel consumption would have spiked in the Early and Middle Middle Woodland and then begun to taper off. However, for several hundred years there is a consistent and similar proportion of hazelnuts found in nut assemblages (Simon and Parker 2006: 222-225). This suggests that the habitat closely surrounding the Gehring site remained somewhat stable throughout the Middle Woodland occupation of this site. It is unlikely that the occupants would continue to forage farther and farther away from the site if the forest edge, where hazel would be most prominent, were in constant recession away from the site as a consequence of wood harvest. One could argue that hazel consumption could have had some unknown cultural importance since it was maintained for several hundred years, but this is merely conjecture. It is clear though that some type of forest management was occurring during this time, perhaps in the form of burning (Killburn and Brugam 2010; Simon and Parker 2006). It is unclear, however, what was the precise purpose of this burning. This management may or may not have been specifically for hazelnut management but for small mammal habitat as hunting grounds.

It is also unclear why the hazelnut consumption was not continued into the later Emergent Mississippian periods. It is possible that the cultural evolution from the dispersed Hopewellian Interaction Sphere, with no state level organization, to the later Emergent Mississippian and Mississippian periods, in which Cahokia acted as a centralized organizing unit, caused hazelnut consumption and forest management to become obsolete practices. Rising populations would force the occupants to require more wood and more ample food sources. Given that subsistence is conservative (Binford 1968), it would be unlikely that the occupants would expend effort to rely so heavily on a particular nut type (which would not be domesticated easily) while the local floodplain weeds, and eventually maize, were so readily available.

Overall, the nut consumption clearly decreases through time, indicating a decrease in foraging and wild food source consumption. The number of nutshells present in the Middle Woodland/Hopewell occupation is over three times higher than the Edelhardt occupation, though more charcoal in total was recovered from the Edelhardt occupation features. This may be because only one pit feature of the Edelhardt was sampled, while three pit features of the Middle Woodland/Hopewellian occupation were sampled. However, buds and small stem bark appeared in the Edelhardt occupation, suggesting the use of younger woods which may coincide with deforestation and receding forest edge away from the site. This is consistent with an increase in cultivation and dependence on cultivated crops as well as an abandonment of forest management and maintenance practices.

It can be safely assumed that the Middle Woodland/Hopewellian occupants of the site were engaging in some type of cultivation and horticultural practice. The Eastern Starchy Seed Complex was present in all features and, as expected, maygrass did in fact dominate (Simon and Parker 2006). Four times as many seeds were recovered from the Edelhardt occupation than the Middle Woodland/Hopewellian. Chenopod dominated the native seed assemblage. This may be an indicator of monocrop agricultural systems rather than the small garden complex of the earlier periods. The seed coats of the chenopod recovered were not measured, therefore it is unknown what percentage, if any, of these chenopod were the domesticate subspecies.

Maize was present in three of the four pit features, as well as the former structure. The extremely high number of maize fragments present in the Edelhardt component, simultaneous with the high number of chenopod, is consistent with the idea that maize was added during the Emergent Mississippian as a supplement to the native seeds, not as a replacement (Rindos and Johannesson 2003). The predominance of both chenopod and maize in the Edelhardt pit feature suggests monocrop agriculture, as suggested above. However, the presence of maize in two Middle Woodland/Hopewellian features is surprising, particularly since one feature (111) contains Marion Thick sherds. It may be that this pit was reused over time. Also, the small amount of maize recovered from 111 may indicate that it is an invasive contaminant due to site reuse and plow disturbance. Regardless, the context, and corresponding lithic and ceramic artifacts, of the recovered maize requires further analysis to determine the likelihood that this maize is in fact in good Middle Woodland/Hopewellian context. If this is determined, this maize should be AMS radiocarbon dated. Were this maize in fact dated to the Middle Woodland, it would be monumental in that it would be only the second Middle Woodland site in the American Bottom region to have maize (Simon and Parker 2006; Riley et al. 1994).

It should be noted that there were no oily seeds recovered (sunflower), nor any significant amount of cucurbit. The 2009 excavation yielded some sunflower, but very few. Therefore, given the small sample size for each temporal range, as well as the small amount of the site which has been excavated, it is possible that there are several confounding factors which have yet to be seen.

