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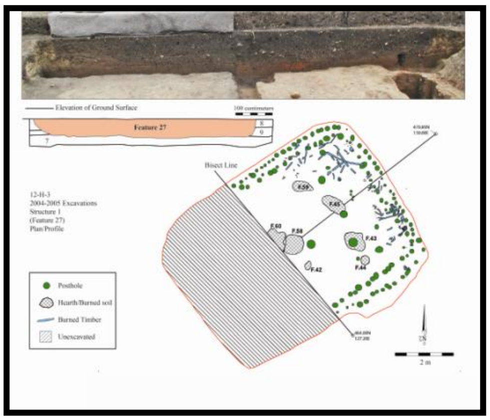

Indiana Department of Natural Resources
Division of Historic Preservation
and Archaeology (DHPA)

Indiana Department of Natural Resources

INDIANA DIVISION OF HISTORIC PRESERVATION AND ARCHAEOLOGY

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Indiana Department of Natural Resources

INDIANA DIVISION OF HISTORIC PRESERVATION AND ARCHAEOLOGY

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Notes: The projects discussed in several of the articles, noted below with "**HPF**," received federal financial assistance from the Historic Preservation Fund Program for the identification, protection, and/or rehabilitation of historic properties and cultural resources in the State of Indiana.

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<u>Reports / Features</u>

INTRODUCTION

Per state statute (Indiana Code 14-21-1-12), one of the duties of the Division of Historic Preservation and Archaeology (DHPA) is to develop a program of archaeological research and development, including the publication of information regarding archaeological resources in the state. This journal is one of the ways the DHPA addresses that mandate. Also, Indiana Code 14-21-1-13 states that the Division may conduct a program of education in archaeology. Indiana's cultural resources management plans have also listed educating the public about Indiana's prehistoric and historic Native American cultures and identifying, and studying Native American, African-American, and other ethnic and cultural heritage resources, as ways to accomplish several preservation goals. The variety of archaeological sites in Indiana is wide-ranging and impressive. Virtually all of the cultural groups prehistorically and historically in Indiana are represented archaeologically in one way or another.

We are pleased to offer this digital document containing articles on a broad range of archaeological and anthropological topics. Archaeology is happening regularly in Indiana, and all of these articles provide the reader with various insights into many important sites, theories, and projects. To view previous volumes of *Indiana Archaeology*, go to http://www.in.gov/dnr/historic/3676.htm.

For those who may not be familiar with some archaeological terms, a helpful glossary of some of these general terms is included in the back of this journal. To also aid the non-archaeologist reader, a general overview of prehistoric time periods may be found at the end of this volume. Additional archaeological outreach documents, including *Early Peoples of Indiana*, may be accessed at www.IN.gov/dnr/historic. For those readers who may not be familiar with the authors and editors of the volume, biographical information is provided. Feel free to access our Indiana archaeological travel itinerary (http://www.in.gov/dnr/historic/files/travelsarchaeo.pdf) if you would wish to visit an archaeological site. The DHPA also urges you to participate in the annual Indiana Archaeology Month in September. If you have an interest in providing a voluntary financial donation to contribute to archaeology in our state, please consider the Archeology Preservation Trust Fund (http://www.in.gov/dnr/historic/5897.htm).

This volume of *Indiana Archaeology* is dedicated to the memory of Mark Cantin who passed away on January 19, 2012. He was Assistant Director of the Archaeology & Quaternary Research Laboratory, a unit of the Department of Earth & Environmental Systems at Indiana State University (ISU). Mark, our resident Indiana chert expert, will be truly missed by his many colleagues and friends in the archaeological community in Indiana and many other states.

-- JRJ, ALJ

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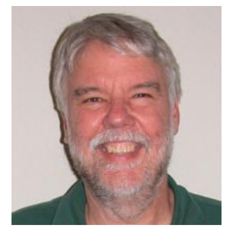

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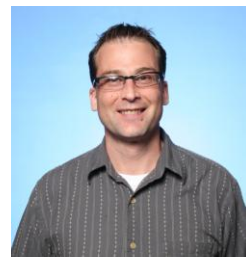

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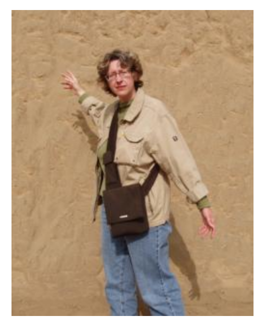

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RECENT ARCHAEOLOGICAL INVESTIGATIONS OF THE FALLS MISSISSIPPIAN COMPLEX ELLINGSWORTH AND SMITH-SUTTON SITES

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Falls Mississippian is Mississippian, but that does not imply that it was identical in adaptation to other kinds of Mississippian. (Jon Muller 1986:250)

[*Editors' note: To be consistent, site numbers will be written, for example, as 12W245, exceptions being when county abbreviations with an "l" before the numbers, such as Allen (Al) or Clark (Cl). Counties such as the latter will be designated with a space between the 12 and the county abbreviation and a space between the county abbreviation and the site number, such as 12 Cl 127 in the below article. This is done so that the reader understands that the site is from Clark County (Cl), and the number of the site is 127, rather than 1127.*]

The archaeological importance and complexity of the Falls of the Ohio region has been noted and periodically studied beginning at least as early as the late nineteenth century with the explorations of geologists (Cox 1874, 1875). Later, E. Y. Guernsey conducted extensive survey of the area in the early 1930s but only generated three short lectures to the Indiana Academy of Sciences (1937, 1939, 1942). The locations of some of his detailed records are currently unknown but at least some of his correspondence is available. He recognized not only the importance but also the cultural complexity of the area and encouraged further study of the region, stating,

> In the foregoing we have attempted to discuss as briefly as possible the several complications presented in the region. It must be admitted that the entire Ohio Falls region is decidedly important archaeologically. It must appear obvious that our own survey has accomplished little more than to suggest the desirability of further investigation [Guernsey 1939:32].

A nearly 40-year hiatus of work followed Guernsey's admonishment. Though neither conducted archaeological work in the Falls area, both Griffin (1978:551) and Kellar (1973:59) both stated that there once existed a significant concentration of sites at the Falls serving as the easternmost Mississippian expression along the Ohio River. Janzen (1971) conducted limited archaeological work at the Prather site, resulting in the partial exposure of a Mississippian structure and the first radiometric date for this period (Figure 7, Janzen 1971).

Muller's (1986) environmentally focused book concentrated on the Angel and Kincaid sites but referenced Falls Mississippian along with other regional complexes. Based on the lack of a major mound center, he questioned whether the sites at the Falls actually fit the definition of Mississippian, calling them a type of "backwoods Mississippian" (Muller 1986:250). He conjectured it was more likely Falls sites were small, widely separated towns that were culturally in transition as a gradient of Fort Ancient cultures to the immediate northeast (Collins 1979; Muller 1986). However, he retracts these statements by acknowledging that what he viewed as marginal Mississippian was possibly the result of poor data and actually a small amount of attractive settlement areas from the Mississippian point of view (Muller 1986:250). Others

(Sieber and Ottesen 1989) disagreed with Muller's assessment and believed that Mississippian at the Falls is fully Mississippian. So, what is Falls Mississippian? Is it Mississippian or a combination of something more? How long was the Falls area occupied and are all sites in the Falls area contemporaneous?

What Constitutes Mississippian?

Mississippian is a term used to describe prehistoric groups that lived in ranked societies with a highly organized subsistence economy and a chiefdom-based political economy. Within Mississippian chiefdom polities, settlement hierarchies were established. Settlements included dispersed farmsteads and hamlets, small villages made up of several hamlets, and dense population concentrations nucleated in and around large villages and towns, or mound centers. Individuals of elite rank are believed to have exerted some level of control over the production and distribution of surplus subsistence goods. Mississippian food economies were centered on maize agriculture, hunting, and fishing.

Large earthen mounds were constructed at larger Mississippian sites, not only for burials as in previous periods, but also to serve as platforms for ceremonial buildings. The Angel Mounds site located east of Evansville, Indiana, is an example of a large Mississippian (Angel phase) town with monumental (platform mound) architecture (Black 1967). Within the Mississippian tradition, triangular projectile points (Justice 1987) and pecked and ground stone tools continued to dominate the lithic tool assemblage. Bone, hematite, catlinite, fluorite, and coal were also commonly worked into a variety of tool forms. The abundance of ceramics at Mississippian sites reflects their importance within an agricultural food economy. A large variety of ceramic vessel forms, both utilitarian and ceremonial, were produced, including salt pans, storage and cooking jars, bottles, beakers, plates, bowls, and a range of human and animal effigy forms. Mississippian ceramics were most often tempered with crushed freshwater mussel shell. In comparison to Late Woodland pottery, a much smaller percentage of decorated ceramics (e.g., negative painted, incised, punctated) is represented in Mississippian assemblages. However, this pattern does not necessarily represent a decrease in the decoration and/or ceremonial use of pottery but more likely reflects an increase in the sheer quantity of plain, utilitarian ceramics manufactured and used in Mississippian households.

An extensive, highly organized exchange network linked Mississippian societies of Indiana with those as far west as Oklahoma and as far southeast as Georgia and Florida. It has long been assumed that elites controlled the trade and distribution of exotic raw materials and finished goods, especially those items that are believed to have served as displays of prestige. However, the recovery of such luxury or "display" items from a wide range of site types and contexts suggests that distribution and use of these goods was not exclusively controlled by elites (Muller 1997:46).

The easternmost Mississippian presence in Indiana and Kentucky, labeled either the Prather or Falls Mississippian Complex (Munson et al. 2006), was centered on the Falls of the Ohio region in the rapidly expanding modern Louisville metropolitan area. The Prather Complex represents the northeastern limit of Mississippian occupation in the Ohio Valley and is also situated near the southwestern limit of the Fort Ancient culture. Sites in this area with shell-tempered pottery and stone box graves were reported in the nineteenth century, and in 1934 E. Y.

Guernsey (1939, 1942) confirmed the presence of Mississippian components at seven Falls area sites in Clark County, Indiana: the Devil's Backbone on a steep bluff overlooking the river; Prather (12 Cl 4); Willey (12 Cl 16); Spangler-Koons (12 Cl 701); Clark's Point/Collins (12 Cl 1); Newcomb (12 Cl 2, Bader 2004); and Elrod, or Kelly, which is a continuation of Newcomb. Limited excavations at Prather were undertaken by Guernsey (1942) and later by David Janzen (1971), and more extensive investigations recently have established that Prather was a Mississippian mound center settlement with four mounds surrounding a central plaza, a habitation zone, and an encircling palisade (Munson and McCullough 2004; Munson et al. 2006). Smaller upland sites or camps with shell-tempered pottery and triangular points in Clark (Wells et al. 2008) and neighboring Floyd counties have also been reported. On the Kentucky side of the river, several small camps have been reported (Granger et al. 1981:170), while more extensive habitation sites have been investigated recently, including upland sites (15JF650/651 and 15JF671) southeast of Louisville (Bader 2003:28-33), Shippingport (15JF702) on an island at the Falls (French 2010: II; Keeney and Hemberger 2003), and Eva Bandman (15JF668) on a terrace margin in downtown Louisville (Henderson 2004). Additionally, Joseph Granger (Bader 2003:18) has plotted a large Mississippian mound center (15JF95), based on nineteenth-century maps and reports, and located in what is today downtown Louisville. This substantial Mississippian presence on the periphery of the Mississippian world remains little known, and the relationships among the sites in the Falls area and their connection to other Mississippian centers farther south and west is poorly understood. The Falls Mississippian sites are marked as much by diversity as hierarchy in settlement structure, type, and location; the frequency of upland habitation sites is uncommon although not unknown in Mississippian settlements of similar size; and evidence of trade with other Mississippian centers is limited (Munson et al. 2006:15-17).

Archaeological research and cultural compliance work over the last decade have begun to answer some of these questions while complicating others. Excavations at Prather (Munson and McCullough 2004; Munson et al. 2006), Ellingsworth (Arnold 2010; Bader and Stallings 2003), Newcomb (Bader 2004) and Smith-Sutton (Wells et al. 2008) in Clark County, Indiana, and Eva Bandman (Henderson 2004) and Shippingport (French 2010:II) in Jefferson County, Kentucky, are all contributing to the advancement in understanding the complexity of the Falls Mississippian complex. This article will discuss research conducted at the Ellingsworth and Smith-Sutton sites over the past four years.

Geophysics and Mississippian Settlement Patterns

Lewis et al. (1998:11) defined a Mississippian town as having the key elements of a plaza, mound, palisade, and gates. Green and Munson (1978:309-310; French 2010:11) created a classification for southwestern Indiana Mississippian sites, with the common determining factors focusing on site size (acreage), presence of mounds, occupation intensity, site activities, and presence of midden and structures. The resulting settlement hierarchy divided sites into six types: town, large village, small village, hamlet, farmstead, and camp. The classes below large villages were moundless villages, small hamlets made up of clustered homesteads, and individual outlying homesteads dotting the landscape in and around larger towns (Maxham 2000:338; Pauketat 1989:290). Applying Green and Munson's attributes to the Falls Mississippian sites works as a starting point for settlement patterning.

Smith-Sutton Site (12 Cl 130)

Geophysical survey and limited archaeological excavation data indicate Smith-Sutton was a traditional Mississippian domestic village, with an ephemeral screening wall and a residential perimeter surrounding a central plaza. Smith-Sutton is at least 1.2 ha in size, with midden deposits over 40 cm thick in some areas within the village. Deposits were likely much deeper prior to modern plowing. At least 33 linear magnetic anomalies corresponding to architectural shapes were identified by Graham in the 2010 geophysical data (Figure 1). The houses, in combination with the flora and fauna recovered from features, indicate a period of intensive occupation. Smith-Sutton has all of the attributes of a large village, except that it lacks a mound.

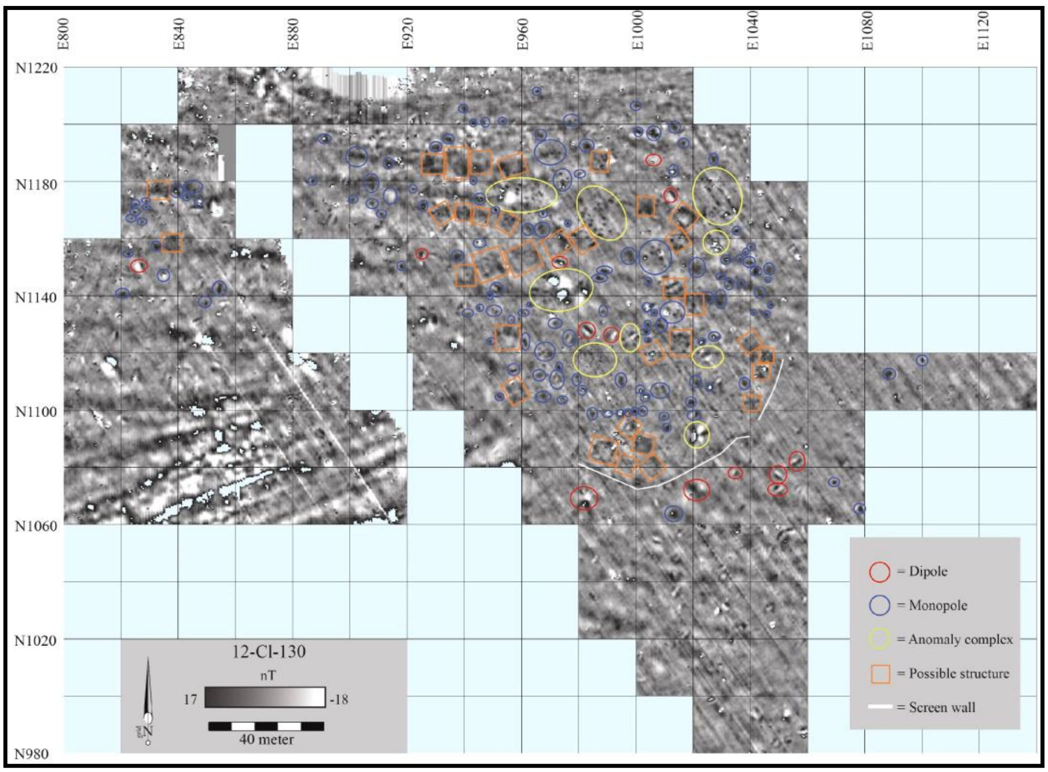

Figure 1. Magnetic gradient composite at the Smith-Sutton site (12 Cl 130) showing anomalies (Arnold and Graham 2011:Figure 3.6).

Lewis et al. (1998) stated the plaza was framed by the other key elements of the town design, like mounds. However, to date, Smith-Sutton is lacking a mound. While it is not visible in the archaeological data collected thus far, it is possible a mound existed but has been considerably deflated due to erosion and decades of plowing.

During the 2007 and 2010 field seasons, 107 20 x 20 m blocks were surveyed using both gradiometry and resistivity across the project area at the Smith-Sutton site. Thirteen blocks were later assigned to site 12 Cl 942 and are discussed in the Farmsteads and Outlying Areas section below. A total of 15 blocks was completed using resistivity. The survey grid extended 240 m north-south and 340 m east-west at the greatest dimension and was located on a mostly open agricultural field with varying topography (Figure 2). Unfortunately a fence and tree line extended through a portion of the grid preventing survey of that area.

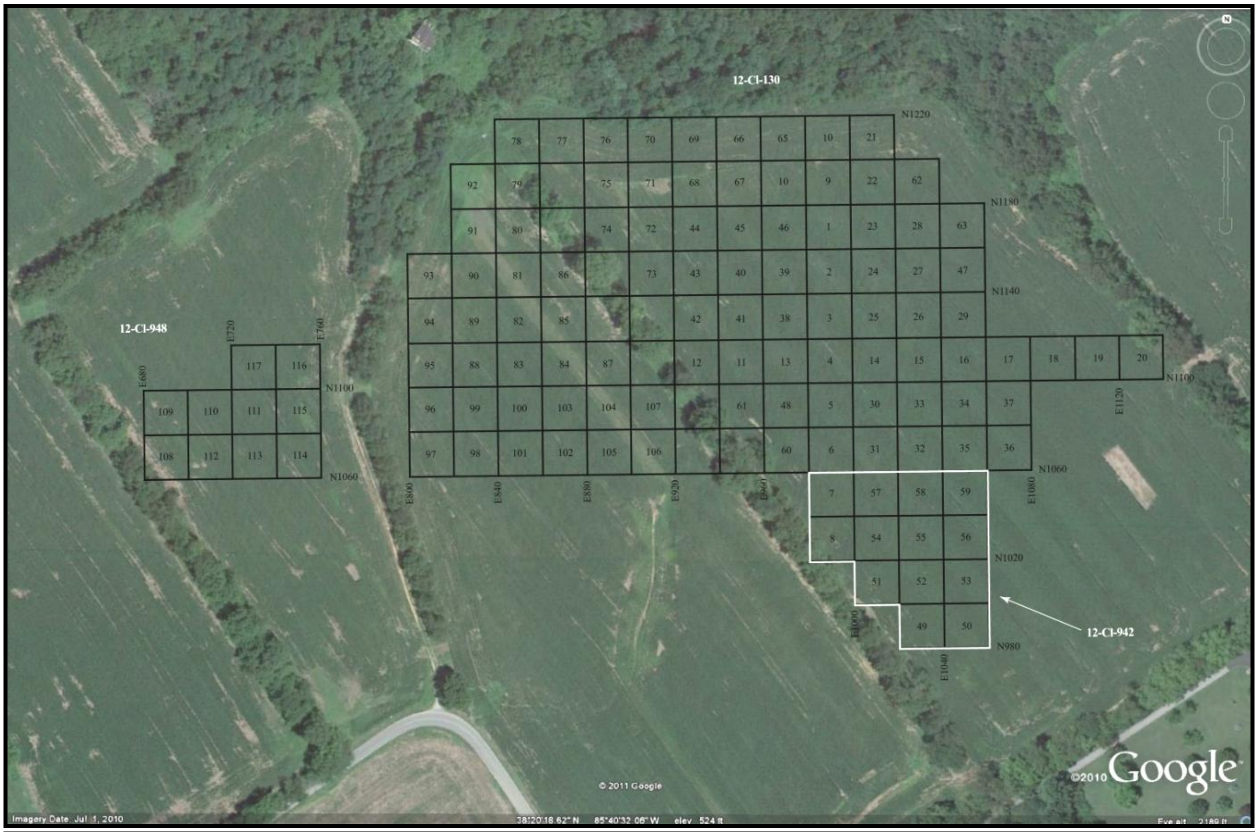

Figure 2. Grid map overlaid on an aerial photograph showing geophysical survey blocks over the Smith-Sutton site (12 Cl 130) project area (Arnold and Graham 2011:Figure 3.4).

Features and Houses. Numerous regular to irregular anomalies are highlighted throughout the project area. Most varied in intensity and shape. The majority of the anomalies ranged between 1.0 and 2.0 m in diameter, while some were much larger. These anomalies are interpreted as being culturally derived and may represent pit features, structures, hearths, earth ovens, or buried materials, such as pieces of fire-cracked rock, or pottery. Several large anomalies with rectangular outlines surrounded by linear patterns of magnetic positive and negative values are apparent within the central portion of the project area. These linear outlines are often caused by the placement of wall trenches associated with structures. Other possible structures are identified as large anomalies with either magnetic positive or negative rectangles or squares. Many of these large anomalies or structure complexes have smaller circular monopoles within or outside their boundaries, suggesting associated pit features, hearths, or burned areas. Although structure anomalies varied in size and shape, the majority were rectangular and measured approximately 8 m by 6 m (Figures 1 and 3).

A concentration of anomalies and anomaly clusters, including 33 possible structures, is located between N1200 to N1060 and E960 to E1060, suggesting prevalent cultural activity and possible site limits (Figures 4 and 5). Interestingly, the structures within the possible site boundary are aligned in rows or clusters, or are isolated, possibly surrounding a central plaza (Figure 4). Whether these clusters result from hierarchical divisions or are possibly familial or clan groups are currently not understood.

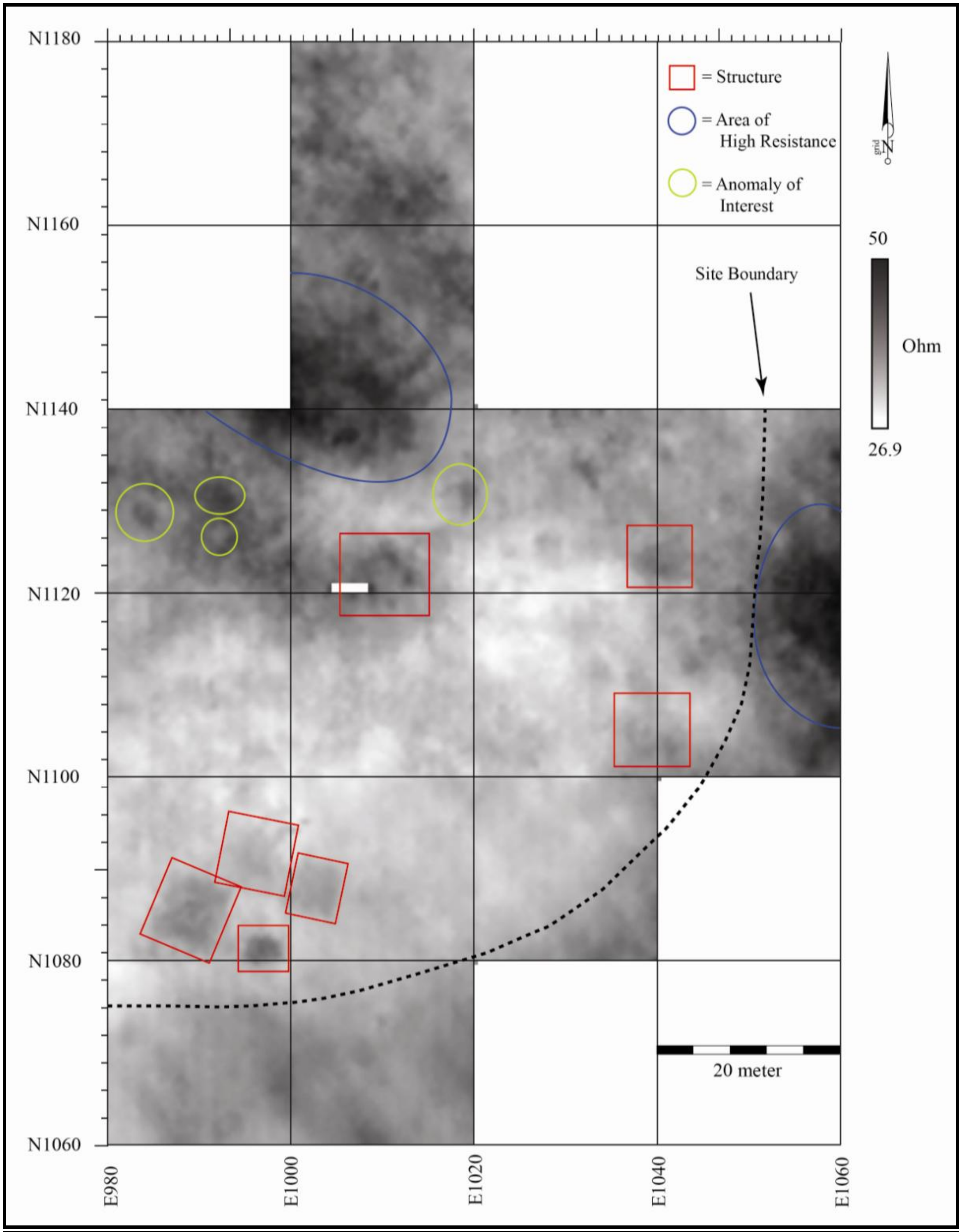

Figure 3. Resistivity composite over a portion of the Smith-Sutton site (12 Cl 130) showing anomalies (Arnold and Graham 2011:Figure 3.8).

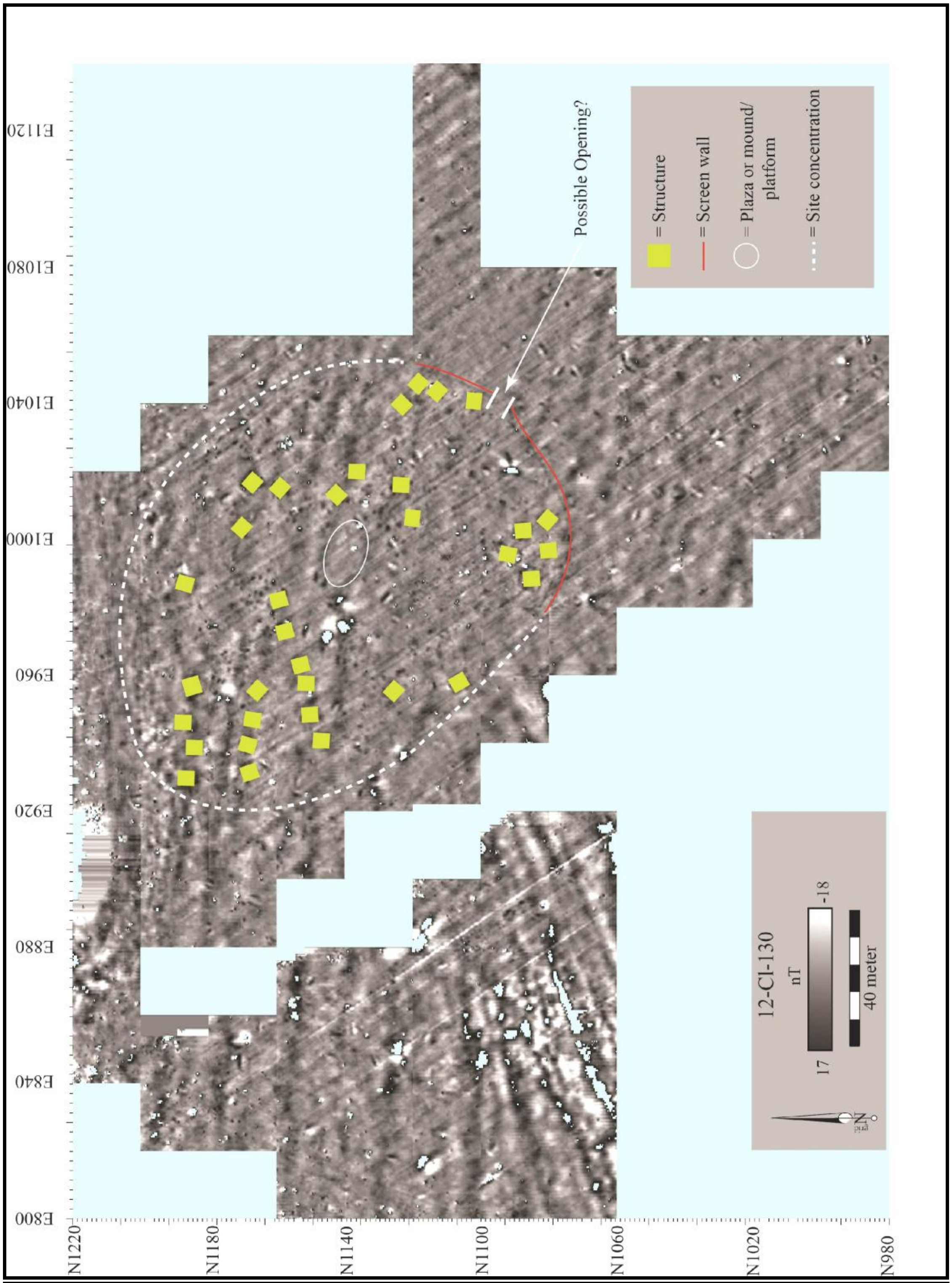

Figure 4. Magnetic gradient composite showing possible boundaries and structures at 12 Cl 130 (Arnold and Graham 2011:Figure 3.16).

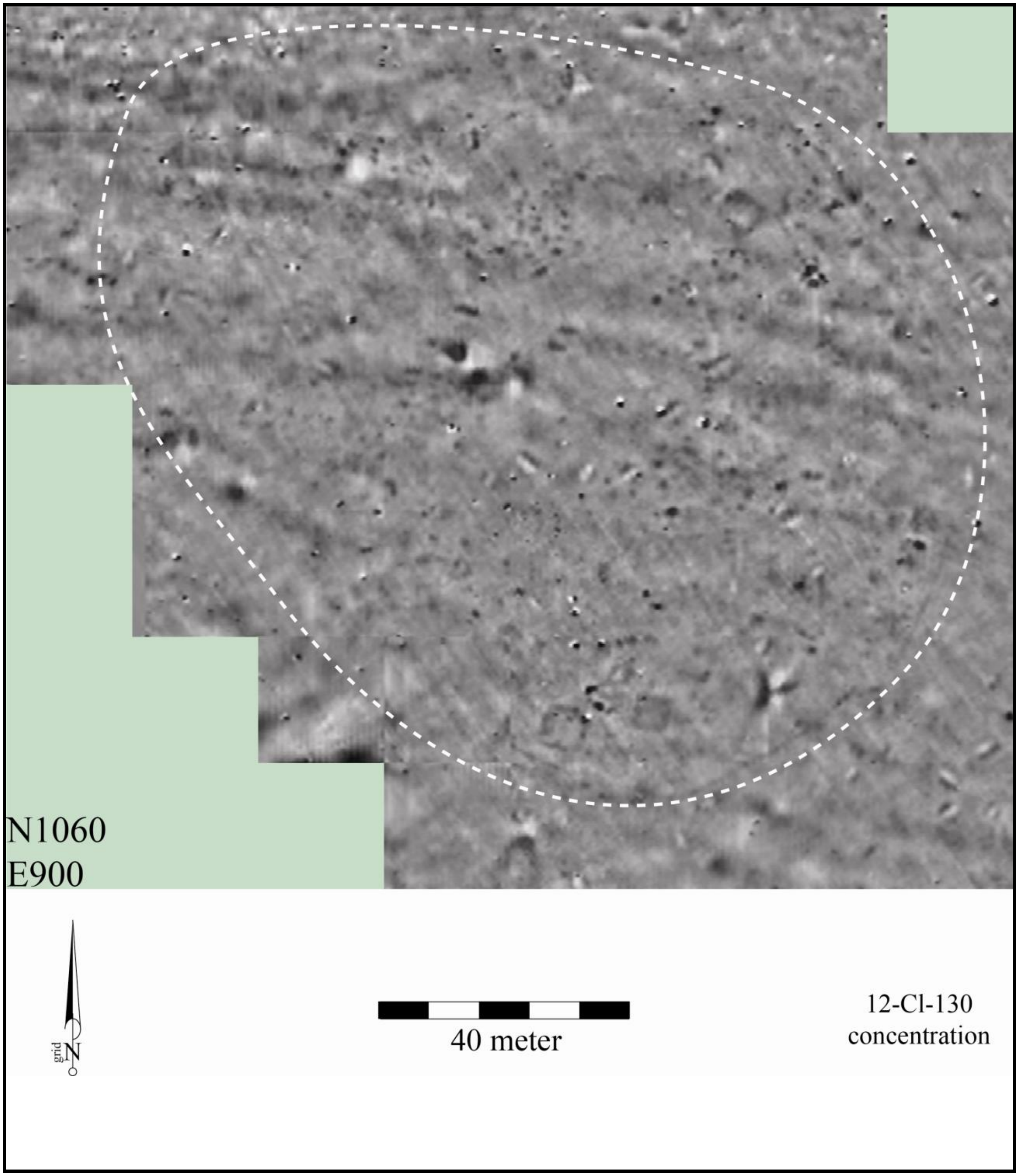

Figure 5. Close-up view of 12 Cl 130 concentration (Arnold and Graham 2011:Figure 3.17).

Screening Wall or Palisade. Several patterns identified within the survey area over the Smith-Sutton site provide useful data about site layout. Previous investigations (Wells et al. 2008) of subsurface test probes and geophysical survey provided preliminary information that indicated numerous anomalies, several features, and a high density of cultural material near the center of the grid. Test excavations in 2007 revealed a shallow trench with postholes signifying a possible wall trench or screen wall (Wells et al. 2008).

A long, linear anomaly is apparent near the central portion of the grid and extends from the southwest corner of Grid 5 at N1080, E980 and arcs to the northern edge of Grid 16 at N1120, E1050 (Figure 1). The anomaly is defined by a linear pattern of positive values. The linear anomaly is interpreted as a screen wall that likely functioned as a barrier or southern boundary of the site. It is possible that the wall continued north, but it was not clearly evident in the gradiometer data. An approximate 4 m gap or break in the line in Grids 33 and 34 may denote an opening near the southeast corner (Figure 6).

Plaza and Possible Mound. An oval to circular area near the center of the site may delineate an open central plaza or possibly a mound or platform. A portion of this area was detected as a high-resistance anomaly that contrasted sharply with other anomalies within the resistivity data. When compared to the gradiometer data-set, the same area was devoid of anomalies and surrounded by numerous possible structures and features (Figure 4). The 2007 shovel probe (Wells et al. 2008) artifact densities lend further evidence of a central plaza; probes through the area exhibited a distinct decrease in artifact quantities.

Additionally, the resistivity survey served as a complement to the gradiometer survey, also detecting numerous anomalies. Two very large anomalies with high-resistance signatures are located in the northern and eastern portion of the grid. One is located outside of the possible boundary of the site and may be caused by naturally occurring variances in the soil. The second is located near the northwest portion of the survey grid in an area with surrounding anomalies and may represent a large feature or unique space within the site.

Ellingsworth Site (12 Cl 127)

Ellingsworth was a moundless small village made up of several homesteads surrounding a small plaza. The crucial differences between Smith-Sutton and Ellingsworth are the size of habitation and the presence of a palisade. Based on geophysical data collected in 2010, Ellingsworth does not appear to have a palisade fence like Smith-Sutton, though one may be present but not visible in the geophysical data. This remains to be confirmed through limited excavations. At least two anomalies interpreted as structures were archaeologically investigated by limited test excavations in 2010 and confirmed as structures (Arnold 2010). Additional Phase Ia survey conducted this past year (Arnold and Graham 2011) further confirmed the locus of occupation and revealed the presence of a small plaza, approximately 30 m in diameter, based on piece-plotted ceramics collected during the field reconnaissance. Further analysis using kernel density analysis in ArcGIS 9.2 confirmed the presence of a plaza by displaying a ring of ceramics with a nearly vacant interior. The two structure anomalies investigated by IPFW-AS in 2010 plotted in areas devoid of pottery, possibly indicating deeper house basins where artifacts are not so readily brought to the surface by agricultural tillage.

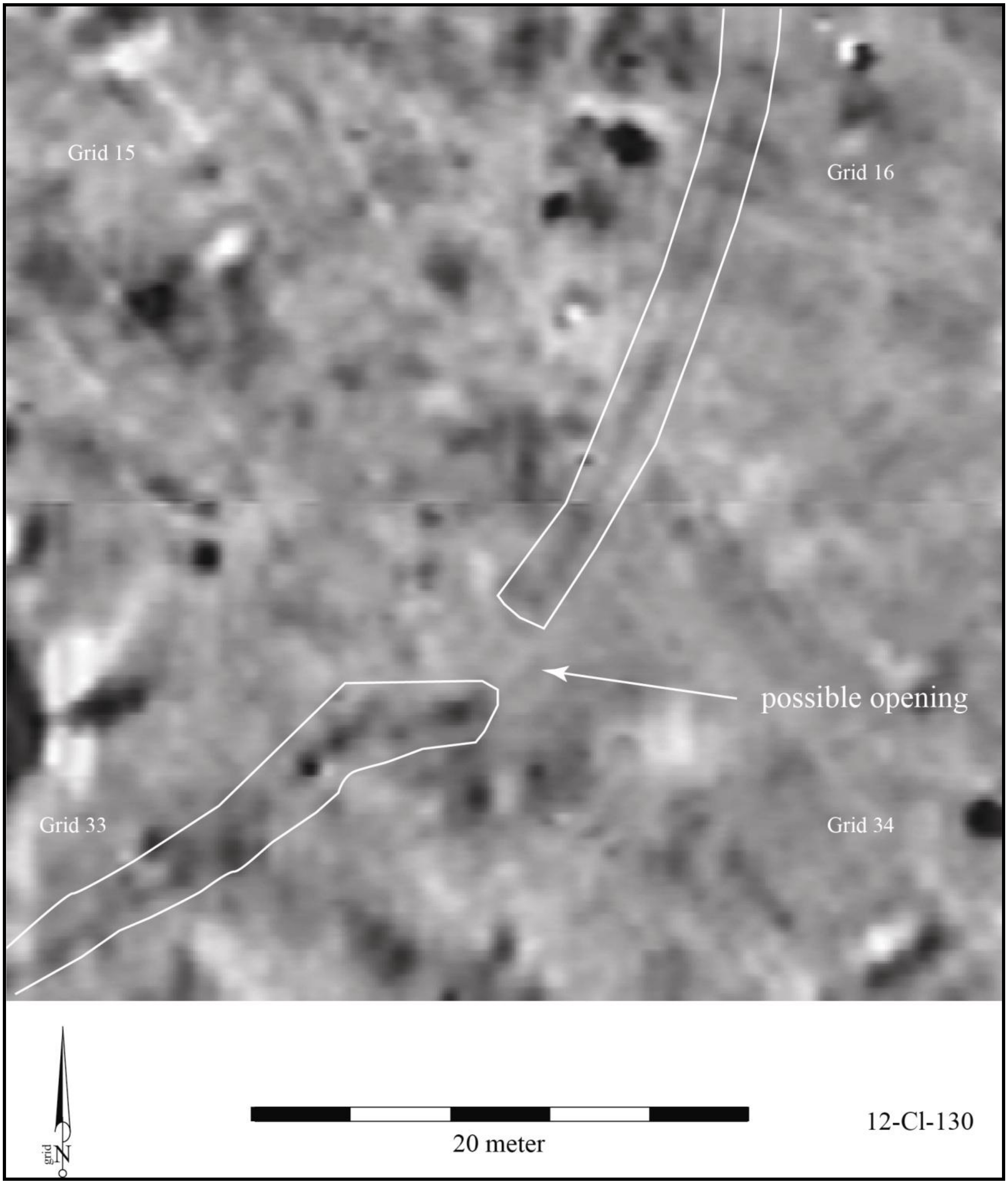

Figure 6. Close-up view of the possible opening in the screen wall near the southeast portion of 12 Cl 130 (Arnold and Graham 2011:Figure 3.15).

Farmsteads and Outlying Areas

At least six additional presumed Mississippian structures were identified in the geophysical data on three separate sites in the immediate vicinity of Smith-Sutton (Figure 1). Three structures were recognized on 12 Cl 942 south of 12 Cl 130 and outside, or beyond, the screening wall. Two potential structures were identified on the western edge of 12 Cl 130 away from the habitation core. Finally, one structure was identified in four geophysical grids collected north of Utica-Sellersburg Road and site 12 Cl 127, and was designated as 12 Cl 127 extension. Should any or all of these be directly associated with the Smith-Sutton and Ellingsworth sites respectively or are they to be treated as separate entities, or perhaps designated as outlying farmsteads?

Lewis et al. (1998:18) question the application of boundaries of Mississippian settlements stating that archaeologists normally bound these areas based on ditches, palisades, or natural terrain features. If so, does the screening fence around Smith-Sutton delineate the site boundary or should the cluster of structures to the south on 12 Cl 942 be included as part of the larger village? It is proposed that there is a direct correlation between the structures on Smith-Sutton and 12 Cl 942.

The situation is likely similar for the 12 Cl 127 extension located to the north. Modern features of terrain and infrastructure have most likely influenced current site boundaries, limiting the northern extent of the Ellingsworth site to the current road's edge. There appears to be a plaza present in the area surveyed but the full extent of the site is probably larger than currently documented. For example, Mississippian artifacts are routinely encountered in the housing subdivision garden plots north of the area (Perry Harrell, personal communication 2010). Taking these points into consideration, it is likely that the boundaries of interaction for Smith-Sutton and Ellingsworth do not end at the screening wall or modern site boundaries but should be extended to include these entities.

Additionally, a small site, 12 Cl 943, having Late Prehistoric artifacts was encountered during 2010 fieldwork (Arnold 2010). It is located southeast of the Smith-Sutton site. Artifacts included two Late Woodland/Mississippian triangular projectile points and 26 ceramic sherds, only one that was shell-tempered. So what is site 12 Cl 943? Is this a Fort Ancient household living in close proximity to a Mississippian village and is it contemporaneous with Smith-Sutton and Ellingsworth? While site 12 Cl 943 is not fully defined, it plays an important role in the Falls Mississippian context.

In order to understand Mississippian settlement patterns, all types of sites must be investigated, from the top-tiered mound center down to the bottom-tiered individual homestead. There are many sites surrounding Smith-Sutton in close proximity. Defining each site and identifying its relationship to Smith-Sutton will, in turn, provide more information about Smith-Sutton's place within the greater context of Falls Mississippian. The noticeable lack of identified mound centers in the area may necessitate a bottom-up approach through study of farmsteads and habitation sites.

House Structures

Pauketat and Alt (2005:214) suggested that not only the product of physical construction but the construction process itself is a manifestation of cultural identity, and examining construction method is a means of examining cultural change. Below-ground construction design elements like postholes, wall trenches, daub, and burned remains provide clues to above-ground architectural style. To date, Falls Mississippian exhibits characteristics of both flexed pole and rigid post Mississippian architecture, but it has variability as well.

Flexed pole architecture utilized small, long poles closely set together, usually in a wall trench. The poles were bent over and weaved together to create a dome or curved roof (Lacquement 2007:49). Flexed pole construction did not necessarily require wall trenches; however, wall trenches were far more efficient in time and labor costs than individually set poles. It is far easier to dig a trench than set individual poles. Wall trenches also offered more control and consistency in the construction process. Moreover, walls could have been prefabricated on the ground and placed into the trench as a unit (Reed 2007:20-21). Wall trenches were most advantageous when walls were framed and placed in the trench as a unit. During Blanton and Gresham's 1990 flexed pole reconstruction at the Etowah site in Georgia they found that the pre-fabricated walls preformed beautifully and were highly efficient for erection in wall trenches (Blanton and Gresham 2007:42). The traditional open-cornered wall trench perfectly met the needs of flexed pole architecture. The open corners allowed for the poles to bend inward and be woven together (Reed 2007:23). The flexed pole frame was sufficiently sturdy without corner posts because the basket weave provided stability (Blanton and Gresham 2007:42).

In contrast to flexed pole architecture, the rigid post or hipped or gabled roof architecture had large posts widely spaced apart with no wall trench. Lacquement noted in west-central Alabama that the widely spaced postholes were not found in wall trenches. Furthermore, there was a strong correlation between the increase in post size diameter and the increase in distance between posts (Brennan 2007:79; Lacquement 2007:57). The larger rigid post construction often had internal posts indicative of roof supports and large quantities of daub (Lacquement 2007:65). In Mesoamerica, hipped or gabled roof houses had heavy post construction averaging 20 cm in dia. The posts were widely spaced and set individually (Reed 2007:14). In comparison, Brennan's work at Kincaid site excluded any pole greater than 7.6 cm in diameter as being flexed pole because it could not feasibly be bent by hand (Brennan 2007:Table 5.1).

Of course, there was also evidence of simultaneous or transitional style usage (Reed 2007:17). Smith-Sutton, Ellingsworth, and Shippingport had houses that appear to be a conglomerate of wall trench and individual post construction. While this variability from the two dominant architectural styles is a small sample, it warrants discussion as it may help to shed light on the Falls Mississippian expression (French 2010:110).

At Smith-Sutton, Block 1 had definitive wall trenches visible in plan, but when the wall trenches were bisected and viewed in profile, the posts extended well below the trench, and were farther apart than traditional wall trench posts. In Block 1, the average diameter of the six confirmed posts was 12.5 cm. The posts in the northeast wall trench were spaced approximately 40-50 cm apart. The northeast wall trench was approximately 15-20 cm deep. However, posthole 1-7 extended 10 cm beyond the bottom of the trench and posthole 1-8 extended 5 cm beyond (Arnold and Graham 2011:Figure 4.15). The northwest wall trench ranged from 7.5 to 35 cm deep, but posthole 1-6 extended an additional 22.5 cm below (Arnold and Graham 2011:Figure 4.11), and posthole 1-9 extended approximately 35 cm below.

Also worth noting is the large quantity of burned soil recovered from 2010 investigations at Smith-Sutton. Over seven pounds of burned soil was identified as either daub or waste clay. Nearly all of this material was recovered from Blocks 1, 2, and 4, with the majority of material coming from Block 2. Much of the burned daub from Block 4 was exposed and left in place, so the amount of daub present was actually greater than recovered (Arnold and Graham 2011:156). As discovered in reconstruction efforts, daub rapidly failed on the flexed pole houses because of exposure and required a covering or eave for protection (Blanton and Gresham 2007:45-46; Sullivan 2007:130-131). A hipped or gabled roof was designed with an eave.

At Ellingsworth, the wall trenches of Anomaly 1 were traditional Mississippian open corner construction. However, when viewed in profile, the southeast wall trench appeared to be irregular in shape; the confirmed posts did not extend below the bottom of the trench, but were much wider than posts normally associated with wall trench construction, averaging 17.3 cm in dia. The larger posts were spaced approximately 10-15 cm apart (Arnold 2010:98-99).

For comparison, the walls of House 3 at the Shippingport site included both wall trenches and individually set posts. The smaller posts associated with the wall trenches averaged 12.5 cm in diameter, while the larger individually set posts averaged 20 cm in diameter and were spaced at intervals of 40 to 50 cm apart (French 2010:85-86).

In some Falls Mississippian structures the wall trenches appear stereotypical in plan, but the posts associated with the trenches appear to be individually set. Why? French (2010:86) proposed that House 3 survived several rebuilding episodes, with the earliest construction method being the wall trenches, and the individually set posts later intruding into the trenches. The switch from wall trench construction to individual post construction may suggest a change in the appearance of the above-ground structure the posts were supporting. Lacquement proposed a chronology in west-central Alabama that transitioned from small individual poles to wall trenches to large post construction. The latest change may have happened rapidly, resulting in large posts immediately superimposed on wall trenches (Lacquement 2007:64). There are several possible explanations for a change from one style to another: a change in climate, an increase in population, a decrease in available materials (Lacquement 2007:70-71), a change in seasonal usage, or a change in permanence. These may not have happened independent of each other, but as combinations or episodes.

The switch in construction method could also be capturing, in physical form, cultural identity at the Falls of the Ohio. As Pauketat and Alt proposed, construction methods were localized and repeated practices, but a changing community may have been motivated to try or adopt alternative construction methods (Pauketat and Alt 2005:217). The adoption of wall trench construction in the outlying, rural areas of Cahokia was slow as people held on to their local traditions. As a result, an interesting hybrid wall trench appeared as a combination of trench and individual post construction. In plan, the trenches looked like normal wall trenches, but when viewed in profile, it was clear the trenches were not deep enough to support the setting of a wall. Instead, hidden below, at the base of the wall trench, were individual posts. Perhaps the builders were trying to incorporate the wall trench technology, but lacked the necessary skills and wanted to be agreeable, or they could have been purposefully hiding the individual posts (Pauketat and Alt 2005:225-226). In short, the hybrid design was a way of recognizing a new or alternative construction method, while still holding on to what's familiar (Alt and Pauketat 2011:109).

Both construction and the product of construction provide valuable information about cultural identity (Pauketat and Alt 2005:214). Lewis et al. defined architectural grammar as the set of rules or patterns formed and combined to create the built environment of the culture (Gougeon 2007:136-137; Lewis et al. 1998:2-4). Houses are a perfect starting place to develop an architectural grammar for Falls Mississippian.

Ceramic Assemblage

The pottery recovered from the Smith-Sutton site represents two widely distributed Late Prehistoric ceramic traditions, Mississippian and Fort Ancient, although the Mississippian ceramics overwhelmingly predominate in the assemblage. The Mississippian pottery is consistent with other Falls Mississippian sites in the area, rather than Mississippian centers farther down the Ohio River, such as Angel or Kincaid, or to those farther southeast. Generally Mississippian pottery is almost always shell-tempered, while Fort Ancient ceramics were initially grit-tempered but predominantly shell tempered by A.D. 1400 in Kentucky (Pollack et al. 2008). Similarly, some surface treatments were unique to each group, but other treatments were common to both.

Determining whether the Fort Ancient and Mississippian occupations in the Falls region were contemporary or sequential is essential to understanding the cultural dynamics of this borderland area. Distinguishing the components, however, is made more difficult by the presence of shell-tempered pottery associated with both the Mississippian and the Fort Ancient styles in this region (e.g., Pollack et al. 2008). Because both groups used shell tempering in their pottery, this analysis was conservative when assigning cultural affiliation, and, when possible, affiliation was determined by a combination of characteristics. For instance, in the Smith-Sutton shell-tempered assemblage, one of the best indicators of cultural affiliation was neck sherd morphology or the identification of Mississippian vessel forms. Mississippian ceramics can be classified by vessel form, as well as by categories that denote paste or temper and surface treatment. Typically, Mississippian ceramics consist of "five basic vessel forms—plates, bottles, bowls, jars, and pans" (Hilgeman 2000:33).

Most vessels at Smith-Sutton were jars, but pans, plates, bowls, and a bottle also were identified in the Mississippian assemblage. However, during cataloging it was difficult to determine if the rim/neck sherds were associated with deep-welled plates (which are well represented) or jars unless the sherd was large enough to show a constricted orifice. If the difference could not be determined with certainty, the specimen was not classified to form. This conservatism probably accounts for an under-representation of jars

The Smith-Sutton assemblage, however, is more interesting for its temporal indications. Recent work in the Falls region (for a summary of Late Prehistoric Falls area chronology, see French 2010:II) has established that the Mississippian occupation there "appears to have begun as early as AD 1000 and continued as late as the mid-fifteenth century" (French 2010:II:500). The Prather mound center (Munson and McCullough 2004; Munson et al. 2006) and an early Mississippian component at Shippingport, a site on the Louisville side of the river (French 2010:II), appear to be the earliest Mississippian expressions in the Falls region. A later component at Shippingport (French 2010:II), Eva Bandman (French 2010:II:500), and Smith-Sutton represent the later portion of the Mississippian occupation. Radiocarbon dates from excavated contexts place Smith-Sutton in the early to mid-fifteenth century, which is reflected in the ceramic assemblage.

For example, cordmarking is more prevalent earlier in the occupational sequence. At Prather, nearly 9 percent of the shell-tempered pottery was cordmarked (Munson et al. 2006:103), while 33.9 percent of the ceramic assemblage from the earlier Mississippian component was cordmarked (Pollack et al. 2010:164). At Ana Lynn, a multicomponent Late Prehistoric settlement in Washington County that returned dates in twelfth century, 18.1 percent of the ceramic assemblage (>½ inch) exhibited cordmarking (McCullough et al. 2010), although this disparity was obviously due in part to the presence of shell-tempered Fort Ancient materials. At the Smith-Sutton site, the 14 cordmarked shell-tempered body sherds constitute only about 0.6 percent of the shell-tempered (>½ inch) assemblage. Interestingly, only 55 cordmarked sherds (of all temper types) were recovered during this investigation, giving a relative frequency of only 2.4 percent. With the radiocarbon dates from the Smith-Sutton site placing it in the fifteenth century, it appears that the frequency of cordmarking in Falls Mississippian drops off through time.

Pans are well represented in the Smith-Sutton pottery assemblage (*n*=21), which reflects its later temporal position in the Falls region. At Shippingport, pans are absent in the early Mississippian component (Pollack et al. 2010:165), as well as at the earlier Prather and Ana Lynn sites. Pans have been recovered, however, from the Middle Mississippian component at both Eva Bandman and Shippingport (Pollack et al. 2010:166). At these sites, both Kimmswick plain and Kimmswick impressed varieties were recovered, while at the Smith-Sutton site only Kimmswick Fabric Impressed was identified. Thus the near absence of cordmarked shell-tempered pottery, the presence of pans, and the radiocarbon dates all suggest a Middle Mississippian component roughly contemporary with the later Mississippian component at Shippingport.

Thus, the low frequency of cordmarking, the presence of pans, and, to a lesser degree, the frequency and type of decoration all indicate a temporal placement of the Smith-Sutton site later than the occupation at the Prather mound complex and the early Mississippian component at Shippingport, somewhat later than the Eva Bandman site, and contemporaneous with the Middle Mississippian component at Shippingport. Since the dates from the Smith-Sutton site appear to be later than those from Prather, it appears that the frequency of cordmarking in Falls Mississippian society diminishes through time.

Radiocarbon Dates

Radiocarbon dates for Falls Mississippian sites in Clark County, Indiana, and on the Kentucky banks of the Falls of the Ohio region span from A.D. 1000 through 1650 (Figures 7 and 8). Temporal relationships among the Falls Mississippian sites are equally tentative: five radiocarbon assays from Prather indicate an occupation from A.D. 1000 through 1260 at two sigma (Munson et al. 2006:154); Shippingport assays resulted in dates ranging from A.D. 1010 through 1480 at two sigma (French 2010); reliable contexts at Eva Bandman returned dates from 1270 through 1470 at two sigma (Munson et al. 2006:158); radiocarbon dates from Ellingsworth returned a split date of A.D. 1240 to 1380 at two sigma and A.D. 1300 to 1430 at two sigma (Arnold 2010:213-214). Further research to more fully define the Prather Complex, or Falls

Mississippian, in Clark County is urgently needed, especially in the face of the area's rapid development.

The Prather site (12 Cl 4) is the most northeastern identified Mississippian mound center in the Falls of the Ohio region. Prather is also the earliest known Falls Mississippian site, yielding radiocarbon dates of A.D. 1000 through 1250 (Munson et al. 2006:154). Two radiocarbon dates from Smith-Sutton resulted in a very tight range of A.D. 1420 to 1460 and A.D. 1400 to 1440 at two sigma (see Figure 7); while Smith-Sutton is only a few kilometers south of Prather, these dates are nearly 200 years later. Prior to the 2010 investigations at Smith-Sutton, archaeologists hypothesized that Smith-Sutton was both spatially and temporally connected to Prather. Because of their proximity to one another, Smith-Sutton was thought of as a satellite village to the mound center. However, the two radiocarbon dates from Smith-Sutton collected thus far postdate those from Prather, indicating a much later occupation. The ceramic assemblages from the two sites are also markedly different in composition with the Prather assemblage indicative of an earlier occupation and the Smith-Sutton assemblage closely aligning with the later Shippingport occupation.

Smith-Sutton does appear to be contemporaneous with Ellingsworth (12 Cl 127) to the southwest. Radiocarbon dates from Ellingsworth returned a split date of A.D. 1240 to 1380 at two sigma and A.D. 1300 to 1430 at two sigma (Arnold 2010:213-214). While Smith-Sutton is an upland site, it appears to be contemporaneous with the later component periods of two Kentucky sites located on the Falls of the Ohio vicinity downriver. Investigations at the Shippingport site at the Falls of the Ohio sampled nine structures for radiometric dates, returning a refined median range of cal A.D. 1310 to 1400 (French 2010:56). The Eva Bandman site, a hamlet or small village located on the floodplain terrace northeast of Shippingport, also had a later component with dates between A.D. 1270 and 1470 at two sigma (Munson et al. 2006:158).

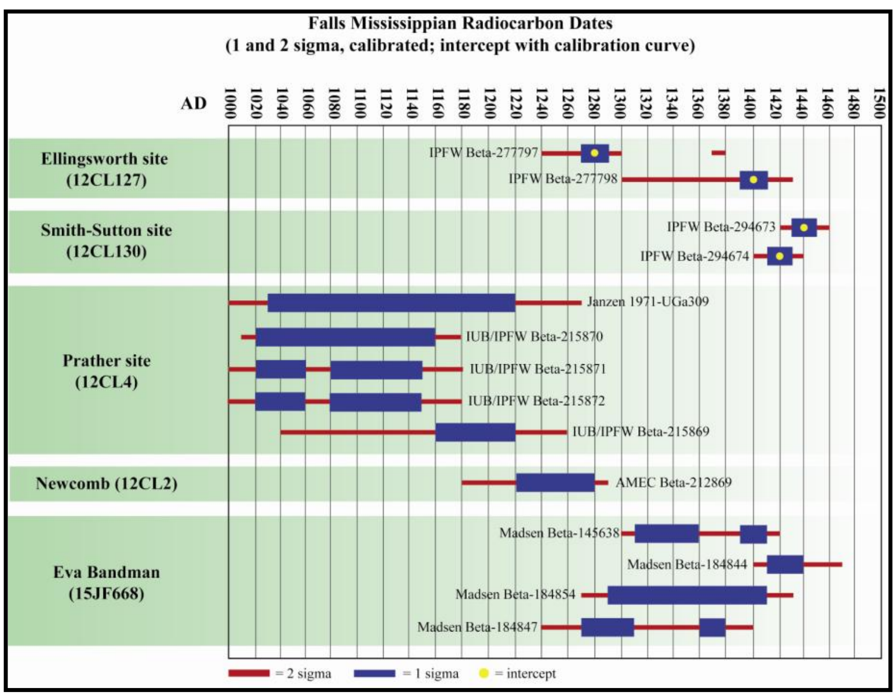

Figure 7. Radiometric dates from Falls Mississippian sites (Arnold 2010; Arnold and Graham 2011:Figure 8.1; Bader 2004; Munson et al. 2006:Figure 7.9).

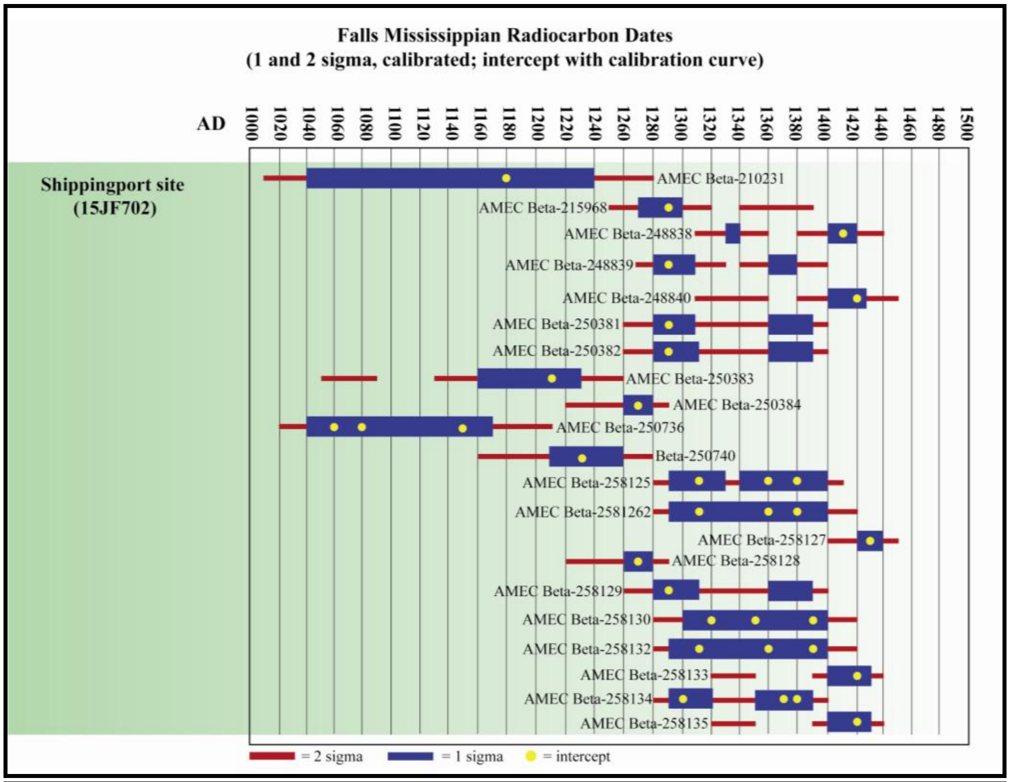

Figure 8. Radiometric dates from the Falls Mississippian Shippingport site (Arnold and Graham 2011:Figure 8.2; French 2010:Figure 16.1).

Conclusions

The limited work conducted at the Ellingsworth and Smith-Sutton sites when combined with that at Prather, Shippingport, and Eva Bandman, does not definitively provide conclusive answers to questions regarding Falls Mississippian. But, when taken as a whole, the archaeological investigations appear to indicate that Falls Mississippian is Mississippian. It is not an Angel or Kincaid Mississippian expression but rather a unique Falls Mississippian expression. Radiometric dates indicate a temporal span extending over a nearly 650 year period. There is an early Prather complex occupation with at least one mound center located at the Prather site. There is a much later temporal occupation by Falls Mississippian groups located both on the floodplains and in upland settings. Interestingly, to date, the Mississippian sites exhibiting integration of significant Fort Ancient ceramics and subsistence strategies are those more closely tied to the floodplains along the river rather than to those sites such as Smith-Sutton and Ellingsworth in the uplands.

To date, many questions remain unsatisfactorily answered resulting from what still remain limited excavations. Only continued work at Falls Mississippian sites will further unravel the cultural and temporal complexity of Mississippian culture in the Falls of the Ohio area.

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USING TREE-RING GROWTH PATTERNS TO DATE THE CONSTRUCTION OF A BEATER HAY PRESS BARN IN ALLENSVILLE, SWITZERLAND COUNTY, INDIANA

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Introduction

This article describes the use of tree-ring growth patterns to date the construction of the John N. Wycoff hay press barn, located in Allensville, Indiana. Beginning in the early decades of the nineteenth century, Mid-Ohio River farmers commercially produced and baled hay for export to east coast cities to fuel urban horses. In response to this demand, Samuel Hewitt invented the beater hay press in 1843. The three-story tall, animal powered press was typically housed in a barn type built to facilitate pressing, storing, and exporting hay.

The goal of this research is to use tree-ring data, in association with supporting historical evidence, to establish the year of construction, describe, and interpret the Wycoff barn. A variety of historical documents are used to support the dendroarchaeological findings including patents, records of deeds, newspaper articles and advertisements, property surveys, atlas maps, and the population census. The usefulness of the beater press took place in a small window of time that began with Hewitt's 1843 invention (USPTO 1843) and lasted until the mid-1880s. Currently, only thirteen beater hay press barns of various size, layout, and construction materials have been identified. Knowing the construction dates of hay press barns helps identify evolutions of form, and clarify the landscape distribution patterns of this rare agricultural resource. This specific press barn holds special interest to commercial hay culture scholarship since Hewitt was a resident of Allensville when he patented his invention. Therefore, this project has the additional goal of establishing if the barn is an artifact directly associated with the inventor.

Hay Press Scholarship and Origins for Mid-Ohio River Commercial Hay Production

Dendroarchaeology of hay press barns fits within several historical archaeological frameworks. The historical archaeology of farmsteads (farmstead archaeology) reveals important cultural information about people in our recent past, information that is also relevant to historians, cultural geographers, folklorists, and the numerous other disciplines interested in agricultural history and resources (Groover 2008). The hay press culture is constructed within a social system of capitalism where objects are examined within local and particular contexts, such as agriculture in southeast Indiana in the mid-nineteenth century (Johnson 1999:227). A landscape archaeology framework can be applied where material culture is examined within the context of inhabitants manipulating their environment, and in turn, the way places affect inhabitants (Branton 2009). State Geologist E. T. Cox concluded that particular aspects of the Switzerland County geography, the upland flats, were highly suited for hay production (Cox 1872:472), and this system of commercial production could not succeed without the transportation route of the Ohio River. Barns and presses also display timber species distinct to the region, and species selection by a farmer or barn builder shows an understanding for the structural qualities required to make a functional and lasting machine and building (Baas and Rubino 2013). For the authors, the dendroarchaeology of barns is approached within a framework of interpretive archaeology (Wilkie 2009) since they are working closely with local museums and individuals to describe the commercial system for producing hay for interpretation in public history settings (Baas 2004a, 2004b; Strezewski 2004).

There is minimal documentation of hay presses, press barns, and the region's commercial hay production system. Local historians provide accounts of Hewitt's ingenuity (Dufour 1925) and the "Hay King" Ulysses Schenck's hay production and shipping enterprise (Beach 1987:19). Folklorist Warren E. Roberts documented a Crawford County, Indiana barn and press using field work and oral history (Roberts 1993). That press and barn was moved to O'Bannon Woods State Park and restored in 2004. It is the only press currently available for public view. The Thiebaud farmstead in Craig Township, Switzerland County, that contains a hay press barn, was described in an archaeological report examining the site's potential as an agricultural museum (Baas 2004a, 2004b; Strezewski 2004). Press operations, along with an evaluation of wood and metal press parts, have been described (Baas and Rubino 2013). This article reports a portion of field work performed by the authors in 2010 and 2011 that collected tree-ring data for twelve hay press barns in southeast Indiana and northern Kentucky.

Origins for the Mid-Ohio Valley system of commercial hay production stem from the demand for hay by urban liveries. Steadily growing urban horse populations created huge demands for hay throughout the 19th century (McShane and Tarr 2007; Tarr and McShane 2005). Compressed hay is easier to store, transport, and sell, so techniques were developed to reduce its bulk properties through pressing and baling. All early presses required the act of "tramping in"--climbing into a hay-filled box and using human weight and movement to compress the stems before pressing a bale (Harris 1851:260). The earliest, and simplest, press forms had wood or metal screws that pressed hay into a box from the top or side, and most likely evolved from, or along with, technologies for baling cotton. By the 1840s, in response to the growing demands for hay, Mid-Ohio Valley farmers were supplying distant markets with timothy via the Ohio River and the subsequent water transportation routes of the Mississippi River, the Gulf of Mexico, and the Atlantic Ocean.

Samuel Hewitt, a resident of Allensville, patented the beater hay press in 1843. This automated, animal-powered machine compacted timothy by dropping a massive wooden block--guillotine style--into a hay-filled box. The invention was typically referred to as a "beater press," but since Hewitt was a well-known Mormon, it became commonly known as the "Mormon Press," or the unfortunate combination of both names--"Mormon Beater Press." The press produced 2' x 3' x 4,' 400 pound bales that simplified the handling, storage, and transportation of hay. Hewitt's invention was appealing to the region's farmers because it increased the pressing power of a metal screw with horsepower and incorporated a beater to replace the undesirable, cumbersome, and time consuming process of tramping in (Figure 1). Farmers profited from the system until the late 1870s, even though urban demand for hay extended into the early decades of the 20th century. The oversupply of hay depressing the national market, the national growth of the railroad replacing river travel and opening up interior lands for hay export, and the region's farmers depleting soil fertility are all potential reasons for a drop in hay profits and the end of the system in Indiana and northern Kentucky (Baas and Rubino 2013).

The Town of Allensville and Samuel Hewitt

Allensville, Indiana is located near the center of Cotton Township, Switzerland County. It is situated on a ridge top on the north bank of the West Fork of Laughery Creek (that flows northwest towards Ohio County). Very little history has been recorded about the village. The town was laid out in 1816 by Peter Demaree (Dufour 1925), and a late-century atlas displays an image of a small village of sixty-six lots, but only sixteen structures (Lake 1883). However, the small town contained several substantial buildings such as a school, church, and Masonic Temple, all located on the central square (Figures 2 and 3). Like many small nineteenth century start-up towns, survival depended upon access to major transportation routes. Although the Allensville Road (Dove Street) was declared a state highway in 1833, the inability to organize and construct the Allensville, Center Square, and Vevay Turnpike in the 1850s prohibited the town from expanding (Dufour 1925:189-190; State of Indiana 1833:27).

The Allensville press barn is of special interest because beater hay press creator, Samuel Hewitt, identifies the village as his residence. Therefore, the barn could be tangible link to the inventor (USPTO 1843). Very little is known of Hewitt. He was an Elder in the Liberty Branch of the Church of the Latter Day Saints that met in nearby Liberty School in Cotton Township (Taylor 1843:43). Martha Hewitt (1802-1830), his wife, is buried in the Allensville Cemetery on the north edge of the village. He quickly begins to sell the rights to construct his invention to area farmers for $25 (The Indiana Palladium 1844). However, by 1849 J. C. Smith had become his local agent for business affairs working on Hewitt's behalf (The Indiana Palladium 1850). Since the inventor cannot be located in the federal population census, it is presumed he left the area. This time coincides with the Mormon relocation to Nauvoo, Illinois, and a detailed genealogy might show if Hewitt participated in the group's western migration.

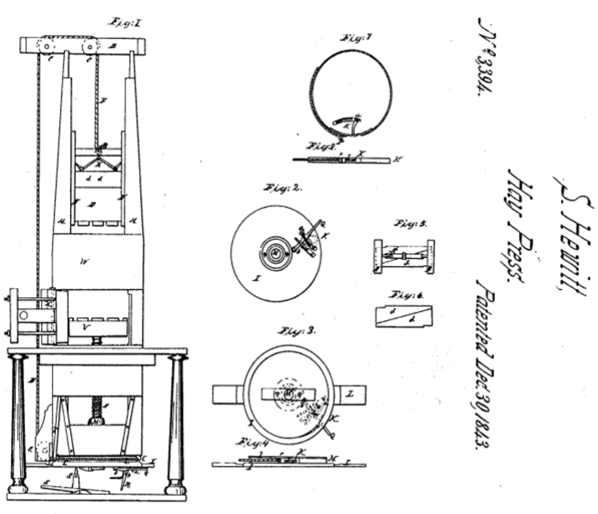


Figure 1. Improvement in Hay-Presses. U.S. Patent No. 3,394, issued December 30, 1843 to Samuel Hewitt (USTPO 1843).

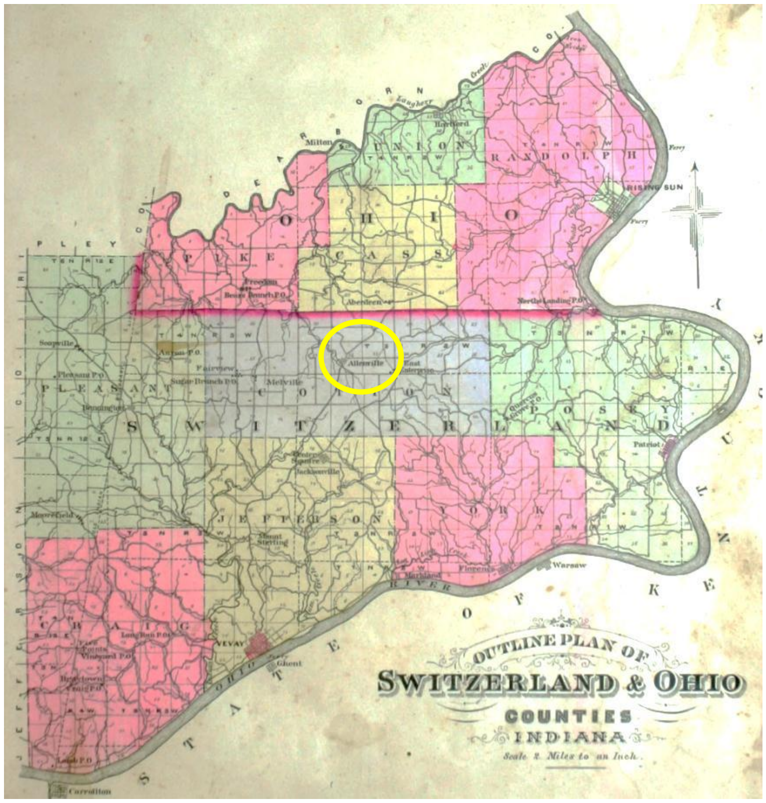


Figure 2. Map of Switzerland and Ohio Counties showing location of Allensville, Indiana (Lake 1883:5).

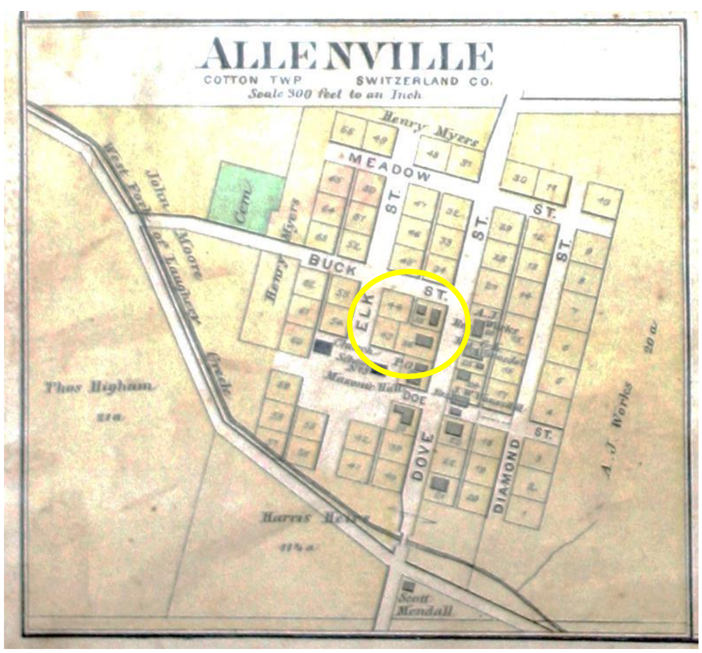


Figure 3. Map of Allensville, Indiana showing press barn location (Lake 1883:26).

The Beater Hay Press Barn as a Vernacular Barn Type

The Allensville Wycoff press barn displays character defining features established through field documentation of the thirteen known resources. While it is too early to establish a press barn precedent (i.e., was a known barn type adapted to pressing hay), one barn type example that may have influenced the press barn form is the raised version of the three-bay barn type (a.k.a., English Barn) common to Ohio (Glassie 1968; Hutslar 1981; Noble and Cleek 1995). Further research is needed to support this hypothesis.

As a specific vernacular type, the barn's description can be broken down into the fundamental components of form, construction, and use (Glassie 1968:8):

Form (See Figures 4-7)- The structure is three stories in height (or, could also be defined as two stories over a cellar), and has a gable roof that is oriented east to west. It measures 50' x 54,' and contains four bays oriented north and south.

A mow is located in Bays 1-3. Bay 2 contains the hay press, and Bay 3 has doors that are accessed from ramps and barn bridges (the southern ramp and bridge have been removed). Bay 4 is open from the cellar to the roof.

The cellar houses the press' sweep and screw. The timber floor joists for the mow span 33 feet to create an open space for press operations (and eliminate the need for support posts).

The mortise and tenon timber frame structure contains two bent forms specific to press barns. Two *press* bents define Bay 2 (See Figure 8). They are constructed to carry the weight of the press, and accommodate the torque and pounding of its operation. A hay bent is located between Bays 3 and 4, and is assembled with a large portal to facilitate the movement of hay from the mow to the cellar (See Figure 8).

Construction- The barn and press display materials typical of mid-nineteenth century, southern Indiana barn construction. Timber species include tulip poplar posts, and floor joists of hickory, white oak, and red oak. It has vertical wood plank siding. The barn has a stone foundation. The press is constructed of white oak and tulip, and contains small samples of hickory (Baas and Rubino 2013).

Use- The barn was designed to house a beater hay press and facilitate the operations of pressing and baling hay. The mow level of Bays 1 and 2 were used for storing and pressing hay. Hay was fed into the press and a bale removed in Bay 2. Bay 3 is a wagon aisle that allows a wagon to pass through the barn. Bay 4 provides space for the storage of loose and baled hay, and may have been a cellar level aisle where bales could be lowered into wagons. The cellar space housed the horse-related operations of the press.

Figure 4. South and East facades of hay press barn (photo courtesy of Christopher Baas).

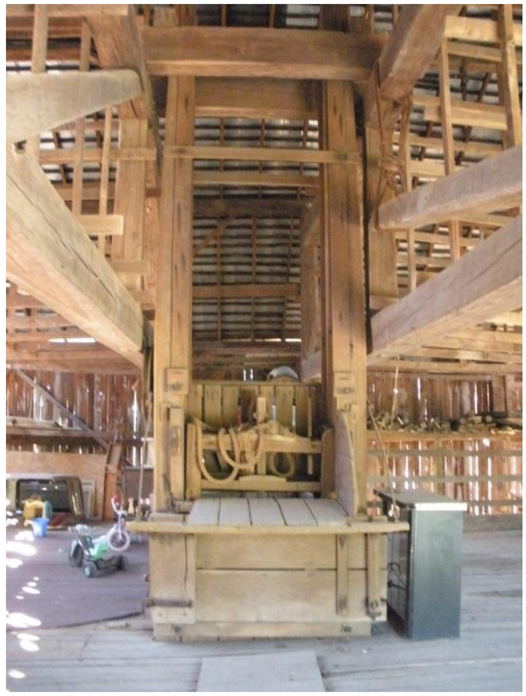


Figure 5. Hay press on the mow level. Note that the filling door is open and the top of the beater is visible. Portions of the press bents are visible on each side of the machine (photo courtesy of Christopher Baas).

Figure 6. Hay press at the cellar level (photo courtesy of Christopher Baas).

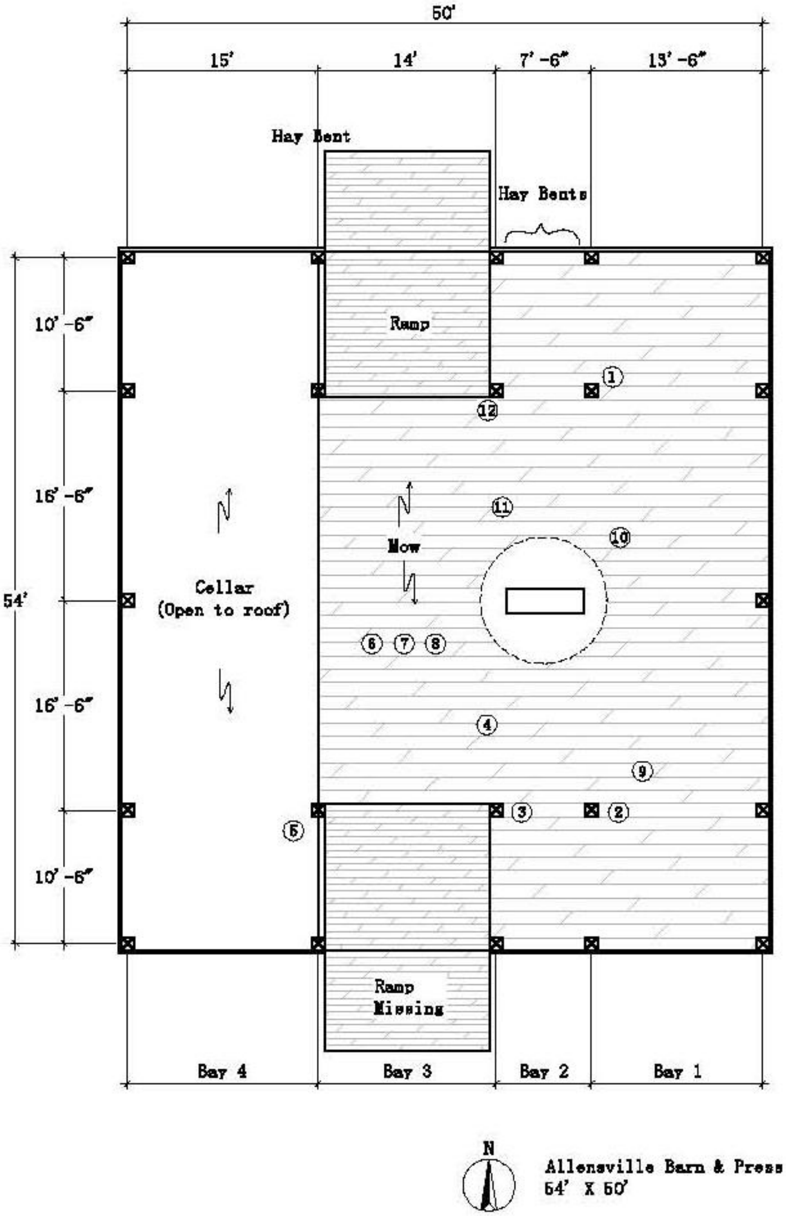


Figure 7. Press barn plan (graphic by Qin Wang, Ball State University). Numbers represent dendroarchaeological sampling locations.

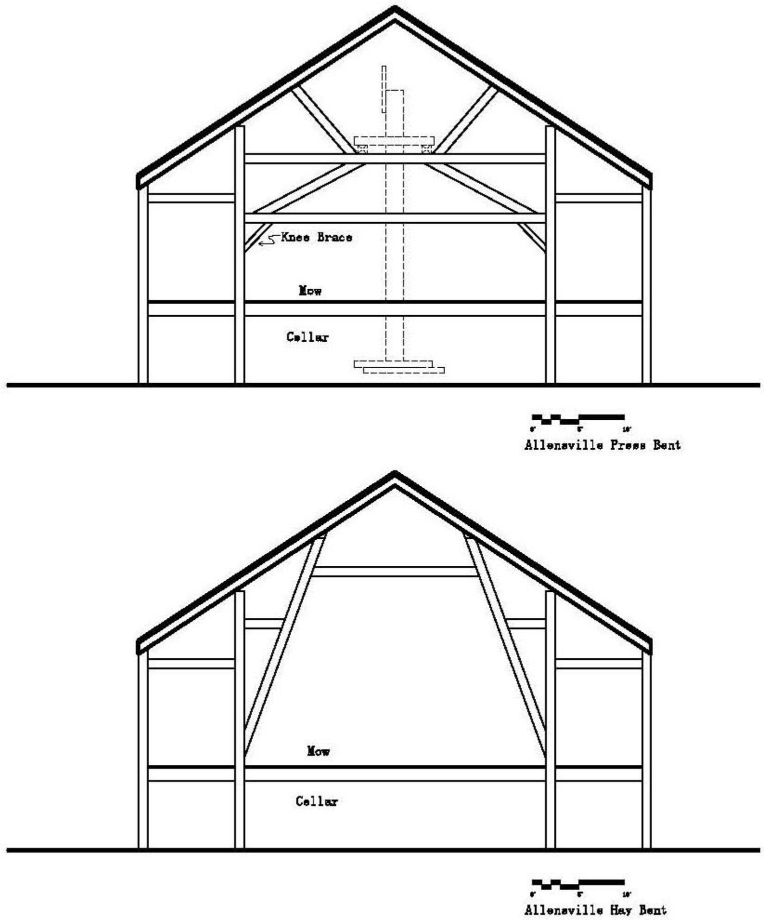


Figure 8. Top: Press bents. Bottom: Hay bent (graphic by Qin Wang, Ball State University).

Dendroarchaeology

During each annual growing season, trees deposit a layer of cells, a tree ring, around their circumference. Dendrochronology is the science of assigning individual growth rings to the calendar year in which they were formed. Individual tree rings can be identified by studying the distribution and characteristics of the cells found in each ring. The size of individual tree rings is dependent upon various environmental conditions; large rings are indicative of favorable growing season conditions (moderate temperatures and abundant precipitation), while smaller rings indicate less favorable conditions (hot and droughty). By accurately measuring individual ring widths and noting the patterns of large and small rings, an investigator can deduce much information about a tree such as its age, when it began growing, and what its response was to particular climatic events such as droughts.

Dendroarchaeology is a sub-field of dendrochronology that deals specifically with the sampling of historically constructed buildings (and other wooden objects) to tap the tree-ring information found within their timbers. Dendroarchaeological studies are often performed to determine when a structure was built. In the absence of reliable tax records, deeds, or local oral tradition, dendroarchaeology provides an accurate and reliable means of determining the construction date of a building.

In dendroarchaeological studies, the date of formation of individual tree rings in building timbers is unknown. These dates can, however, be determined through a process called crossdating (Stokes and Smiley 1968). Crossdating is performed by matching (both visually and with computer assistance) the pattern of small and large rings in samples with known dates to a sample with rings of unknown age (Figure 9). Crossdating is a highly reliable method for dating wood of unknown age, and dendroarchaeological techniques have proven to be powerful and effective research tools. Dendroarchaeological techniques and crossdating have been successfully used to determine and/or verify the date of construction (and/or subsequent modification) of buildings by numerous researchers throughout the United States (Bortolot et al. 2001; Grissino-Mayer and van de Gevel 2007; Stahle 1979; Therrell 2000; Towner et al. 2001; Wight and Grissino-Mayer 2004).

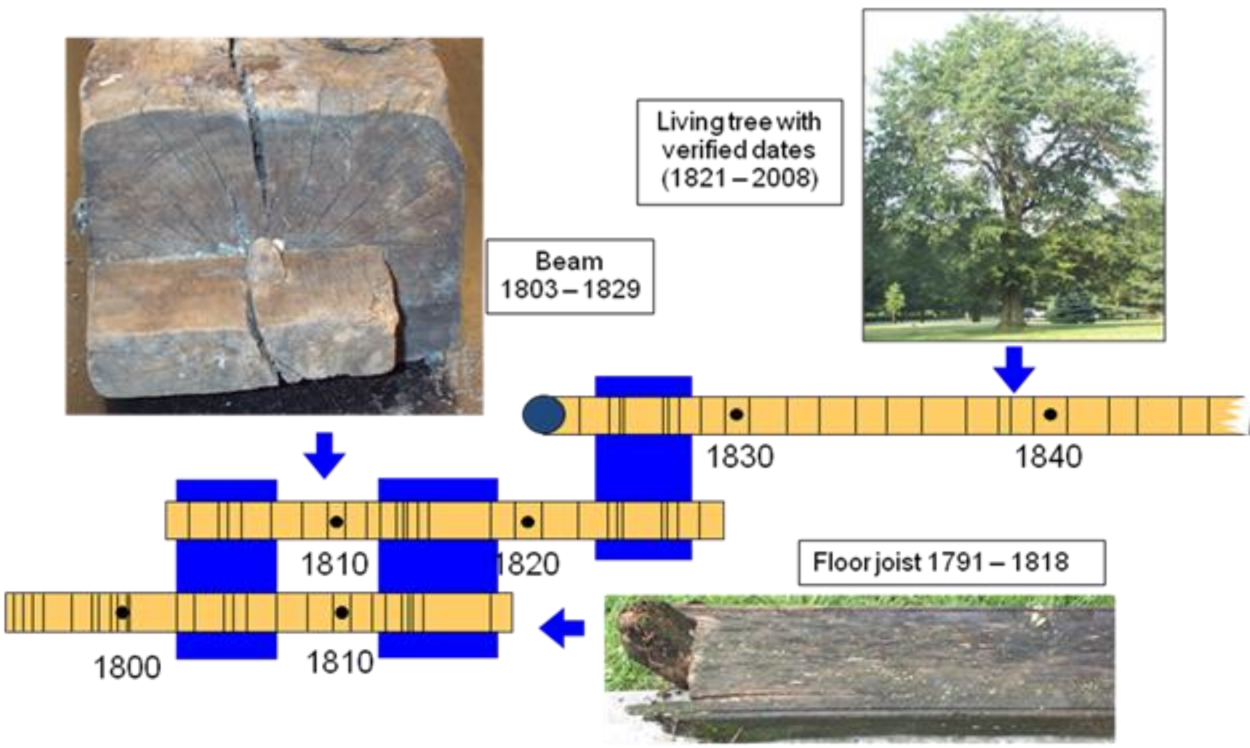


Figure 9. Crossdating is performed by identifying the tree-ring patterns in samples with verified dates (upper right) and by comparing and locating the same patterns in samples with unknown dates. Blue areas represent growth patterns that enable crossdating to be performed. Note: the sample lengths used in this demonstration are much shorter than those that are used in actual analyses (photos courtesy of Darrin Rubino).

Construction dates for buildings can be suggested by identifying and accurately dating, through the crossdating process, the outermost ring of an individual timber. The outermost ring will be the year in which an individual tree died. However, for hypothesized construction dates to be accurate, the outermost ring must represent the last year of growth for the tree. That is, the ring must either be adjacent to bark or be associated with the wane of the piece of lumber. Wane can be identified by noting a uniform, rounded outer surface of a timber that is free of any tool marks (e.g., those created by hatchet, ax, adze, chisel, or saw). Hence, if wane is present but bark is not, the outermost ring of the timber represents the last ring formed by a tree, and the bark was most likely removed or fell off over time. In such a case, dating the death of a tree is still possible. If a number of timbers from a structure have similar (or comparable) death dates, one can infer a likely construction date.

Field and Laboratory Methods

Since determining the date of construction of the barn was the main goal of this investigation, sampling attention was focused on wane- and bark-bearing timbers. Samples were obtained from throughout the barn and from the structural members unique to the press (e.g., bents). This was done to ensure that all timbers were harvested from approximately the same time (i.e., no recycled timbers from other structures were used) and that the press and barn were constructed simultaneously.

For each timber analyzed, digital photographs were taken, and the location and provenience of the timber was noted. Notes related to function (e.g., floor joist, vertical support post), general size, and shape were made. Prior to sampling, the length of each timber in the barn was carefully inspected to make certain that either bark or wane was present. Those timbers which did not exhibit bark or wane (and, thus, not the last year of growth) were excluded from analysis since their year of death could not be accurately determined.

Prior to sampling individual timbers, the soundness of each piece was carefully assessed. Timbers were deemed suitable for tree-ring analysis only if they were characterized by a sound outer surface and if a core of sufficient length could be obtained. Additionally, when the butt of a timber was visible (e.g., floor joists) a rough ring count was performed to determine if enough rings were present in the timber for crossdating. Only suitable timbers were sampled since they would provide a reliable death date and would provide a long enough series of rings for accurate and reliable crossdating and subsequent dating.

Sample cores were obtained using a battery-powered drill (0.5 inch chuck) and a dry wood boring bit (Forest Research Tools, Knoxville, Tennessee; Figure 10). Prior to coring the timber, a permanent marker was used to color the outermost surface of the wood or bark to ensure that it was kept intact during the coring process. The bit was drilled into the timber until it passed the approximate center or pith (the oldest portion of the timber) or until a void in the timber was reached. Voids are caused by internal rot or cracking of the timbers that result during drying. To minimize friction and stress to the core during the boring process, the borer was intermittently removed from the beam, and compressed air was used to remove saw dust from around the core (Figure 10).

For several timbers, two cores were extracted to increase sample size, to provide a better opportunity for dating if one core was undatable (e.g., presence of an interior scar or extensive insect damage), and to ensure that the outermost ring did in fact represent wane. Replicate sampling of an individual timber is especially beneficial when working with tulip poplar (a major species of wood found in the structure) because this species is prone to the formation of “missing rings.” A missing ring results from a tree not forming a complete ring around its entire circumference or any ring at all in a given year due to injury or stressful growing conditions. Replicate samples increases the likelihood of obtaining a sample without a missing ring.

Each sample or core was assigned a unique identification containing three portions: a three-letter structure identification (ALA), a two digit provenience (individual timber) identification, and a letter indicating the individual series sampled from a provenience. For example, sample ALA04B identifies the second series (B) obtained from the fourth provenience (04) sampled from the structure. Immediately upon extraction from the timber, each core was placed in a labeled PVC tube to avoid mechanical damage during transport.

Figure 10. Drilling a floor joist to obtain a sample (left) and cleaning the saw dust with compressed air during the boring process (right). Note the borer chucked into the drill in both photos. Photos courtesy of Darrin Rubino.

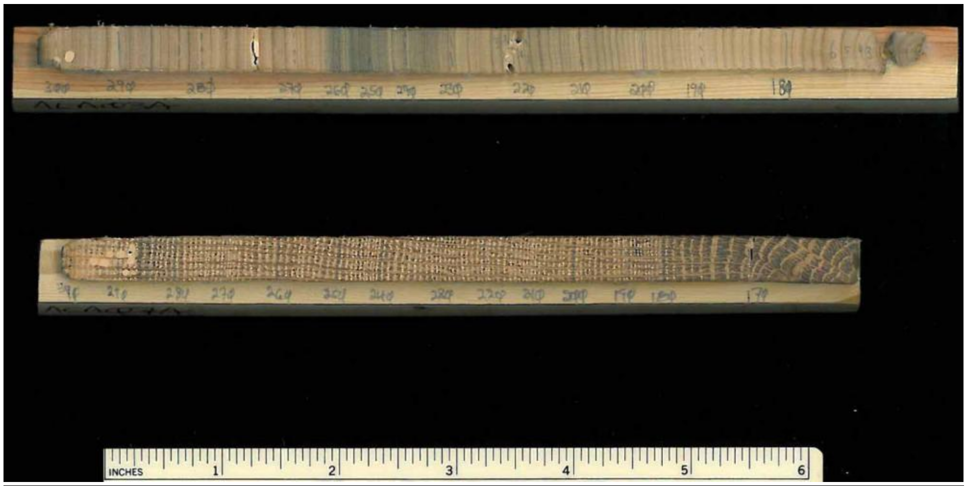


Figure 11. Mounted cores ALA07A (white oak; bottom) and ALA03 (tulip poplar) obtained from the press barn. The outermost (wane) end of the cores is to the left. The round holes to the left in each core are insect damage. Photo courtesy of Darrin Rubino.

Laboratory Procedures

The cores were glued into individually labeled mounting boards (Figure 11). The cores were placed in the mounts so that the vessels (cells) were aligned vertically for later surface preparation, ring measurement, and dating. Cores were clamped to the mounting boards using masking tape. Each core was sanded with progressively finer grits of sandpaper (Stokes and Smiley 1968) to expose the tree-ring structure. Each core was sanded with a belt sander with ANSI 80-, 120-, 180-, and 220-grit sanding belts. A palm sander was then used with ANSI 220-, 320-, and 400-grit sandpaper (Orvis and Grissino-Mayer 2002). Each core was then hand sanded/polished with 30 micron sanding film and 600- and 800-grit sandpaper. Once all cores were sanded, they were scanned under a dissecting microscope to make certain that all ring boundaries were clearly visible. Any observable imperfections in the surface were removed by re-sanding trouble spots by hand.

The individual tree rings in each sample were then assigned years—not dates—using a boom dissection microscope at 40× magnification (Olympus SZ40; Olympus America Inc., Melville, New York). The innermost (oldest) tree-ring was assigned "year 1," and each subsequent ring was assigned year 2, etc. The resulting tree-ring series were then considered to be "floating" since individual rings were assigned arbitrary years and not calendar dates (Grissino-Mayer 2001). For each floating series, a skeleton plot was manually created. Skeleton plots are prepared to graphically highlight the pattern of small and large rings in the samples (Stokes and Smiley 1968). The skeleton plots of each series were compared to each other to identify common growth patterns and potential marker years (e.g., abnormally small rings). The skeleton plots were also used to crossdate or compare and match the tree-ring patterns in the timbers to those in samples with known, verified dates from regional tree-ring studies.

The ring widths of each floating series were measured to the nearest 0.01 mm (0.0004 inch) with a boom dissecting scope (45× magnification), VELMEX unislide measuring device (VELMEX Inc., Bloomfield, NY), ACU-RITE linear encoder (ACU-RITE Inc., Jamestown, NY), and Quick-Check digital readout device (Metronics Inc., Bedford, NH) connected to a computer. The program MEDIR (Version 1.13; Krusic et al. 1997) was used during the measurement process to create computerized ring-width series consisting of years and measurements for each sample.

The outermost ring in each series with wane was not measured since it is not possible to know if the ring was fully formed (i.e., the tree could have been harvested during the growing season). Likewise, the innermost ring of most samples could not be measured since sawing, hewing, cracking, or decay does not follow a ring boundary, and the ring would be incomplete. The innermost ring of a series can be measured only if pith is present since the innermost ring would be fully present and adjacent to the pith. Measurement of an entire series is not always possible if the sample has an irregular growth pattern due to scar tissue or growth anomalies associated with branching. When such patterns were encountered, measuring was performed only in the region where normal growth was observed. Inclusion of incomplete rings and abnormally formed rings in the ring-width series is avoided since the true ring width is not determinable and subsequent inclusion of such measurements would bias growth pattern analyses.

To assign calendar dates to the rings in the floating series, the tree-ring series obtained from the barn were crossdated against local chronologies with known dates. Chronologies are series of dated and measured tree rings created by studying numerous trees in an area. These local chronologies consist of living trees and crossdated timbers from other regional structures. White oak and tulip poplar chronologies from Switzerland and neighboring counties were used for crossdating.