The data indicate that the Gehring site has been periodically used for cultivation both in the Hopewellian cultural expression during the Middle Woodland and the Emergent Mississippian periods. The presence of the native starchy seed complex as well as evidence of stone tools used for cultivation in both the presence and absence of maize suggests that the intentional plant production, assumedly as a food source, took place at this site from possibly as early as 500 B.C. Maize production also occurred at this site alongside the native cultigens and increased through time.

This data is preliminary given that more analysis must be done with the artifact assemblage yielded by the 2010 excavation, and still much more work is in progress. The botanical remains of this site will continue to be further analyzed in light of more analysis. It would be beneficial to AMS date the maize recovered from Middle Woodland features to determine a more specific period for the appearance of maize at this site. Full analysis will also be completed on the wood remains recovered from the 2010 excavation, which was beyond the scope of this project. These data, in conjunction with the archaeobotanical data recovered in 2009, will aid in further botanical reconstruction of the successional communities of the surrounding areas and assessing their change through time. In the summer of 2011, further excavation will take place at the Gehring site to recover additional samples of botanical materials from the former structure and surrounding area. Further statistical analysis is also currently in progress, as well as more in depth analysis of the data.

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Appendix A: Test Unit and Feature Artifact Counts

Table 6. Feature Artifact Counts.

Feature	Chert	Sherds	FCR	FCR (g)	Bone	Burned earth (g)	Other
111	191	51	3	99	52	89	1 scraper; 1 hematite
116	1					0.11	
120	1	1					
127	1						
128	1						
136				1	34		
137	7	1	1	34		1.3	
138	172	580	16	531		751	2 hoe flakes
144	1	1					
154						1	
156		1					
157	1						
158	55	95	7	153	37	69	1 blade
160	152	108	17	1034	81	108	1 blade; 1 mica; mud dauber nest
161	69	201	6	96	10	11	1 hoe
162	16	4	4	15.58	7	420	

Table 7. Test Unit Artifact Counts.

Test Unit	Level	Type	Count	Weight
J	1	bone	1	0.38
J	1	burned earth	53	61.92
J	1	fcr	8	370.7
J	1	historic	72	108
J	1	lithic	162	140.12
J	1	other (blade)	1	2.9
J	1	other (hoe flake)	1	0.28
J	1	other (shell)	1	1.78
J	1	pottery	138	176.62
J	2	burned earth	9	25
J	2	fcr	3	9.58
J	2	historic	2	2.54
J	2	lithic	22	52.18
J	2	pottery	5	8.72
J	3	burned earth	4	103.4
J	3	historic	4	10.35
J	3	lithic	3	10.4
J	3	pottery	6	5.81
J	5	pottery	1	4.2
K	1	bone	12	2.38
K	1	burned earth	79	68.91
K	1	fcr	3	210.55

K	1	historic	249	285
K	1	lithic	89	58.33
K	1	pottery	55	66.36
K	2	bone	5	1.47
K	2	burned earth	35	21.04
K	2	historic	82	76.24
K	2	lithic	44	19.74
K	2	pottery	21	31.57
K	3	bone	1	0.17
K	3	burned earth	5	101
K	3	fcr	1	1.82
K	3	historic	4	4.96
K	3	lithic	8	3.08
K	5	burned earth	2	0.28
K	5	lithic	1	0.12
K	5	pottery	2	0.93
K	7	historic	2	1.04
L	1	bone	10	2.72
L	1	burned earth	198	118.5
L	1	fcr	3	93.25
L	1	historic	9	42
L	1	lithic	502	400.02
L	1	other (galena)	2	4.61
L	1	pottery	143	274.1
L	2	burned earth	11	7.41
L	2	fcr	1	14.85
L	2	historic	2	4.1
L	2	lithic	59	58.78
L	2	pottery	11	22.19
L	3	lithic	8	5.81
L	3	pottery	3	18.1
L	4	burned earth	6	13.98
L	4	fcr	1	6.75
L	4	lithic	4	3.4
L	4	pottery	10	31.63
M	1	bone	16	5.94
M	1	burned earth	221	150.49
M	1	fcr	51	510.94
M	1	historic	71	157
M	1	lithic	565	430.54
M	1	other (biface)	3	42.93
M	1	other (galena)	1	7.85
M	1	other (hoe flake)	5	4.42
M	1	pottery	480	630.53
M	2	bone	1	0.34
M	2	lithic	17	8.46
M	2	pottery	14	13.2
M	3	bone	5	0.93