Crossdating was performed using skeleton plots created from local chronologies. Also, after ring-width measurement, computer-assisted crossdating was performed using the computer program COFECHA (Holmes 1997). COFECHA utilizes a correlation procedure to enhance time-series characteristics (the pattern of small and large rings) in the samples. COFECHA assists in date assignment of floating tree-ring series by comparing the measured floating series to measured series with known, verified dates. Following a run of COFECHA, a list of possible calendar dates for dating each of the floating series is provided (Grissino-Mayer 2001; Holmes 1997). These tentative dates were then compared to the growth patterns observed in the skeleton plots and in each core sample to assist in final calendar date assignment. Crossdating was performed separately for each of the different species analyzed since response to climate varies among species.

COFECHA was also used to verify date assignments (i.e., quality control). COFECHA breaks each series into consecutive 50-year segments overlapping by 25 years (Grissino-Mayer 2001; Holmes 1997). The correlation of each of the segments is then checked against all other series. If a correlation coefficient has a probability lower than 0.01 (critical r-value > 0.33) the crossdating is verified, and date assignment is likely successful.

Each timber type was identified to the lowest possible taxonomic rank (species or genus) using macroscopic and microscopic wood anatomy features and the identification keys prepared by Panshin and de Zeeuw (1980). Subsamples for wood identification were obtained by removing paper-thin sections of wood with a double-edged razor blade. Subsamples were taken from incomplete rings found from the innermost portion of each core so as to not hinder ring-width measurement.

Results

Dendroarchaeological samples were obtained from four different timber types: true hickory, tulip poplar, white oak (*Quercus* subgenus *Lepidobalanus*), and red oak (*Quercus* subgenus *Erythrobalanus*; Table 1). Using only wood anatomy, identification to exact tree species is not possible for true hickory, white oak, and red oak (Panshin and de Zeeuw 1980). Based on tree species distribution records for Switzerland County provided by Jackson (2004), three hickory, four red oak, and five white oak species were potentially analyzed (Table 1). A total of 20 samples (series) were obtained from 12 timbers (proveniences; Table 2) from throughout the barn. All of the series were successfully crossdated and subsequently assigned calendar dates.

Combination of all of the series obtained from the barn produced a 186 year-long master chronology that spanned from 1680 – 1865 (Table 2). This chronology consists of 1,955 accurately dated and measured tree rings. A complete description of each of the different species chronologies can be found in Table 2, and the mean annual growth rate for true hickory, tulip poplar, and white oak are in Figure 12. A detailed description of each of the proveniences analyzed can be found in Table 3.

Both tulip poplar and white oak timbers exhibited strong correlation among the different series (Table 4). All segments but one (ALA07A 1725 – 1824 segment) were significantly correlated ($P < 0.01$) with the other species-specific series. The strong correlation results suggest that crossdating between different timbers of the barn was successful. The skeleton plots also confirmed the crossdating between the different series. Strong correlations were found while crossdating the chronologies from the barn against regional chronologies (Table 5) thus suggesting proper calendar date assignment to individual tree rings. Tables 4 and 5 only show results for white oak and tulip poplar since these were the most common types of timbers found in the barn. Similar results were obtained for the red oak and true hickory timbers. Similar crossdating and correlation analysis were performed and provided very strong correlation between growth patterns in these timbers, other timbers in the barn, and regional chronologies.

Table 1. Timber types analyzed from the Wycoff press barn. More than one species of tree may be called by a single timber type because identification of wood is not possible to the species level for various timber types. For example, a white oak timber could be a swamp white oak or a bur-oak. A species is considered "possible" if its natural distribution occurs in Switzerland County. Species distributions are based on Jackson (2004); taxonomy and nomenclature follows Gleason and Cronquist (1991).

Timber type	Scientific name	Common name
True hickory	*Carya glabra* (Miller) Sweet	Pignut-hickory
	C. laciniosa (Michx. *f*.) Loudon	Shellbark-hickory
	C. ovata (Miller) K. Koch.	Shagbark-hickory
Red oak	*Quercus palustris* Muenchh.	Pin-oak
	Q. rubra L.	Northern red oak
	Q. shumardii Buckley	Shumard oak
	Q. velutina Lam.	Black oak
Tulip poplar	*Liriodendron tulipifera* L.	Tulip poplar
White oak	*Quercus alba* L.	White oak
	Q. bicolor Willd.	Swamp white oak
	Q. macrocarpa Michx.	Bur-oak
	Q. michauxii Nutt.	Swamp chestnut-oak
	Q. muehlenbergii Engelm.	Chinkapin-oak

Table 2. Chronologies (series of measured and dated tree rings) created from dendroarchaeological samples collected from the Wycoff barn.

Timber	Number of proveniences	Number of series	Number of tree rings	Time span	Number of Years
True hickory	2	3	433	1680 – 1864	185
Red oak	1	2	76	1730 – 1781; 1841 – 1864	76
Tulip poplar	6	11	1009	1724 – 1864	141
White oak	3	4	437	1723 – 1865	143
Total	12	20	1955	1680 – 1865	186

Table 3. Series data for each of the timbers sampled from the barn and press. "First" and "last" refer to the first and last years measured or present in a series. A "w" indicates the presence of wane or bark on an individual series. A "+" indicates that additional rings were present on the sample but could not be accurately dated due to growth irregularities or lack of sample integrity. See text for an explanation regarding the identification code of individual series obtained from a provenience. If more than one sample (series) was taken from an individual timber (provenience), the species and provenience description are only given once and not for each series. All samples have been archived in the Hanover College botanical collection.

		Sample		Measured			
Sample	Species	First	Last	First	Last	Wane	Provenience
ALA01A	Tulip poplar	1737	1865	1741	1864	W	East press bent north post
ALA01B		1807	1865	1808	1864	W	
ALA01C		1723	1806	1724	1805		
ALA02A	Tulip poplar	1724	1865	1725	1864	W	East press bent; south post
ALA03A	Tulip poplar	1736	1865	1737	1864	W	West press bent; south post
ALA04A	Tulip poplar	1778	1865	1779	1864	W	West press bent; bottom chord
ALA04B		1768+	1865	1769	1864	W	

ALA05A	Tulip poplar	1768+	1805	1752	1804		Post; southwest corner
ALA05B		1806	1844	1807	1843		
ALA06A	White oak	1734	1866	1735	1865	W	Joist; west hay mow
ALA07A	White oak	1730	1866	1738	1865	W	Floor joist; basement and main floor
ALA08A	Red oak	1840	1865	1841	1864	W	Floor joist; basement and main floor
ALA08B		1727	1782	1728	1781		
ALA09A	White oak	1771	1809	1772	1808		Floor joist; basement and main floor
ALA09B		1722	1864	1723	1863	W	
ALA10A	Hickory	1775	1845	1776	1841		Floor joist; basement and main floor
ALA10B		1679	1865	1680	1864	W	
ALA11A	Hickory	1682	1865	1683	1864	W	Floor joist; basement and main floor
ALA12A	Tulip poplar	1779	1862	1780	1861		Post; basement
ALA12B		1740	1865	1741	1864	W	

Table 4. Series and segment (50-year segments overlapping by 25 years) correlation analysis and mean and standard deviation (mm) of each series. In each column headed by a set of dates the correlation coefficient found by correlating each of the series' segments against all other series of that species is given. A correlation coefficient greater than 0.33 indicates a statistically significant correlation (*P* < 0.01).

Series	1725 - 1774	1750 - 1799	1775 - 1824	1800 - 1849	1825 - 1874	Seris *r*-value	Mean	SD
Tulip poplar								
ALA01A	0.80	0.79	0.87	0.89	0.74	0.81	1.23	0.929
ALA01B				0.86	0.81	0.80	1.23	1.207
ALA01C	0.74	0.84	0.87			0.80	1.71	1.096
ALA02A	0.76	0.83	0.80	0.82	0.70	0.76	1.37	0.797
ALA03A	0.48	0.68	0.80	0.78	0.63	0.65	1.37	0.659
ALA04A			0.74	0.78	0.66	0.72	1.33	1.029
ALA04B		0.76	0.69	0.81	0.72	0.73	1.51	0.897
ALA05A		0.82	0.73			0.74	1.44	0.544
ALA05B				0.67		0.67	0.69	0.214
ALA12A			0.70	0.74	0.65	0.74	1.4	0.557
ALA12B	0.71	0.74	0.66	0.72	0.66	0.71	1.42	0.592
All tulip poplars						0.74	1.37	0.793
White oak								
ALA06A	0.59	0.60	0.48	0.50	0.45	0.52	1.32	0.374
ALA07A	0.64	0.54	0.30	0.44	0.42	0.47	1.16	0.462
ALA09A		0.79				0.79	1.29	0.375
ALA09B	0.50	0.44	0.35	0.53	0.38	0.43	0.65	0.31
All white oaks						0.50	1.05	0.379

Table 5. Correlation results of 50-year segments (overlapping by 25 years) for white oak (barn compared to Jefferson and Switzerland County, IN white oak chronologies) and tulip poplar (barn compared to Washington County, IN tulip poplar chronology). Correlations are significant (*P* < 0.01) if the correlation coefficients are greater than 0.33.

Chronology	1723-1772	1748-1797	1773-1822	1798-1847	1816-1865
Jefferson County, IN	0.51	0.57	0.59	0.62	0.56
Switzerland County, IN	0.52	0.54	0.63	0.66	0.51
	1724-1773	1749-1798	1774-1823	1799-1848	1815-1864
Washington County, IN	0	0.55	0.58	0.54	0.56

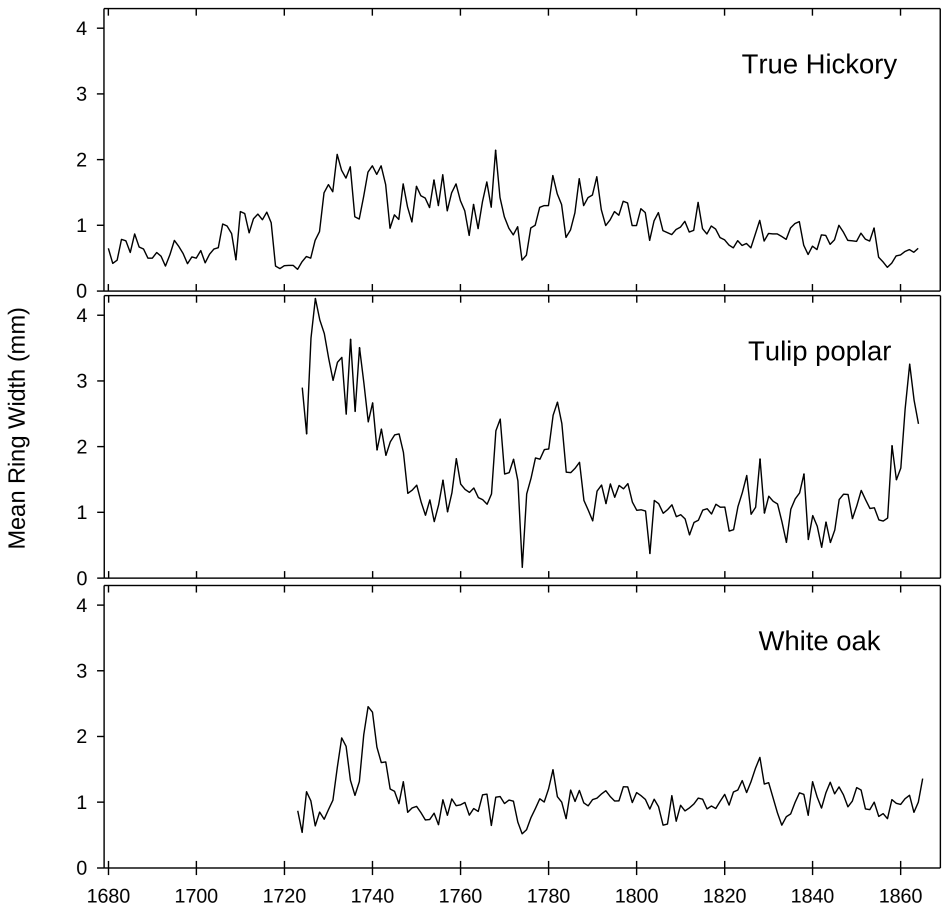


Figure 12. Composite mean chronology for true hickory, tulip poplar, and white oak. Note: red oak was excluded since only one timber of this type was sampled.

Discussion

Based on dendroarchaeological evidence, the Wycoff press barn was most likely erected during the spring or early summer of 1866. Of the 11 timbers for which it was possible to establish a death date, eight of the samples showed a death date or outermost ring of 1865 (Table 3). This means that the trees were alive at the beginning of the 1865 growing season, produced a growth ring during the 1865 growing season, and died prior to the initiation of the 1866 growing season. In this context, growing season refers to the period of the year when a tree deposits wood around its circumference not when it is in leaf. Wood is deposited around the circumference of a tree for only part of the spring and summer, most likely from April through August (Phipps and Gilbert 1961). Two of the timbers (ALA06 and ALA07) did have an 1866 tree ring. However, this ring consisted only of earlywood vessels (the cells produced at the initiation of annual growth). These trees lacked 1866 latewood (wood formed during the late spring and early summer). Most likely these trees died in April or May 1866. One of the timbers, ALA09, had an 1864 death date. This tree may have been harvested after it had already died. The sample exhibits a prolonged suppression (extended period of minimal growth) prior to death that lasted for several decades, and indicates that its health was in decline. The death date of ALA05 could not be determined due to extensive beetle galleries that caused the core to deteriorate during boring and sanding. The 1866 construction date assumes that construction was done with green (i.e., not seasoned) timber.

A review of deed recordings shows that John N. Wycoff purchased as many as fourteen Allensville lots in 1864 and appears to have constructed the press barn two years later. Wycoff's 1860 population census entry shows him living at, or near, the small berg of Pleasant located in western Pleasant Township, Switzerland County (approximately 8 miles west of Allensville) as a boarder with the Lucinda Olmsted family. He was 26 years old and lists Indiana as his birthplace and his occupation as merchant. He cannot be located in subsequent census population reports.

The barn is located on Allensville lots #43 and #44, with lot #43 fronting the village square (See Figure 13). All surviving hay press barns are located on rural farmsteads, so the urban location of the Allensville barn is a curious inconsistency with their patterns of distribution. The only other known urban press was constructed in 1864 by U. P. Schenk in his Vevay riverside warehouse, but it was later destroyed by fire in 1878 (Indiana Reveille 1864b; Vevay Reveille 1878).

Owners of hay press barns were typically farmers, so Wycoff's listing of his occupation as "merchant" in the population census is uncharacteristic. He appears to have been involved in the hay culture through the provision of hay hoops, the wood or metal ties farmers used to bind their bales. An 1864 classified ad in the local newspaper advertises the sale of as many as ten thousand hoops from his house near the town of Bennington (Indiana Reveille 1864a; Figure 14). Since he was already commercially involved in the system, perhaps Wycoff viewed the construction of a press and barn as an entrepreneurial investment into the hay business, and chose Allensville, a setting familiar to a cross-roads village merchant. Like the Schenk's in Vevay, his press provided a centralized facility for baling hay to farmers for a fee. Or, perhaps, like the Schenk's and other Vevay merchants, Wycoff sought to purchase loose hay, and press and export bales.

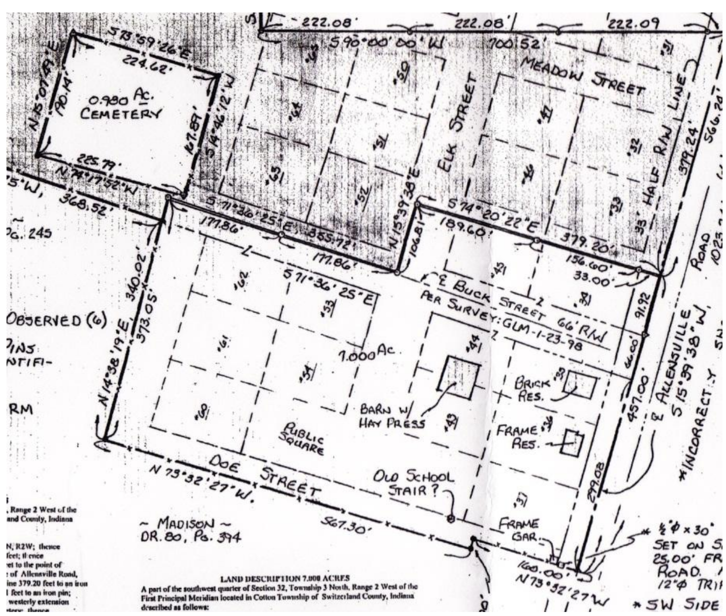
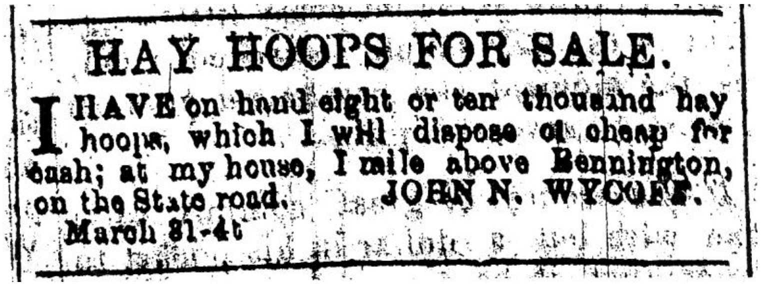


Figure 13. Land survey for Arnett property, 2008 (Rooser W. Woodfill, Surveyor). Map from Switzerland County Recorder's Office, Vevay, Indiana. The press barn is identified on Allensville lots 43 and 44.



HAY HOOPS FOR SALE.

I HAVE on hand eight or ten thousand hay hoops, which I will dispose of cheap for cash; at my house, 1 mile above Bennington, on the State road. JOHN N. WYCOFF.
March 31-4t

Figure 14. The Indiana Reveille, March 31, 1864.

Unlike Wycoff, owners of rural press barns were farmers, and their hay production could be tracked in the federal agricultural census. This primary source has supported tree-ring data for dating the construction of other press barns, but was not helpful here (Baas 2004a, 2004b).

Since the construction of the barn postdates Hewitt's invention by 23 years, there are no records of Hewitt residing in the county as late as the 1860s, and the barn property was owned by John N. Wycoff at the date of construction, no direct connections to the beater press inventor could be established.

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SUMMARY OF STRUCTURES IDENTIFIED TO DATE AT ARCHAEOLOGICAL SITES WITHIN THE VICINITY OF STRAWTOWN, INDIANA

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Archaeologists have been aware for decades of three Late Prehistoric cultural expressions in the vicinity of Strawtown (Griffin 1943; Lilly 1937) in Hamilton County, Indiana. Since 2001, archaeological investigations (for a summary, see McCullough and Graham 2010:II) have confirmed a substantial, Great Lakes-derived population, now known as the Castor phase, in settlements along the broad floodplains of the White River as early as A.D. 1050 and a Middle Fort Ancient occupation within the Strawtown enclosure, an earthen embanked and ditched enclosure, by about A.D. 1200. Settlements with a co-occurrence of both Castor and Fort Ancient cultural elements that date between A.D. 1200 and 1450 have been identified along both forks of the White River; this co-occurrence is called the Oliver phase, and it probably originated in the Strawtown vicinity. By the mid-1300s an Oneota group was occupying the floodplain across the river from the Strawtown enclosure, and there is solid evidence of Oneota feasting and ritual activity within the enclosure. Understanding the household-level patterning found among the Late Prehistoric horticultural societies who inhabited central Indiana—Fort Ancient, the Western Basin–derived Castor people, and an Oneota group—is vital in interpreting the population dynamics of the central Indiana region.

Castor Phase Structures

The material culture of the Castor phase peoples is most like that of groups around the western edge of Lake Erie, but structures within the Younge or Western Basin Tradition are found only infrequently. In Ohio, only four sites have fairly certain evidence of structures: the Cufr site, 33FU4 (Cufr 1970; Stothers 1984); the Brooke site, 33DE3 (Buchman 1969–1974, cited in Schneider 2000:140), Indian Hills, 33WO4 (Graves 1984, cited in Schneider 2000:152), and Missionary Island No.1, 33LU391 (Stothers et al. 1994:Figure 14). At a fifth site, the Patyi-Dowling site (33FU5), a "postmold configuration which may be a habitation structure" was located near a Late Prehistoric burial and dated A.D. 1300±45 (Schneider 2000:176). These structures all appeared to be oval to circular structures defined by a single line of posts on the perimeter. At Indian Hills, a multicomponent site, there were five circular postmold structures ranging in diameter from about 10 to 20 ft that were unlike others elsewhere on the site and were in an area that produced Western Basin ceramics (Schneider 2000:151-152). At the Cufr site, a well-defined, almost rectangular, shallow basin structure 3 by 4 m was identified, and there were possibly three additional shallow-basin structures, as well as numerous postmolds throughout the site (Cufr 1970; Schneider 2000:40). Only a single "ovoid" structure associated with a "Younge phase specialized activity camp" was found at Missionary Island (Schneider 2000:170), and at the Brooke site in Defiance County, "numerous post molds" were "representative of at least one structure" that contained a hearth feature and Younge or Springwells phase ceramics (Schneider 2000:140, 142). In addition to these structures, postmolds in a semicircular pattern were identified at Gunn-Eberle No. 2 (33HY77) that dated in the 1100s (Schneider 2000:73), and at the MacNichol site (33WO10), 21 postmolds "arranged in two parallel lines approximately one meter apart" probably represented "a rack for drying fishes" (Schneider 2000:118).

In southeastern Michigan, even fewer Late Prehistoric sites with structures are known. At the Riviere au Vase site (20MB3), "one of the largest and most intensively occupied sites" in southeastern Michigan (Fitting 1965; Krakker 1999:231), numerous postmolds were present but not in patterns that clearly represented structures. The Younge site (20LP1) is well known for the remains of at least two longhouses (Greenman 1937): Enclosure 1 was composed of "hundreds of poles averaging 3.5 inches in diameter . . . set vertically into the ground in two parallel bands 6 feet wide" and "585 feet long" (Greenman 1937:7, 9), while Enclosure 2, 400 ft to the south, was about 251 ft in length, with "two rows of post molds about 5 feet apart . . . over the first 127 feet from the east end" and "but a single row on each side . . . over the remaining 124 feet" (Greenman 1937:22). And at the Frazer site (20SA9) in the Saginaw valley, "parallel rows of postmolds in one area show probable longhouses with lengths in the range of 50 ft or more" (Krakker 1999:231). These longhouses, however, are remarkably lacking in domestic debris, and their association with the Late Prehistoric Younge or Western Basin Tradition is not certain.

Structures firmly associated with the Western Basin Tradition in northeastern Indiana were equally elusive. Excavated sites in Allen County, such as 12AL505 (Cochran 1987:199; Hipskind 2010) and those in Fox Island Park (Cochran 1980) produced Western Basin ceramics but no evidence of postmolds or structures. The recent investigations at the Kramer enclosure, however, exposed a wall trench segment of one structure and identified a portion of a basin structure in another area of the site (Graham and McCullough 2009; McCullough and Graham 2010:I).

The limited number of Western Basin structures excavated to date around Lake Erie make the Castor phase structures in central Indiana of especial interest. At least five types of structures have been identified on the White River floodplains near Strawtown, including two kinds of pit structures.

Pit Structures. Geophysical surveys have identified two types of pit structures at the Castor Farm site (12H3), an extensive, palisaded village. The most substantial was a pair of large semisubterranean structures located near the center of the site (Figure 1), labeled structures 1 and 2. These are situated end to end and oriented along a low ridge running northeast-southwest through the central portion of the site. Both of these structures measure about 8 by 6 m, and, in plan view, appear to have entrances along their southeast edges. At this time, a line of posts around the southeast corner of Structure 1 appears to be a screening wall around a possible entrance. Structure 2 has been minimally tested (McCullough 2011), but the entirety of Structure 1 was exposed in plan view by hand excavation (McCullough 2005:Figure 4.9). Structure 1 was excavated in three field seasons, with the northeast half removed first (McCullough 2005, 2010, 2011a) revealing a basin with rounded corners that penetrated up to 51 cm below the point of definition (80 to 85 cm below surface). The basin had been dug through outwash deposits of sandy loam and gravels to an underlying alluvial silt loam that gave a solid floor to the base of the structure.

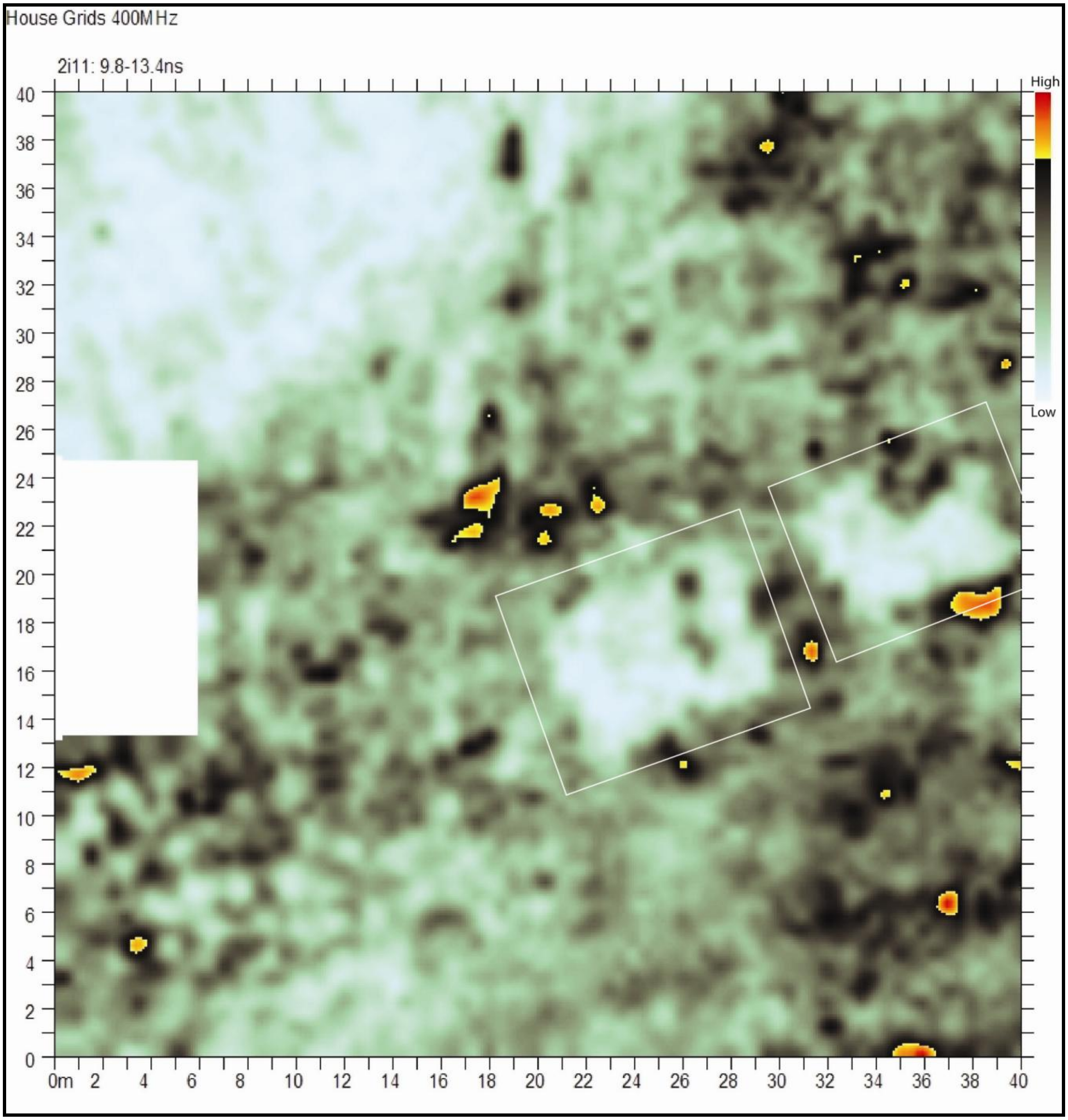

Figure 1. **Ground-penetrating radar image of the two central structure basins on the Castor Farm site (12H883) (McCullough 2011b:Figure 7.3).**

This structure appears to have been intentionally burned after its contents were cleaned out, or it was kept relatively free of debris during use. Around the north corner and northeast wall, burnt timbers were found in the floor of the structure (Figures 2 and 3). In an area along the east wall (McCullough 2005:Figure 4.17), there are two points where cross-timbers that were burned in place suggest a collapsed bench. Two radiocarbon dates from these timbers produced dates of A.D. 1020 to 1280, while soot removed from a Castor phase vessel recovered from the lowest fill zone within the basin had a date of A.D. 1020 to 1220 (all dates at 2 sigma, calibrated). Very few artifacts were recovered from the actual floor of the structure: a few small pieces of pottery, lithics, and fire-cracked rock (FCR). Most were located under the burned timbers, or bench, where a few pieces of burned and unburned fauna were also recovered, as if a few pieces were missed under the benches when cleaning out the structure. The burned fauna, most notably a deer mandible, was only burned on the upper side. A Madison triangular point was also recovered from the area of the timbers. All the burned timbers thus far analyzed have been ash wood (Bush 2005:211).

Figure 2. Leon Hostetler cleaning floor of the structure basin with burned timbers in the base of structure 1 (12H3).

The excavation also demonstrated that the basin contained a substantial structure of mostly single-set posts arranged in a double line around the perimeter (see Figure 3). The depths and sizes of these posts were highly variable, with most penetrating 30 to 45 cm below the point of definition but ranging between about 4 and 55 cm deep. Figure 4 shows a cross section of the double line of posts in a segment along the south edge. A narrow excavation trench was placed between the rows, with the view facing north representing the inner row and the view south the outer row. As is evident in both lines of posts, smaller, non-load bearing posts are interspersed with large ones. The smaller ones were probably used as bench or other supports, while the smaller ones along the edge also could have supported an external wall or screen to keep the surrounding loose sand and gravel from filling up the basin while in use. On the interior, inside of the perimeter posts, is a less well-defined row of posts running parallel to the northeast wall that forms a partition or narrow room (McCullough 2010). A second interior screening wall was present in the southwest corner, defined by an arc of small, stake-like posts intersecting the double row of posts about midway along the west wall and about a third of the way along the south wall. Within this arc, in the southwest corner, a small hearth was identified with large posts on either side (McCullough 2011a). Various interior support posts also were identified, as was evidence of surface burning and hearths. Of the wood identified from the wall posts thus far, two were ash and one hickory (Bush 2005:213).

Figure 3. Plan and profile of structure 1 (Feature 27, 12H3) (modified from McCullough 2005, 2010).

While interpreting the above-ground appearance of structures based on archaeological data is always tenuous, large single-set wall posts and interior support posts are most common with a rigid roof (gabled or hipped) type of construction, as opposed to bent pole or flexed roof type structure (Lacquement 2007a). Further, many of the bent-pole type of structures are placed within wall trenches that often have horizontal support poles placed on the exterior and, less often, on the upper, interior edge of the wall trench (Blanton and Gresham 2007:33-34; Brennan 2007:75; Reed 2007:20). The interior support posts and the double line of large single-set posts around the perimeter indicated a rigid roof structure. The walls of the structure were probably covered with bark or mats, as no definitive evidence of daub was recovered from the excavation. (Since the structure burned, this would have fired the daub, which would have been readily visible during the investigation.) Given the structure's location on a prairie surrounded by forest with readily available resources, roof coverings of either bark or bundled grass are equally plausible. A soil resistivity survey (McCullough 2010) and excavation revealed a high density of gravels surrounding the structure, suggesting the backdirt from digging the basin was bermed around the walls of the structure so that only the upper portion of the walls and the roof were exposed. Interpreting these paired structures as winter dwellings is plausible, but their mirror imaging, central location, and unique structure type suggests they were communal structures in a social system emphasizing duality.

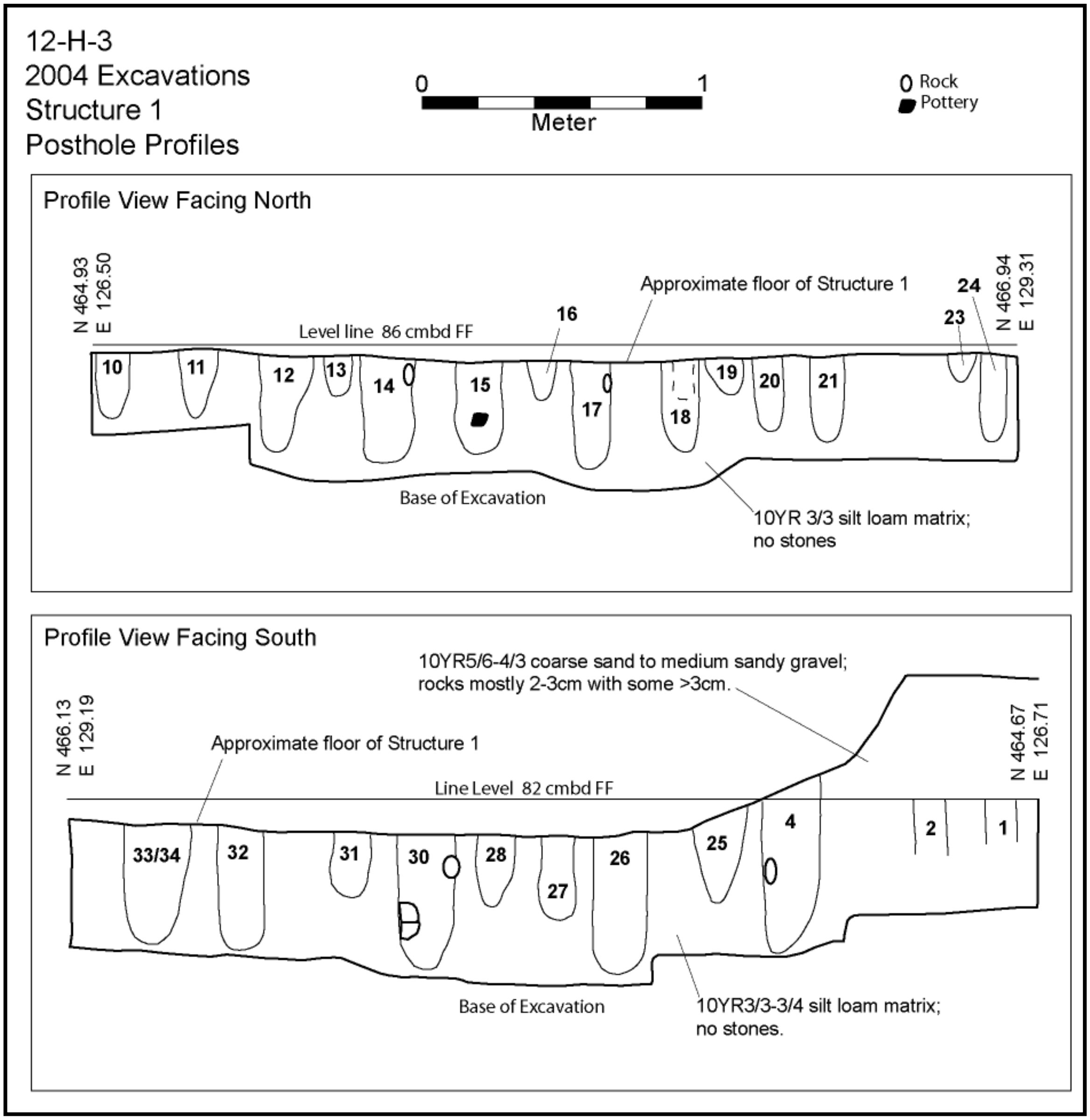

Figure 4. Partial profile of double line of posts around the perimeter of structure 1: upper row, inner line; bottom row, outer line (adapted from McCullough 2005:Figure 4.18).

A second type of pit structure (structure 3) was excavated in its entirety during the 2009 Archaeology Month investigations (McCullough and Graham 2010:II). This structure was smaller than structures 1 and 2, measuring about 6.8 m by 5.7 m (Figure 5, see also McCullough and Graham 2010:II:Figure 4.16), with the basin only extending about 30 cm below the point of definition (70 cmbs) The 2009 investigation was able to expose the entire floor plan, revealing a single episode of use: no superpositioning, rebuilding, or reuse was evident. A single line of individually set posts was placed in the basin around its perimeter. A sloping entry ramp was present along the east side, where soil was not excavated with the remainder of the basin. A break of about 85 cm in the perimeter post line allowed access to the interior of the building, and what appears to be a large marker post (post number 46) was present along the southern edge of this ramp (see Figure 5). This was the largest post recorded within the structure, measuring 20 by 24 cm and penetrating about 70 cm below definition. Support posts were also identified within the structure, including a central support post that was the second largest in the structure, measuring 23 cm in diameter and penetrating 62 cm below the point of definition. A shallow hearth and a storage pit were located on either side of the central support post. A smudge pit was present in the northwest quadrant that contained charcoal, rotten wood, and bark but only one piece of corn. This piece of charred corn and another from the storage pit produced 2-sigma calibrated dates between A.D. 1160 and 1280. Upon abandonment, this structure was not burned; rather, the contents were removed and probably placed in a newly constructed house. Material distribution within the basin fill suggests that the structure rotted in place while the site was still occupied. A higher density of artifacts was recovered within the structure adjacent to the entry ramp, as if basket loads of refuse were discarded by going through the entrance to the structure. Clusters of artifacts including portions of vessels that could be reconstructed indicate individual discard episodes. In addition, after active use of the structure but before deposition of midden fill, a large rim sherd and a subadult cranium (left in situ) were placed within the smudge pit and another shallow pit placed along the north edge of the entry ramp at the time of abandonment contained a few isolated human remains (also left in situ): several ribs, a part of a pelvis, and a portion of a foot (McCullough 2011:249-251).

Other Structure Types. Other types of structures are not as easily discernible as the basin structures, since hundreds of postmolds have been identified on the Castor Farm site. Identifying specific structures is difficult because of the intensity of occupation and the resultant superpositioning (Figure 6). The clearest example of a structure with single-set posts has been labeled structure type A (McCullough 2005:158). One type A structure, originally excavated during the 2003 IPFW archaeological field school (McCullough et al. 2004), measured about 4.5 by 4 m with a hearth in the southwest quadrant and two large interior support posts on the north and south ends. The posts around most of the perimeter of the structure were small (ca. 5-8 cm), spaced about 30 to 40 cm apart, and appeared to be driven or screwed into the ground. The west wall was less clear, showing a combination of the smaller stake-sized posts and larger ones. An opening was present along the north end of the west wall. This structure was not substantial and may have lacked walls or had ones that could be removed when necessary such as for warm weather usage. Similarly sized posts were found elsewhere within the excavation, but only this one definite pattern could be discerned. Undoubtedly, other structures like type A were present on the site (McCullough 2011:251-252).

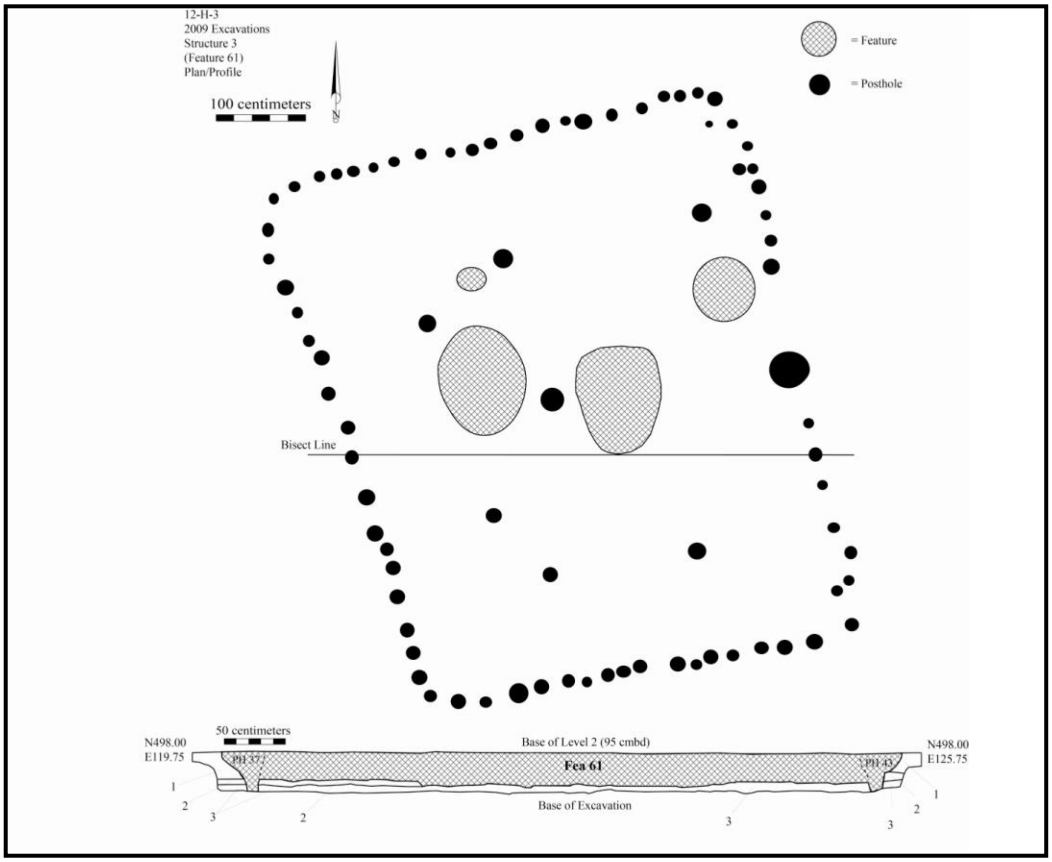

Figure 5. Floor plan in base of structure 3 basin (12H3); the marker post is the largest post on right at the edge of the entry ramp (McCullough 2011b:Figure 7.7).

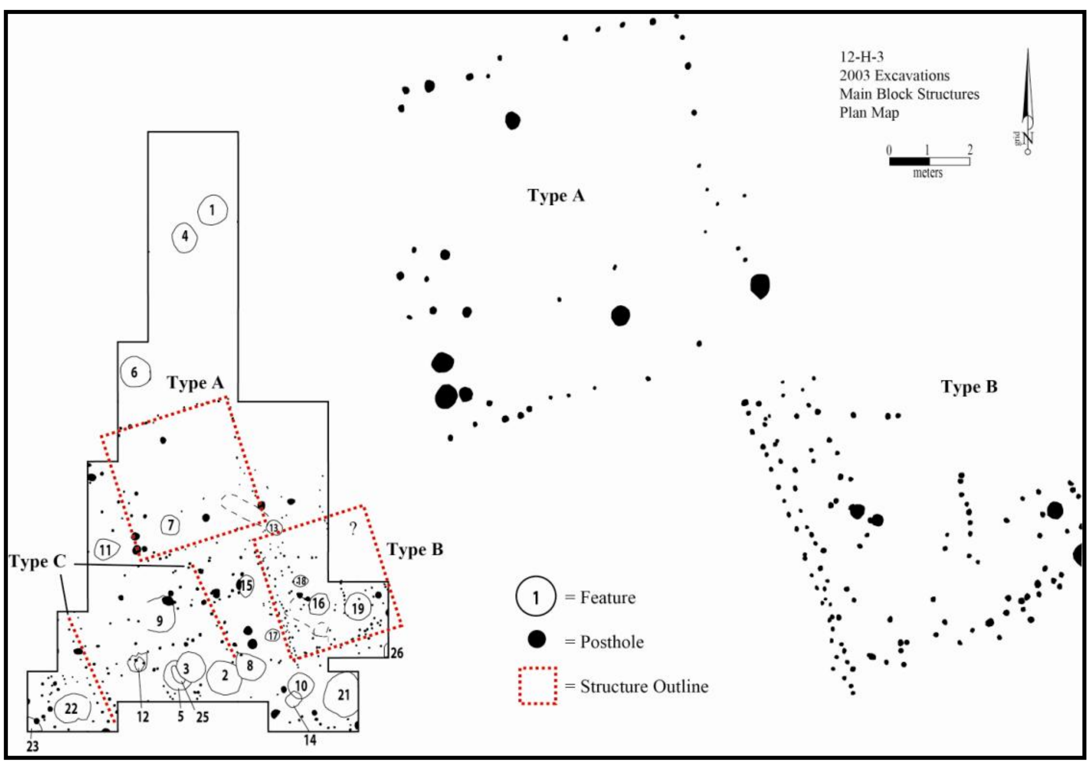

Figure 6. Structures identified during the 2003 excavation at 12H3 (adapted from McCullough 2005:Figure 7.2).

A second type of structure, type B, also utilized small poles for a frame (see Figure 6). However, type B construction consisted of a roughly double line of posts spaced about 15 cm apart. The individual small posts were set from 12 to 18 cm apart for a length of about 4.5 m. One wall of this type of structure was oriented roughly the same as the type A structure, and was located about a meter to the southeast. A mixed and more jumbled line of posts extended from near the south edge of this line to the northeast. At the north end of the double row of stake-sized posts is a corner, but there is a break in the post pattern along this wall. Unfortunately, the structure pattern could not be fully discerned because of the excavation limits. The type B structure in all likelihood resembled a Quonset hut in shape and could be left open at one end or covered, as needed, with skins or matting. The inner poles of the double line were probably bent over to form an elongated, flexed roof, a covering such as bark was placed over the inner poles, and the outer row of poles was bent over the covering to hold it in place. Based on the size of the posts, this structure, along with type A, represents more ephemeral types of structures (McCullough 2011:252-253).

Other structures on the Castor Farm site were represented by large, deep posts that were set singularly and intended for a structure with a substantial, rigid roof style of architecture. The most distinctive, referred to as type C (see Figure 6), consisted of a double row of these larger posts, similar to those placed in the bottom of the Structure 1 basin. Thus far, only two parallel walls have been identified for this type of structure, which is not associated with a basin. The walls are located south of the type A structure and west of the type B structure and oriented in the same direction, although an entire structure outline has not yet been identified. Single lines of large posts have been identified in several areas of the site, representing other types of structures; however, because of excavation unit placement and the high degree of superpositioning, the outlines are not certain. To better detect domestic structures, future excavations need to find a quieter, or less intensively occupied, portion of the site to understand the variety of post patterns (McCullough 2011:253).

Structures within the Strawtown Enclosure (12H883)

To date, the occupation within the Strawtown enclosure, an earthen embanked village on a terrace near 12H3, seems most similar to the contemporaneous Anderson phase of Middle Fort Ancient (A.D. 1200-1400) in terms of radiocarbon dates, ceramic assemblages, features, and site structure. Middle Fort Ancient villages were larger, more nucleated sites than Early Fort Ancient villages. With structures arranged around a central plaza, the villages were circular, planned, and more permanent, having multiple zones of activity within them (Drooker 1997). Many also have thick midden deposits and large storage/refuse pits. Middle Fort Ancient domestic structures generally were squarish to rectangular, averaging 6.9 m in length and 4.8 m in width (Stoner and Ahler 2010). Single post construction was the norm, although wall trench structures are not unknown, "usually as a solitary occurrence" in Ohio (Cook 2008:36) and somewhat more commonly in Kentucky (Henderson 1992). Larger structures also occur among the domestic structures, as at Sunwatch where three larger structures have been interpreted as evidence of Mississippian migration or influence on village leadership (Cook 2008); large structures also occur in isolation and may have had a ritual significance (Stoner and Ahler 2010).

As at Castor Farm, the intensive occupation at the Strawtown enclosure has made identifying structure types extremely difficult. The 2010 investigations on the enclosure focused on extending the block excavation started in 2006 and continued in 2007 and 2008 to fully expose a basin structure and other superimposed wall post structures. In addition, the excavations targeted a large shallow basin (Feature 47) that probably represented an ephemeral hut-like structure. In 2010 the excavation block was expanded to the north, west, and south (Figure 7). What resulted are very complicated patterns of postmolds, many of which will probably never be associated with a particular structure. Some patterns emerged, however, and at least three structures and possibly a fourth are superimposed within this large excavation block. The clearest structure is the single line of posts set into a shallow basin, labeled structure A for this discussion (Figure 8). It measured about 10 by 7.5 m with an opening along the east side facing the central plaza. The entrance was an earthen ramp that protruded into the basin fill (Figure 9; see also Graham and McCullough 2010:Figures 4 and 6) similar to the smaller basin (structure 3) excavated in 2009 at 12H3 (McCullough and Graham 2010:II).

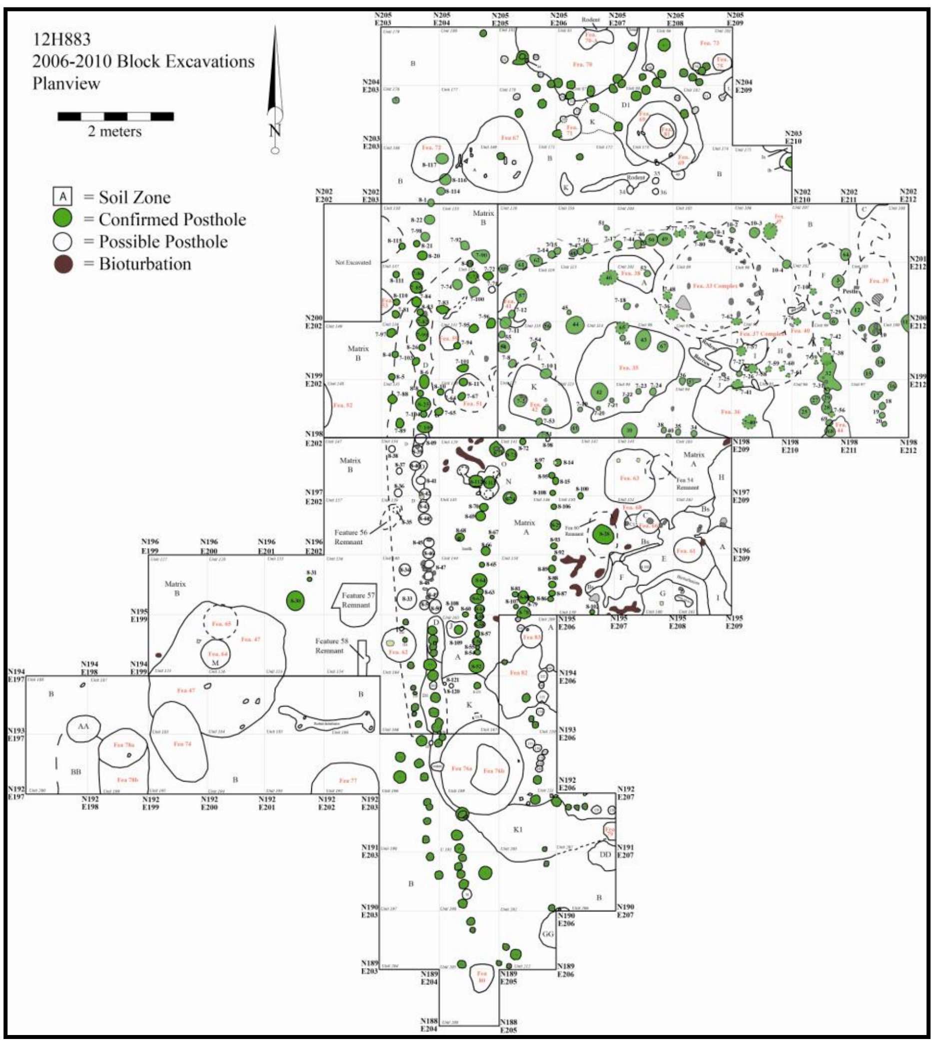

Figure 7. Large block excavation from 2006, 2007, 2008, and 2010 along the east side of the Strawtown enclosure (12H883) (McCullough 2011b:Figure 7.9).

The perimeter of this structure consisted of a single line of mostly large posts set deeply in the ground below the basin floor. Occasional areas of probable repair are evident and form a clear line along the northern edge of the structure basin north of features 33 and 38. The south edge of the basin extended to between N191 and 192 at the E207 line. The posts along the southern perimeter were not as clear, since the excavations barely exposed these anomalies along the north edge of Unit 207. The eastern edge of structure A appears to run along the western edge of features 34 and 44. The western edge of the basin structure shows potential repair as well as superpositioning with a large wall post structure (Structure B, Figure 10). Several posts demonstrated superpositioning and in places, segments of informal wall trenches were present, probably a result of setting another wall where a previous one had been placed. In plan view, this is evident where the posts associated with the basin structure intersect structure B posts at about N200, E202. South of this intersection the posts are crowded in, but north of that line there is somewhat greater spacing between the posts. Unfortunately, at this point it is impossible to determine which structure represents the later one (McCullough 2011:256-257).

Structure B is the largest structure found thus far in central Indiana. While its full length and breadth have yet to be determined, it so far measures at least 15 m long by 5.5 m wide, and the perimeter consists of a single line of individually set posts without a discernible structure basin. What appear to be several large central support posts are present within the interior, but which structure they are associated with is unknown, because the size of either would require the use of center roof supports. Similarly, pieces of burned soil or daub that are clearly structural material were recovered from the fill of a hearth feature (Graham and McCullough 2009:Figure 5.6), but it is difficult to associate them with a specific structure.

Structure C (Figure 11) represented a structure that mostly consisted of the smaller, stake-sized posts that appear to be driven or augered into the ground. Currently it appears to extend possibly as long as 9 m north-south, however, it is possible that future excavation to the south could extend this structure. The east-west dimension has not yet been established, but it is at least 5 m in width. Five of these stake-sized posts clearly were superimposed on Feature 35, a large prepared hearth (McCullough 2008:Figure 3.41). During the 2010 excavation, the west wall of structure C was also found to cut across Feature 82 (another hearth), but further excavation in this area is needed in order to identify all the posts along this edge of the excavation.

The least well-defined structure is designated structure D (Figure 12), whose west wall is represented by the row of posts farthest west in the excavation. As with structure B, the dimensions of this structure have yet to be determined, but this structure extends at least 13 m long and about 5 m wide. It has assorted sizes of posts with most in the smaller range. The proposed north wall of this structure superimposed on top of Features 67 and 69, both Oliver phase deep storage pits. Along the west wall, two small Taylor Village, or Oneota-related, pits (Features 56 and 62) were superimposed over the line of posts.

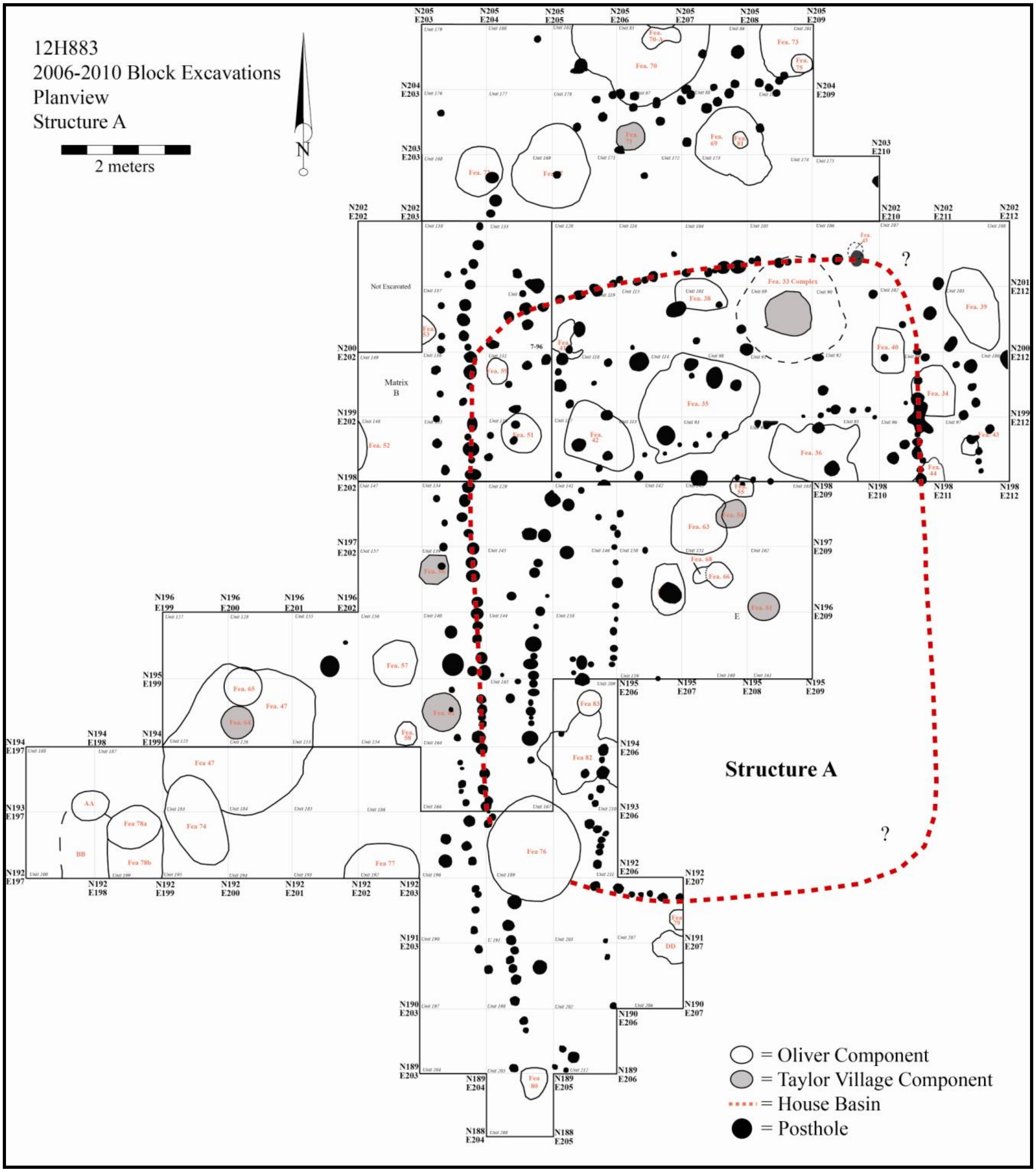

Figure 8. Outline of basin structure (structure A) at the Strawtown enclosure (12H883) (McCullough 2011b:Figure 7.10).

Figure 9. Photograph showing basin and ramp into structure A (adapted from Graham and McCullough 2009: Figure 3.15).

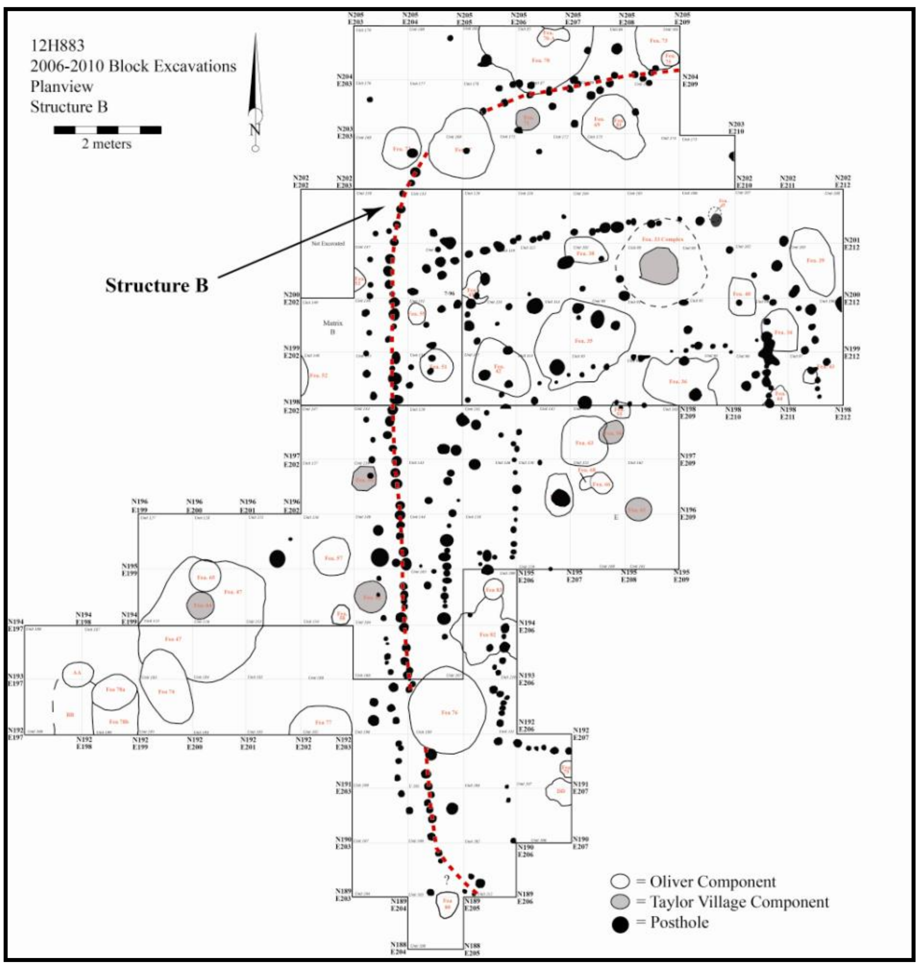

Figure 10. Outline of the largest wall post structure (structure B) within the Strawtown enclosure (12H883) (McCullough 2011b: Figure 7.12).

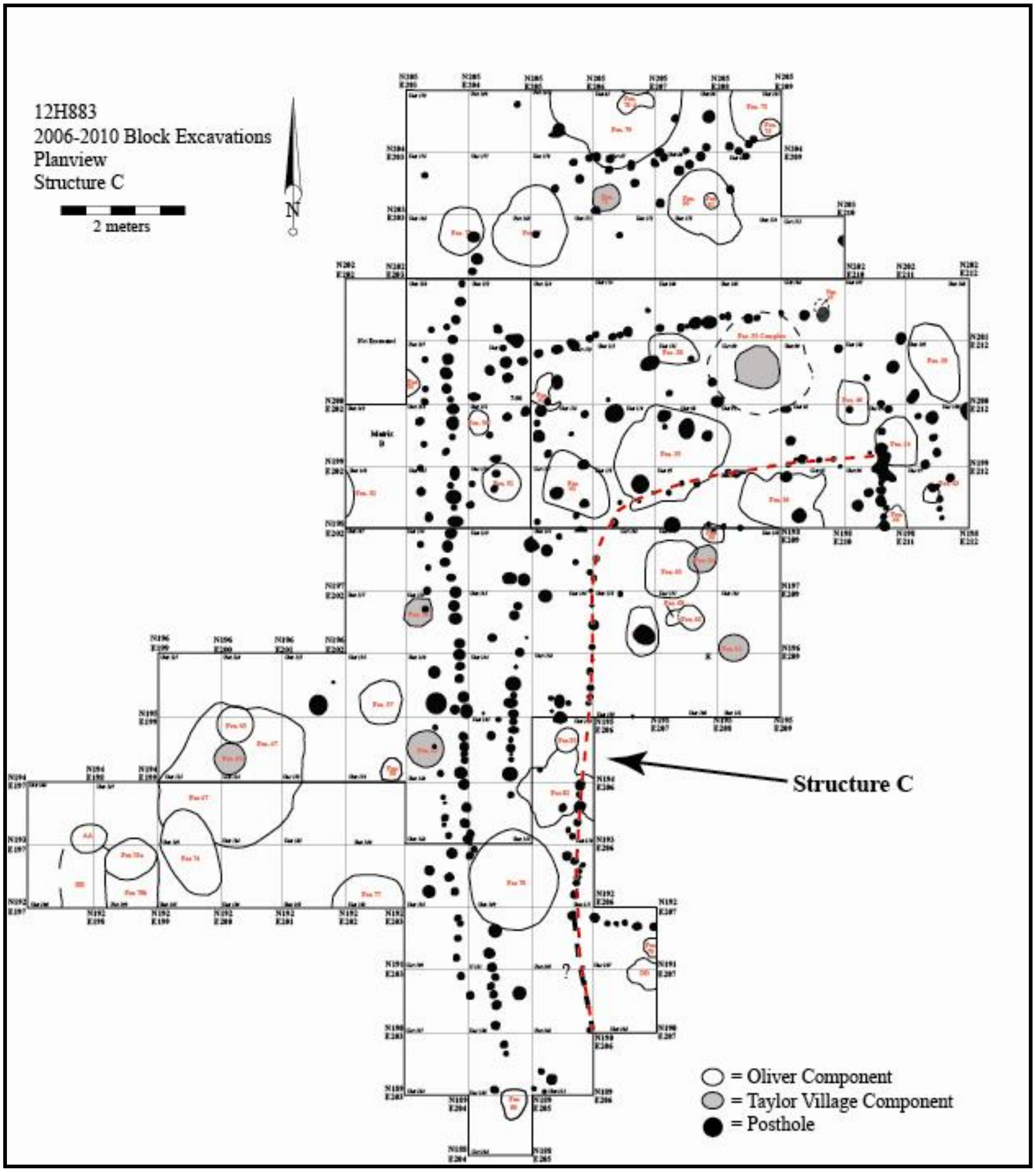

Figure 11. Outline of structure C showing superpositioning over two hearths (Features 35 and 82) within the Strawtown enclosure (12H883) (adapted from McCullough 2011b:Figure 7.13).

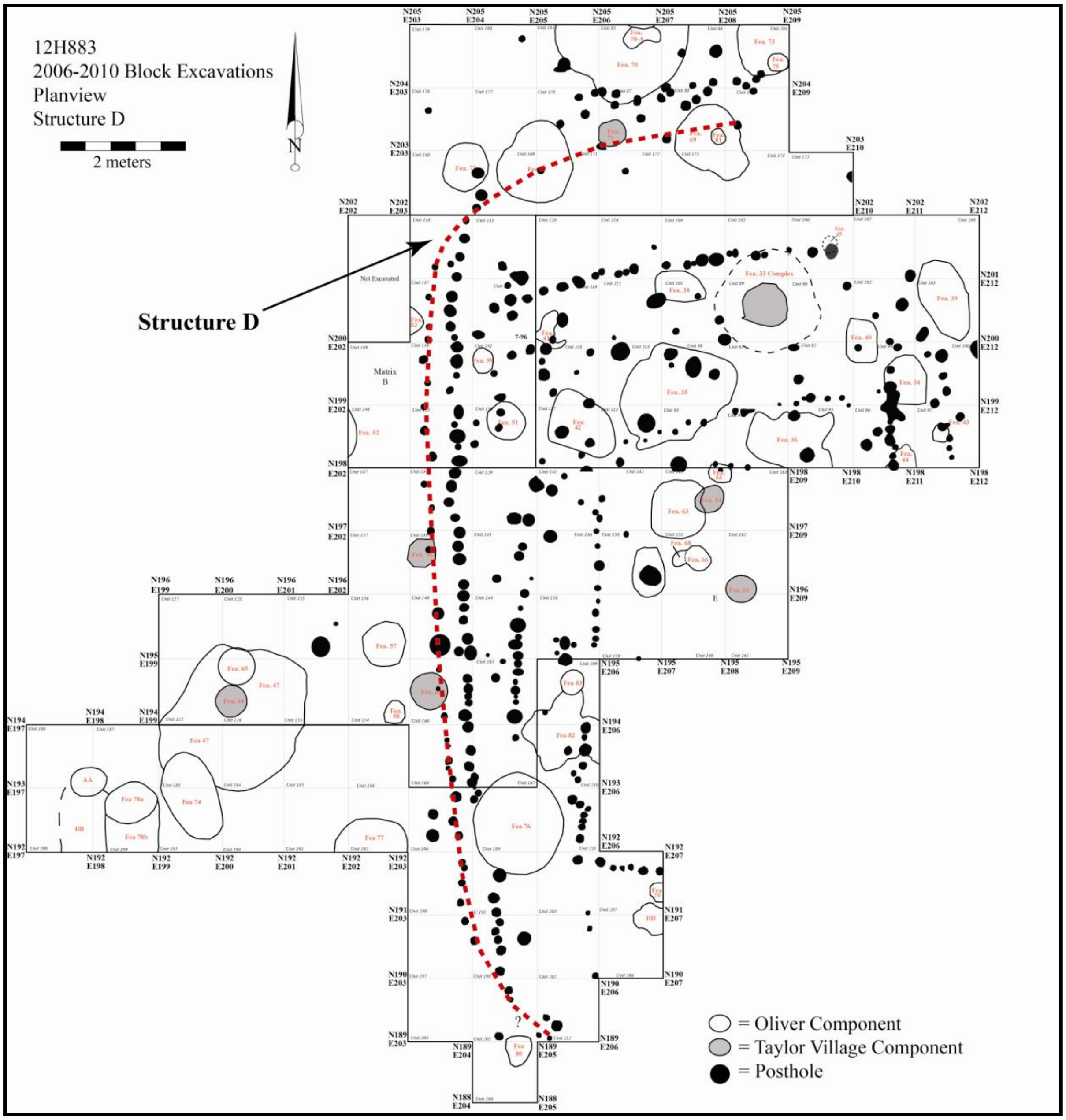

Figure 12. **Outline of structure D at the Strawtown enclosure (12H883) (McCullough 2011b:Figure 7.14).**

An unexplained, and thus far unique, feature represents a possible hut-like structure. Feature 47 in the western extension of the excavation was a large shallow basin feature extending about 2.7 by 2 m. The basin was superimposed by a small Taylor Village pit (Feature 64), and a small, mostly empty, pit was found at the base of this feature along the north edge. No postholes, hearths, or clusters of FCR were noted to aid in the interpretation of its use. The basin is similar in size and attributes to the features interpreted as huts at the Cufr site, 33FU4 (Cufr 1970; Stothers 1984), however, posts were not identified around the outside perimeter of the basin in the enclosure. It is possible that the structure could have been more temporary, like a tent, or that evidence of shallow stakes did not survive cultivation of the site. Similar features of about the same size that have been interpreted as huts were present at the contemporary Oneota-related Crouch site (12Jo5) south of Indianapolis (McCullough and Wright 1997).

The numerous hearths (Features 35, 36, 42, and 82, as well as one not yet fully defined) within the structure areas attest to the intensity of structure use along this portion of the eastern edge of the enclosure. However at this point it is unknown which hearth is associated with which structure; only the fact that features 35 and 36 are not associated with Structure C is certain.

Notably, the placement of structures was not continuous along the perimeter of the Strawtown enclosure. A large contiguous block previously placed about 12 m north of the 2010 excavation did not contain any evidence of structures. Instead, large storage pits were clustered in this area. Although storage pits were identified in and among the structures, their density was far less than that found in the block to the north. With the exception of some evidence of roasting in the abandoned storage pits, the large hearths found within the structures also were absent from the storage zone (relative to the edge of the enclosure). Inward toward the plaza some burned areas were noted, but they appear to be external fire events and not associated with structures. Interestingly, the size of the Strawtown storage pits in this area eclipse those from any other known Oliver site. The volumes of the storage pits from the Strawtown enclosure, for example, are about three times the size of those identified from the Clampitt site (Redmond 1994b). However, all of the wide-area excavation has only taken place along the east edge of the enclosure, and it is unknown whether this pattern of large structures adjacent to clusters of large storage pits is typical of the village plan for the Strawtown enclosure or is the product of communal activities in this portion of the village.

Oliver Phase Structures outside Central Indiana

Outside the park, investigations of Oliver phase sites have identified only three or four structures: wall remnants of two possible domestic structures at the Sugar Creek site (12Jo289); and one structure each at Pottersville (12Ow431) and Cox's Woods (12Or1). A structure was excavated at the Ana Lynn site (12Ws284), a multicomponent site with both Mississippian and Oliver phase ceramics on the Blue River in Washington County, but that report is not yet available (Jackson n.d.). The three reported sites reflect the diversity of structures identified within both Western Basin and Fort Ancient cultures, but do not necessarily have counterparts in the Strawtown area.

Sugar Creek Site (12Jo289). The Sugar Creek site is a small Oliver phase site along Sugar Creek just above its confluence with a major branch of the Blue River. Testing in 1995 revealed a "loose arrangement of middens or features . . . scattered around a possible central plaza area" (McCullough and Wright 1996:94). Two possible wall remnants were identified: one was a wall trench oriented northeast-southwest with five postmolds also aligned northeast-southwest at its base; the other remnant (Figure 13) appeared to be the corner of a subrectangular structure formed by the intersection of two linear trenches about 52 cm in width. Postmolds at the base of the corner, however, were scattered instead of aligned with the trenches. Although wall trenches are most closely associated with Mississippian architecture, other groups utilized wall-trench construction, and the wall trenches at 12Jo289 varied in "both width and depth and became amorphous at the corners, unlike Mississippian-type wall trenches that are usually straight narrow segments with posts placed at fairly regular intervals" (McCullough and Wright 1996:95).

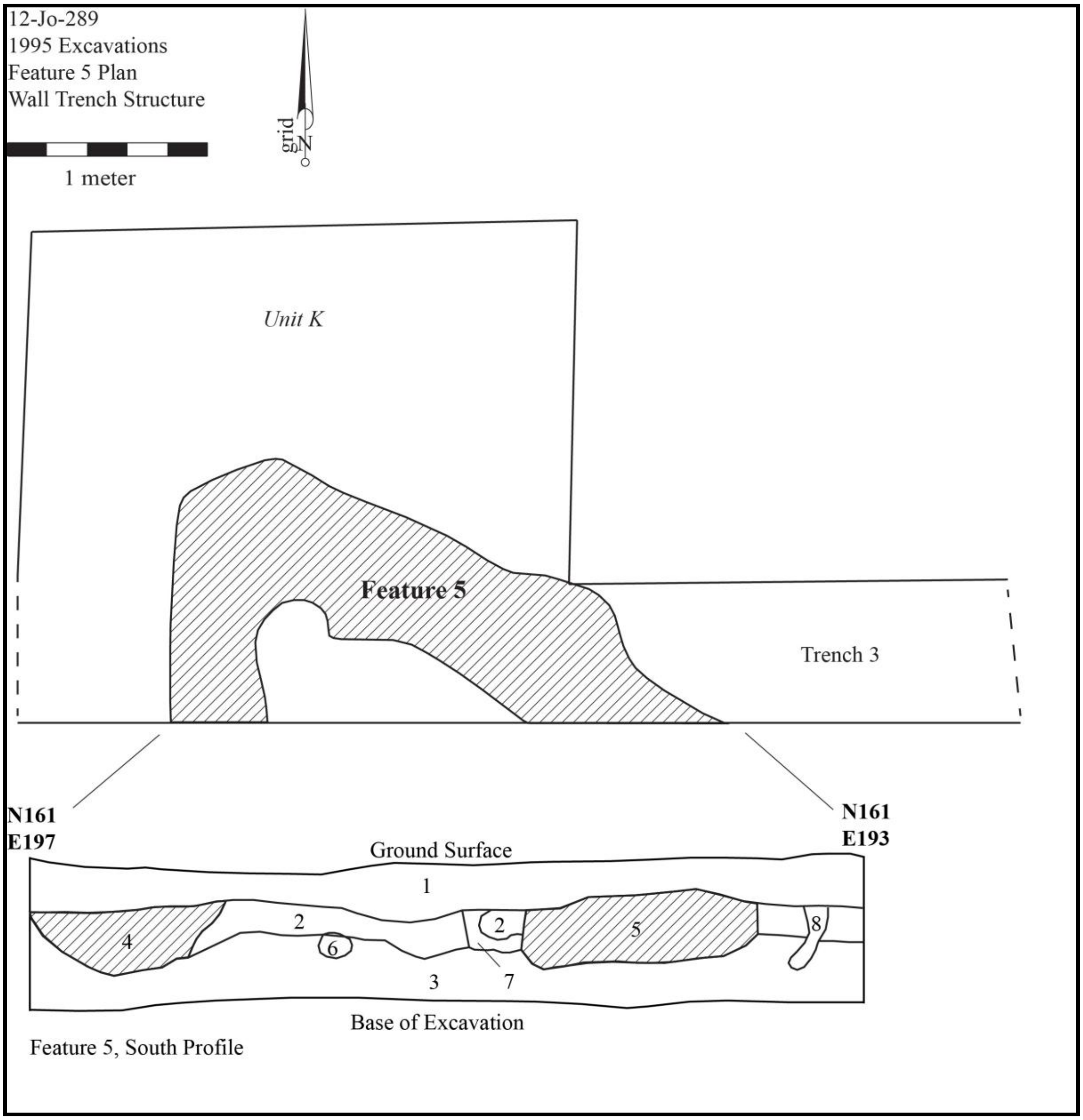

Figure 13. Corner of structure (wall trenches in profile) identified at the Sugar Creek site, Johnson County, Indiana (adapted from McCullough and Wright 1997).

Pottersville Site (12Ow431). The Pottersville site is a small Oliver phase habitation site dating around A.D. 1275 and badly damaged over the years by flooding from the west fork of the White River (Strezewski 2002). The single structure identified at the site was circular (Figure 14), measuring approximately 7 by 7.5 m, and built by setting posts about 58 cm apart into a deep wall trench. These posts were 14 to 19 cm in diameter, "which strongly suggests that they were fairly substantial, and therefore too thick to have been bent over" (Strezewski 2002:9). Strezewski noted the circular structure's similarity to ones identified in northwestern Ohio and suggested that it had been a basin structure, given the extensive flood damage to the site and the evident loss of shallower features (2002:53-54). The once-substantial semi-subterranean dwelling, along with the site's small size and its location on the low floodplain liable to spring and early summer flooding, led Strezewski to suggest that Pottersville may have been a winter camp or habitation site (Strezewski 2002:54-56), not unlike ones known historically among the Great Lakes and Ohio Valley Native American groups (e.g., Trigger 1978).

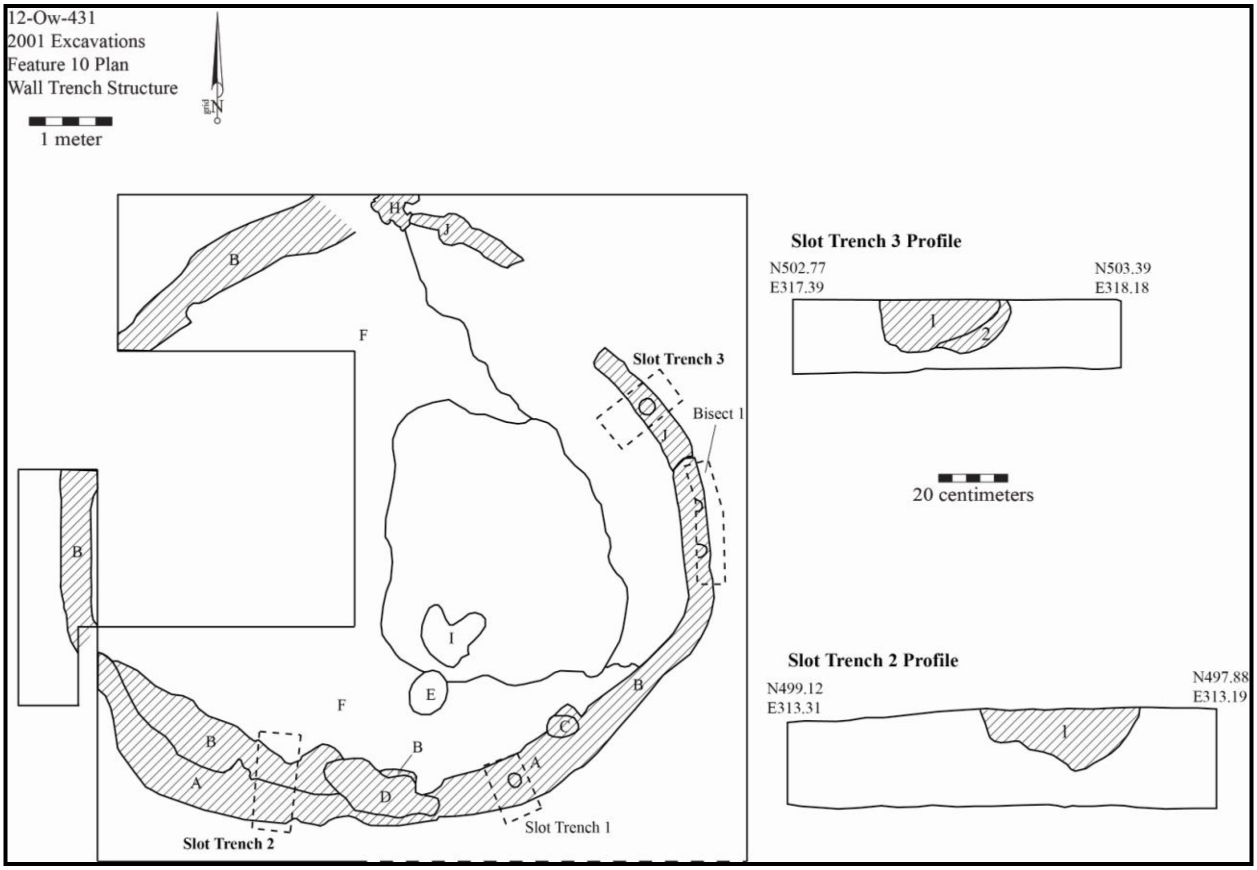

Figure 14. Circular wall-trenched basin structure identified at the Pottersville site, Owen County, Indiana (adapted from Strezewski 2002).

Cox's Woods Site (12Or1). Cox's Woods was a fortified Oliver phase village in the White River's east fork drainage that dates to A.D. 1300-1450, with a double earthen embankment and stockade; a shallow ditch is present between the embankments. It is ovoid in plan and open on the length along Lick Creek. Like Fort Ancient circular villages, no features were found within the central plaza. A habitation area was situated between the embankment/stockade and the central plaza, suggested by the presence of many pit features and a domestic structure identified in the 1994 investigations at the site (Redmond 1994a; Redmond and McCullough 1995, 1996). The domestic structure was subrectangular in shape, oriented northwest-southeast, and measured approximately 6 m in length and 3 to 4 m in width, with an opening on the northeast (Figure 15). It was constructed by posts placed irregularly in wall trenches on all four sides (Redmond and McCullough 1995:27). Like the wall trenches at 12Jo289, those in the structure at Cox's Woods are wider and shallower than typical Mississippian wall trenches.

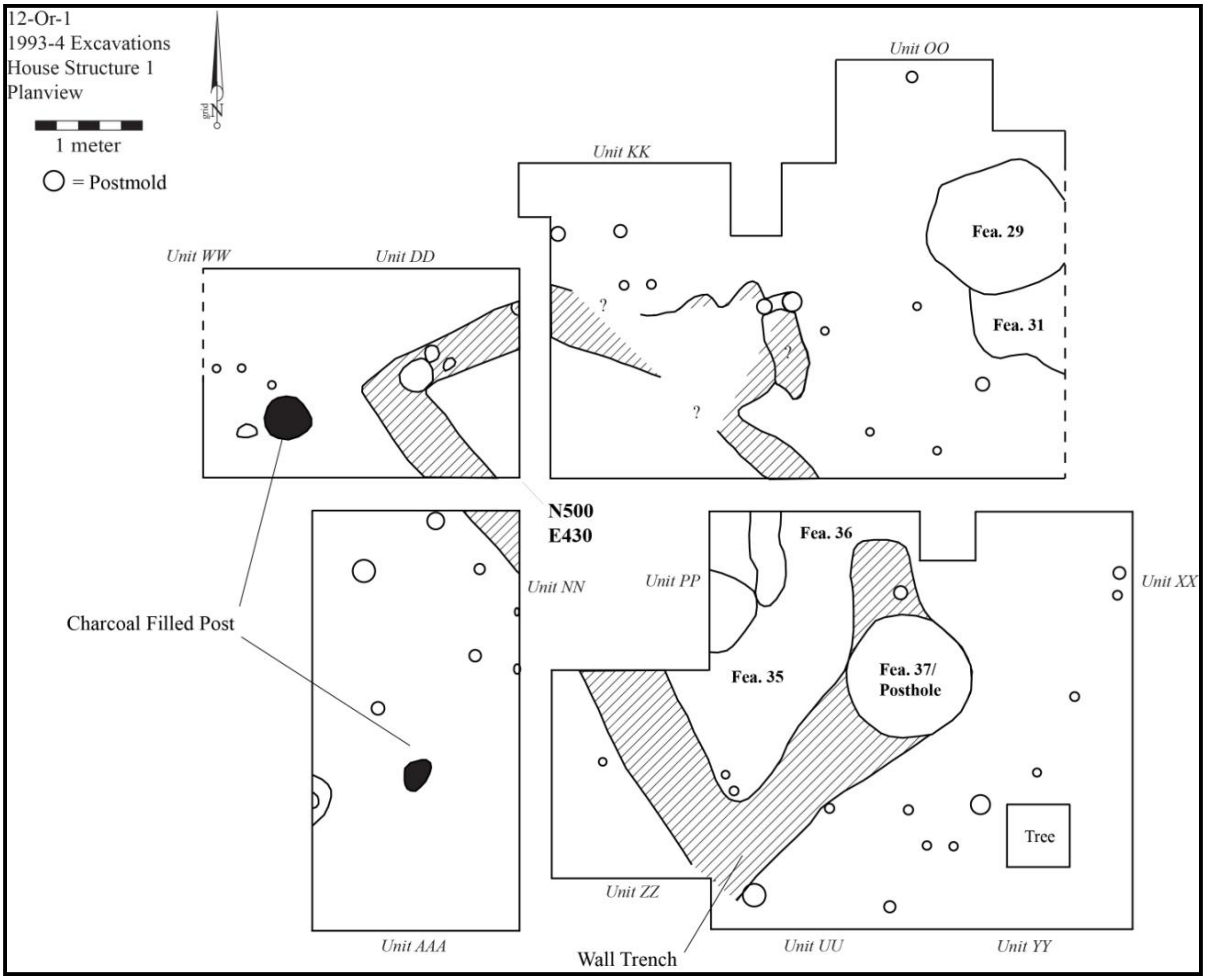

Figure 15. Subrectangular wall-trenched structure identified at the Cox's Woods site, Orange County, Indiana (Redmond and McCullough 1996).

Summary Discussion

Understanding the variety of house forms utilized by groups in central Indiana is daunting, especially when our information to date is so limited and preliminary. The almost bewildering variety of structures identified so far in the Strawtown vicinity is not so surprising; however, given its borderland position and the three cultural groups occupying the area during the Late Prehistoric period. Other elements of material culture indicate a number of accommodations or adaptations over time among Castor phase, Fort Ancient, and Oneota peoples, from cultural sharing through boundary maintenance to displacement (McCullough 2005, 2010). The Oliver phase, a cultural grouping based on selections from the cultural repertoire of both Castor phase and Fort Ancient peoples, originated along the White River floodplains in Hamilton and Marion counties and then spread throughout the river's drainage in central and south-central Indiana, as far south as Orange and Washington counties.

Like other elements of material culture, physical structures, both domestic and communal, serve as "mirrors" of the cultures that created them, reflecting social patterning and priorities:

> As a material object, the house has to meet particular needs, the most important being to provide suitable shelter for a particular environment. In terms of behavioral needs, the structure must enclose enough space to perform a set of activities, while the social components of a household may reveal the status of individuals within a household, the status of the household as a whole, and ideas about gender [Gougeon 2007:136].

At the Castor Farm site, five types of structures have been identified to date: large, paired, semi-subterranean structures with single-set posts in a double line around the perimeter (see Figure 3); a smaller pit structure with only one line of single-set posts at the perimeter (see Figure 5); a structure with small posts around the perimeter and two large, interior support posts (type A, see Figure 6); another structure (with small posts round the perimeter but in a double row (type B, see Figure 6); and a structure with large, single-set posts in a double row around the perimeter (type C, see Figure 6), similar to the large, semi-subterranean structure but without an excavated basin. None of these structures has an exact analog in Western Basin Tradition sites to the northeast, although small, near-rectangular, shallow-basin structures with only a few perimeter posts were identified at the Cufr site in northwest Ohio (Cufr 1970; Schneider 2000:40) and a portion of a basin structure was exposed at the Kramer site in Allen County, Indiana (McCullough and Graham 2010:I). The type C structure, with its double row of posts in two parallel lines about 4 m apart, may represent a structure similar to the longhouses identified in southeastern Michigan (Greenman 1937; Krakker 1999), but the superpositioning at Castor Farm obscures the structure's entire perimeter. Certainly the paired, communal structures have no precedents in any Western Basin site to date, nor has any similar structure been identified elsewhere in Indiana; these structures may be our best example of the cultural innovation that can occur in borderland areas like central Indiana, where cultural norms can lose their salience in new situations.

Within the Strawtown enclosure, at least four different structures can be identified despite extensive superpositioning in the eastern portion of the village: structure A is a basin structure with a single line of fairly large, single-set posts around the perimeter (see Figure 8); B, the largest structure found thus far in central Indiana, is represented by a single line of individually set posts without a basin (see Figure 10); C is composed of smaller, stake-sized posts (see Figure 11); and D is a segment of a line of mostly smaller-sized posts (see Figure 12). To the extent that these structures are of individually set posts and roughly rectangular, they are consistent with Fort Ancient structures, although they are somewhat larger than most domestic structures and may represent a locus of community activities. In addition to these four structures, a smaller basin structure may be represented by Feature 47, a large shallow basin lacking perimeter posts. Interestingly, Feature 47 is similar to features interpreted as huts at the Western Basin Cufr site (Schneider 2000) and at the Oneota-related Crouch site in Johnson County, Indiana (McCullough and Wright 1997).

Structures from Oliver phase sites outside the Strawtown vicinity add to the range of structural diversity within these Late Prehistoric groupings: subrectangular, wall trench structures were identified at Sugar Creek (see Figure 13) and Cox's Woods (see Figure 15) in Johnson and Orange counties respectively, while a circular basin structure with fairly substantial posts set into a perimeter wall trench was found at the Pottersville site in Owen County (Strezewski 2002). Wall trench structures are usually associated with Mississippian populations, but these wall trenches were not typical of Mississippian construction. Wall trenches are also encountered in Fort Ancient settlements, and the wall trench segment found at the Kramer enclosure suggests that wall trench construction was widely dispersed.

It is important to note that not all structural diversity can be attributed to a specific ethnic grouping. Within a single cultural grouping, most architectural grammars contain a variety of structural options based on such factors as function, use-life, or even seasonality. For example, basin or semisubterranean structures, which occur widely, have long been interpreted as winter houses (e.g., Webb 1952); their substantial construction, below-grade floor, and bermed soils on the perimeter mitigated temperature extremes and held heat more effectively. In some Mississippian villages, basin structures have been identified standing next to smaller, less substantial constructions that probably served as summer shelters when more activities could be moved outside (Gougeon 2007).

Temporal differences can also contribute to a variety of forms. Within a Mississippian context, there is good evidence that individually set, small-post construction was replaced by single-set, large-post structures, perhaps due to a "decrease in the availability of suitable materials," since "small trees for flexed pole construction needed to meet the strict qualifications of being slender, long, and free of deformities" and "would have been exploited quickly" (Lacquement 2007b:70-71). Similarly, wall trenches became more prevalent over time, not only because "it is easier to dig a trench with shell, flint hoe, or wooden spade than to dig an individual hole," but also the wall trench made it possible to erect preassembled wall segments, simplifying house construction (Reed 2007:21).

Although we have yet to decipher the meanings of the variety of structures, those structures identified to date in the vicinity of Strawtown are an important first step in understanding the domestic and community patterning of the groups inhabiting central Indiana along the White River, as well as the complex population dynamics of the Late Prehistoric period, when groups were interacting in border areas well beyond their traditional homelands and adopting cultural elements of neighboring peoples or adapting their own. The investigations also have provided essential data for the Hamilton County Parks and Recreation Department's long-term plans for a reconstructed Native American village area in Strawtown Koteewi Park to better explain the area's long history of human habitation.

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A DATA DEFICIENT REGION: AN ARCHAEOLOGICAL SURVEY OF MONTGOMERY COUNTY, INDIANA

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Abstract

The Applied Archaeology Laboratories (AAL) at Ball State University conducted a data enhancement project for threatened archaeological resources in Montgomery County, for a FY2010 Historic Preservation Fund Grant (Grant # 18-10-21921-9). Approximately 915 acres (370.3 hectares) of agricultural land were surveyed, and 220 new archaeological sites were recorded. The survey recovered 372 prehistoric artifacts and 1,329 historic artifacts from 16 parcels of land within Montgomery County. Cultural periods that are represented in the artifact assemblage include Early Archaic, Middle Archaic, Late Archaic, Early Woodland, Middle Woodland and Late Woodland/Prehistoric components that were documented from the precontact era. The average site density recorded for the project area for precontact sites was one site per 5.4 acres.

Introduction

The Applied Archaeology Laboratories (AAL) at Ball State University conducted a FY2010 Historic Preservation Fund Grant to survey portions of Montgomery County, Indiana. The project involved a pedestrian survey of approximately 915 acres (370.3 hectares) of agricultural land. The main goals of the project were to increase the site database for the county (prior to this survey, there were 146 sites in SHAARD, the Indiana State Historic Architectural and Archaeological Research Database), construct a cultural chronology for the county, refine settlement patterns of the precontact era, and enhance our understanding of the early Euro-American period. The Sugar Creek Valley and northern half of the county were targeted for this project because they have not been systematically surveyed and are threatened due to gravel mining and erosion. In addition to the large-scale survey, four reported mound sites were investigated and potential chert sources were researched to help define lithic resource areas and utilization in the region. Though the project did not focus on minority-related resources of the historic period, an attempt was made to locate Cornstalk Town, a historic Miami occupation documented to be in the southern portion of the county.

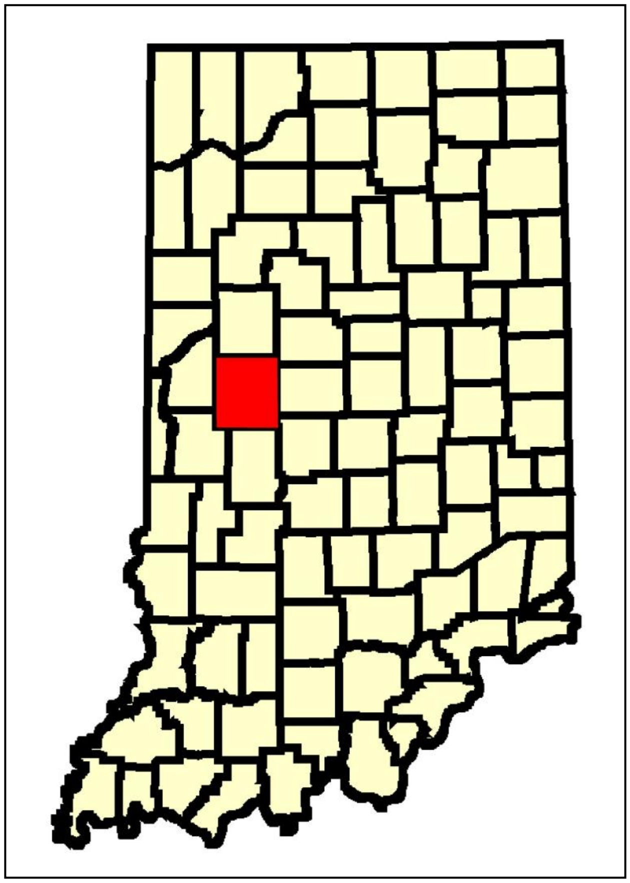

Figure 1. Location of Montgomery County within the State of Indiana.

Background

To provide a framework for interpreting the data collected during this project, a review of the natural and cultural setting was undertaken. The background information presented in this paper includes environmental and archaeological information concerning Montgomery County and the Sugar Creek Valley.

Natural Setting

Montgomery County is located in central Indiana (Figure 1) and is bounded to the east by Boone County, to the south by Putnam County, to the west by Fountain and Parke counties and to the north by Tippecanoe County. The county is approximately 323,520 acres (130,924 hectares) in size (Hosteter 1989) however for the proposed research we targeted the northern half of the county and the Sugar Creek Valley which included approximately 162,646 acres (65,821 hectares).

Montgomery County is within the general physiographic unit known as the Tipton Till Plain, an area of low relief with extensive areas of ice-disintegration features (Gray 2000). This gently rolling, almost featureless plain is almost entirely composed of glacial till and only slightly modified by post glacial stream erosion. The flat till plain is broken by end moraines, eskers, esker troughs and meltwater drainages (Schneider 1966:49-50).

Sugar Creek is the major water source running through Montgomery County, however there are also many other smaller streams and creeks. Near Sugar Creek, the topography is characterized by abrupt elevation changes and deep draws that cut into level areas (Hosteter 1989:1). Sugar Creek is a tributary of the Wabash River watershed which acts as a drainage system for two thirds of the state flowing in a northeast-southwest direction (Hale 1966:92; Schneider 1966:50). In addition, the county has two lakes, Lake Waveland and Lake Holiday in the southern part of the county, which are important surface water deposits.

Attica chert and Sugar Creek chert (an Attica variant) are the only documented bedrock cherts in the region around Montgomery County (Cantin 2008). Attica chert outcrops appear in adjacent Fountain, Warren and Boone counties (Cantin 2008:11-12). Stratigraphically, Attica chert is a member of the Muldraugh Formation of the Borden Group of the Mississippian Period (Cantin 2008:15). Outcrops likely do not occur in Montgomery County because Sugar Creek does not cut deep enough to reach Mississippian bedrock; Pennsylvanian sandstone dominates the rock faces in the county. Also known as “Wabash Green” and “Independence,” Attica chert is described as being blue-green in color with blue-grey streaks, bands and mottles (Cantin 2008: 11-12). When heat treated, Attica chert takes on a purple color with pinkish bands and streaks (Cantin 2008:12). Texture is variable, ranging from fine-medium to medium-coarse; luster is generally usually dull to slightly glossy (Cantin 2008:12). Fossil inclusions are rare with the exception of microscopic sponge spicules which make up the structure of invertebrates such as sponges; however, crystalline vugs (seen on a larger scale in geodes) have been encountered (Cantin 2008:12). Temporally, Attica chert is found in all cultural periods in Indiana, however little use is documented for the Woodland and Mississippian periods (Cantin 2008:13).