M	3	lithic	11	3.14
M	3	pottery	3	2.86
N	1	bone	4	1.93
N	1	burned earth	18	16.16
N	1	fcr	28	472.94
N	1	lithic	294	213.15
N	1	other (copper)	1	1.05
N	1	other (galena)	1	2.02
N	1	other (hoe flake)	2	0.67
N	1	pottery	485	572.94
N	2	bone	4	1.09
N	2	burned earth	12	48.69
N	2	fcr	5	167.96
N	2	historic	1	0.47
N	2	lithic	71	56.54
N	2	pottery	132	294.65
O	1	bone	1	1.58
O	1	burned earth	234	127.38
O	1	fcr	51	489.8
O	1	lithic	209	194.04
O	1	other (bead)	1	0.41
O	1	pottery	339	350
O	2	bone	1	0.24
O	2	burned earth	29	17.06
O	2	fcr	41	117
O	2	historic	73	66.84
O	2	lithic	86	52.74
O	2	other (hoe flake)	1	0.13
O	2	pottery	190	209.2
O	3	bone	12	2.64
O	3	burned earth	116	80
O	3	fcr	12	53.1
O	3	lithic	150	79.1
O	3	other (blade)	1	1.93
O	3	other (copper)	1	0.4
O	3	other (hoe flake)	1	0.1
O	3	pottery	155	219.5
O	5	burned earth	1	4.1
O	5	pottery	6	5.3
O	6	pottery	1	1.8
P	1	bone	14	4.89
P	1	burned earth	5	3.27
P	1	fcr	25	468.05
P	1	historic	189	371.16
P	1	lithic	218	178.17
P	1	other (biface)	1	10.5
P	1	pottery	340	326.69
P	2	bone	4	2.05

P	2	burned earth	8	10.77
P	2	fcr	15	417.94
P	2	historic	105	455.3
P	2	lithic	138	118.79
P	2	pottery	283	253.4
P	3	bone	3	1
P	3	burned earth	1	3.04
P	3	fcr	6	221.06
P	3	historic	34	64.14
P	3	lithic	73	55.82
P	3	pottery	108	144.98
Q	1	bone	18	5.21
Q	1	burned earth	36	40.67
Q	1	fcr	22	306.55
Q	1	historic	373	587.69
Q	1	lithic	185	137.55
Q	1	other (hoe flake)	3	3.27
Q	1	pottery	293	463.92
Q	2	bone	2	0.19
Q	2	burned earth	3	93
Q	2	fcr	3	27.53
Q	2	historic	2	0.44
Q	2	lithic	11	3.47
R	1	bone	5	1.07
R	1	burned earth	51	32.54
R	1	fcr	10	353.6
R	1	historic	7	32.62
R	1	lithic	165	108.37
R	1	other (blade)	1	1.34
R	1	other (galena)	1	1.55
R	1	pottery	224	334.5
R	2	burned earth	23	29.19
R	2	lithic	48	55.2
R	2	pottery	109	260.66
S	1	bone	2	1.38
S	1	burned earth	41	26.14
S	1	fcr	31	124.87
S	1	lithic	92	91.95
S	1	pottery	141	197.34
S	2	bone	1	0.68
S	2	burned earth	14	12.64
S	2	fcr	8	93.92
S	2	lithic	17	27.75
S	2	pottery	26	39.89
T	1	bone	4	1.7
T	1	burned earth	62	31.1
T	1	fcr	73	1740.9
T	1	historic	93	105.49

T	1	lithic	250	183.51
T	1	pottery	503	596.79
T	2	bone	3	0.8
T	2	burned earth	27	14.2
T	2	fcr	13	40.69
T	2	lithic	45	25.18
T	2	other (hoe flake)	1	1.37
T	2	pottery	57	147.69
U	1	bone	2	0.73
U	1	burned earth	56	48.7
U	1	fcr	15	63.05
U	1	historic	7	4.18
U	1	lithic	51	30.94
U	1	pottery	104	117.63