Cultural Setting

The natural setting of Montgomery County demonstrates a hospitable environment following the retreat of the Wisconsin glaciation. Site components in the county include Early Archaic through the historic period. Per the State Historic Architectural and Archaeological Research Database (SHAARD), the most frequently identified cultural affiliation is historic, followed by Late Archaic and Early Archaic.

Archaeological investigations in Montgomery County have been predominantly oriented toward surface surveys and only a small percentage of sites have been tested or excavated. Major surveys have been conducted within and around the current research universe and include portions of the drainage basin of the Wabash River. The major surveys performed within the region consist of a survey of Miami occupations (Wepler 1984), an archaeological survey of the Wabash Moraine (Cochran and Buehrig 1985) and a survey of Paleoindian and Early Archaic sites (Holstein and Cochran 1986). Excavations within the region of the current research universe consist of an archaeological assessment of the Wingate Sewage Treatment Plant resulting in the location of one site (12My21) through test excavations (Pace 1980). Excavation in Montgomery County has focused on Middle Woodland Havana and Late Woodland Albee sites (Anslinger 1986, 1990; Anslinger and Pace 1978; McCord and Cochran 1994; Pace 1989; Trubowitz 1989). Montgomery County holds one of the best known Albee Phase sites (Morell Sheets, 12My87) in the state which was excavated by Ball State University (McCord and Cochran 1994).

The first European settlers in Montgomery County were William Offield and party who settled in what is now southwestern Union Township in 1821. Within a year, a community began to settle at what is now Crawfordsville, the county seat (Henning 1986:xiii). The county was organized in 1822 with the Indiana State Legislature voting to take a part of northern Putnam County and turn it into Montgomery County (Henning 1986:xiii). It was named for Brigadier General Richard Montgomery who found fame in the Revolutionary War (Lu 2001:59). In 1823, the federal land office was relocated from Terre Haute to Crawfordsville which led to growth for the county (Henning 1986:xiii). Land sales brought an influx of immigrants from Kentucky and Ohio (Lu 2001:59). Another notable name from Montgomery County is Major General Lew Wallace, the son of Indiana's sixth governor, who participated in several Civil War battles (Lu 2001:63). Wallace later became the Indiana's adjutant general and went on to receive fame as a war hero and author of the novel *Ben Hur* (Lu 2001:63).

Archaeological Survey

Introduction

Approximately 915 acres (370.3 hectares) of agricultural land were surveyed by pedestrian transects between August 18, 2010 and March 11, 2011. The survey sampled 40 acres (16.19 hectares) of floodplain, 227 acres (91.86 hectares) of outwash, 179.5 acres (72.6 hectares) of outwash plain, and 468.5 acres (189.6 hectares) of uplands. The survey documented 220 new archaeological sites and recovered 389 prehistoric artifacts and 1,312 historic artifacts.

The field survey was executed using pedestrian transects spaced at 10m intervals. The survey interval was reduced to 5m when artifacts were encountered. The areas surveyed by pedestrian transects had between 30 percent and 90 percent ground surface visibility. All artifacts were collected and bagged by site specific provenience, with the exception of brick and FCR which were counted and noted in the field. All artifacts were taken to the AAL laboratory for processing, identification and analysis. Artifacts were cleaned, classified and cataloged. Diagnostic point types were classified using Justice (1987). Lithic raw materials were identified by comparison with reference samples and published descriptions on file in the AAL laboratory (Cantin 2008). All chert identifications were made microscopically at 10x or greater.

Results

Approximately 915 acres were surveyed during this project and 220 new archaeological sites were recorded. Montgomery County was sampled from sixteen locales. The survey documented the human occupation of Montgomery County beginning from the Early Archaic period and extending until the Historic period. Considering the limitations of Phase I surveys, it is presumptuous to assign functionality to sites identified solely by pedestrian survey. Site types were therefore not defined beyond isolates and scatters. However, it appears likely, based upon the variation in artifact classes discovered on the sites, that multiple sites types were represented. Surprisingly, the majority of sites found were located on upland landforms, which are a shift from the results of previous large-scale survey projects in Indiana. These results could be due to landform bias, the lack of large, desirable valleys in the county, and parcel tilling status at the time of survey (Smith et al. 2009).

Artifacts

This project recovered 376 prehistoric artifacts and 1,325 historic artifacts (Table 1). The majority of prehistoric artifacts consisted of lithic debitage. The edge modification to several flakes indicates that debitage can function as expedient tools. The majority of formal lithic tool types were projectile points dating to the Early Archaic, Middle Archaic, Terminal Archaic, Late Archaic, Early Woodland, Middle Woodland and Late Woodland/Prehistoric periods (Table 2, Figure 2-5). Other stone tools consisted of endscrapers, groundstone tools, and core tools. Historic artifacts included a variety of ceramics, glass, metal objects and brick (1650 to present).

Table 1: Artifacts Recovered

Prehistoric	**No.**	**Historic**	**No.**
Bone	3	Brick	14
Biface	45	Button	1
Core	28	Ceramics	589
Edge modified flake	16	Container glass	571
FCR	2	Electrical insulator	4
Ground stone artifacts	6	Field tile	1
Nonflake	26	Flat glass	106
Unmodified flake	250	Horseshoe	1
Total	376	Hammer head	1
		Metal, bolt	3
		Metal, hinge	2
		Metal, latch	2
		Metal, nut	2
		Metal, pipe	1
		Metal, unidentified	10
		Metal, washer	1
		Nail	2
		Shotgun shell	1
		Slag	13
		Total	1,325

Table 2: Projectile Points by Cultural Time Period	
Cultural Period	**Projectile Point Styles**
Early Archaic	Rice Lobed Cluster (1), MacCorkle Stemmed (1)
Early-Middle Archaic	Graham Cave Side-Notched (1)
Middle Archaic	Raddatz Side-Notched (1)
Terminal Archaic	Genesee Cluster (1)
Late Archaic	Merom Cluster (1), Brewerton Eared-Notched (2), Matanzas(2), Matanzas Side Notched (1)
Early Woodland	Adena Stemmed (1), Motley(1)
Middle Woodland	Affinis Snyder (2)
Late Woodland	Madison (2)

Figure 2. An Early/Middle Archaic projectile point from site 12My237.

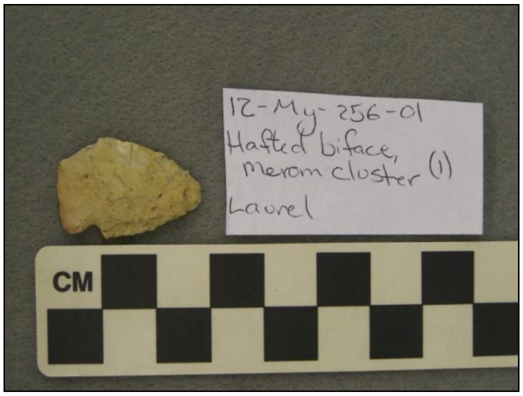

Figure 3. A Late Archaic Merom Cluster projectile point from site 12My256.

Figure 4. An Early Woodland Adena Stemmed projectile point from 12My335.

Figure 5. A Middle Woodland Affinis Snyder projectile point from 12My377.

Chert

The lithic artifacts were dominated by Attica chert (54.95 %) (Table 3). There are currently no confirmed Attica chert outcrops within Montgomery County. Sugar Creek does not cut deeply enough to expose the Mississippian bedrock in most areas. There is an area between Crawfordsville and Shades State Park, which is relatively deep that could potentially yield Attica chert or its variant Sugar Creek. The closest confirmed Attica chert outcrop near the project site is located in the neighboring counties of Boone, Fountain, and Warren (Cantin 2008:15). Unknown cherts made up the next most frequent chert type with 20.33 percent. Muldraugh chert was the next highest identified material (5.22%) (Table 3). Local cherts (cherts that outcrop 50 miles and <) including Attica, Cataract, Fall Creek, Kenneth, Lead Creek, Liston Creek and Upper St. Louis) represent 57.97 percent of the total lithic material collected. With Attica excluded, local cherts only represent 2.47 percent. Exotic cherts (cherts that outcrop 50 mi. and >) such as Allens Creek, Bryantsville, Derby, Ditney, Haney, Holland, Holland Dark Phase, Indian Creek, Jeffersonville, Laurel, Muldraugh and Upper Mercer represent 21.70 percent of the total lithic material collected. With Muldraugh excluded, exotic cherts represent 16.48 percent.

Table 3: Chert Raw Materials Found in the Survey Area					
Chert	**No.**	**%**	**Chert**	**No.**	**%**
Allens Creek	3	0.82%	Indian Creek	13	3.57%
Attica	200	54.95%	Jeffersonville	6	1.65%
Attica HT	2	0.55%	Kenneth	1	0.27%
Bryantsville	4	1.10%	Laurel	8	2.20%
Cataract	2	0.55%	Laurel HT	1	0.27%
Derby	6	1.65%	Liston Creek	6	1.65%
Ditney	2	0.55%	Muldraugh	17	4.67%
Fall Creek	7	1.92%	Muldraugh HT	2	0.55%
Haney	1	0.27%	Quartzite	2	0.55%
Holland	2	0.55%	Unknown	74	20.33%
Holland Dark Phase	3	0.82%	Upper Mercer	2	0.55%
HT = Heat Treated ; **Total**= 362					

Sites

Of the 220 archaeological sites, 170 had unidentified prehistoric components (Table 4). The identified prehistoric components consisted of Early Archaic, Middle Archaic, Terminal Archaic, Late Archaic, Early Woodland, Middle Woodland, and Late Woodland/Prehistoric. Forty-one sites had historic components.

Table 4: Site Components		
Component	**No.**	**Comment**
Unidentified Prehistoric	170	7 Multicomponent (Historic)
Early/Middle Archaic	1	0 Multicomponent
Early Archaic	4	2 Multicomponent (1 Late Archaic) (1 Historic)
Middle Archaic	1	0 Multicomponent
Terminal Archaic	1	0 Multicomponent
Late Archaic	6	2 Multicomponent (1 Early Archaic) (1 Historic)
Early Woodland	2	0 Multicomponent
Middle Woodland	2	1 Multicomponent (Historic)
Late Woodland/ Prehistoric	2	0 Multicomponent
Historic	41	10 Multicomponent (7 Unidentified prehistoric) (1 Early Archaic) (1 Late Archaic) (1 Middle Woodland)
Total	230	

The frequency of identified components encountered in the project area was similar to what had already been identified in Montgomery County. One new cultural period (Middle Woodland) was discovered in the county, and almost every cultural period was represented with the exception of the Paleoindian period.

Historic Settlement

Results from the survey were not able to elucidate historic Native American or early Euro-American settlement within the study area. No artifacts were discovered that were definitively from historic Native American occupations and only a few dated to an early Euroamerican time period. Forty-one sites contained historic components, a few of which were large scatters.

Density

The density and distribution of sites are important for modeling and prediction and can assist archaeologists in the understanding of prehistoric lifeways and subsistence patterns. The project documented an average one site per 5.40 acres and an average density of one artifact per 0.54 artifacts per acres surveyed. Outwash plain had the highest density with one site per 2.24 acres.

Investigations at Cornstalk Town (12My112)

Background

Cornstalk Town, site 12My112 in the SHAARD database, was first documented in 1820 in General Land Office survey notes as, "an Indian village on our right" (GLO survey 1795-1840). Sources (Brelsford 1985:97-98) place the town in the southern portion of the county near Ladoga, Indiana.

Montgomery County folklore indicates that the Chief of the Cornstalk, named Peter Cornstalk, was a very agreeable and sensible man, and the conglomerate Miami groups that were present at the site were reportedly very friendly with the white settlers (Brelsford 1985:15).

Written into the proposal for this project was an attempt to determine the location of Cornstalk Town. Based on the GLO maps and notes, permission was obtained to survey a 100 acre parcel on which the site was reported to be located. Upon arrival on location, it was discovered that the landowner practices no-till farming, and the surface visibility in most of the parcel was below the 30 percent needed to reliably complete a pedestrian survey. Upon consultation with the DHPA, it was decided that we would pedestrian survey a 32 acre portion of the parcel that most likely included the location of Cornstalk Town based on the GLO maps and notes. If a high density of historic artifacts were found, shovel test pits would be conducted in that portion of the parcel and/or the remainder of the 100 acre parcel would be pedestrian surveyed.

Methods

Field Survey

The survey was conducted by AAL staff archaeologist Chris Keller and a group of graduate and undergraduate students on March 3, 2011. Survey was executed using pedestrian transects, spaced at 10 meter intervals. The survey interval was reduced to 5 meters when artifacts were encountered. The area surveyed had between 30 and 90 percent ground surface visibility (30 percent where the crop residue was and 90 percent in washed out areas). All artifacts, excluding fire-cracked rock and brick, were collected and bagged by site specific provenience. Fire cracked rock and bricks were counted in the field and noted, but were not collected. Artifact locations were assigned temporary site numbers. Site coordinates were collected with Magellan handheld GPS units using NAD 1983. Field notes were maintained by Christine Keller, the authors and the crew.

Laboratory

All artifacts were taken to the AAL laboratory for processing, identification, analysis and temporary curation. Artifacts were cleaned, classified and catalogued. Definitions used for classifying prehistoric lithic materials were included in Appendix B. Diagnostic point types were classified using Justice (1987). Metric attributes and raw material identifications were recorded in accordance with AAL standards. Lithic raw materials were identified by comparison with reference samples and published descriptions on file in the AAL laboratory (Cantin 2008). All artifact and chert identifications were made microscopically at 10X or greater. Historic artifacts were identified and dated using references (Barlow 1991; IMACS 1984; Myers 2010; Sutton and Arkush 2009). State site numbers were obtained and a DHPA Sites and Structures Inventory form was entered in SHAARD for each site identified during the project.

All materials generated by this project were accessioned at the Applied Archaeology Laboratories at Ball State University under accession number 10.46. Artifacts were identified, analyzed and photographed per DHPA guidelines and then returned to the landowner.

Results

The pedestrian survey recorded a total of three sites from the area thought to possibly contain Cornstalk Town, each containing one artifact (Table 5). Site 12My292 consisted of a core tool made of Fall Creek chert which outcrops in Hamilton County, Indiana (Cantin 2008). Site 12My293 was an isolated find consisting of a Raddatz Side Notched projectile point made of Attica chert (Figure 6). Raddatz points occur over a large area of the Midwest and are diagnostic of the Middle Archaic period (Justice 1987:68). Site 12My294 consisted of a cut metal nail (Figure 7) that was manufactured no later than 1890 (Sutton 2009:163). None of these artifacts indicates a historic Miami village was present on the parcel.

Table 5: Artifacts from Survey Area 8 (Cornstalk Town)			
Prehistoric	**No.**	**Historic**	**No.**
Biface	1	Nail	1
Core Tool	1		
Total	2		1

Due to the low artifact density encountered upon surveying the designated 32 acres, it was decided that additional investigation of this parcel would be unlikely to produce any evidence for Cornstalk Town, and that evidence of the village was either obscured by crop residue or that the location of this village was likely elsewhere in the vicinity.

Recommendation

Given the historical resources associated with this village, the most likely location for the village is on the parcel that was partially surveyed. Due to the low artifact density for this parcel, additional study and further testing for Cornstalk Town is recommended when the parcel is tilled and better visibility is available.

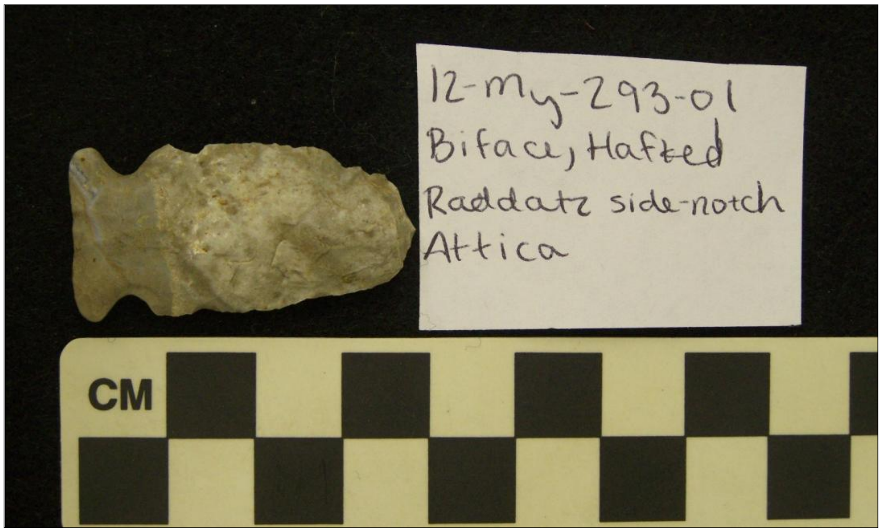

Figure 6. Raddatz Side Notched projectile point from 12My293.

Figure 7. Cut metal nail from 12My294.

Montgomery County Mound Survey

Introduction

The Applied Archaeology Laboratories (AAL) at Ball State University conducted a data enhancement project for Montgomery County, Indiana, for a FY2010 Historic Preservation Fund Grant. The proposal included the documentation of four mounds, three recorded in the SHAARD database (12My24, 12My25 and 12My111) and one found in a geological report of Montgomery County (Collett 1876:418). This section covers the archaeological investigation of those four mounds.

12My111

Mound site 12My111 is documented in the southern portion of the county. This mound was reported during the General Land Office surveys describing the mound as being, "An ancient mound, 20 feet high" (GLO survey 1795-1840). The mound may be the one that was mentioned in the old geological report of the county (Collett 1876:418). Permission to survey the property for a man-made mound was not able to be obtained. However, from the road and the adjacent property, no mound was visible and the lot was highly disturbed by development (Figure 8). Photographs were taken of the reported site for documentation.

Figure 8. A photograph from the road of site 12My111.

Recommendation

If permission to survey can be obtained for this parcel, further investigation would be necessary to determine if the reported mound still exists. The General Land Office Survey reports that the mound should be in this location, but the landform has been destroyed by architectural development that suggests no intact deposits from the mound may still exist, leaving the mound ineligible for further testing.

12My24

Site 12My24 is located in the northern part of the county. This mound is listed in the SHAARD database which places the mounds in a Late Archaic/Early Woodland context. It was recorded in 1980 by an artifact collector. Permission was not able to be obtained from the current landowners to survey this mound. Archaeologists did take pictures from the road for documentation. From the road, it could be seen that there were two potential mound locations on the property (Figure 9).

Recommendation

If landowner permission can be obtained, further archaeological investigation into this reported mound is recommended. The current archaeological investigation could not confirm the presence of the earthwork(s) in this location; therefore, register eligibility assessment can not be made.

Figure 9. A photograph from the road of site 12My24 showing two potential mounds on the property.

12My25

Site 12My25 is located in the northern part of the county. This mound is listed in the SHAARD database which places the mounds in a Late Archaic/Early Woodland context. It was recorded in 1980 by an artifact collector. Permission from the landowners to survey this mound was not able to be obtained; however, pictures were taken from the road for documentation. There was no mound visible from the road, and the area appeared to be highly disturbed by development and agricultural silos (Figure 10).

Recommendation

If landowner permission can be obtained, further archaeological investigation into this reported mound is recommended. The SHAARD database reports that the mound should be in this location, but the landform has been destroyed by architectural development that suggests no intact deposits from the mound may still exist, leaving the mound ineligible for further testing.

Figure 10. A photograph from the road of site 12My25.

Pedestal Rock Nature Preserve

The first mention of a group of mounds possibly in what is now Pedestal Rock Nature Preserve reported ". . . a cluster of low mounds was mentioned by J.M. Rice Esq. . ." (Collett 1876:418). In 1985, a Montgomery County local, Bridgie Brelsford, published a book about the prehistoric inhabitants of the county. In the book she included a geological map from the old Geological Survey of Indiana placing the mounds in this area (Brelsford 1985; Collett 1876).

The area in question had not been professionally investigated for the presence of mounds. The mounds are not listed in the SHAARD database for Montgomery County, and there are no reported mounds in SHAARD for Parke County. When contacted in January 2011, the assistant property manager of Shades State Park was unaware of the presence of any prehistoric mounds in Shades State Park. After looking at topographic maps and speaking to an earth-sciences professor at Purdue University, he advised AAL staff to investigate in Pedestal Rock Nature

Preserve. AAL staff then contacted a professional regional ecologist who also had no knowledge of any mounds or earthworks in the area.

After correspondence with the assistant property manager, AAL staff investigated numerous historical records including geological surveys, the SHAARD database, GLO maps, topographic maps, plat maps, historical maps of Indiana and AAL's county history files in Montgomery and Parke counties. No other mention of mounds in or around the area has been found. Using all of the available resources, AAL staff composed a project proposal to investigate the approximate 43 acres which seemed to be the best area for possible mound locations based on the references that were gathered. In March of 2011, Ball State University was granted two permits from the Department of Natural Resources to survey the 43 acres targeted for this portion of the project and take soil cores if necessary.

Methods

Under state statute (IC-14-21-1-16) AAL turned in a plan to the DHPA for the field investigation on state property (archaeological resources on state property are protected). Landowner permission from the Department of Nature Preserves was obtained and submitted to DHPA prior to survey. Investigation was authorized under DHPA approved plan #2011004, and approximately 43 acres were investigated for this part of the project. The field crew walked into the survey area and then used pedestrian transects. The project area can be separated into two sections: ridge tops and lowlands. Survey on the ridge tops included pedestrian survey at 15 m intervals which was adjusted for topography and field conditions; survey on the lowlands (largely in Parke County) included pedestrian survey at 10 m intervals which was also adjusted for topography and field conditions. Field conditions in the nature preserve were dense, heavily wooded forest (Figure 11).

Results

Fieldwork for this portion of the project was completed on March 22, 2011 by Applied Archaeology Laboratories Director Dr. Mark Hill and three graduate students. Staff surveyed the 43 acres in question and found no evidence of any prehistoric man-made mounds in the survey area. These results lead to three possible conclusions: 1. The mounds could have been destroyed between 1876 and present; 2. The mounds are not present or are located outside the area surveyed; or 3. The mounds were missed by investigators. Based on the location on the ridge tops and little evidence of agriculture or destructive events, it is unlikely that the mounds would have been destroyed, though it remains a possibility. It is possible that the mounds were not present to begin with; however, based on the historic maps, it is possible that the mounds may be in another location nearby.

Recommendation

Upon completion of fieldwork in the Nature Preserve, there were no indications of any man-made mounds in the project area. Further investigation is recommended in the southern half of Fountain County to fully confirm or rule out the historical references to the mounds. The current archaeological investigation could not confirm the presence of the earthwork(s) in this location; therefore, register eligibility assessment can not be made.

Figure 11. A photograph showing the heavily wooded landscape of Pedestal Rock Nature Preserve.

Montgomery County Chert Survey

Background

In the proposal for this grant project, we included a short sentence that said that we would investigate potential chert sources in the county, ". . . to more clearly define lithic resource areas and utilization in the region (McCord 2010:4). According to chert researcher Mark Cantin (2008: 9), there are no chert outcrops in Montgomery County; however, there are chert outcrops in the adjacent Boone and Fountain counties. The chert outcrops in the region are known as Attica chert (Figure 12), exhibiting a blue-green color with blue-grey streaks, banding, and mottling (Cantin 2008:15). The outcrop in Boone County, just outside of the eastern edge of Montgomery County, is accepted as an Attica variant, known as "Sugar Creek" chert (Cantin 2008:15).

Figure 12. A photograph of Attica chert from the AAL chert collection.

Methods

Because there are no known outcrops of chert in Montgomery County the investigation began by stopping at road cuts and bridges when we came across them. In addition, the field crew also stopped at locations where there was access to Sugar Creek to investigate for outcrops and chert blocks that may have washed downstream.

Results

All road cuts and bridges that we came across while driving through the county had no signs of chert outcrops (Figure 13-15).

Figure 13. A bluff along Sugar Creek showing Pennsylvanian sandstone.

Figure 14. A photograph from a bridge in the southern portion of the county showing no chert outcrops.

Figure 15. A photograph from a bridge in the southern portion of the county, showing no chert outcrops.

While in the county, we stopped at Deer Mill covered bridge (Figure 16) to investigate any chert outcrops. All that was visible in the valley wall consisted of Pennsylvanian aged sandstone with no apparent chert outcrops. Though there were no outcrops, we did find some blocky chert that appeared to have washed down Sugar Creek and deposited on the bank. The chert was blue with grey to blue banding and mottling and exhibited quartz vugs (a conglomerate of quartz, as seen in geodes) and could be Sugar Creek chert. We were not able to collect this chert because it lay on state property.

The other location that we investigated was on Offield Road at the Sugar Creek Public Fishing Area (Figure 17). The chert that was found at this location was rounded and smooth with varying colors, shapes and sizes, none of which looked like it had recently come off an outcrop.

The only other locations where we found chert were in the fields that we were surveying. We observed chert in the form of glacial till, but we also occasionally came across a rounded block of Attica chert.

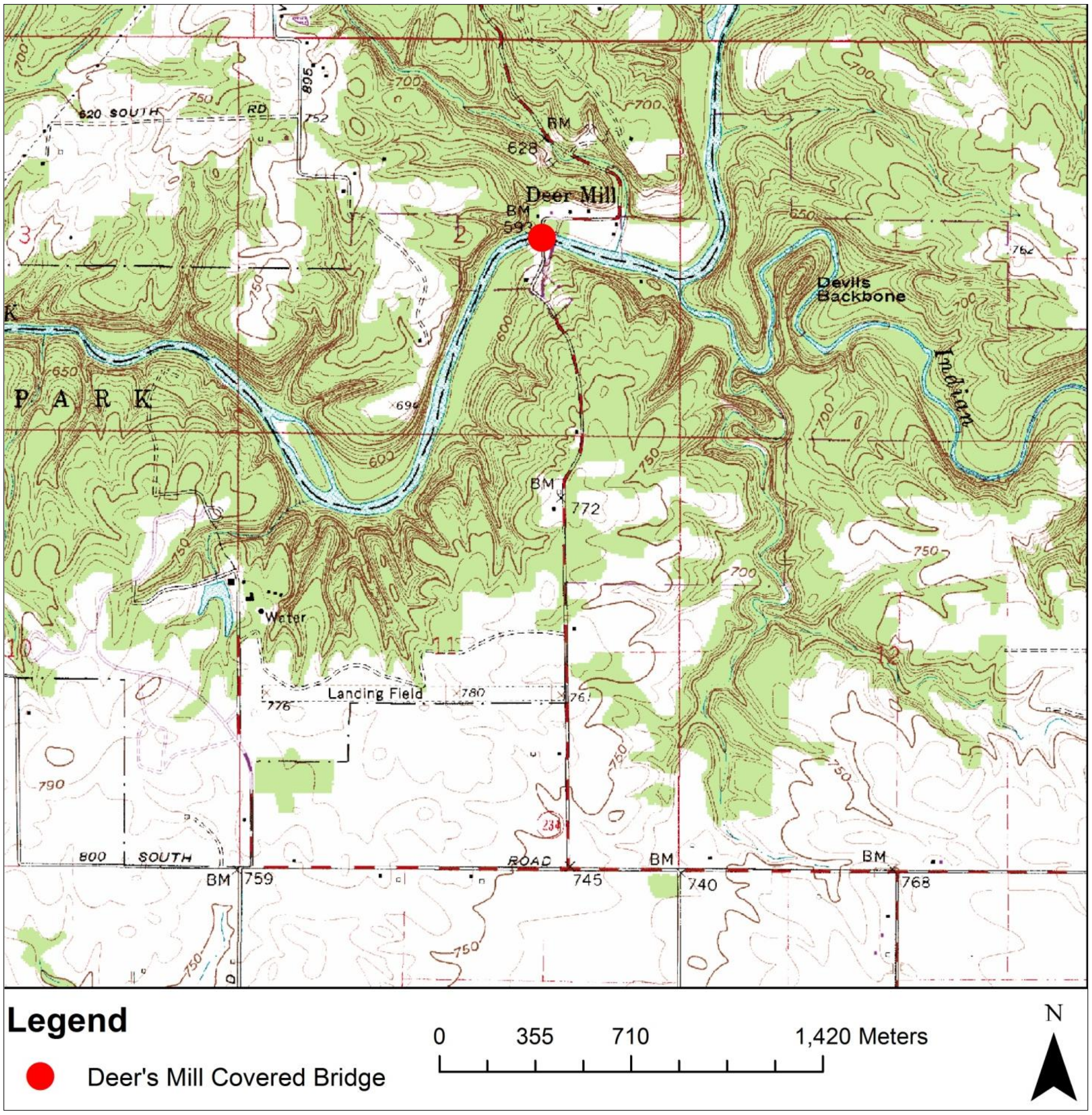

Figure 16. A portion of the USGS 7.5' Alamo, Indiana Quadrangle showing the location of Deer Mill Bridge.

Figure 17. The Sugar Creek Public Fishing Area on Offield Road showing a gravel bed.

Recommendation

Due to the unidentified chert that was encountered at Deer Mill covered bridge, more research is needed to confirm its identity as Sugar Creek chert. Also, more research and fieldwork is necessary to study Sugar Creek chert and give a full description and identification of how it differs from Attica. In the artifact assemblage for this grant project, we identified 202 of 372 prehistoric artifacts as Attica chert. This data shows that Attica was used intensely in Montgomery County, likely due to its near location and effective knapping characteristics. It is recommended that more fieldwork is conducted on Sugar Creek between Crawfordsville and Shades State Park because that is the only location in the county where the creek cuts deep enough to expose Mississippian bedrock. More research is necessary to get a full picture of the lithic raw material availability in Montgomery County and the surrounding counties.

Discussion

Site Density

The densities and distributions of sites are important for modeling and prediction. In the current study not only was site distribution tracked by landform and cultural period, but the amount of the surface that was covered by individual sites was used to demonstrate the percentage of human-utilized surface by landform (Table 6). For example, five small lithic scatters on a given landform may utilize a smaller portion of the landscape than one large lithic scatter on another landform. The percentage of utilized landscape may provide a further refined perspective of how settlement occurred within the research universe.

Table 6: Site Densities and Distributions By Landform

Landform	# of acres	# of sites	Density	Distribution
Outwash	227	50	1 site per 4.54 acres	Sites cover 0.20% of surface area
Outwash Plain	179.50	80	1 site per 2.24 acres	Sites cover 0.03% of surface area
Floodplain	40	7	1 site per 5.71 acres	Sites cover 0.14% of surface area
Uplands	468.50	83	1 site per 5.64 acres	Sites cover 0.51% of surface area
Total	915	220		

Sites on outwash plain occurred with greater frequency with one site per 2.24 acres covering a surface area of 0.03 percent compared to uplands where one site occurred per 5.64 acres, however the surface area was greater at 0.51 percent. The outwash plain and floodplain accounted for 88 percent of the artifacts recovered during the survey (Table 6), and only made up 70 percent of the area surveyed.

Compared to previous large-scale surveys on the Tipton Till Plain (Smith et al. 2009), these results show a greater occupation in upland areas than originally expected. Because these results could be due to a number of different reasons, the general project area of Montgomery

County is worthy of additional investigation and study. Survey bias, availability of desirable valley settings, and cultural factors all could have led to these somewhat unexpected and interesting results.

Landform Chronology

Results from the 915 acre survey show a heavy Archaic presence in the county, as was documented in records before this survey. There were no diagnostic materials found in the 40 acres of floodplain that were surveyed; however, diagnostic projectile points were found on each of the other landforms that were surveyed (Table 7).

Table 7: Projectile Point Site Numbers and Cultural Periods Per Landform

Landform	Site #'s and Cultural Periods
Floodplain	--
Outwash	12My237 (Early/Middle Archaic), 12My256 (Late Archaic), 12My293 (Middle Archaic)
Outwash Plain	12My309 (Late Woodland), 12My335 (Early Woodland), 12My341 (Terminal Archaic), 12My343 (Late Woodland)
Uplands	12My269 (Early Archaic), 12My273 (Middle Woodland), 12My285 (Late Archaic), 12My370 (Early Archaic), 12My377 (Middle Woodland), 12My381 (Late Archaic), 12My384 (Late Archaic), 12My386 (Late Archaic), 12My405 (Late Archaic), 12My409 (Early Woodland), 12My422 (Early Archaic)

Early and Late Archaic prehistoric settlement appears to be more focused in upland and outwash settings. A total of eight Early and Late Archaic diagnostic projectile points were found in upland survey and three Archaic points were found in Outwash. The Woodland period is represented in both the Outwash Plain and Upland landforms; however, Early and Late Woodland are represented more heavily in Outwash Plain, and Middle Woodland was found only in the Uplands. There were no diagnostic points found in the floodplain, likely due to the small amount of acres surveyed (40 acres) and also due to the buried nature of soils in floodplains which are frequently flooded.

Public Outreach

In addition to correspondence with landowners for permission to survey their land, several landowners met personally with AAL archaeologists and students to share examples of artifacts previously gathered from their land or in other areas of Montgomery County. Numerous other residents of Montgomery County stopped by during surveys to talk with AAL archaeologists and discuss artifacts from their collection or the collections of others in the county. Montgomery County seems to have a large and active collector community, with many collectors having documentation of sites and corresponding artifact collections. Future grant research in Montgomery County could certainly include documenting collector reported sites and collections.

On April 11, 2011, a public presentation was given at the Montgomery County Historical Society by AAL archaeologist Christine Keller and Department of Anthropology students Emily Murray, Jessie Moore, and Tori Kiefer. The hour long presentation reviewed all aspects of the grant including background, methodology, and results. Both historic and prehistoric artifacts representative of newly discovered sites were available for the attendees to view. Approximately 25 people attended the presentation which included a question and answer session, and a short discussion of Indiana archaeology laws.

Conclusions and Recommendation

This project targeted the northern half of Montgomery County and the Sugar Creek Valley in Montgomery County, Indiana. The project area was selected due to the lack of known archaeological sites in the state database (SHAARD), and due to the threat of erosion and gravel mining. The goals of the project were to increase the site database, construct a cultural chronology for the county, refine settlement patterns of the precontact era, and enhance our understanding of the early Euroamerican period.

Approximately 915 acres of agricultural land were surveyed during this project and 220 new archaeological sites were recorded. The survey recovered 1,701 artifacts consisting of 376 prehistoric artifacts and 1,325 historic artifacts. The majority of the precontact sites were unidentified by cultural period, however many prehistoric cultural periods were documented. Nine sites were recommended for further testing and 211 sites were recommended as not eligible for listing on the State or National Register.

The survey added one previously undocumented cultural period to the county's history, in the form of a Middle Woodland Affinis Snyder projectile point (12My377). Compared to previous large-scale surveys on the Tipton Till Plain (Smith et al. 2009), these results show a greater occupation in upland areas than originally expected. Because these results could be due to a number of different reasons, the general project area of Montgomery County is worthy of additional investigation and study. Survey bias, availability of desirable valley settings, and cultural factors all could have led to these somewhat unexpected and interesting results.

The average site density recorded for the project area for precontact sites was one site per 5.4 acres. The highest site densities per landform were on outwash plain at one site per 2.24 acres, and the highest percentage of artifacts recovered was 7.8 percent on outwash.

The project suggests that precontact populations were using Montgomery County in different ways. Though our data for how people were using the landscape was unexpected, many factors could influence the data including the locales that were surveyed, whether a parcel was tilled recently or not, and the lack of any large valley settings in the county which are preferable for human occupation. Further research into prehistoric landform usage is recommended within Montgomery County. Archaeologists are still unclear as to the differences in landform uses between different cultural periods in the county and the reasons behind those differences. Further archaeological survey in the county is also recommended because some cultural periods that are represented in artifact collector's collections are not present in the official archaeological record and represent more prehistory that is unknown to archaeologists pertaining to the county.

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A GROUND-PENETRATING RADAR INVESTIGATION IN SOUTH BEND, INDIANA

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Cardno JFNew
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Introduction

In the summer of 2010, Cardno JFNew paired with Dr. James VanderVeen of Indiana University-South Bend Department of Sociology and Anthropology (IUSB) to conduct a ground-penetrating radar (GPR) survey across a vacant, grass-covered lot that was once the location of two historic structures in South Bend, Indiana. The goals of the investigation were both to test the use of GPR in an archaeological setting as well as provide supporting information to IUSB about possible historic features located in the subsurface.

The GPR survey was located on land owned by and directly adjacent to the Northern Indiana Center for History. The Center for History was first organized in 1867, and today it resides in Copshaholm, the 38-room mansion once owned and occupied by the Oliver family (Howard 1907). Copshaholm was built between 1895 and 1896 by the 19th century industrialist J.D. Oliver. Oliver was president of the Oliver Chilled Plow works, which mass-produced the chilled plow in South Bend and was founded by Oliver's father (inventor of the chilled plow) (Howard 1907).

The area subject to investigation consists of a grass-covered lot that at one time contained a corner drugstore as well as a duplex home. The Oliver family purchased the property and had these structures removed to improve the view from their front porch across the street (VanderVeen, personal communication). Sanborn maps of South Bend confirm the demolition of both the drug store and the duplex, though at different times (Sanborn Map 1891, 1893, 1899, 1917 and 1949). Sanborn maps from 1891, 1893, and 1899 depict both the duplex and corner drugstore at the northeast corner of West Washington and La Porte Avenue (Figures 1-3). The next available Sanborn map, from 1917, depicts only the duplex at this lot indicating that the corner store was demolished sometime between 1899 and 1917 (Figure 4). A subsequent Sanborn map from 1949 depicts a vacant lot where the duplex home once stood, indicating its destruction between 1917 and 1949 (Figure 5). No additional structures were built on the property after the demolition of the duplex, making it an ideal location for historic archaeological testing.

During the early summer of 2010, IUSB hosted an archaeological field school at the location of the former duplex and corner store. Nine (9) 1 by 1 m (3.2 by 3.2 feet) and one (1) 0.5 by 0.5 m (1.6 by 1.6 feet) square units were excavated across the grass lot (Figure 6) (VanderVeen, personal communication). Students identified hundreds of historic artifacts including objects likely related to the duplex (ceramic kitchenware fragments, etc.) and objects likely related to the corner drugstore (glass medicine bottles, etc.). In addition, at least one excavation unit revealed large amounts of concrete and rubble, likely related to the demolition of the duplex (based on its location within the grass lot) (Figure 6, unit C). Cardno JFNew conducted the geophysical investigation subsequent to the field school during the summer of 2010.

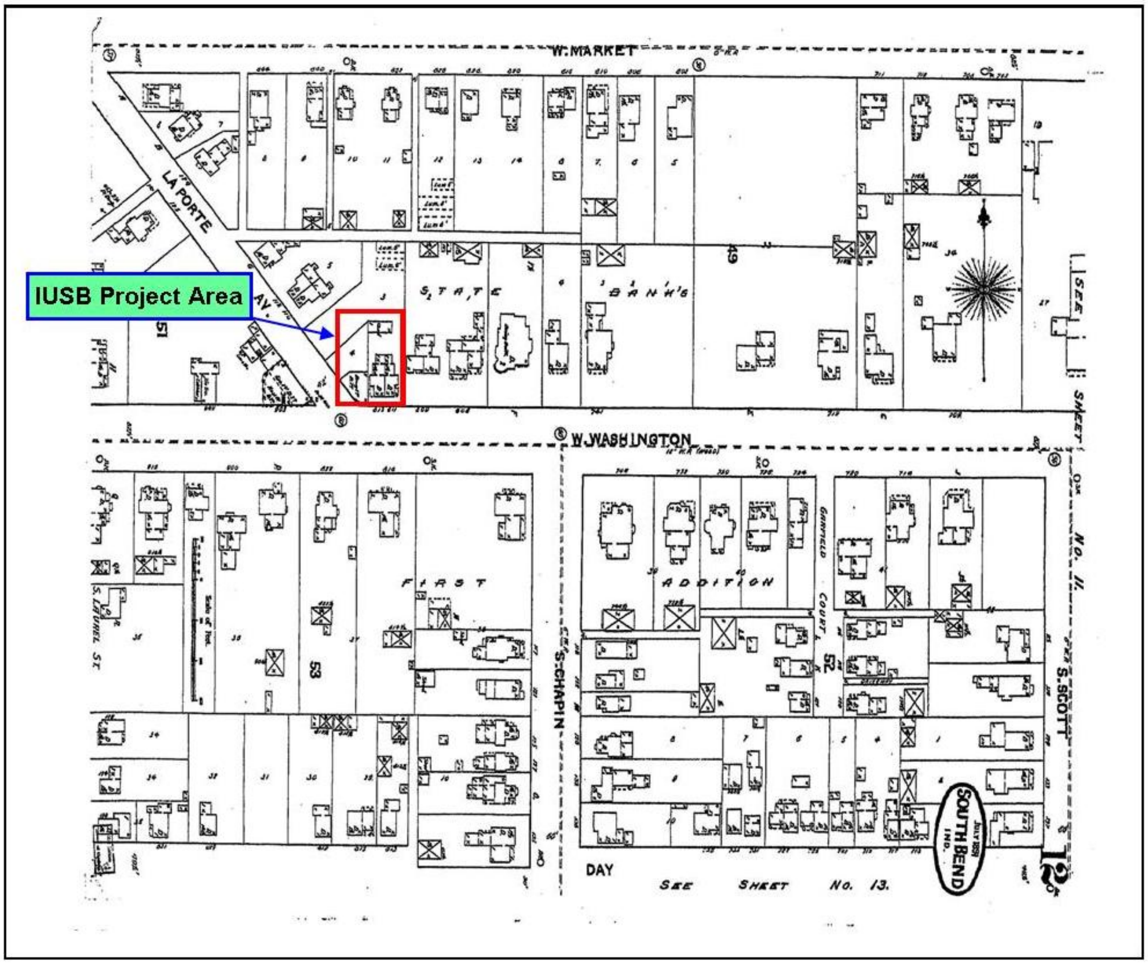

Figure 1. 1891 Sanborn Fire Insurance Map (Sanborn Map 1891).

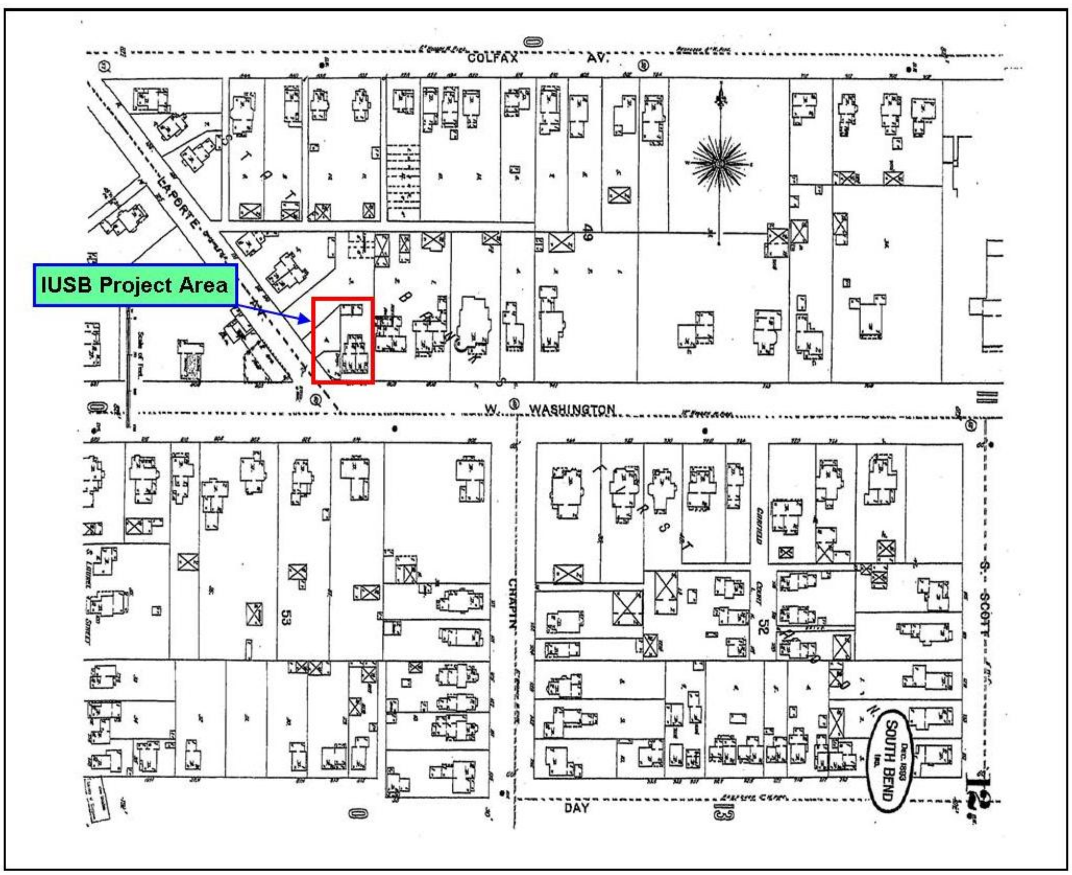

Figure 2. 1893 Sanborn Fire Insurance Map (Sanborn Map 1893).

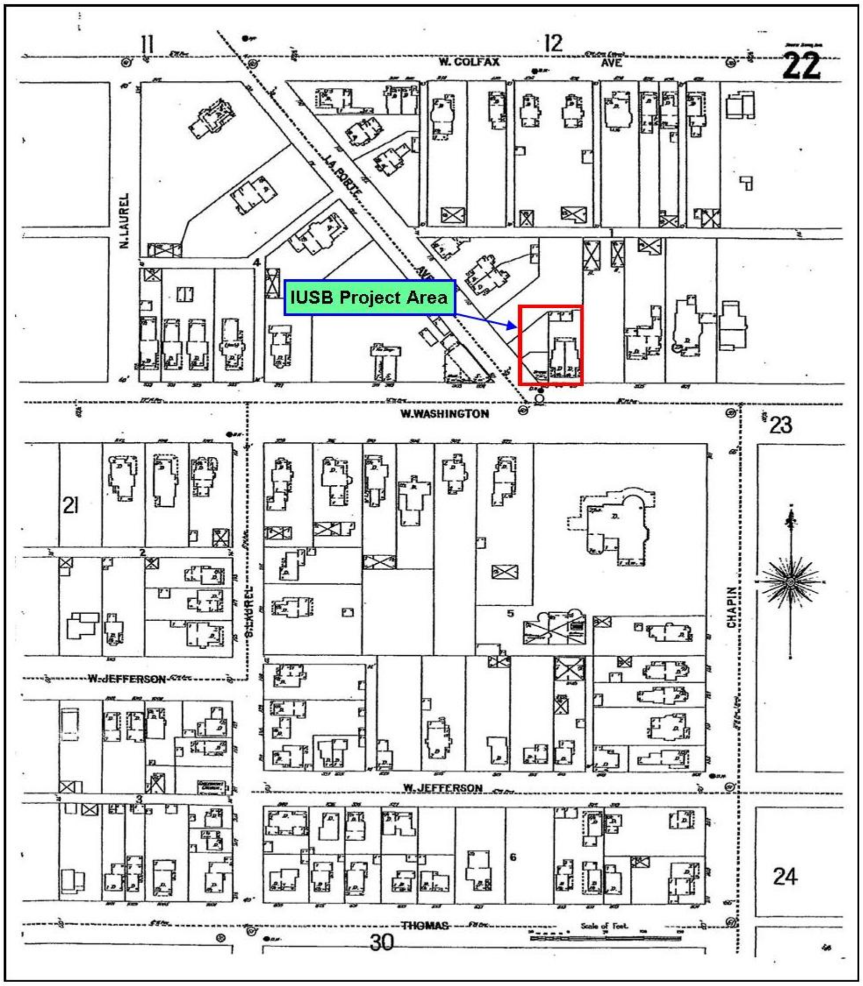

Figure 3. 1899 Sanborn Fire Insurance Map (Sanborn Map 1899).

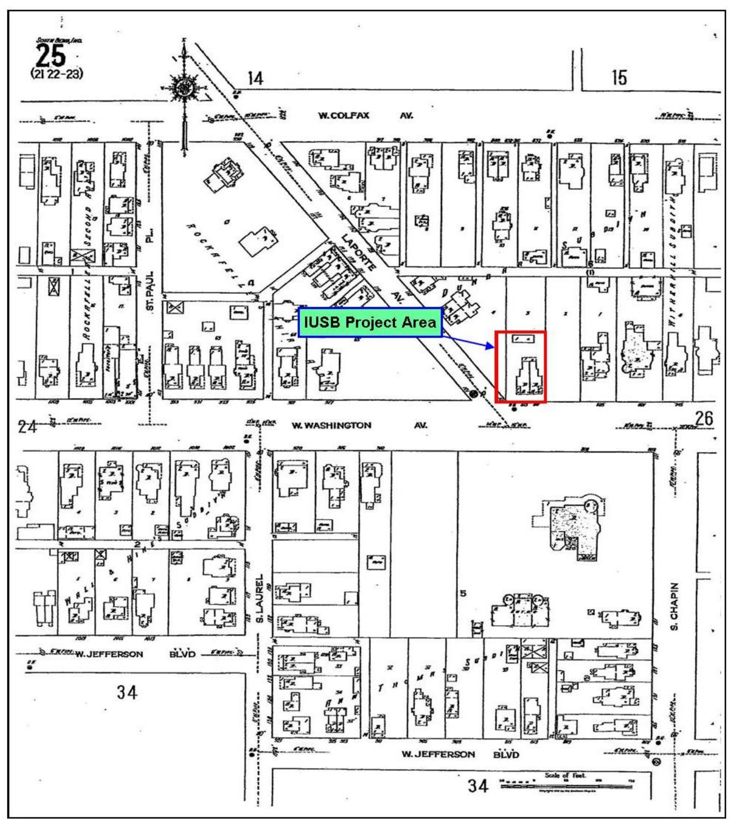

Figure 4. 1917 Sanborn Fire Insurance Map (Sanborn 1917).

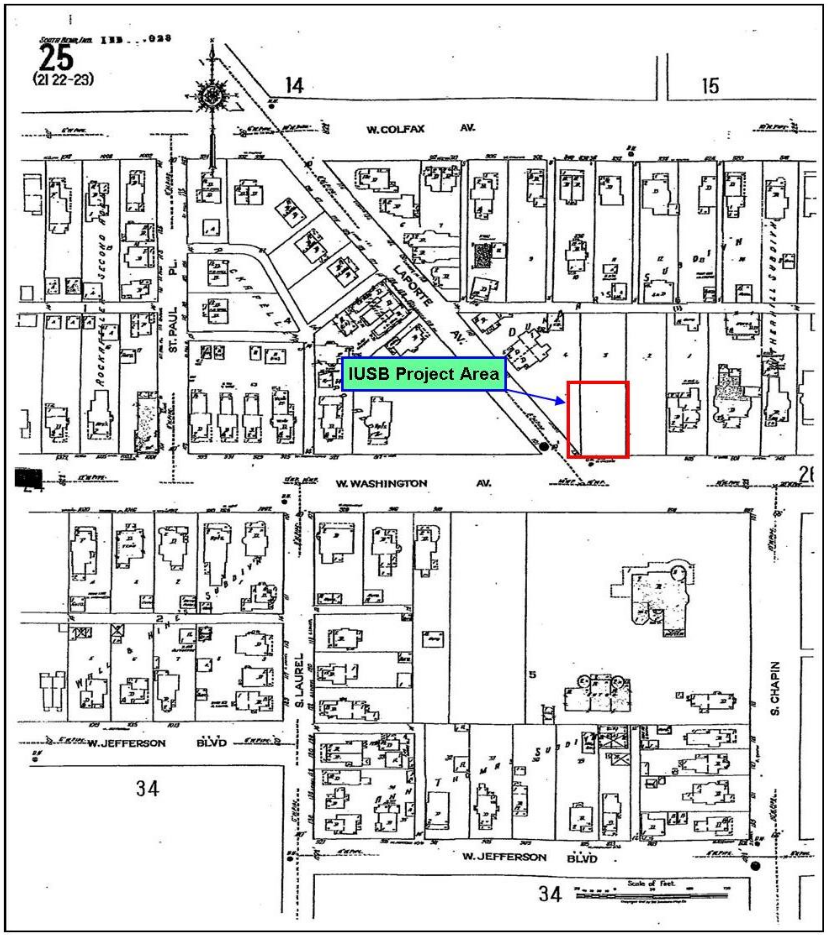

Figure 5. 1949 Sanborn Fire Insurance Map (Sanborn Map 1949).

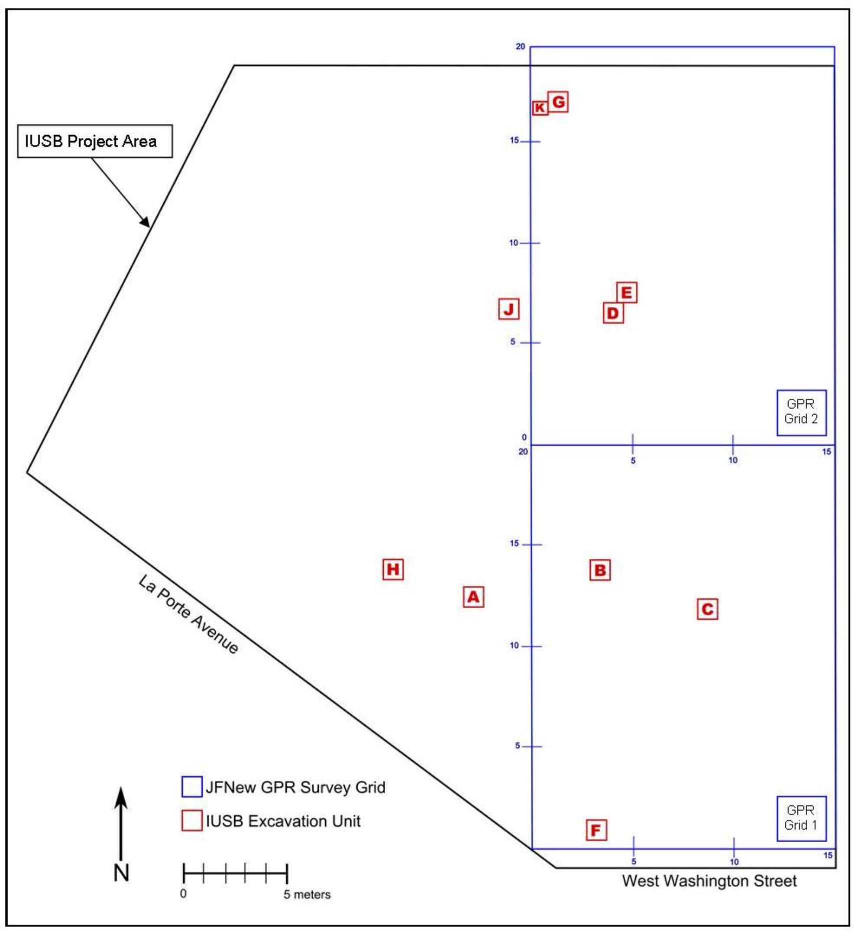

Figure 6. IUSB excavations and GPR survey grids.

Geophysical Methods

Ground-penetrating radar (GPR) first appeared as a technique to study the archaeological record in the early 1970s (Bevan and Kenyon 1975; Dolphin et. al 1978; Vickers and Dolphin 1974). Since then it has become one of the most commonly applied geophysical techniques for generating information about the subsurface. GPR is often selected for archaeological investigation over other geophysical methods because it provides high resolution images of objects and features located within the subsurface, as well as the corresponding depths of the objects/features. Depth information is a unique feature of GPR among all geophysical techniques.

In GPR, pulses of electromagnetic energy (radar) are transmitted into the ground through an antenna that is dragged over the surface (Conyers and Goodman 1997). As the wave of energy travels through the ground, portions of it are reflected back to the surface when they encounter buried objects (Figure 7). The time it takes for the energy to be reflected back to the surface as well as the strength of that signal is recorded by the instrument. This results in an image of the different radar wave signals (amplitudes) as they appear in profile under the ground (Figure 8). Strong GPR signals are called hyperbolas, and appear as upside-down "U"s when viewed in profile (see Figure 8). In archaeological contexts, strong hyperbolas generally correspond to features of interest. Data collected by the instrument is initially only visible as a two-dimensional profile (radargram), but the data can then be processed into 3-dimensional plan view images using specific software.

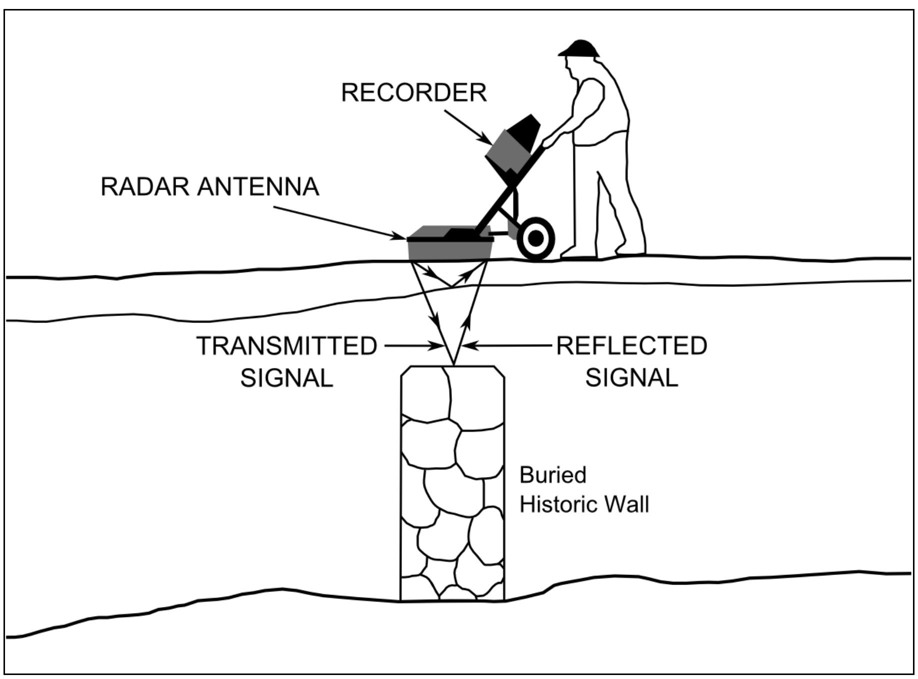

Figure 7. GPR survey diagram (Veronica Parsell, 2012).

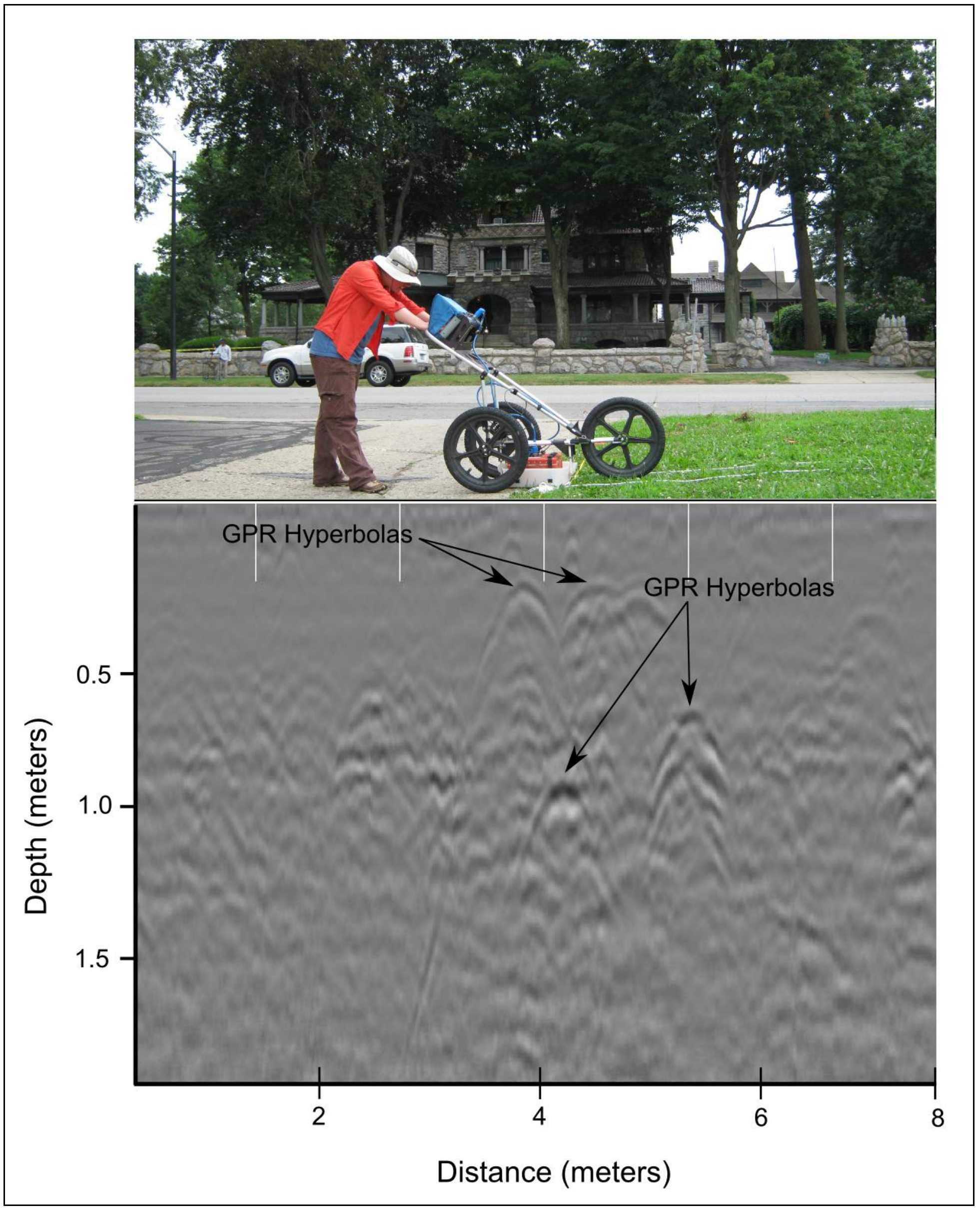

Figure 8. Example radargram.

The ability of GPR to detect archaeological features depends on a number of factors. First, the electrical and magnetic properties of the features relative to the background environment are critical. The feature must be sufficiently distinct from the materials that surround it in order to create a boundary that will reflect radar waves. This is important because GPR doesn't "see" features beneath the ground. Rather, it records changes in signal strength as the radar penetrates through the soil and encounters different objects. Second, the frequency of the radar energy strongly influences the results. The depth to which radar energy can penetrate and the sensitivity of GPR to different materials is a function of the frequency of the radar that is transmitted. GPR antennas generally vary from about 10 to 1000 megahertz (MHz). Radar waves with lower frequency are capable of deeper penetration but have a much lower resolution. These types of antennas are generally used in geological investigations (not archaeological). Higher frequency antennas can resolve smaller features but have much lower penetration into the ground. These types of antennas are generally selected for archaeological investigations, as features of archaeological interest are generally located close to the surface. Finally, radar signals can be affected by materials in the overlying sediment. In particular, soil with high concentrations of limestone or sediments with large amounts of water and/or clays will absorb radar and make the deposit impenetrable to GPR.

The soil type present within the IUSB GPR survey area includes the urban land-Tyner complex. This soil type is described on the NRCS web soil survey as an excessively drained sandy loam (USDA/NRCS WSS 2011). Sandy loam does not contain a high amount of clay and is very well drained in this area, indicating that it is well suited for GPR investigations. In addition, the NRCS provides GPR suitability maps that offer state-wide information on areas where GPR surveys are likely to be successful, based on soil types and drainage. The IUSB survey area is located in an area that received a moderate to very high suitability rating (USDA/NRCS 2011).

Cardno JFNew utilized a GSSI SIR-3000 GPR unit with a 400 MHz antenna for the geophysical survey. The 400 MHz antenna is capable of defining subsurface features to a depth of about 3 m (10 feet) depending on soil conditions. However, at the IUSB survey area depth investigation of approximately 1.5 m (5 feet) was obtained.

Fieldwork and Data Processing

Two small, adjacent GPR surveys were conducted at the IUSB project area during July of 2010 (See Figure 6). Portions of the far eastern side of the project area were selected for investigation based on historic maps of the city indicating at least one structure in this area over time. In addition, the eastern portion was selected based on its rectangular shape for ease of GPR survey. After surveying both of the selected areas, the collected data was imported to a computer for processing and analysis.

Survey Methods

The first step for all geophysical surveys is to establish the location and size of the survey grids. Grid references are established so that data can be collected in a systematic manner, and so that the locations of any anomalies identified as a result of the geophysical survey have a known location in the world. Two adjacent 15 by 20 m (49 by 65 foot) survey grids were established for the IUSB survey. Data was collected by moving the GPR unit across the grid in a zig-zag pattern (bi-directionally) at 0.5 m (1.6 feet) intervals (transects). This interval was selected so that radar beams from adjacent transects slightly overlapped, thereby creating 100% coverage of the survey area and decreasing the margin of error in determining the exact location of a signal within the subsurface. Transects were oriented East-West, and each pass was tracked using a rope stretched between the ends of the grid units (Photograph 1).

Photograph 1. GPR survey across Grid 1.

The two survey grids were established along the eastern boundary of the IUSB project area. Due to the polygonal shape of the project area and the presence of an occupied modern home along the northwest boundary of the grass lot, the eastern portion was selected as the largest contiguous area for GPR survey.

Block 1 was established along the southern and eastern edges of the grass lot (See Figure 6). Block 2 was established directly adjacent to Block 1 to the north (See Figure 6). Both Blocks measured 15 by 20 m in size. Block 1 contained IUSB test excavation units B, C and F while Block 2 contained IUSB test excavation units D, E, G and K. Both grids were aligned North-South and given coordinates within an arbitrary grid system. The locations of all grid corners were mapped with a Trimble GeoXH GPS unit capable of sub-meter accuracy.

Data Processing

GPR data was downloaded each day after data collection. Data processing occurred the week following fieldwork using GSSI's RADAN software (version 6.6). RADAN provides the ability to display, process, analyze, interpret and present GPR data and was designed specifically for use with GSSI SIR systems. For the IUSB GPR survey, RADAN was utilized to view the radargrams and apply simple filters in order to clean up the data, as well as to create plan-view depth slices using the 3-D QuickDraw module.

In archaeological contexts, GPR data is often effectively viewed and interpreted when it is processed and converted from vertical profiles into horizontal time slices. These horizontal slices allow one to view spatial patterning in the radar data and outline features that are not apparently visible when viewed only as hyperbolas in profile view. Using RADAN's 3-D QuickDraw module, the data from the IUSB GPR survey was processed so that plan view images could be examined. The goal was to identify spatial patterns consistent in size and shape with historic structure remnants, as well as to compare the 3-Dimensional data with the radargrams in order to confirm that strong hyperbolas visible in profile view exhibited similar characteristics in plan view.

Interpretation

GPR data interpretation is based on recognizing spatial patterns that are explicable as the result of past human activity. Linear and rectangular concrete, stone, and wooden walls and foundations are often visible against the surrounding soil matrix, and thus appear as linear and rectangular features in GPR data. If there is a sufficient difference between the chemical and physical properties of any remnant architectural material and the surrounding soil matrix this will be evident in the GPR data as a series of high-amplitude (strong hyperbola) reflections. To be explained as the result of historic architecture remnants, these strong hyperbolas must also exhibit as patterned variation within the subsurface. This ‘patterned variation’ is most visible in horizontal plan view images as geometric shapes such as lines, squares and rectangles. These types of shapes do not often occur naturally and when structures are known to have been located in the area under question, there is a higher likelihood that these types of shapes correspond directly with remnant walls and foundations.

Block 1

Block 1 was surveyed on July 22, 2010. Conditions were dry and sunny making the day ideal for GPR data collection. Analysis of Block 1 revealed several rectilinear features that proliferated through multiple depths, indicating a strong likelihood that these features represent structural remains.

The data collected over Block 1 was examined in profile and then processed into planview images. Radargrams revealed numerous hyperbolas across the survey grid, and several hyperbolas appear in the same location on numerous profiles, indicating linear features (Figure 9). The location, size and shape of the features identified as possible architecture in profile are more easily discernable when viewed in planview. Based on analysis of the radargrams, the instrument recorded the clearest and strongest signals between .3 m and 1.5 m below the surface.

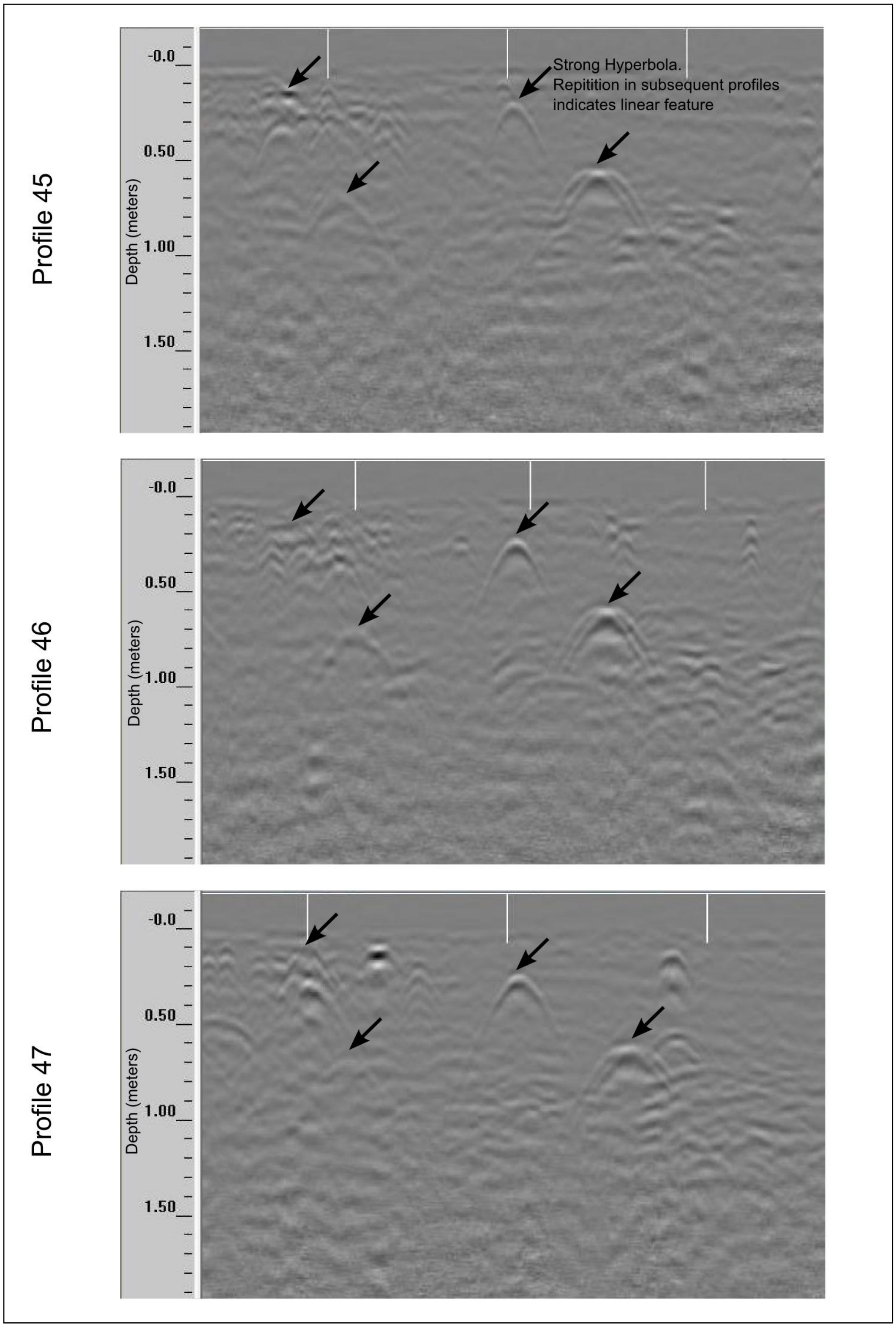

Figure 9. Example radargrams, Block 1.

Block 2

Block 2 was surveyed on July 23, 2010. Moderate rainfall occurred throughout the evening of July 22nd, thus saturating the ground before survey. High water content within soil can adversely affect radar by scattering the signal within the ground, affecting the clarity and depth of the results. Due to the rainfall prior to survey, results from Block 2 are less definitive than Block 1. While rectilinear features were identified, they were not visible until depths below initial identification in Block 1. This suggests that water penetrated within the soil to at least .5 m, greatly affecting the signal up to this depth.

The data collected over Block 2 was examined in profile and then processed into planview images. Radargrams revealed numerous hyperbolas across the survey grid, and several hyperbolas appear in the same location on numerous profiles, indicating linear features (Figure 10). The location, size and shape of the features identified as possible architecture in profile are more easily discernable when viewed in planview. Based on analysis of the radargrams and taking rainfall into account, results between 0.6 m and 1.5 m are most suggestive of buried architectural features.

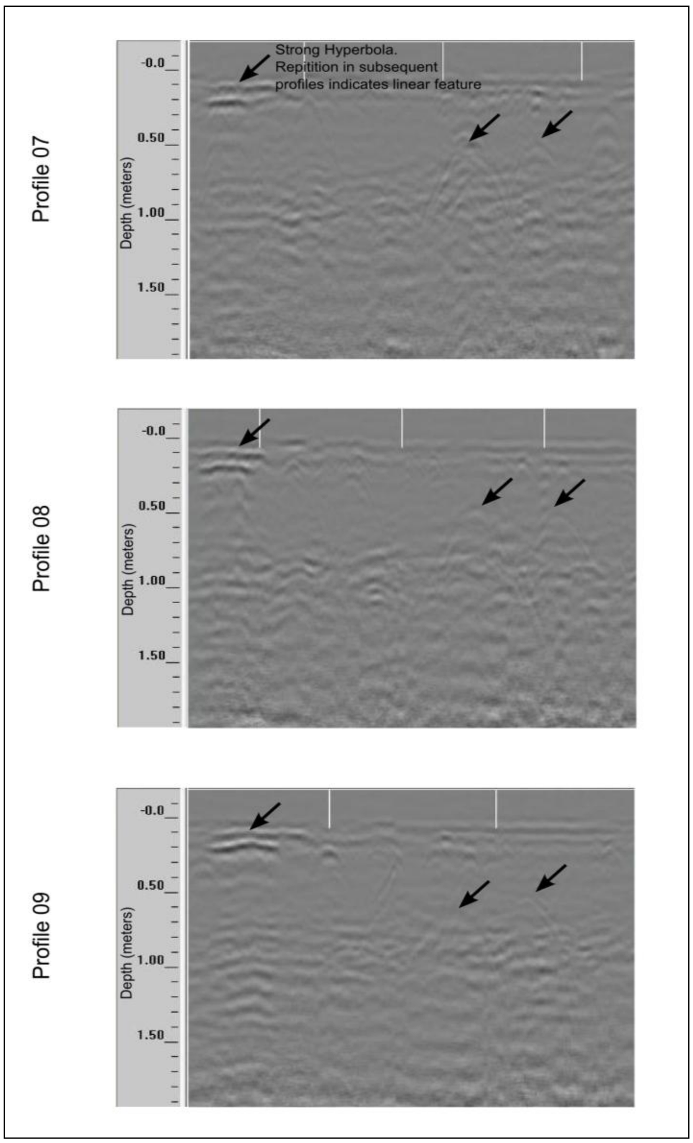

Figure 10. Example radargrams, Block 2.

Results

Results of the GPR survey will be discussed at four different depths (0.5 m, 0.7 m, 0.9 m and 1.1 m below surface). These depths were selected as representative slices of the subsurface. As the survey grids were created arbitrarily, both grids will be discussed jointly in order to focus on the features identified within the project area. Features identified within each Block likely relate to each other as historic architectural features.

Results from Block 2 have less clarity at shallower depths due to overnight rainfall than the results from Block 1, which was investigated when the ground was still dry. At these depths, Block 1 appears to contain the majority of features that may correspond to historic structure remnants. This result does not necessarily mean that Block 2 lacks historic components. Rather they could not be discerned through the current GPR study. The GPR results help supplement the results from IUSB's excavations by highlighting additional (unexcavated) areas with high potential for structural remains.

Depth: 0.5 meters

At 0.5 m depth, the effects of the rain on Block 2 are most apparent. For the most part, the signal is washed out and no rectilinear features are identifiable (one anomaly in Block 2 appears to correspond with a feature identified in Block 1). This is likely due to an increased amount of groundwater, as results from Block 1 are strong and clear. In Block 1, one linear and three rectilinear features were identified (Figure 11). Feature A spans almost the entire length of Block 1 and at 0.5 m depth it exhibits as a thick, patchy rectilinear feature. At this depth, it is hard to classify Feature A as something other than a rectilinear anomaly probably related to building rubble. At this depth it is also possible components of this feature are tree roots, as stumps were present at the coordinates 3-4m and 14.5-16m. Feature B is located centrally within Block 1 and consists of a strong rectangular anomaly. IUSB excavation unit C is located within this feature as well. Feature B likely corresponds to a large rubble pile and possible foundation remnant, as IUSB unit C consisted predominantly of large pieces of rubble. It is likely that GPR identified the extent and diameters of a large rubble pile here. Feature C is located in the north-central portion of Block 1 and consists of a linear feature that runs at an angle NW to SE. Given the strength of the signal, it is possible this feature corresponds to metal piping of some sort. Feature D represents a rectangular anomaly located in the north-central portion of Block 1 and the south-central portion of Block 2. The northern portion of Feature D is the only anomaly identified within Block 2 at this depth.

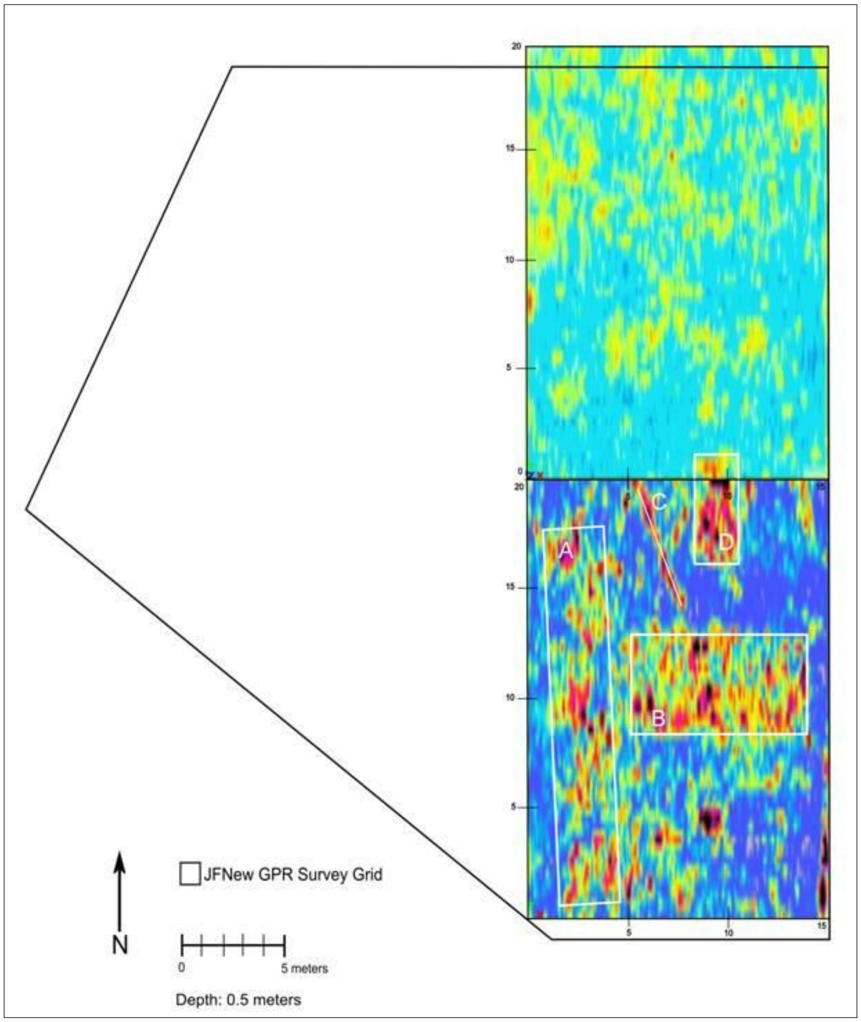

Figure 11. Annotated planview, 0.5 m depth.

Depth: 0.7 meters

At 0.7 m depth, ten rectilinear features were identified across both GPR grids, and in several instances features visible at this depth appear very well-defined (Figure 12). Feature A originally identified at 0.5 m (see Figure 11) now appears fragmented into two features, A1 and A2. A1 likely represents buried components of a tree stump visible on the surface in this location. Feature A2 likely represents building rubble and/or possible foundation remnants. Feature B continues to proliferate in size and signal strength at 0.7 m. Feature C is no longer visible, lending further support that it is a pipe and not an architectural feature (which one would expect to have depth and be visible through several slices). Feature D is still visible in the north-central portion of Block 1; however this feature now appears more linear in shape and extends approximately 15 m intersecting Feature B. Feature E is the final feature identified in Block 1 at this level. It appears as a linear alignment in the south-central portion of Block 1 and runs diagonally, parallel to La Porte Avenue. Given its shape and orientation, it is possible Feature E represents a pipe of some sort.

Results from Block 2 are still slightly washed out at 0.7 m; however several GPR anomalies are now visible. Most interesting are Features F and G, which are rectilinear anomalies that likely represent historic structure remnants. Feature G in particular appears to be a rectangular foundation as the corners are clearly visible in the planview image. Feature F is less visible, but a general rectilinear shape is present. Feature H appears similar to Feature B in size, shape and signal strength. Given the excavation results from IUSB unit C, Feature H is classified as building rubble as well. Finally, Feature I is identified in the northwest portion of Block 2 as a small rectangular anomaly. Given its small size, this feature may or may not be related to the historic buildings once located in the project area.

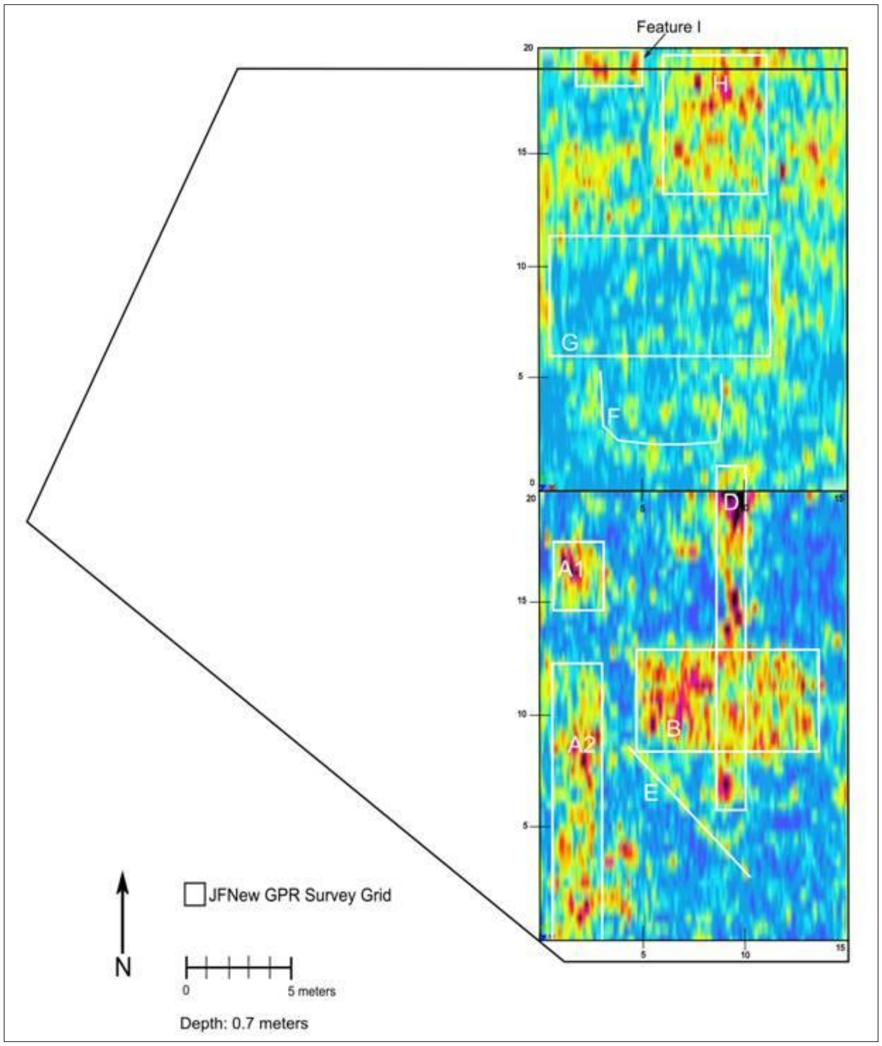

Figure 12. Annotated planview, 0.7 m depth.

Depth: 0.9 meters

Almost all of the features identified at 0.7 m depth are still visible at 0.9 m, and several subtle changes are apparent (Figure 13). Feature A1 is still relatively the same size and shape; however the anomaly has less strength at this level indicating it may be near its termination. The feature also appears more circular than rectangular at this depth. Feature A2 is also weaker at 0.9 m and appears to have shifted slightly eastward. Feature A2 is still best explained as remnant foundation components or building rubble. Feature B continues to proliferate in size and strength, and building rubble is still the best explanation for this anomaly. Feature D maintained its linear shape and now appears longer in size, stretching approximately 17 m and intersecting Feature E. Feature E has also extended in length.

In Block 2, Feature F is no longer visible, and portions of Feature G are also no longer as clearly defined as at 0.7 m depth. Features H and I still proliferate with similar size, shape and signal strength.

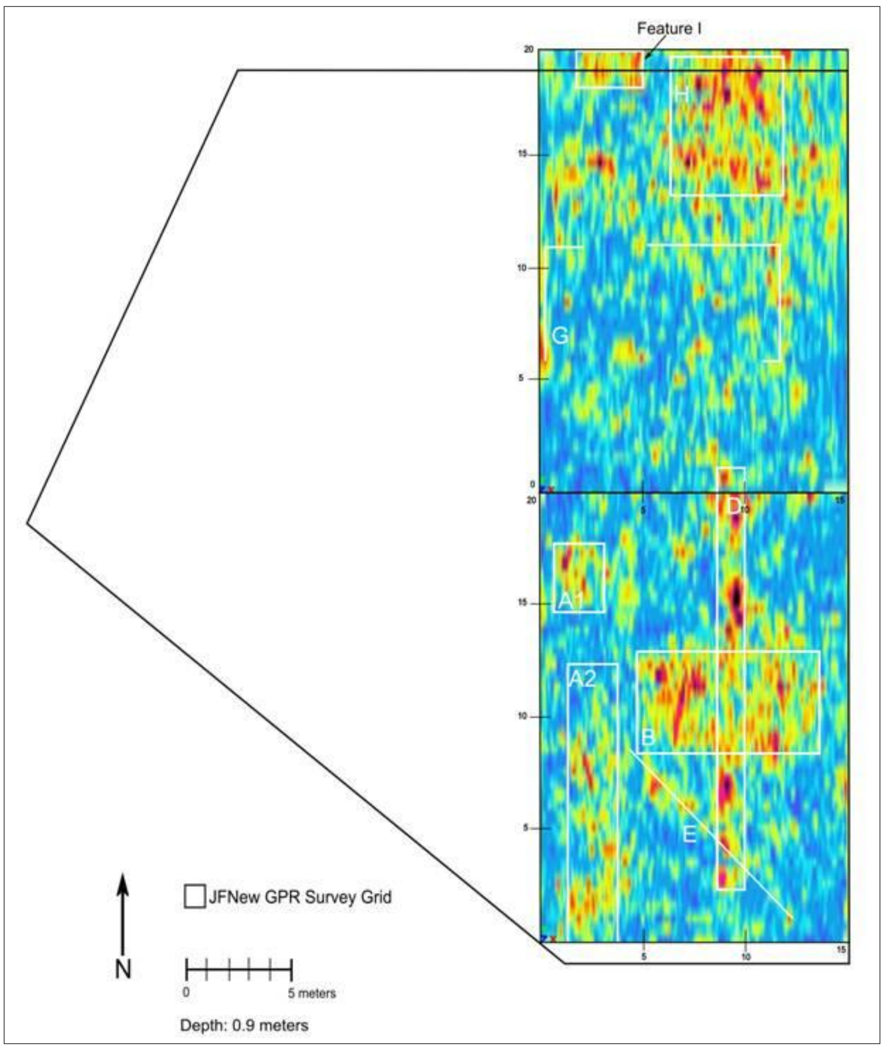

Figure 13. Annotated plan-view, 0.9 m depth.

Depth: 1.1 meters

By 1.1 m depth, the majority of the previously defined features are no longer visible (Figure 14). This may be due in part to signal attenuation at greater depths, but may also indicate that the majority of historic activity occurred at prior, shallower, depths. In Block 1, Feature B remains the only feature with a strong signal. It continues to maintain the size and shape apparent at shallower depths. However, the signal does appear weaker than at previous depths. In Block 2, Features H and I also retain their size, shape and signal strength. The similarity in signal strength between Feature H and Feature B coupled with the excavation results in unit C suggest that both of these features correspond to building rubble piles, and may further correspond with foundation remnants given their rectangular shapes. Anomalies in the area identified as Feature G are still visible, but they are no longer as well-defined as at shallower depths. This could be due to signal attenuation at this depth, and therefore it is possible this feature is still present, though poorly visible in the GPR data.

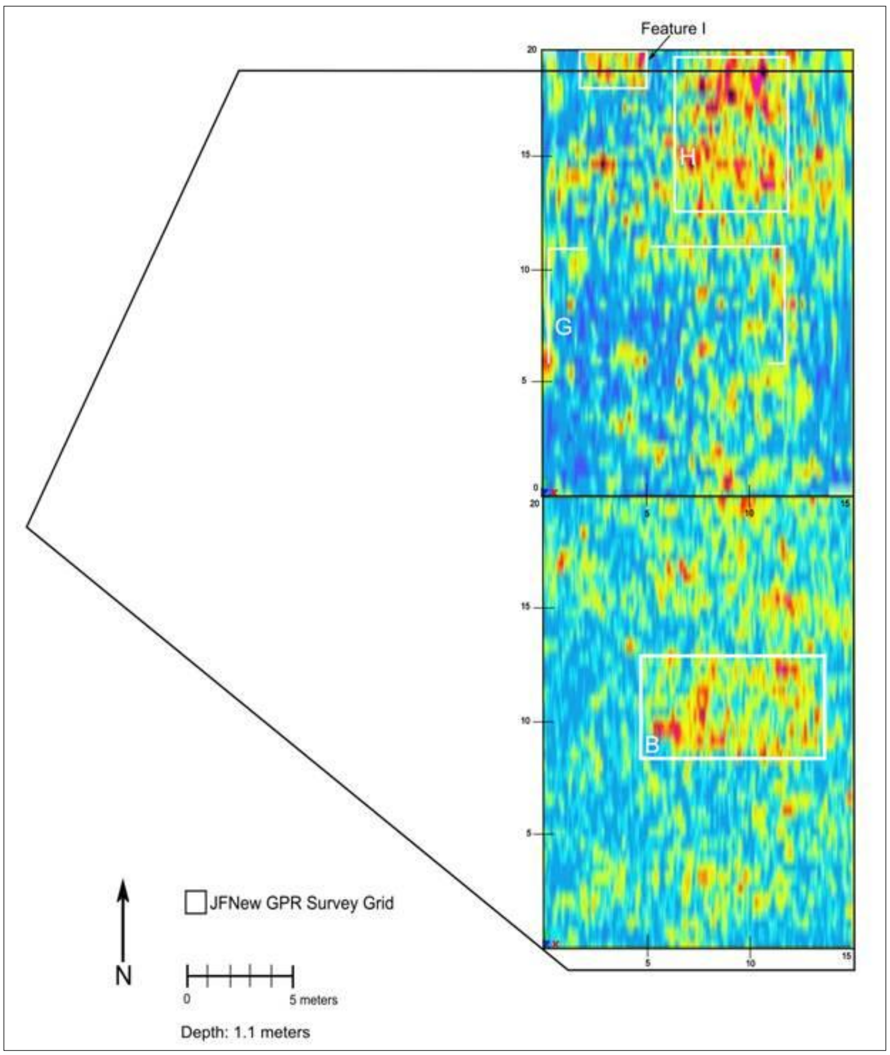

Figure 14. Annotated planview, 1.1 m depth.

Conclusions

This study demonstrates the effectiveness of using GPR to identify historic structure remnants. Together with Dr. James VanderVeen and the IUSB Department of Sociology and Anthropology, JFNew conducted two small GPR surveys within a grass lot where at least 2 historic structures were once located. Both survey areas consisted of 15 m by 20 m grids.

Radargrams (profiles) and planview images were examined in order to determine and illustrate possible archaeological features, including historic structure remnants. Average depths of .5 m to 1 m were positive for features that could be explained as a result of past human activity.

The results obtained from the present study indicate that conditions in the urban setting of South Bend, Indiana are conducive to GPR investigations. The outcome also provided valuable information to Cardno JFNew about survey and data collection parameters, and post-processing methods for future GPR studies. GPR is an effective noninvasive subsurface-mapping tool; however it is also important to note that results are an interpretation of data and might not necessarily reflect what is actually beneath the ground. Nevertheless, results from the IUSB GPR project indicate that historic building remnants are located in the subsurface at the intersection of La Porte Avenue and West Washington Street in South Bend, Indiana. GPR features representing linear, rectilinear and rectangular shapes were identified, likely corresponding to pipes, wall and foundation remnants and buried rubble piles. In addition, the results of this study indicate the importance of assessing field conditions prior to survey as rainfall between surveys had a demonstrated impact on the clarity of the GPR data.

Acknowledgements: This article is based on a report written by Cardno JFNew and submitted to Dr. James VanderVeen of IUSB as a product of our investigation. We wish to thank Dr. VanderVeen for his help and spirit of collaboration in providing us with an avenue to utilize GPR.

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ACQUIRING HISTORY AT SPRING MILL STATE PARK: PUBLIC ARCHAEOLOGY AND EDUCATION

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Abstract

The Pioneer Village at Spring Mill State Park in Lawrence County, Indiana, has been a tourist destination and a venue for educational programs for more than 80 years. During that time, although the interpreters may have changed, the village itself stayed remarkably constant. The Pioneer Village, in addition to being an example of early preservation efforts in Indiana, is an archaeological site of rare magnitude and complexity. This article presents the results of a public archaeology program that is part of a comprehensive preservation and educational programming initiative started by the authors in 2006. This research was funded in part by the U.S. Department of the Interior, National Park Service's Historic Preservation Fund (Grant #21921-8) administered by the Indiana Department of Natural Resources, Division of Historic Preservation and Archaeology (DHPA). The archaeological investigation was conducted under DHPA approved plan #2010018. Work covered under this grant included a one-week public field school and geophysical survey. Other activities related to this project included an educators' workshop, a public presentation, a tri-fold brochure, and portable interpretive signage to be used for traveling exhibits and educational programs in the future. An archive of historical photographs was amassed and will be used to inform current interpretation and to guide future archaeological and historical research. The field school and geophysical survey were conducted in the summer and fall of 2010, under the direction of Melody Pope and April Sievert. A public talk held at the Inn at Spring Mill State Park (SMSP) took place during Indiana's Archaeology Month, and the one-day educators' workshop was held in March of 2011. Archaeological testing in the yard area of the Lower Residence, an original village structure locus, and remote sensing using magnetometry demonstrate the integrity and rich potential of Spring Mill Pioneer Village (12Lr1101) to contribute to archaeological knowledge about early Indiana settlement and industry, the historic preservation movement, and tourism.

Introduction

How do people gain an appreciation of history or develop a vision of the past? Perhaps an even more interesting question is, why would anyone bother? Answers to questions such as these lie somewhere in the ways in which people experience places and events, how they remember them, and what these memories mean (Feld and Basso 1996). Whether from a desire to hold on to something special lest it fade away, or a desire to discover something long forgotten, people spend a tremendous amount of time and energy in exploring that distant world called the past. From the far-reaching success of Ancestry.com and collaborative efforts of GenWeb, to the popularity of the History Channel, it seems clear that people across the world hunger to discover the past. In addition, the development and endurance of historic or heritage destinations such as the Roman Forum, Jerusalem, or Colonial Williamsburg demonstrate that people of all ages and backgrounds continue to find ways to interact with resources of the past by visiting historic locales.

During the park-building era of the first half of the twentieth century, Americans sought to affirm a national identity by specifying places of historical consequence that Americans could visit (Shaffer 2001). At that time, a historic preservation movement was sweeping the nation, with both private and public efforts starting on a grass roots level. The movement was bolstered by the passage of the American Antiquities Act of 1906, 16 USC 431-433, which made it illegal to "appropriate, excavate, injure, or destroy any historic or prehistoric ruin or monument, or any object of antiquity, on U. S. lands" (National Park Service n.d.), thereby providing a mechanism for the preservation of places deemed important to the nation's heritage. Federal leadership was soon followed by state efforts to set land aside not only for presenting the past, but also for recreation, appreciation of nature, and enjoyment.

One place in particular that embodies this process is Spring Mill State Park in Lawrence County, Indiana (Figures 1 and 2). For more than 80 years Spring Mill has drawn visitors from near and far to its cool glades, caves, and picnic grounds. But perhaps the greatest draw is the Pioneer Village, the site of a rural industrial milling settlement. Established in 1814, just before Indiana achieved statehood in 1816, Spring Mill flourished well into the mid-nineteenth century. The Civil War, railroads, and steam power took their toll, and by 1900, Spring Mill's industrial era was at a close. In the twentieth century, the site of the old village was reborn as Pioneer Village, whose restored and reconstructed structures create a place for celebrating Midwestern history and heritage.

What is both alarming and fascinating about the Pioneer Village is that not everyone who visits there is aware that this village was once a "real" place, in spite of the massive stone Grist Mill, placards on each structure, and interpretive signage (Pope et al. 2007). In a world in which people are saturated with information and in which many interpretations of nineteenth-century life are replicas (Young 2006), it is no wonder that people might assume that Spring Mill is not "authentic."

Figure 1. Location of Spring Mill State Park in Lawrence County, Indiana.

It is the responsibility of practicing archaeologists to work toward improving public access to archaeology and to counter some of the impressions that are created by popular media. The prevalence of misconceptions about archaeology and about Spring Mill's place in history inspired the historical archaeology project "Acquiring History at Spring Mill State Park." Historical archaeology provides methods for engaging with the past by linking written history to material culture, or artifacts. This combination results in archaeology that is more accessible to a public audience because it offers direct and familiar connections between the resource and public history consumers (Slick 2002). Because descendents of Spring Mill residents still remain in the area, building archaeological literacy up from a local level has the potential to affect real change in perceptions about archaeology and history (Munson and McGill 2009).

This project was designed to incorporate public programs and public involvement in archaeological research at Spring Mill's Pioneer Village (SMPV), where little research had been done. The Pioneer Village archaeological site (12Lr1101) has the potential to yield well-preserved archaeological deposits. The project received support from the U.S. Department of the Interior, National Park Service's Historic Preservation Fund (HPF) and from the Indiana Department of Natural Resources (DNR), Division of Historic Preservation and Archaeology, which administered the grant. Integral to this project was collaboration with the DNR Division of State Parks and Reservoirs, specifically, Spring Mill State Park. Park administrators provided the infrastructure to make the project possible, and park naturalist Jill Vance collaborated on public presentations, activities in the park, and interpretation.

The HPF-funded project included support for the annual Archaeology Weekend at Spring Mill, a week-long public field school, public presentations, and an educators' workshop. The archaeological component of the project included limited test excavation in an area that showed promise from earlier glimpses below the surface but that had not been adequately explored. Researchers also performed magnetometry around village structures, and did archival research into historic resources that could shed light on land-use history within the village area.

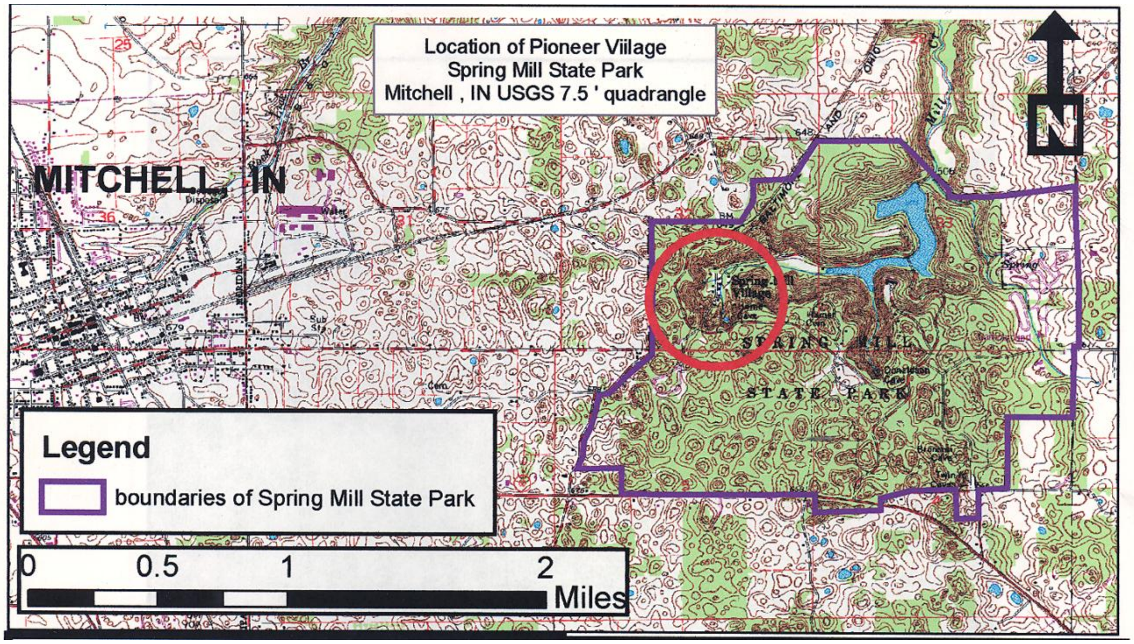


Figure 2. Spring Mill State Park. The Pioneer Village Area is within the red circle.

Spring Mill Pioneer Village—Background

Spring Mill State Park (1,319 acres), located in the geologic region known as the Mitchell Plain, comprises ravines deeply cut by spring-fed streams that emanate from caves, upland karst with frequent sinkholes, a narrow floodplain along the primary stream-course (appropriately dubbed, Mill Creek), and steep slopes (Figure 2). The location is a little more than two miles from the town of Mitchell and about two miles south of the East Fork of the White River. The Village area is at the west end of the canyon formed by Mill Creek. The location is sheltered because the slopes down to the Village are steep. In the 1820s, a road that became a stagecoach road to the north and south was graded into and out of the village. For visitors, the relative inaccessibility enhances the other-worldly charm of the restored village area because the park has been careful to keep most modern trappings to a minimum (Figure 3).

The Pioneer Village is groomed to offer a tantalizing glimpse backward into life at a different time, within an historic location "vivified so that one may hear the clank of the loom, the whirr of spindles, and the splash of water over the ponderous wheel of the mill" (Guernsey 1931:38). In the 1920s, Richard Lieber, the force behind Indiana's state park movement (Frederick 1960), and Elam Y. Guernsey, archaeologist, historian and state representative from Bedford, conceived the idea to renew the crumbling Grist Mill and overgrown village site. From Spring Mill, abandoned village, arose Spring Mill Pioneer Village, destination for a Sunday drive in an A-Model Ford. When these visitors arrived at Spring Mill, not only were they treated to the statuesque first-growth trees in an area of the park called Donaldson Woods, they also got a chance to see the only rural industrial settlement to be restored in Indiana at that time (Figure 4).

Figure 3. Spring Mill Village in 2009 during a reenactor event.

The history told at Spring Mill Pioneer Village consists of narratives about core American social ideals: homesteading, industry, agriculture, commerce, community, and family life in the nineteenth-century Midwest. Elam Y. Guernsey (1931) was among the first to delve into the site's history, researching the site and its former occupants so that a more in-depth story might be conveyed to park visitors. Other histories were written either by trained historians for providing raw material to be used in interpretation (Ansari 1985; Overlease 1956), or for a public audience (Brooks 2005; Evans 1958). The history that follows is taken from these sources.

Figure 4. Bullitt Mill, built 1817–18 of local limestone, restored 1928–29.

Village history begins with Samuel Jackson, Canadian veteran of the War of 1812, who homesteaded, supposedly built a small mill, and legally acquired the land in 1816. Upon receiving title he almost immediately transferred the property to Louisville entrepreneurs Cuthbert and Thomas Bullitt. The Bullitts, originally from Virginia, constructed a mill architecturally reminiscent of grain mills in the Mid-Atlantic. The Bullitt mill was a full-scale merchant mill, producing highly valued wheat flour as well as cornmeal (Pope and Sievert 2010). A 24-foot overshot waterwheel turned the millworks using water brought from a cave (now called Hamer Cave) via a flume set high on limestone pylons.

The Bullitts also built two residences: one for a miller, one for themselves. The structure built for themselves, according to William Overlease (1956), was at the location of the structure now referred to as the Lower (downstream) Residence. These houses were probably completed shortly after the Grist Mill was finished in 1818. The residences were most likely constructed with logs, the most easily attainable building material. It is unclear whether or not the Bullitts ever stayed at the small community that developed around the mill. The two men appeared to hold more than 7000 acres in Lawrence County (Bradley and Wells 2008; Pope and Sievert 2010).

The Bullitts sold the mill property to business associates Montgomery and Son of Philadelphia in 1823, the year Thomas died. The Montgomerys, father William and son Joseph (not brothers, as suggested in several village history narratives), hired John Hammersley, a miller from nearby Lawrenceport to operate the business for them. Hammersley soon engaged, in turn, two brothers, Thomas L. and Hugh Hamer, who operated yet another grain mill in a similar geologic setting about thirteen miles to the east on Clifty Creek in Washington County. Perhaps as early as 1824, Hugh and Thomas L. moved their families into the two residences, Hugh in the Upper Residence, and Thomas L. in the Lower Residence. The histories suggest that under Montgomery ownership, a distillery, sawmill (perhaps already in operation under the Bullitts), and a tannery were added.

William Montgomery died in 1832, leaving disposition of the Indiana property to his son. Montgomery made a deal with the two Hamers, conveying the property and its improvements to them on an installment plan. Hugh became the Spring Mill postmaster in 1831, and served in the state legislature as a member of the Whig party. The Hamers operated in a traditional Midwestern system in which corn was converted to both whiskey and pork, and sent to markets either in Louisville by wagon, or down the Ohio River to New Orleans and points in between (Clark 1966).

In 1848, Robert Johnson Hamer, son of Thomas L. Hamer, died. Thomas L. dissolved his partnership with Hugh in 1849, and moved to another plot of Hamer land north of Spring Mill. Hugh Hamer continued to live in the Upper Residence until his death in 1872 from smallpox. The operation of the mill passed to his son, Robert B. Hamer. Throughout the 1860s, the economic viability of the Hamer mill declined. The railroad came through Indiana, without a stop near Spring Mill. By 1859, even the post office had been disbanded.

In 1881 Robert B. Hamer turned the property over to a nearby resident, well-to-do farmer and merchant Jonathan Turley. Turley kept the mill and distillery operating, switched from using the overshot waterwheel to a turbine, and marketed his product under the name "Daisy Spring Mills." He gave up on milling commercially in 1892, but continued to run the distillery until the mid-1890s, producing brandies. He died in 1896.

After Turley's death, Lehigh Cement Company of Mitchell, Indiana, acquired the property for water rights associated with Hamer Cave. Most of the structures fell into disrepair.

Descendents of former residents, particularly the Hamers, returned to the site for reunions. Caretakers continued to live on the site in a house built between the Upper and Lower Residence sites by Lehigh Cement. The romantic notion of the “ruin,” while true in the sense of crumbling structures, belies the fact that the site was occupied through the restoration period (Figure 5).

Figure 5. Grist Mill in the mid-1920s. View north along stagecoach road. Photo courtesy of Spring Mill State Park archives.

Restoration was completed on most of the village property in time for the park to open to the public in 1930. The Indiana Department of Conservation, which Richard Lieber directed, was responsible for the restoration. Engineer Denzil Doggett was faced with the monumental task of restoring the limestone Grist Mill and getting it running again, while Guernsey took on the task of re-creating the “living” village (Guernsey 1931). Their efforts assured that the mill itself would remain an edifice symbolic of the past achievements of Indiana pioneers (never mind that they were initially capitalists from Kentucky and investors from the East), pre-Industrial Revolution crafts, and American ingenuity.

After the park opened, labor became available— via the Civilian Conservation Corps (CCC)—which set up camps in numerous state parks and properties across the nation as part of economic recovery under the New Deal Works Progress Administration (WPA). For a long time, the history interpreted at Spring Mill State Park included little information about the CCC, but recently interpretation of CCC life and activity in the park has expanded.

Nineteenth-century settlement and life, restoration, and finally tourism provide important archaeological contexts, and contribute to the richness and complexity of this site (Pope et al. 2011). The Acquiring History project hopes to bring these three historic contexts into the public eye, and to show that archaeology has important contributions to make at historical tourist sites that have restored or reconstructed structures (Young 2006). Figure 6 shows structures and areas at SMPV (12Lr1101) and indicates the origin of each structure. The site offers contexts for investigating multiple archaeological and historical questions, all of which can be pursued with public involvement.

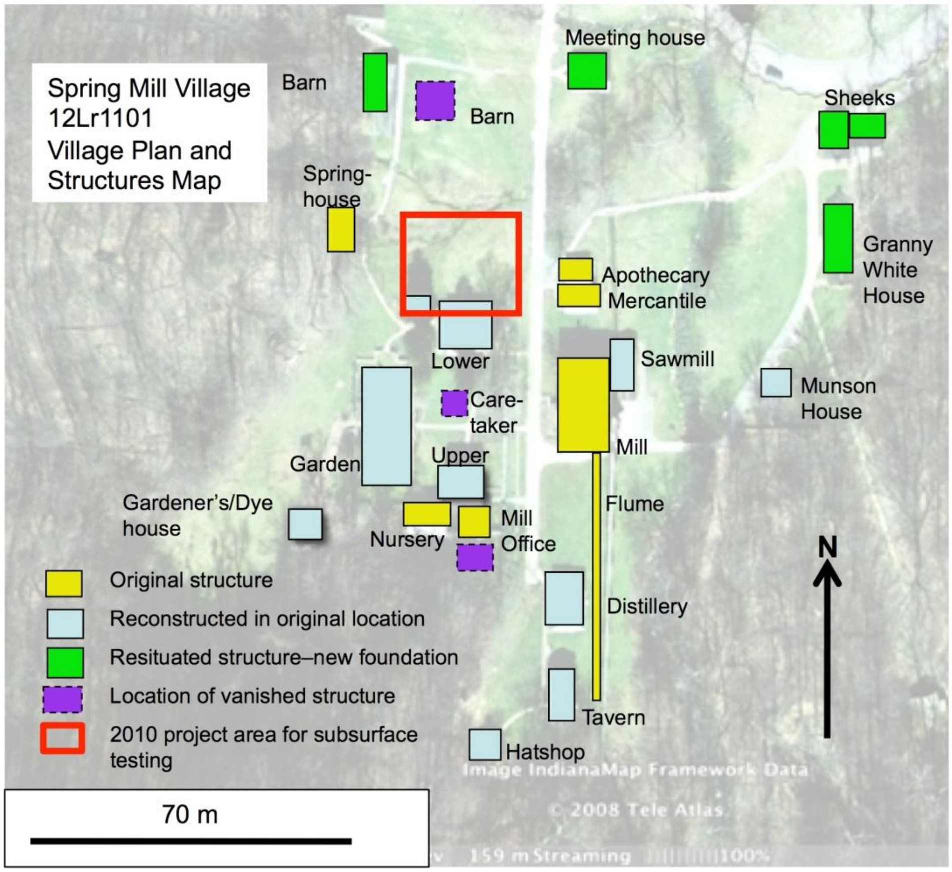


Figure 6. Map of Spring Mill Pioneer Village showing structures and general target for the Acquiring History Project. Aerial Imagery provided by IndianaMap.

Educational and Archaeological Objectives

Educational instruction in archaeology was paired with a well-defined yet small-scale testing program that serves a specific need for archaeological data on site stratigraphy, extent, and character. Utility-line monitoring in 2004 turned up considerable historic material remains (Pope and Mankowski 2005). Additional archaeological reconnaissance with public involvement commenced in 2007 (Sievert et al. 2007). Previous small-scale testing as part of Archaeology Weekend in 2007 and 2008 had opened a small window into the stratigraphic sequence in the yard area immediately north of the Lower Residence, revealing an apparent sealed nineteenth century deposit below the current ground surface. Because of the brevity of the 2007 and 2008 work, a complete stratigraphic sample of the area or representative sample of materials had not been obtained. Materials previously recovered suggested that the subsurface deposits had the potential to yield archaeological information from in-situ contexts that would apply to both the nineteenth century Village in general, and Lower Residence, in particular. The area identified for testing during the Acquiring History project in 2010 is broadly shown in red on Figure 6.

Our objectives for the HPF-funded project also included the compilation of historic photographs directly relevant to archaeology at Spring Mill. Photographic resources such as Figure 7 are not only critical for archaeologists who want to understand past land use, but also are particularly engaging for the public.

Figure 7. Circa 1910 view of Spring Mill, looking south. The Lower Residence is on the right. Photo courtesy of Spring Mill State Park.

In addition, because previous excavation produced a clear indication that intact subsurface contexts including buried surfaces and features were likely, a magnetometry survey of selected areas across the site produced a broad sample of readings from different functional and depositional contexts.

Educational objectives included conducting archaeological research in the context of public programs. Educational activities and products included a public field school, public presentations of results, an educators' workshop to inform those who are teaching the next generation of citizens, and interpretive materials so that the public could learn about archaeology at Spring Mill even when no archaeology was occurring.

Educational Methods and Outcomes

Public Field School and Archaeology Weekend

Test excavation north of the Lower Residence was designed as part of a public field school conducted from June 14–20, 2010. Jill Vance, Interpretive Naturalist at Spring Mill assisted with the logistics for the field school and organized food service for field school participants. The six field school students were all adults older than eighteen. The field school was remarkably effective even in light of heat advisories and severe weather. The field school group meshed well together and developed a positive group dynamic that occurs when people of varied age and experience come together for a common purpose. The students assisted in gridding the unit, removing sod and soil carefully, taking notes and using level forms, measuring depths, and piece plotting. They screened, bailed the unit after a heavy rain, and washed artifacts. Each student spent some time learning about doing soil probes and got some practice assisting with mapping using a total station (electronic distance meter with laser transit) (Figure 8).

Figure 8. Field school students at work.

Archaeology Weekend (June 19-20, 2010) coincided with the end of our field school. Activities consisted of having groups of 8 to 10 individuals sign up to work with archaeologists for a period of 45 minutes each. These visitors received a tour and explanation of the site and excavation areas, and assisted with screening and washing artifacts. Visitors were also able to observe another excavation site within the Village. The field school students assisted in managing visitors, helping them to screen or identify artifacts, and answering questions. Both days of Archaeology Weekend were exceedingly hot, with heat advisories issued each day. Park attendance was low overall, and attendance for Archaeology Weekend activities was lower than in previous years.

A survey of park visitors who participated in Archaeology Weekend activities received only eight responses. Of the respondents, three were from Indiana, four from Kentucky, and one from Illinois. The visitors were asked a series of questions about archaeology, what they participated in, and what they gained. While the sample is too small to be statistically meaningful, it does set the stage for improving assessment of the effectiveness of archaeological outreach. The respondents were evenly divided between male and female, and five out of eight came from states outside of Indiana. Most (five) were between 18–25 years of age; two 26–55, and one was under ten (her mother filled out the survey on her behalf).

Other questions concerned archaeological activities that related to Archaeology Weekend. Only two respondents expected to see archaeology at Spring Mill on Archaeology Weekend; one had seen archaeology at Spring Mill before. Several questions used a modified Likert scale (which asks respondents to indicate how strongly they agree or disagree with a statement) to gauge the effect of archaeology outreach and education at Spring Mill. On a scale of 1–5, five indicates strong agreement. The mean scores for these questions (all of which included the proviso "as a result of archaeological activities") follow:

My understanding of archaeology increased.	4.17
My understanding of village history increased.	4.00
My enjoyment of the Village increased	4.43

Although sample size very small, and the respondents are likely a self-selected group predisposed to find the activities engaging, the results are nevertheless auspicious and consistent. Most people will be unaware that archaeology is being done at Spring Mill, but they find it both enlightening and enjoyable. More data are clearly needed. Respondents were asked what they found most and least enjoyable. They liked digging, finding a button, finding valuable artifacts, and learning English. They were also asked what they found most educational. Here they identified talks by archaeologists, learning what was found, and teamwork. No one had negative comments. Overall, the survey did not provide statistically significant data, but it does suggest that surveys of engagement may produce useful and credible data if conducted on a larger scale, and the responses suggest that archaeology does bring a desired and different perspective to the park experience.

Public Presentations

Pope and Sievert delivered the talk *Presence of Owners Past* at the Spring Mill Inn on September 10, 2010. Notification of the talk was included in Indiana Archaeology Month activities. The presentation drew 15 people, including individuals who were guests at Spring Mill Inn that weekend; one of our field school students, Rachel Smith; and Vicki Basman, Chief of Interpretation for Indiana DNR, Division of State Parks and Reservoirs. The talk introduced previous work at the Village as well as the 2010 investigations and preliminary findings from excavations beneath the Munson House under Indiana Code 14-21-1, executed by Melody Pope and April Sievert from September 2009–August 2010. The Munson cellar, as a sealed deposit, underscores the importance of recognizing that restored or reconstructed structures are still associated with important intact subsurface archaeological deposits. This emphasized the importance of archaeological context.

The excavation of the cellar in the Munson House was itself a public presentation and interpretation of archaeology. Park officials worked with the archaeologists and provided a platform that allowed visitors to observe archaeological work from a safe distance and to interact with archaeologists.

In February 2011, Sievert attended the Hoosier Association of Science Teachers, Inc. annual conference in Indianapolis. The two-day conference allowed Sievert to talk to over 100 educators about archaeology at Spring Mill, to distribute materials relating to the educators' workshop in March 2011, and to answer questions about archaeology and anthropology in general. Through contacts made at the conference, an archaeology program for 175 4^{th}–8^{th} graders was presented in June 2011 at Spring Mill State Park. This one event was remarkably successful in contacting interested educators.

What became clear after talking to some teachers is that there is deep interest but naiveté among teachers about the goals and responsibilities of archaeology. Educators may be conducting excavations without knowledge of Indiana code or how the state protects archaeological resources. Educational programming aimed at different ages and groups is vital to insure that archaeological sites are conserved, and that archaeology offers something useful to the populace at large (see Smardz and Smith 2000).

Educators' Workshop

A one-day workshop for educators was held on March 5, 2011. Lynn Alex, Melody Pope, and April Sievert facilitated the program. Fifteen educators attended, including people from the Indianapolis Children's Museum, Lawrence and Bartholomew County Schools, and Indianapolis Schools. The day-long workshop began with an introduction to the archaeology at Spring Mill, and to the potential for teachers to use archaeology to meet Indiana Core Curriculum Standards. The archaeologists conducted a guided tour through the Pioneer Village and explained about the archaeological work that had been completed. Afternoon sessions included active-learning exercises that utilized both historic photographs and artifacts recovered from excavations.

Muggs Murphy, who teaches gifted students at Mitchell Schools, told archaeologists that her husband's family is related to John Sheeks and Jonathan Turley, two men important in Spring Mill's history. It is likely that for historic sites elsewhere in Indiana local teachers may actually represent descendent communities. This tie should make teachers some of the best advocates of historic preservation and archaeology.

Interpretive materials

Three types of interpretive materials were created under this grant. They include (1) educational materials handed out to field school and workshop participants, (2) a brochure to be distributed widely to locations in Indiana, especially to venues in and around Spring Mill and other state parks, and (3) posters that can be used in a portable exhibit for traveling to schools, libraries, local museums, and other locations for outreach programs.

A tri-fold full-color brochure outlining the archaeology program at Spring Mill State Park was also created. The brochure includes information from test excavation, as well as information derived during excavation of the intact cellar discovered beneath the floor of the Munson House structure, located east of the Grist Mill. This brochure will be available at Spring Mill State Park, as well as at other public locations in Lawrence County and surrounding areas, including Monroe, Lawrence, Washington, and Orange County visitor bureaus.

Three posters will be used for display at public events and in public venues.

1. *Archaeology and Education at Spring Mill State Park*. This poster delineates the public archaeology aspects of Spring Mill archaeology, listing the four types of educational activities

conducted: Archaeology Weekends, public field school, public presentations, and the educator's workshop.

2. *Archaeology Adds to the Historic Record for Spring Mill's Pioneer Village*. This poster recaps the archaeological work in the Pioneer Village area and relays findings to a general audience.

3. *What Does Archaeology Tell Us About 19th Century Life at the Munson House?* The third poster goes into more detail on the 2009–2010 excavation at the Munson House (Leather Shop). For seven months during which the structure was open to visitors, archaeology became one of the attractions in the Pioneer Village. While archaeologists worked intermittently to complete the removal of nineteenth-century cellar deposits, visitors could stand on a platform overlooking the excavation. This offered an optimal venue for explaining archaeology, its procedures, and its findings.

Historic Photographic Archive

The historic photographic archive component of the project involved digitizing, compiling, and analyzing 70 photographs, primarily housed at Spring Mill. These photographic resources can be used by archaeologists, interpreters, and educators. When linked with archaeological data from excavation and broader surveys, the photographs in the archive (which include Figure 7) will be extremely useful.

Archaeological Methods and Results

Subsurface testing

The principal focus of the 2010 archaeological work at the Village, conducted under approved DHPA plan #2010018, was exploration of the north yard area at the Lower Residence, which was built in 1818 (Figure 6). One 2 x 2 meter test square, designated Unit 5, was placed adjacent to and partially overlapping Unit 2 (a 1 m x 0.5 m unit opened in 2007 and 2008) in order to sample the full stratigraphic sequence in this part of the site. Unit 5 excavation occurred between June 14 and 22, 2010 as the main focus of the public field school conducted as a part of the 2010 HPF grant project (21921-8).

A unit datum was established at the southwest corner of Unit 5. Excavation of the unit proceeded by natural stratigraphic layers (Table 1). Each noticeable difference in sediment color and texture, indicating some type of depositional change, was considered a distinct depositional layer. The lowest layer was excavated in two arbitrary levels to ensure finer resolution since this layer appeared to be a distinct locus rich in nineteenth century materials, whose archaeological and depositional context has yet to be fully understood.

All layers sampled were dry screened, through one-quarter-inch mesh, and all artifacts recognized in the screen were collected. The volume of excavated deposit from each screened layer was measured by counting the number of bucketfuls of sediment excavated. In this way, it is possible to calculate the densities of artifacts by layer, by dividing artifact counts (or weights) by the volume of excavated deposit to yield a count (or weight) per liter. Density figures allow meaningful comparisons across contexts, by controlling for the amount of deposit excavated, and are therefore preferable to comparisons based on raw counts, weights, or percentages of items (Pollock 1999; Wright 1981). Soil samples for flotation and chemical analysis were taken from designated cultural and stratigraphic layers.

Four distinct stratigraphic layers were identified as delineated in Table 1, shown in Figure 9, and diagrammed in Figure 10. However, Layer 4 was not fully excavated, but was documented using an Oakfield probe. The probe revealed that the underlying Layer 4 deposit is a natural stratigraphic layer that appears to be culturally sterile. The uppermost 16 cm in Unit 5 (Layer 1) consisted of a moderately well developed soil with few cultural materials. Layer 2, between 16 cm and 34 cm below the surface, consisted of strong brown, blocky, silt loam. The contact boundary between layers 1 and 2 was gradual and somewhat diffuse. The contact layer between layers 2 and 3 was abrupt with Layer 3 strongly demarcated on the basis of both soil color and notable increase in cultural materials (see Table 2).

Table 1. Soil Description for Unit 5 Stratigraphic Layers

Depth (cmbs)	Layer	Horizon	Description
0 – 11	1	A	Very dark grayish brown, 10YR 3/2, silt loam with few 2-4 cm clasts of red clay, 10R 5/8, firm, angular blocky, noneffervescent, few < 5mm rounded pebbles, abundant roots, gradual and diffuse boundary.
11–16	1	A/B	Very dark grayish brown, 10YR 3/2, silt loam with abundant rip-up clasts of strong brown, 7.5 YR 5/6; firm, subangular blocky, noneffervescent, 3.5 cm angular pebble, abundant roots, 3.7 cm wood, charcoal, gradual and diffuse boundary.
16–34	2	B (truncated horizon, historic fill?)	Strong brown, 7.5 YR 5/6, heavy silt loam, firm, subangular blocky, mottled with brown 10YR 4/3, common, fine Mn and few, medium Fe concretions; abundant worm traces filled with very dark grayish brown, 10YR 3/2; noneffervescent; few roots; abrupt boundary.
34-45	3	Ab (buried 19th century surface	Black, 2.5Y 2.5/1, sandy silt loam with fine to medium sand, common limestone fragments, common large limestone blocks, common cultural artifacts; moderately effervescent.
45–53	4	Pre-occupation, natural soil horizon?	Yellow Brown (10YR 5/1-5/2) to Dark Gray, Greenish Black (Gley 1 2.5/1) soil

Based on the currently available, if limited, soil and artifact data (see below), the most plausible interpretation is that Layer 2, immediately overlying the buried cultural horizon (Layer 3), is fill perhaps brought in sometime late in the nineteenth or early twentieth century as part of landscaping efforts or drainage control. The principal items recovered from Layer 2, corroded metal (mostly nails), some concrete, plaster and rock, also support the interpretation of the layer as fill that may have been brought in during restoration work. The nearby springs, Mill Creek, and high water table attest to the wetland-like nature of the area immediately north of the Lower Residence, as does the presumed pre-Village natural gley (water logged) soil underlying Layer 3 and the preservation of organic materials (e.g., wood, leather, and felt) in Layer 3. The uppermost A-horizon soil (Layer 1) is interpreted at this time to be the result of natural pedogenesis, an organic and humic zone formed over the past 100+ years. Layer 3 is interpreted as a sealed occupational surface where refuse accumulated or was purposefully dumped during the time in which the Lower Residence was occupied.

Figure 9. Unit 5, south profile close-up, showing location of soil column, near the southwest (datum) corner of the unit. Depth is 50 cm below surface. Note abrupt change from Layer 2 to Layer 3.

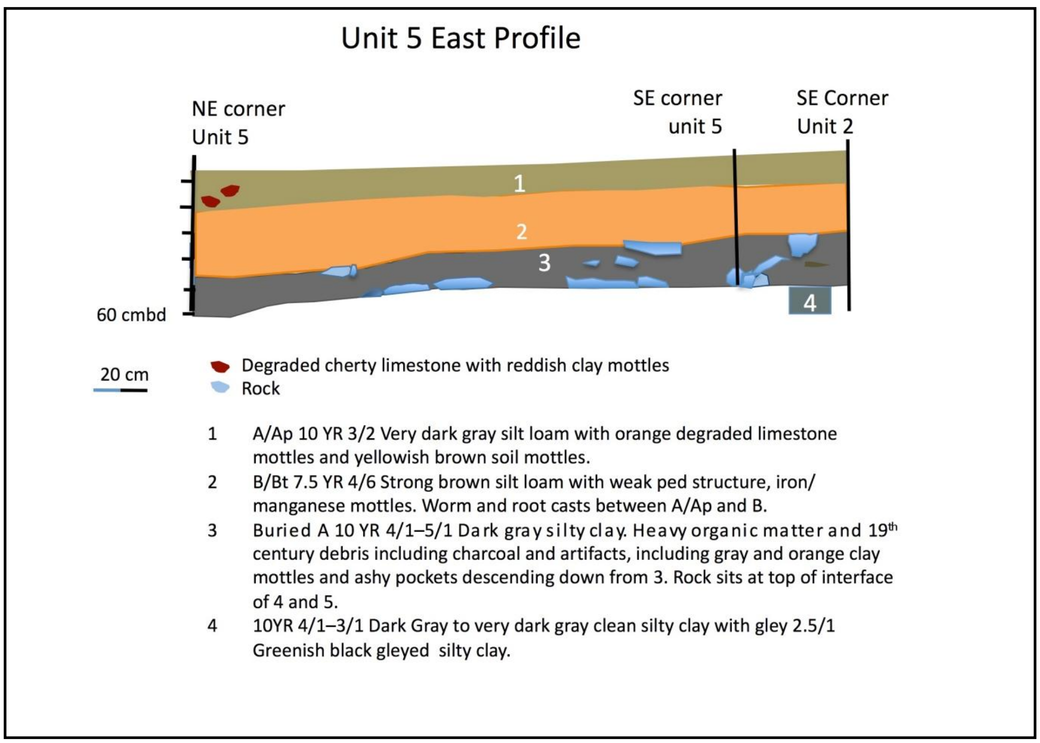


Figure 10. Unit 5, profile of south wall.

The most numerous find categories at Spring Mill, as at many historic sites, are pottery, glass, and metal. Artifacts were sorted into classes and, where applicable, into further subdivisions of material, type, and function. Depending on the artifact class and type, items were either counted, weighed, or both.

The stratigraphic analysis of artifacts from Unit 5 relies on densities of artifact classes. Density measurements reflect the kinds and intensities of past activities and control for differences in the volume of excavated contexts. Artifact counts and weights are standardized as densities per liter of screened soil and are presented as densities per layer. While the quantity of materials by weight is similar for the two uppermost stratigraphic layers, the density of material in the buried soil, Layer 3, is markedly higher by comparison (Table 2).

Table 2. Density of Combined Artifact Classes by Stratigraphic Layer

Stratigraphic Layer	Volume (liters)	Weight (g)	Density (g/liter)
1	766.55	1,024.6	1.34
2	286.36	809.2	2.82
3	889.60	10,011.2	11.25

Table 3. Artifact Class by Density Across Stratigraphic Layers

Class	Layer 1		Layer 2		Layer 3	
	Wt. (g)	Density (g/l)	Wt. (g)	Density (g/l)	Wt. (g)	Density (g/l)
Ceramic	45.1	0.06	58.3	0.20	1413.6	1.59
Glass	0.2	0.0003	9.8	0.03	1623.2	1.82
Metal	69.1	0.09	300.1	1.05	4382.7	4.93
Organic	20.5	0.03	3.2	0.01	219.9	0.24
Raw Material	863.8	1.13	437	1.53	1615.1	1.82

A comparison of weight densities by different material classes allows further interpretation of the three stratigraphic contexts (Table 3). Densities of rock fragments, plaster, coal and slag, items grouped in the raw material class, are similar across the three stratigraphic layers. Contexts above the buried cultural surface show much lower weight densities for ceramics, glass, metal, and organics. The lower artifact densities imply that deposits above the buried surface may represent contexts of abandonment or a different use of outside space. The high weight densities for the lower, buried surface likely indicates a context associated with living surfaces used for the disposal of household garbage and episodic dumping, perhaps from hearth cleaning. Archival photographs (Figure 7) indicate that there were two back doors on the Lower Residence, facilitating the discard of refuse into a back yard area. The nature, frequency, and association of artifacts from the three stratigraphic contexts provide additional evidence that Layers 1 and 2 represent very different depositional contexts from that of Layer 3. The base of Layer 3 was characterized by rocks, most of which lay horizontal in the unit. Figures 11 and 12 show the rocky character and the dark coloration of the terminus of Layer 3. In all, excavation of

Unit 5 confirmed that an extensive buried surface lies beneath the top layers of fill behind the Lower Residence.

Only a small quantity of glass and ceramics were recovered from Layers 1 and 2 compared to Layer 3 (Table 4). Glass from the fill layer (Layer 2) consisted of only 10 flat glass fragments weighing 9.5 gms. In contrast, 1,524 pieces of glass weighing 1,623.2 gms were recovered from Layer 3. Flat glass is plentiful and likely derived from windows. Curved glass from Layer 3 includes a wide variety of glass containers, including fruit jars, at least one patent medicine bottle, goblets, and drinking glasses. Other types of glass items from the buried surface include buttons, beads, thin glass perhaps from oil lamp chimneys, and several leaded glass items. Two small hand-blown bottles, both with blow-pipe pontil marks, are similar to opium bottles and were recovered from the buried surface. Another glass item is a fragment of an interior foot from a lacy Sandwich Glass compote bowl (Lee 1939). The thickness of the piece suggests that it may date to the late 1820s or early1830s (Ingalls, personal communication).

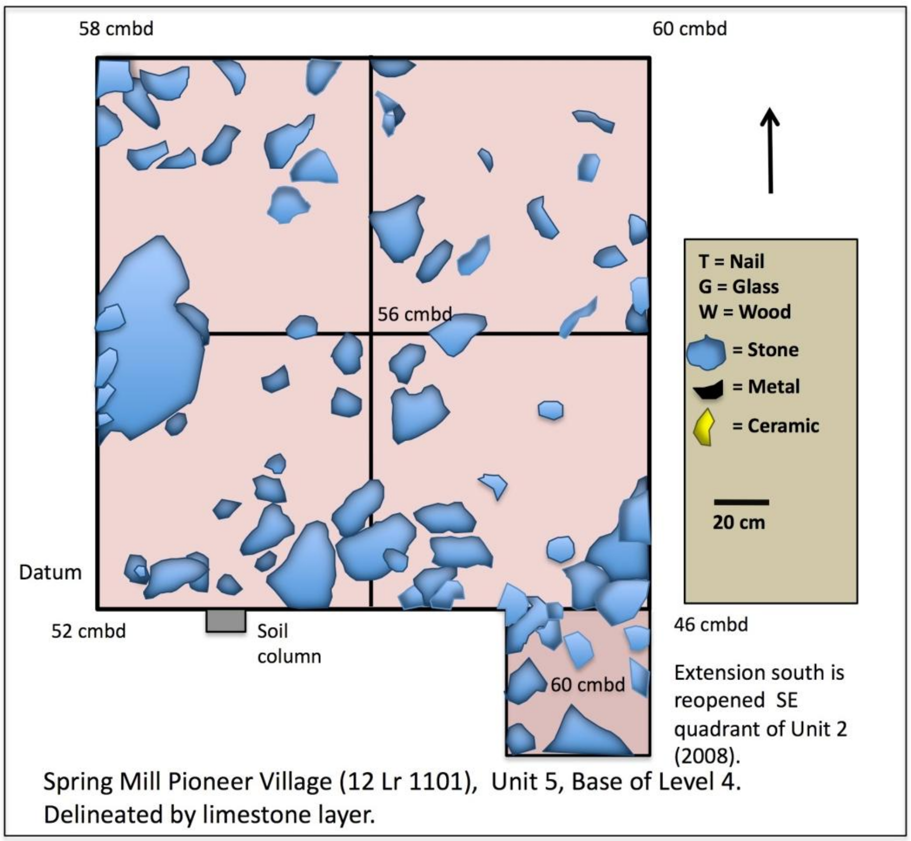


Figure 11. Unit 5, plan view, base of stratigraphic Layer 3 (excavated level 4).

Figure 12. Unit 5, base of Layer 3 showing dense rock debris.

Table 4. Count and Weight (g) of Glass Items by Layer

Type	Layer 1		Layer 2		Layer 3		TOTAL	
	Ct.	Wt. (g)	Ct.	Wt. (g)	Ct.	Wt. (g)	Ct.	Wt. (g)
Flat	0	0	10	9.5	1,151	828.6	1,161	838.1
Curved	0	0	0	0	331	785.9	331	785.9
Green Safety	1	0.02	0	0	0	0	1	0.02
Blue Faceted Bead	0	0	0	0	2	0.6	2	0.6
Clear Faceted Bead	0	0	0	0	1	0.3	1	0.3
Very Thin	0	0	0	0	33	5.4	33	5.4
Opaque	0	0	0	0	2	1.2	2	1.2
Button	0	0	0	0	5	1.2	5	1.2
TOTAL	**1**	**0.02**	**10**	**9.5**	**1,524**	**1,623.2**	**1,536**	**1,622.7**

Ceramic frequency data illustrates greater diversity of wares in the buried surface (Layer 3) compared to the overlying layers. The upper A-horizon soil (Layer 1) contained only a few fragments of redware and the underlying fill (Layer 2) only five sherds, including a single stoneware jug handle. In contrast, a variety of ware types were recovered in the buried surface deposit (Table 5). White-paste earthenware and redware occur frequently. A wide variety of fine tea and table wares are represented by the white-paste earthenware, which exhibits decorative treatments including transfer printing in red, blue, green, mulberry, brown and black (Figure 13). Hand-painted sherds feature small motifs with fine stems bearing tiny flowers and leaves. In addition to vessels, other ceramic items found in Layer 3 include marbles and pipe bowls, including one nearly complete, ornate, stoneware pipe bowl (Figure 14).

Table 5. Relative Frequency of Ceramic Wares from Layer 3

Type	Ct.	Wt. (g)	% Ct.	% Wt.
Yellow ware	21	44.5	2.7	3.2
White paste earthenware	450	450.0	58.2	32.1
Gray paste earthenware	2	3.6	0.30	0.5
Redware	244	402.6	31.6	28.6
Porcelain	10	6.8	1.3	0.5
Pearlware	7	8.9	0.9	0.6
Stoneware	39	484.2	5.0	34.5
TOTAL	**773**	**1,400.6**	**100.0**	**100.0**

The majority of metal items are ferrous nails, many of which are highly corroded. There are, however, a few other significant metal items including items made from copper alloys. Notable metal items from the buried surface include a fine saddle stirrup, a number of fragments of metal banding, and a Norfolk style thumb door latch, circa 1800-1820 (http://robinsonsantiques.com) (Figure 15). A Georgian-style fob seal or pendant (circa 1770-1820s), with what appears to be a rock crystal intaglio (illegible), was also recovered (Figure 16).

Faunal Analysis

Analysis of 166 faunal remains gives a small but useful glimpse at food and the use of animals at Spring Mill. Remains of pig, cow, groundhog, fox squirrel, and chicken appear to be the food sources best represented. Raccoon and turkey are also present. Small rodents were prevalent and probably were attracted to the depositional layer from which the faunal remains derived, predominantly Layer 3. The collection of animal bone suggests that site 12Lr1101 has great potential to provide data for understanding food consumption at the site, and to illuminate and add to the traditional narratives of Spring Mill which focus on hog production. Pigs were present, but people were also consuming wild animal sources.

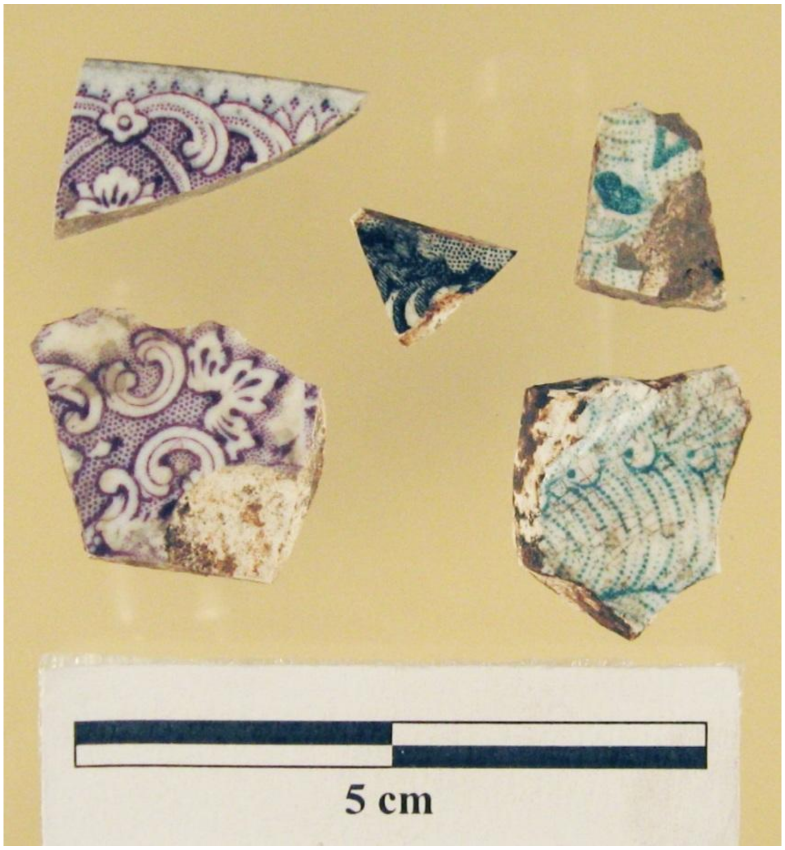


Figure 13. Transfer-printed ceramics in blue, mulberry, and teal.

Figure 14. Stoneware pipe fragments from Layer 3.

Figure 15. Norfolk style thumb door latch, circa 1800–1820.

Figure 16. Georgian-style fob seal with intaglio.

Magnetometry survey

At the time of restoration in the 1920s, observers suggested that remains of fifty structures were visible in the village area at Spring Mill (Scott 1930). Many locations were known either because some structures had extant remains or because they were remembered. Remote sensing increases our knowledge of village structures and features and will guide future research, site interpretation, and site maintenance.

Dr. Michael Strezewski at the Sociology Department at the University of Southern Indiana, Evansville, conducted remote sensing using flux gradiometry. The instrument used was a Geoscan FM-256 gradiometer. The survey was conducted with a 0.5 m traverse interval, with eight readings taken per meter. Results of the survey were processed in the program Archeosurveyor, version 2.4.0.23. In the course of the survey, a total of 625 m^2 was surveyed.

Ten grid units of 100 m^2 or less, in nine locations of interest in the Pioneer Village area were surveyed (Figure 17). Survey grids were either ten-meter squares or contiguous five-meter squares, depending on location. Survey grids were distributed throughout the Village, including areas currently interpreted as the Blacksmith Shop, Carriage Barn, and Lower Residence, near the Gardener's House (former dye house location), behind the Tavern and Distillery, and north of the Munson House/Leather Shop on the east side of Mill Creek.

Figure 17. Location of magnetometry survey grids at selected locations in the Pioneer Village. Base map from Indiana Historical Aerial Photo Index, Indiana Geological Survey, 2005.

Results of the survey are promising and informative. In the north village area, all three scans (Grids A–C) suggest buried metal. Grid A, east of the Blacksmith Shop (Figure 18, left) shows evidence for a large piece of metal possibly buried on end, as well as other smaller dispersed ferrous metal fragments. The structure nearby has been used as a smithy for decades. Subsurface testing would be necessary in order to distinguish between nineteenth century materials and debris from twentieth century craft production. Grid B (Figure 18, center) east of the current Carriage Barn shows considerable ferrous metal signatures. This area is of interest for two reasons. First, it may represent the area of the former barn recalled in interviews with Thelma and Pauline Jean conducted by J. Andrew Evans in the 1980s (Evans 1987). If so, numerous metal fragments would be expected. Sources suggest that Hugh Hamer had wagons drawn by oxen, kept in a barn somewhere in this vicinity (Evans 1958). Second, property manager Mark Young advised on the probability that a buried tank used to store water during early park years was located roughly in this location. Readings do not suggest a tank per se within Grid B.

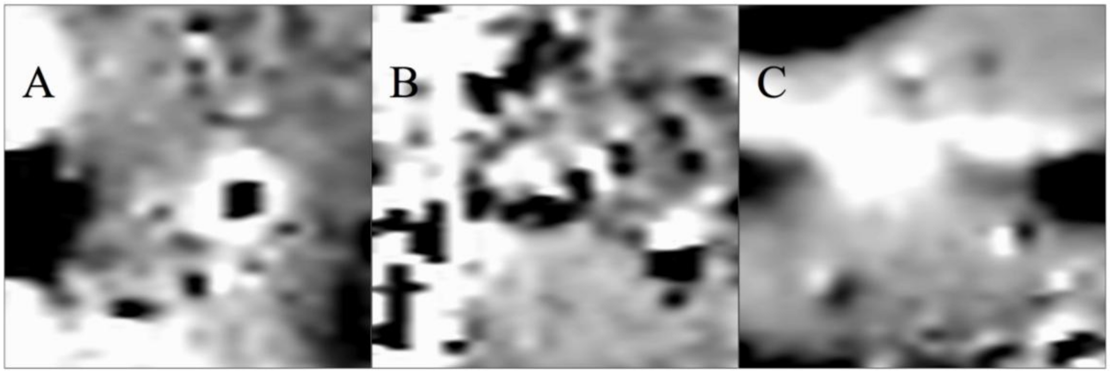


Figure 18. Grid A, east of Blacksmith Shop, Grid B, east of Carriage House, Grid C, north of Lower Residence. Each is 10 m x 10 m.

Grid C (Figure 18, right) is of particular interest because it is located north of the test excavation near the Lower Residence. This grid also exhibits signs of buried metal, especially closer to the building. Given current understanding of yard use near the Lower Residence, with the buried-surface Layer 3 decreasing to the north, this makes sense. Other strong positive anomalies lie along the northwest and east-central portions of the grid.

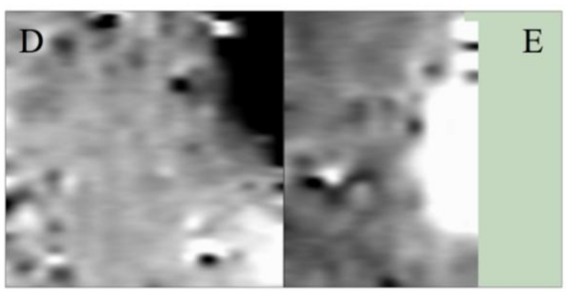


Figure 19. Grids D and E near the Gardener's house. Each is 10 m x 10 m.

Grids D and E, which targeted areas near the Gardener's House in the west village (Figure 19) are fairly quiet. Some smaller buried ferrous metal is likely in the southwest part of Grid D, while for Grid E a circular anomaly on the western edge of the unit is intriguing.

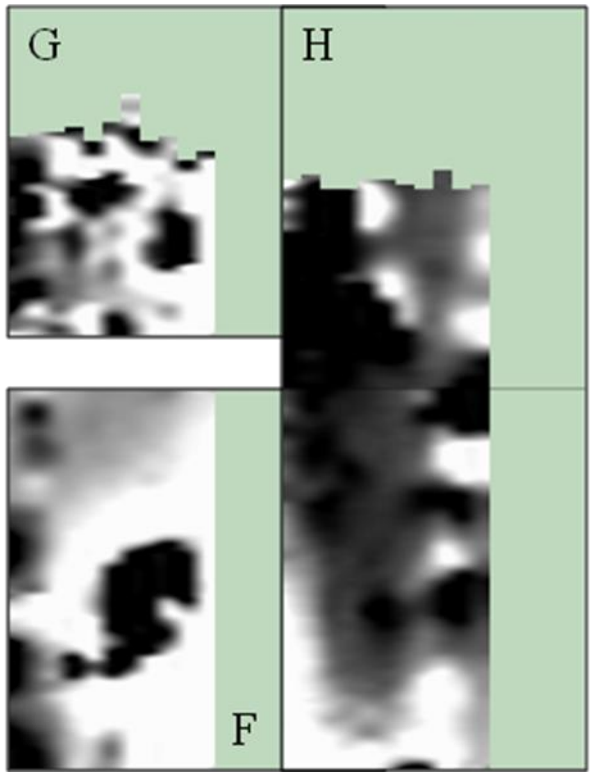


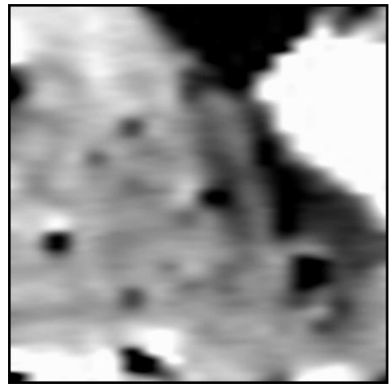
Figure 20. Clockwise from upper left. Grid G north of distillery, Grid H along creek, grid F behind tavern. F, G, and H. are based on 5 x 5 meter contiguous units.

Survey units F, G, and H (Figure 20) were placed in the areas behind the Tavern and Distillery. These two structures were likely reconstructed on their original foundations, remains of which are visible in older photographs. The distillery was the last industry at Spring Mill to suspend operation, closing in 1896. Both F, east of the Tavern, and G, northeast of the Distillery show clear features associated. Behind the Tavern is a highly magnetic anomaly that may represent a brick or burned feature, which bears investigation. A photograph of the tavern building during early park years shows a structure added on to the back of the current building. Near the distillery is another circular anomaly. Grid H (Figure 20) has indications of some metal along with a long feature along the right edge that may be a ceramic pipe.

Grid I (Figure 21) is north of the Munson House and reveals a linear anomaly, perhaps large piece of ferrous metal, and a roughly rectangular feature. In a 1928 park development plan (Pope and Mankowski 2005), a smithy was proposed for this area, but never constructed. Whether or not the 1928 proposal was based on historic knowledge is unknown at this time.

Magnetometry proved highly successful in the village area, giving a better, though still patchy glimpse of site structure. Future archaeological, historic preservation, maintenance, development, and interpretation plans should take these findings into account. The findings may shed light on both nineteenth century activity as well as restoration efforts.

Figure 21. Grid I north of the Munson House. 10 x 10 m.



Conclusion

This article summaries results of a public archaeology research project, *Acquiring History at Spring Mill State Park*, funded in part by a grant from the U.S. Department of the Interior, National Park Service's Historic Preservation Fund, administered by the Indiana Department of Natural Resources, Division of Historic Preservation and Archaeology, Grant 21921-8. Archaeological investigations, including a small test excavation and magnetometry survey, were conducted under approved plan #2010018 (Indiana Code 14-21-1). This work is a collaborative effort by researchers affiliated with Indiana University and The University of Iowa, Office of the State Archaeologist, in partnership with the staff at Spring Mill State Park.

The principal objective of this project was to demonstrate how Spring Mill can be used as a study laboratory for learning and curriculum development by focusing on two principal sources of data: archaeological deposits and historic archives, specifically photographs. The results of investigations not only improved archaeological literacy and engaged the public directly in documenting and interpreting Indiana history, but it also resulted in the documentation of archaeological and archival resources that will be invaluable to future historic preservation and research efforts centered at the important Indiana historic site, Spring Mill Pioneer Village (12Lr1101), at Spring Mill State Park.

The HPF-funded project "Acquiring History at Spring Mill State Park" was successful on several levels. Archaeological testing at the site of the Lower Residence confirms the presence of a buried surface that can be linked confidently to the nineteenth century, and to the early part of the nineteenth century at that. Although specific below ground contexts will need to be evaluated on a case-by-case basis, the results of the testing put to rest any doubts about the overall integrity of archaeological deposits at the site, and underscores its potential as a source of archaeological information relevant to archaeological and historic research. The quantity and diversity of materials recovered from the buried surface in Unit 5 exceeded expectations and confirmed that the yard area, directly behind the residence, was likely used as a place where refuse was discarded by Spring Mill's residents. Overlying the nineteenth century surface and preserving the deposit is what appears to be a fill layer originating from twentieth century era restoration activities.

In addition, the archaeology near the Lower Residence contributes to a much better understanding of the original structure that once stood there. Window glass, plaster, and what may be the original door latch were recovered, furthering understanding of the period of early settlement between statehood and 1840. Magnetometry survey conducted under this grant revealed many areas of interest and has implications for further testing because many original structure locations remain unknown. A tremendous amount of information was wrested from a four-square-meter area and a limited remote sensing survey.

Even more successful were the educational programs which brought Spring Mill archaeology to literally hundreds of people over the course of the year. The educators who came to the workshop responded positively, the field school students definitely got their hands dirty, and the brochures and posters will continue to spread the word. The archaeological goals of the project were met in the context of a truly collaborative effort between university scholars, state park staff and interpreters, and the many educators, students, visitors, and volunteers that helped bring the project to a successful conclusion. In the future, it is likely that archaeology will continue to be a part of the interpretation at Spring Mill Pioneer Village.

Archaeological cultures and histories are defined and constructed largely by archaeologists. Cultural heritage is broader, incorporating visions and agendas (political and otherwise) of people living today in local and descendant communities. Cultural heritage research must recognize and incorporate the valuable knowledge and continuing interest of area residents, historians, educators, interpreters, preservationists, naturalists, and park administrators. This project actively engaged the public in direct participation through the field school, educators' workshop, and public presentations. Educational materials were created for future outreach, and an historic photographic archive was initiated. The investigators are grateful to all who helped to make the project a success, and look forward to continued research, educational, and preservation efforts at Spring Mill State Park.

Work should continue in support of listing Spring Mill Pioneer Village on the National Register of Historic Places, as this designation will not only aid future preservation and management efforts, it will also open doors for research and education funding. Early frontier expansion, economic development in the southern Midwest, and the individuals who played key roles in these activities, and early historic preservation, as well as questions about site formation processes at nineteenth century villages and modern tourist sites are just a few themes that should be explored by future research and preservation efforts. Continued efforts to document and evaluate extant archaeological contexts preserved not only within the historic Village (12Lr1101), but also within Spring Mill State Park are strongly recommended. Both will be required to complete an inventory of the many extant historic properties that fall under the stewardship of this Indiana state park, and to further develop a cultural resources management plan to aid in this effort.

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REPORTS / FEATURES

To disseminate further archaeological information of local, topical, and community interest, this section of the journal includes occasional "reports" or "features" on various archaeological topics pertinent to specific regions, counties, or city/towns of Indiana.

HIDDEN STORIES OF CEMETERIES WITHIN STATE FOREST PROPERTIES

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The area now known as southern Indiana witnessed a dramatic change in both its environmental and cultural landscape during the early 1800s. At this time settlers were moving into the newly opened lands from southern and eastern United States. As families moved into the area, they cleared the forested ridges and stream valleys in order to build houses and raise crops. In the following century these settlers worked the land, created towns and communities, and made their mark on the landscape. However, by the early 1900s the depleted soils of the upland ridges gave way and repeated crop failure was common. Severe erosion of the exposed soils acerbated the problems. When the Depression came, many families left or lost their homesteads and moved to urban centers in search of employment (Parker 1997).

During the '30s and '40s the State acquired portions of this land and integrated it into the State Forest system. Utilizing these holdings as opportunities to teach landowners about sound conservation techniques, thousands of acres of trees were planted in order to shore up the soils and prevent further erosion. Over the past century, the properties were managed and cultivated into the current system that can be seen today (INDNR 2006). However, vestiges of the past can still be found nestled among the trees. Stone foundations of the houses, hand dug wells, and scattered piles of stone testify that pioneer settlers once inhabited these now reforested timbered tracts, and, although these sites may tell where and how the settlers lived, we often turn to their cemeteries to tell us who they were (Figure 1).

Figure 1. Cemetery on State Forest property. (Note- photos in this report are all courtesy of the Dept. of Natural Resources).

At least 33 cemeteries have been identified within the boundaries or adjacent to the State Forests. While many of these graveyards are maintained by the township or by cemetery associations, others fall under the responsibility of the State. The Division of Forestry has recently undertaken a project to document these valuable sites. The cemetery survey was designed to map, record, and photograph each cemetery located within the following properties: Clark State Forest, Deam Lake State Recreation Area, Ferdinand State Forest, Francis-Slocum State Forest, Greene-Sullivan State Forest, Harrison-Crawford State Forest, Jackson-Washington State Forest, Morgan-Monroe State Forest, Salamonie River State Forest, Selmier State Forest, Owen-Putnam State Forest, Starve Hollow State Recreation Area, and Yellowwood State Forest.

At each property cemeteries were visited and their locations were recorded by GPS. Photographs were taken, including overall photos of the graveyard and close-ups of grave stones. The state cemetery registry form was completed, and the overall condition of the cemetery was assessed. Cemeteries included single graves, family plots, and larger burial grounds, typically associated with churches or communities.

A wide variety of grave stones exist across the properties. While some burials lack any identifying marker others are simply designated by unengraved locally acquired stone, often uncut sandstone blocks, known as fieldstones (Figure 2). Others possessed more elaborate decoration such as carved stone motifs on tablets, monuments, and entirely carved headstones. Motifs commonly found during the project included folded hands in prayer, the finger pointing upward, a dove, a lamb, the weeping willow, scrolls, lilies, anchors, crosses, and other iconic symbols commonly utilized during the 19th and early 20th centuries. Tree stump markers are common, particularly in the larger cemeteries. Several cemeteries, all located within a couple of miles of one another, contain both tree stump headstones and footstones (Figure 3). It is feasible to believe that the same carver created each of these monuments.

Figure 2. Fieldstone marker.

Figure 3. Tree stump monument with footstone.

These carved motifs can give one a glimpse into the lives of the pioneer settlers. Lambs are typically observed on children's gravestones and are often carved on the face of a tablet or setting on the top of the stone. Spiritual symbols, such as angels, crosses, or the Star of David, can imply religious affiliation. Civic symbols, such as the Masonic insignia, indicate that an individual was a member of a social organization. Carvings may be related to a person's career or to a certain period in an individual's life. For instance, one marker of a Civil War veteran was carved with a solider standing next to a cannon and a weeping willow. The weeping willow is a common motif used to symbolize sorrow and/or regeneration (Riley 2004).

Family histories can also be traced through the engravings on the stones. For instance, the Paris Cemetery is located amidst several parcels of land that contain multiple homesites that were once inhabited by members of the Paris family. By comparing the plat maps from the time period of the burial(s), one can trace where those individuals lived. Military service by an individual is also often designated on the marker. Veterans of the Revolutionary War, the War of 1812, the Civil War, World War I and II are buried among the trees, attesting to the patriotic deeds of these early settlers (Figure 4).

The biggest threat to these hallowed grounds comes from vandals and time. Vandals not only knock over and break headstones, but also shoot and mar these markers (Figure 5). Time and nature can also upset the stones, as freezing and thawing pushes up their bases and knocks them over. While repairs can be made, processes are being explored that will add protection to these honored sites while maintaining the integrity of the past.

Figure 4. Civil War veteran's headstone.

Figure 5. Damage to headstone from shotgun.

The undertaking of this survey has resulted in a two-fold benefit. First, it has allowed for an up-to-date assessment of the cemeteries at State Forest properties, including their size, location, and condition, and complete, accurate survey forms recorded within the Indiana Department of Natural Resources, Division of Historic Preservation and Archaeology office. Secondly, and perhaps more significantly, it has provided some insight to the people and families who settled the region and lived on these properties during the early settlement period of the State.

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BATTLEFIELDS TO BURIAL GROUNDS: RECORDING INDIANA'S CULTURAL RESOURCES FROM THE REVOLUTIONARY WAR AND THE WAR OF 1812

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The War of 1812's bicentennial is 2012-2015. Commemorations of various types are taking place around the United States, and in Indiana we remember as well. Planning has been occurring in a number of ways to commemorate the bicentennial of the War of 1812 here. State collaborative meetings have been taking place among various organizations (Jeannie Regan-Dinius, personal communication 2009), special commissions at the local level have been created to commemorate the historical events and places from the war, and academic symposiums have featured the War and its many complexities. At the national level, the vital importance of documenting the resources of this period in our history, as well as that of the Revolutionary War, was recognized and acted upon years ago.

In 1996 Congress enacted legislation for the Revolutionary War/War of 1812 Historic Preservation Study (Gossett 1999:1). The program, modeled after the Civil War Battlefield Program of 1990, was eventually funded in 2000. Designed to identify sites associated with the Revolutionary War or War of 1812, the National Park Service assigned the study to the Cultural Resources Geographic Information Services and the American Battlefield Protection Program, which worked with an advisory committee of scholars. As a result, 2,800 events were identified for both wars. That number was later reduced to 786 of primary historical significance in the United States (National Park Service 2001a:1). The goal of the program became not only to survey battlefields, but also associated historic properties. From there, the program will foster the protection of surviving battlefields and associated historic properties by providing guidelines for local, state, and federal planning.

As is stated in a National Park Service publication, "no single government agency, organization, or person can preserve this nation's battlefields alone. Together we can. The American Battlefield Protection Program is committed to working with its many partners to save these remarkable places of American history" (American Battlefield Protection Program 1996:4). The National Park Service contracted with the Indiana State Historic Preservation Office (Division of Historic Preservation and Archaeology [DHPA]) to complete the survey and documentation of the majority of Indiana's identified sites (Figure 1). For its portion of the project, Indiana was assigned five battle sites: Fort Harrison (Vigo County), Fort Wayne (Allen County), Mississinewa (Grant County), Tippecanoe (Tippecanoe County), and Vincennes, (Knox County). The four "associated historic properties" in the state include: Fort Harrison, Fort Wayne, Fort Sackville and Vincennes settlement, and Prophetstown. The sites in Vincennes are associated with the Revolutionary War, while the remaining are from the War of 1812. The DHPA staff members (Dr. Rick Jones, Indiana State Archaeologist, Frank Hurdis, then Chief of the National Register section, and the author) were responsible for recording and surveying all of the chosen Indiana battlefields and associated historic sites, with the exception of the ones in Vincennes which were documented by the National Park Service (NPS) staff of the George Rogers Clark National Historical Park.

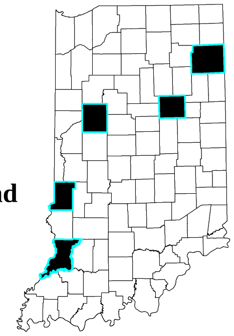

Figure 1. Map showing the location of the counties containing battlefields and associated historic properties which were documented.

The appointed staff from the Archaeology and Survey and Registration sections of the DHPA attended extensive training sessions (covering required research, documentation, and standardized forms to be used; survey levels and methodologies; GPS [global positioning system] techniques, entry and manipulation of spatial data into a GIS (geographic information system); entry of tabular data into a digital survey form; and more; Figure 2) held by the National Park Service in Vincennes, Indiana for a week in 2001, and then began the actual work to complete the surveys. Compared to some other states also in the project, Indiana had relatively few sites to record, but this research, fieldwork, and documentation (combined with the training) to meet the American Battlefield Protection Program's standards, took many months to complete.

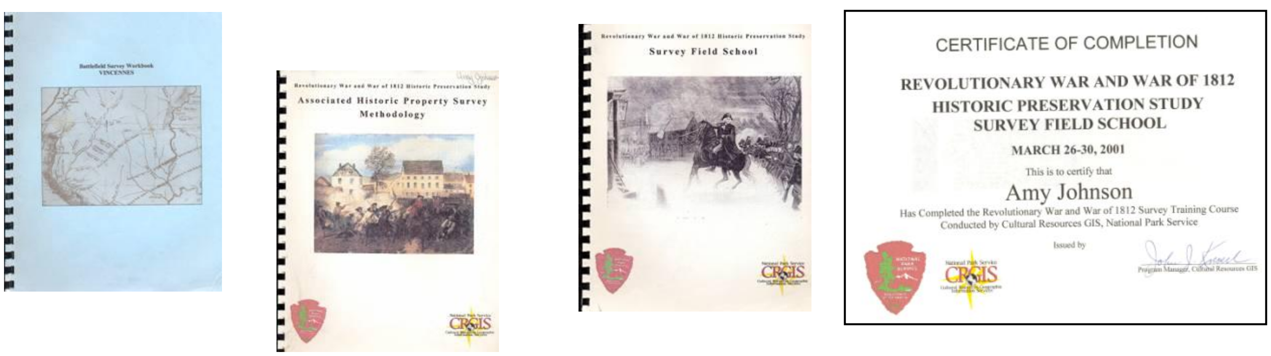

Figure 2. Covers of the various National Park Service (2001b, 2001c, 2001d) manuals (left) which were utilized in the extensive Vincennes training sessions, and the author's Certificate of Completion (right) for the project's survey field school.

Research

Even before Indiana's work began, each assigned site had been given a unique survey code, keyed to this state. For example, battlefields were given numbers such as IN400 and associated historic properties were numbered such as IN1000. Extensive research was completed for each of the Indiana sites which had been chosen. The researchers drew upon records and primary sources available at the state level, and particularly at the local level. Contacts were made with, for example, local historical societies, libraries, local governmental offices (such as surveyors) and landowners, with the goal of finding as much information as possible for the individual historic properties. Items such as historic (and modern) maps, books, land ownership records, photographs, postcards (Figure 3), archaeological records, State and National Register documents and more were reviewed. Data gleaned from these types of sources provided the researchers with valuable documentation to combine with the field research and investigations.

Information about the following was recorded: property ownership; troop movements and battles; Native Americans and settlers involved; changes to the property and/or structures through time; archaeological investigations which had occurred; groups caring for the site; and much more.

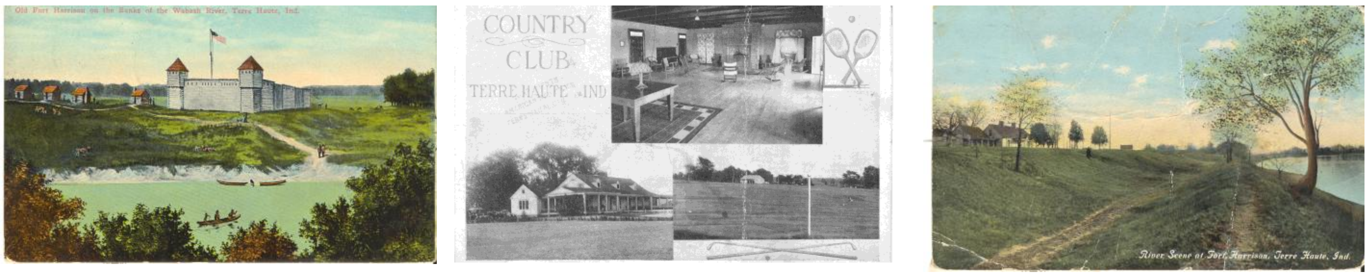

Figure 3. Historic postcards such as these showing various views of one of the fort and battlefield sites (Fort Harrison, Vigo Co.) recorded during the project provided valuable data regarding past land uses (cards from author's collection).

Field Investigations

A critical component of this type of project was the actual fieldwork, and the DHPA staff investigated each of their assigned locations during the project. Field investigations consisted of physically locating the relevant sites and recording them through GPS (Global Positioning System) technology, mapping, and photography (Figures 4, 5). This type of documentation was critical in determining the current physical integrity of the sites, their state of preservation, any potential threats to the properties, and their potential eligibility for inclusion in the Indiana Register of Historic Sites and Structures and the National Register of Historic Sites and Structures. At several of the Indiana properties in the project, archaeological and other types of investigations and studies had taken place in the past.

Figure 4. The author, left, using GPS technology to record a location related to Fort Harrison in Vigo County, and State Archaeologist Dr. Rick Jones taking notes regarding the Battle of Mississinewa field portion of the project. Photographs from DHPA collections.

Figure 5. Recording current monuments at fort and battlefield locations was also part of the field process. A marker commemorating the second Fort Wayne is shown in the photograph on the left, and the monument at the Tippecanoe Battlefield, a National Historic Landmark, is on the right. Photographs from DHPA collections.

Documentation

The required, specific types and levels of documentation for this project were detailed and standardized in order to have consistent recording. Once the research and fieldwork was completed, then began the process of summarizing all the information that had been gathered over many months. Geographic Information System (GIS) software was used to compile the digital data regarding preliminary site boundaries, proposed potential National Register boundaries, photo points, and more. Based on research and fieldwork, maps were generated showing troop movements and positions, battle locations, associated historic property locations, and other relevant features. Photographs (Figure 6) and slides were developed and properly labeled. Hard copies of the survey forms and many documentation sources were organized and sent to the NPS as well as the maps, photographs and other required data.

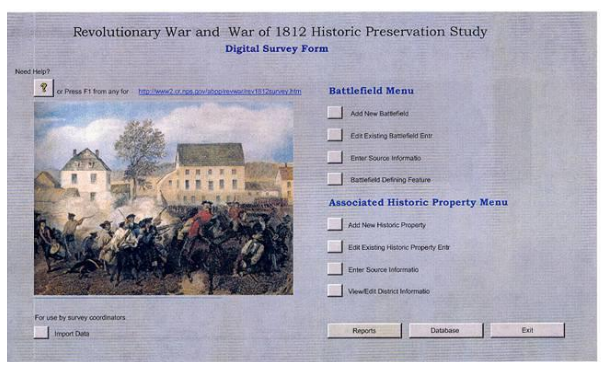

Figure 6. Black and white photographs (image on left from DHPA collections), as well as images in other formats, were part of the products supplied to the NPS at the end of the DHPA work. Information was submitted electronically as well as in hard copy form. Image (right) from the Revolutionary War & War of 1812 Study webpage (www2.cr.nps.gov/abpp/; Berman and Gossett 2000:3) which was available to the partners during the project.

The final study report regarding this project is available for the public to access at http://www.nps.gov/hps/abpp/Rev1812_Final_Report.pdf. Working together, this type of project fosters additional appreciation for our collective past, and preserves the information for the future. The goals of a historic preservation study such as this fit perfectly within the goals for preservation and archaeology established in *Indiana's Cultural Resources Management Plan* (Division of Historic Preservation and Archaeology 1998, 2005). In discussing the possibilities for preservation of these types of resources, it has been stated that "the ultimate purposes of battlefield survey, documentation, and mapping are preservation and education. There are no magic solutions for preserving battlefields [and associated historic properties], only a range of alternatives that must be mixed and matched in ways that are appropriate for each specific site and setting" (Lowe 2000:4).

Keeping the Interest Going

Since the study, in many ways, the interest in the War of 1812 and the Revolutionary War has continued, and even expanded. For example, public presentations have been given regarding the project, its goals and accomplishments. Several years ago, the author (Johnson 2006) gave a presentation about the project at the Midwest Historical Archaeology Conference in Muncie, Indiana. In 2002, a program (Johnson 2002) titled "The Fort on the Bend of the Wabash--Fort Harrison's Role in the War of 1812 and Terre Haute's History" was given at the Cornelius O'Brien Conference on Historic Preservation in Terre Haute. These presentations, and others on Indiana military history and archaeological investigations (e.g., Andres 2008), help foster continued interest among the archaeological and general public communities in the study and understanding of these important cultural resources.

Publications of varying types are also excellent methods of sharing information about topics related to these two wars. For example, articles about Indiana's involvement in the study have been included in the following types of documents: this volume of *Indiana Archaeology*, and the Division of Historic Preservation and Archaeology (DHPA) bi-annual newsletter, *Preserving Indiana* (Hurdis and Johnson 2002). Articles on archaeological topics associated with these two wars have appeared in various publications (e.g., Andres et al. 2009).

As was indicated at the beginning of this report, there are other Indiana sites associated with the Revolutionary War and War of 1812 which exist, but weren't included in the NPS study. Archaeological investigations of sites related to these wars, and the intervening time between, have also been taking place since the NPS project was completed. The Department of Natural Resources (Division of Engineering) was awarded an American Battlefield Protection Program (ABPP) grant from the National Park Service in 2004. The archaeological investigations (Strezewski et al. 2006) in 2005 by the Archaeological Survey at Indiana University-Purdue University (IPFW-AS) for the Department evaluated a number of areas that were potentially associated with the Battle of Tippecanoe. The Indiana State Museum conducted archaeological investigations at the Ft. Knox II site in Vincennes in 2006 (Michele Greenan, Gail Brown, personal communications 2009). Archaeological research and fieldwork has also been conducted to investigate the forts of Ft. Wayne (Andres et al. 2008).

In addition to the opportunities offered through the American Battlefield Protection Program, archaeological grants are available through the DHPA grants program. The Historic

Preservation Fund grant application for Indiana archaeological projects specifically includes historic military-related resources as a high priority topic for archaeological projects. Therefore, the DHPA encourages qualified archaeologists and researchers to consider applying for grant projects which will study important historic military resources in our state.

Much can still be learned about these places, through archaeology and other avenues of investigation. The DHPA staff members were pleased to assist in this unique cooperative project, and to contribute to the further understanding of, and appreciation for, the resources related to these two wars so important in the development of Indiana and the United States. It is our hope that the information that was gathered will help in the continued efforts to preserve and interpret these sites for future generations.

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HISTORY BENEATH US: PUBLIC ARCHAEOLOGY AT THE LEW WALLACE STUDY & MUSEUM IN CRAWFORDSVILLE

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Since 2010 the University of Indianapolis has been working alongside staff from the General Lew Wallace Study and Museum in Crawfordsville in an effort to learn more about one of Indiana's most famous citizens. Beginning with a single public archaeology event in September of that year, the Study has now hosted three community archaeology weekends and one week long UIndy archaeological field school. Additionally, funds from the university's InQuery Collaborative have been used to survey portions of the Study grounds with two remote sensing techniques – Magnetic Gradiometry and Ground-Penetrating Radar (Graham 2011).

The General Lew Wallace Study & Museum is a National Historic Landmark situated on 3.5 acres of grounds in Crawfordsville, Indiana (Figure 1). The Museum passes on the legacy of General Lew Wallace, a lawyer, Civil War general, governor of New Mexico Territory, writer, and inventor. The property is governed by the Lew Wallace Study Preservation Society, a non-profit group that oversees policies and operations. The mission of the Museum is to celebrate and renew the belief in the power of the individual spirit to affect American history and culture. This belief is shared with over 8,000 visitors a year. Two buildings are extant on the property: the Study built by General Lew Wallace in 1898 and the Carriage House Interpretive Center built in 1875 (Larry Paarlburg, personal communication 2011). In addition to the historic structures, the grounds date to General Lew Wallace's ownership of the property and contain features related to his use.

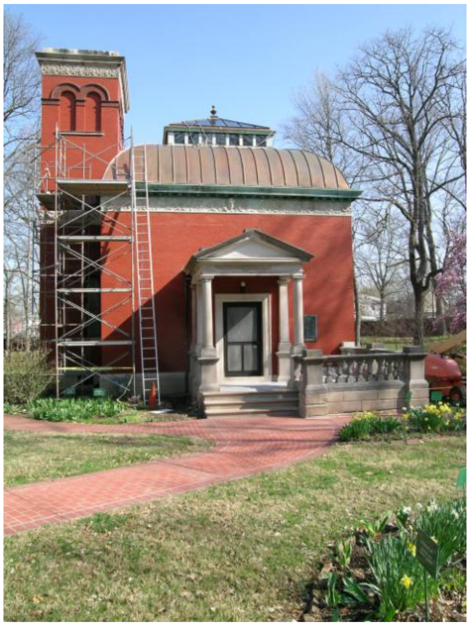

Figure 1. General Lew Wallace Study & Museum. Photo Credit – Christopher R. Moore.

The UIndy/Study collaboration began in the winter of 2009 when staff at the Study inquired about the possibility of conducting some archaeology on the grounds. Conceived from the start as a project in public archaeology, each year community members (including many small children) work alongside UIndy faculty and students digging, screening, and cleaning artifacts (Figure 2). Last May several class field trips from the local elementary school were hosted at the site.

Figure 2. Community archaeology in action at 12My260. Photo courtesy of the General Lew Wallace Study & Museum.

From the beginning, the public component of our work has been a central focus. General Lew Wallace is an important figure in Crawfordsville's history. From an early age schoolchildren in Crawfordsville learn about his accomplishments and visit the Study to experience something of who he was as an individual. Augmenting this experience through the discovery and excavation of artifacts associated with the General is a primary goal of the public archaeology experience. Furthermore, it is hoped that the work at the Study will better inform the community of the value and utility of archaeology as a scientific endeavor. In sum, the goals of the project are to bring the past into the present for the people of Crawfordsville and to secure the future of archaeology by building public support.

Advertising is key to the success of any public archaeology event. Prior to the first excavation in September 2010, a notice was sent to the two Crawfordsville newspapers, as well as a press release to the *Indianapolis Star*. Right away, public interest was piqued. While most visitors to our public archaeology events are locals, there were several volunteers from around the state, including White, Marion, and Hamilton counties. In addition to print media, there has been success advertising on Facebook (www.facebook.com/wallacestudy) and on the Study's blog (www.wallacestudy.blogspot.com).

A main component of the program is to expose UIndy undergraduate and graduate students to field and lab work on a local site (Figure 3). Many of the students who participate are freshmen with no field experience. This project provides valuable hands-on training that complements what the students are learning in the classroom. Lew Wallace is an extraordinary learning experience, giving them the opportunity to do actual fieldwork very early on in their academic careers, and providing context for the information learned in their archaeology courses. Students have commented how fantastic and unique it is to get to dig next to their professors and to get their guidance as freshmen. As one student commented, "The information I gained from the first weekend at Lew Wallace at least doubled what I knew about archaeology."

Figure 3. UIndy students trenching the Reflecting Pool. Photo Credit – Christopher R. Moore.

Another component of the public archaeology mission at the Study is for the archaeological research to aid museum staff in interpreting the site. As a result, the research design is heavily influenced by the staff's needs and mission. Thus far, their interest has centered on locating Wallace's horse, reportedly buried on the property, and determining the exact location and shape of a reflecting pool known from historic photographs to have existed behind the Study (Figure 4). Since fragments of the reflecting pool were visible on the ground surface and the general location was known, work over the last two years has focused on excavating portions of the pool that were not depicted in the photographs (Figure 5). Although analysis is still underway, these excavations have greatly enhanced our understanding of how the pool was constructed, filled, and modified over the past 100 years.

Figure 4. The General and grandsons reading by the Reflecting Pool. Photo courtesy of the General Lew Wallace Study & Museum.

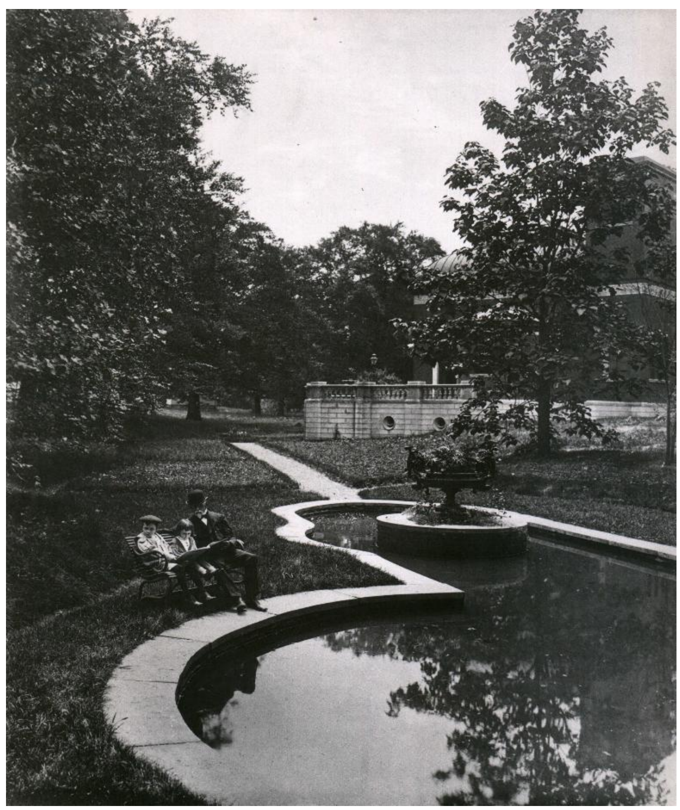

Figure 5. Capstones and rubble at the bottom of the Reflecting Pool trench. Photo Credit – Anne M. Moore.

This information about the subsurface architecture and site formation processes illustrates the utility of archaeology to small museum properties charged with the goal of interpreting historic sites to the public. Any structure, whether a private home or public edifice, is part of a cultural landscape. Interpretation of the structure, and the women and men who made it significant, requires an understanding of context. What other structures were nearby? Where were outbuildings, gardens, and landscape features located, and what did they look like? How did the property change through time and how does it differ from the period being interpreted? This work at the Lew Wallace Study is beginning to provide the answers to many of these questions, and the story is much more complicated than any of us imagined.

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HISTORICAL ARCHAEOLOGY OF CATHOLIC IMMIGRANTS TO SOUTH BEND

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Reverend Edward Sorin came to South Bend in 1844 with a small group of brothers from the Congregation of Holy Cross (C.S.C.) to establish a Catholic educational institution (Schlereth 1977:3). He purchased a 120-acre tract of land south of campus in 1855 (Figure 1) and sold parcels in the neighborhood for $25 down with the balanced repaid through barter, trade or long-term credit agreement (Schlereth 1977:25). He specifically targeted Catholic immigrants, including those of Irish and German heritage, many of whom worked as bricklayers, carpenters, and in other capacities for the University (Giffen 1996:257; McNeill 2008).

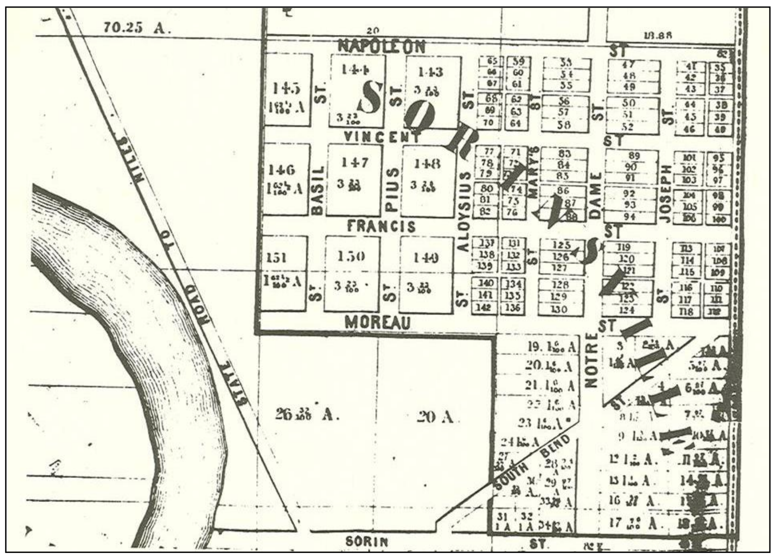

Figure 1. 1873 plat map of the Sorinsville neighborhood, South Bend, Indiana. Courtesy of the University of Notre Dame Archives.

Archaeological and historical investigation of Catholic immigrants to South Bend has focused on a residential homelot at the southern boundary of Fr. Sorin's housing development (Rotman 2010) (Figure 2). Edward and Rose Fogarty came to South Bend from Chicago and purchased the homelot on North Notre Dame Avenue in 1865. Edward was born in Dublin in 1825 (South Bend Tribune 1902) and emigrated as a young boy with his family in 1832 (United States Bureau of the Census 1900). He worked as a bricklayer for the University. Unfortunately, we know very little about Rose, although her obituary indicated that she had been an invalid for some years before her death (South Bend Tribune 1891; United States Bureau of the Census 1870). The Fogartys had two daughters–Catherine and Anna–and, shortly after their arrival in South Bend, had two sons, Edward Jr. and John. Their eldest son, Edward Jr., went on to become mayor of South Bend from 1902 to 1910 (South Bend Tribune 1929). When the eldest daughter, Catherine, married Charles Keller in 1885, they built a house right next door (South Bend Tribune 1885). In 1912, and for reasons we do not yet understand, a small house was built on the rear of the original parcel. This property appears to have always have been a rental unit.

When Catherine and Charles' eldest son, Edward Keller, married his wife, Grace, in 1924, they built a house between his parents' and grandparents' homes (Polk 1901-1910, 1929-1935).

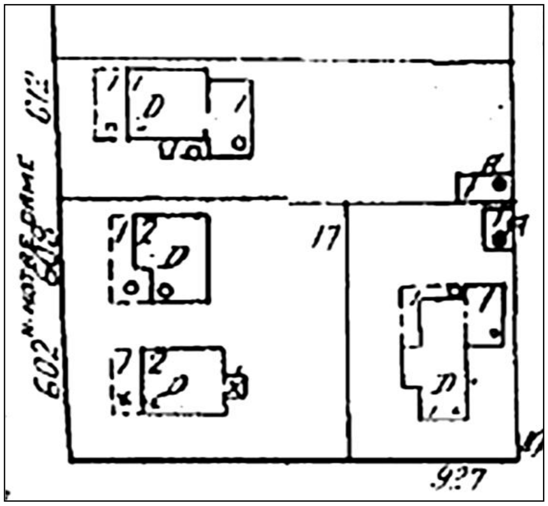

Figure 2. 1949 Sanborn Fire Insurance map showing the Fogarty parcel, with the Fogarty Family homes in a row. The rental property is shown behind.

The archaeological excavation focused on sampling the sheet midden and excavating a large feature believed to be the cellar of the first home constructed on the parcel (Figure 3). The artifact assemblage was associated with two periods of occupation at the site. The first represented the Fogartys as a young nuclear family, dating from ca. 1865–the year they purchased the homelot from Fr. Sorin–to ca. 1885. The later occupation dated from ca. 1885 to ca. 1914. This later assemblage likely included artifacts from the original house on the lot and Catherine's family who lived next door (Rotman et al. 2008).

Figure 3. South wall profile of Unit 6, 12Sj438, showing fill layers of Feature 1. Photograph by the author.

Thirteen patent medicine bottles and three ethical, or doctor-prescribed, medicine bottles were recovered from the site, all of which were consistent with what we know about the health of the Fogarty family. The Simmon's Liver Regulator could have easily been used for mundane ailments that did not necessary require a doctor's intervention, such fever, headache, constipation, and dyspepsia. Foley's Kidney and Bladder Cure and Dr. M. M. Fenner's Kidney and Backache Cure also treated the same class of ailment (Rotman and Holcomb 2008). We know that Charlie Keller, Catherine Fogarty's husband, suffered for some time from dropsy (or edema), which can be a symptom of kidney disease. These vessels may be representative of treatment for that chronic condition. The remaining patent medicine, Bromo Seltzer, would have been used for minor stomach illnesses that could also be easily treated at home (Israel 1968).

This high proportion of proprietary/patent to ethical medicines at the Fogarty site (13 of 16 or 81.3%) is consistent with that observed for Irish immigrant households in the Five Points Neighborhood of New York City. Brighton (2005, 2008) has proposed that reliance on patent medicines rather than physician-prescribed ones was indicative of the families at Five Points being alienated from their larger cultural milieus and discriminated against by local doctors. The Fogarty family would have had access to St. Joseph Hospital in South Bend, located across the street from the nearby St. Joseph Parish and literally two blocks away from the Fogarty residence. Founded by the convent of the Sisters of the Holy Cross, St. Joseph Hospital would not likely have discriminated against Irish Catholics. Nevertheless, the unique history of this particular institution–that is, they cared for primarily the destitute and convicts during their early history–may have made this an undesirable option for health care for the family.

There were at least two members of the family who had chronic health concerns–Rose Fogarty was an "invalid" and Charlie Keller had dropsy. Rose and Charlie may have chosen to self-medicate rather than visit a physician regularly. As such, treating chronic versus acute illnesses may have also influenced the family's uses of primarily patent medicines as part of their health care. Furthermore, as the matriarch of the household, Rose's use of patent medicines and probable pattern of self-medication may have become the customary practice, one that her children followed later simply out of habit.

Although the persistent use of proprietary/patent medicines is identical for 19th century Irish immigrants on the East Coast and in South Bend, the factors shaping those uses were very different. Irish immigrants who came inland may have fared better than their counterparts on the East Coast, particularly in the fledgling urban and economic centers of the Midwest, such as South Bend (McCaffrey 1997:84). The Irish in the Sorinsville neighborhood, for example, had concrete social support from St. Joseph Parish as well as employment opportunities and access to mortgages through the University. In addition, residents of the Sorinsville neighborhood may have had a better standard of living given that the social, political, and economic configurations within the city were still relatively fluid during the second half of the 19th century–particularly in comparison to large, long-established urban centers on the East Coast.

More comparative data is needed to understand where the Fogartys were positioned within the continuum of material possibilities among South Bend's Irish community. This project seeks to help understand the diverse and varied experiences of the immigrants in South Bend, as well as how unique local conditions presented different opportunities to other Irish immigrants in the United States.

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GLOSSARY OF ARCHAEOLOGICAL TERMS

A-horizon soil
The upper layer of soil, nearest the surface.

Anthropology
The study of humankind, with particular emphasis on its cultural and biological adaptations.

Archaeology
The anthropological study of past lifeways, cultures, and cultural processes through the investigation of material remains left behind by humans.

Artifact
Any portable object made, used, and/or modified by humans. Or, more generally, any evidence of human behavior. Common prehistoric artifacts found archaeologically include spear points, arrowheads, knives, chipped or broken stone debris, ground stone axes, grinding stones, mortars and pestles, awls, adzes, gouges, pottery, clothing and ornamental pins, decorative items and ornaments, scraping tools, hammerstones, bone fishhooks, stone perforators, and beads.

Associations
The relationships of artifacts and features at a site, based on provenience and context.

Atlatl
A spearthrower.

Avocational archaeologist
A person who participates in archaeology but does not practice it as a profession. Avocational archaeologists may volunteer to work with qualified professional archaeologists, and many take courses and gain substantial experience in archaeological methods and techniques. Others may be involved in archaeology as a hobby. Generally, avocational archaeologists subscribe to a preservation ethic to protect archaeological resources and to responsibly and legally preserve and study information from sites.

B.P.
Before present. By professional agreement present was established to be A.D. 1950 based on radiocarbon dating. For example, 1000 B.P. means 1000 years before A.D. 1950, or A.D. 950.

Celt
An ungrooved axe. Celts may be made of pecked and ground stone, or hammered copper. It is thought that celts appeared in Late Archaic times, and they continue to occur through later prehistory.

Ceramics
Pottery vessels or potsherds.

Chert
Stone of microscopic or small quartz particles used for the making of stone tools. Some types of chert include flint, agate, and jasper.

Chiefdom
A non-egalitarian hierarchial social organization with a fixed and permanent role for a chief/leader.

Collared
A thickened area present below the rim and above the neck on a clay pottery vessel.

Complicated stamped
Decorations of curvilinear or rectilinear design paddle stamped into a clay vessel.

Context
The position of an artifact or feature in its soil matrix, horizontal, and vertical location, and its relationship with other artifacts and features, related to the behavioral activities which placed it there.

Cord-impressed
Impression into a clay vessel surface before firing by a stick wrapped with cord, or cord on the edge of a paddle.

Cordmarked
Cordage impressions on a pottery vessel as a result of stamping with a cord-wrapped paddle.

Core
A stone which exhibits one or more flake scars, showing that it has been used as a raw material for flintknapping.

CRM
Cultural resource management. The protection, preservation, and recovery of information from archaeological sites, under federal and state laws. Universities and private archaeological companies often are hired to conduct CRM archaeology mandated under federal or state statutes.

Culture
A system of shared, learned, symbolic human behavior for adaptation to our natural and social environment. Culture may be thought of as a system composed of interrelated parts or subsystems, where a change in one part affects or influences the other parts. Subsystems interrelated with culture include technology, communication (and language), biological and physical characteristics, psychology, economics, social and political organization, beliefs and values, subsistence, settlement, environment, etc.

Excavation
The systematic recovery of archaeological deposits through the removal and screening of soil. These can be either test excavations (termed Phase II in CRM investigations) or large-scale excavations (termed Phase III in CRM investigations).

Fabric-impressed
Impressions of woven fabric in the surface of a pottery vessel.

Feature
Non-portable evidence of past human behavior, activity, and technology found on or in the ground. Prehistoric features commonly include fire pits and hearths, burned earth and clay, trash and garbage pits, post molds, evidence of house floors or basins, storage pits, clusters of artifacts (e.g., chipped and broken stones, caches of projectile points, ceramics or pottery sherds), human and animal burials, clusters of animal bone, earthworks (such as mounds and circular enclosures), petroglyphs and pictographs, and middens.

Flake
A by-product of flintknapping, toolmaking, use, or other human activities, resulting in a fragment of stone detached from a parent stone. Often, a flake has evidence of purposeful removal, including a bulb of percussion, ripple marks, a striking platform, etc.

Gorget
Decorative object worn on the chest.

Grog-tempered
Ceramics tempered with fragments of crushed pottery.

Lithics
Stones used or modified for human activities such as the manufacture of prehistoric tools, cooking, hunting, etc.

Microtools
Small tools, predominately of stone, manufactured and used to perform certain tasks.

Midden
Cultural refuse or deposits built up at a site.

Multicomponent
An archaeological site with occupations from more than one culture or time period.

Petroglyphs
Naturalistic or symbolic representations or depictions carved into stone.

Pictographs
Pictures or drawings painted on rocks, cave walls, stone outcrops, or rockshelters.

Prehistory
Human activities, events, and occupations before written records. In North America, this primarily includes Native American prehistoric cultures, but does not imply that these cultures did not have long, rich, and varied cultural and oral histories and traditions.

Protohistory
Protohistoric cultures can be defined as those prehistoric groups developing or continuing directly into early recorded history, some associated with early historic artifacts.

Provenience
The horizontal and vertical location of an artifact at a site.

Red Ochre
Late Archaic-Early Woodland culture with burial practices, usually in mounds, involving the use or placement of red ochre (a red hematite pigment).

Shell-tempered
Ceramics (pottery) tempered with fragments of crushed shell.

Site
The presence or occurrence of one or more artifacts or features indicates an archaeological site. An archaeological site is an instance of past human behavior or activity, where humans conducted some activity and left evidence of it behind, on or in the ground. Some common prehistoric site types include artifact caches, villages and camps, cemeteries, burials, workshops (e.g., stone debris from flintknapping activities), quarries, and earthworks (mounds, embankments, enclosures, fortifications, etc.).

Stratigraphy
Horizons, strata, or layers of soil deposited at a location, where the deepest strata were deposited the earliest, and the more recent layers deposited higher in the stratigraphic sequence.

Survey
The systematic discovery, recovery, and recording of archaeological information such as site locations, artifacts, and features by visually inspecting the surface of the ground if the soil is visible. Or, the use of shovel probes, cores, and/or augers near the surface, if surface visibility is restricted or poor. Termed Phase I in CRM investigations.

Test excavation
Systematic excavation of a representative portion or percentage of a site to evaluate and determine its nature and extent, what information is present, whether there are intact or in situ deposits present, and the degree of disturbance to the site, often to determine whether it is eligible for the National Register of Historic Places. Termed Phase II in CRM.

Wyandotte
A type of dark blue-gray chert found in southern Indiana.

For those with access to the Internet, the following sites also provide opportunities to access definitions and additional information regarding archaeological terms and concepts:

http://www.nps.gov/history/seac/terms.htm#a
http://archaeology.about.com/od/rterms/g/radiocarbon.htm

PREHISTORIC INDIANS OF INDIANA

Note- The word prehistory is a technical term used by archaeologists to indicate information about cultures before written records were kept—in North America at first by Europeans and people of Old World descent—in that area. It does not imply by any means the cultures described did not have long, rich, and varied cultural and oral histories and traditions. All of the cultures certainly did.

Paleoindians:

Paleoindians are the first known people who lived in the Americas, including Indiana. They lived here during the last stages of the last glacial advance, or ice age, and the early part of a changing environment and climate as the glaciers retreated. These people occupied the area now known as Indiana some 12,000 years ago, and lasted until about 10,000 years ago.

These early peoples probably lived in small groups of related individuals who moved around a lot, hunting large game animals, including some now extinct, such as the Mastodon, a large elephant-like creature. They also relied upon the gathering of wild plants to eat for their survival. Their population was very low.

The Paleoindians had very well-made stone tools, made out of a type of stone archaeologists call chert, which is a fine-grained rock that breaks a little like glass when hit by hard materials like another rock or a piece of deer antler. The tools they made by chipping, flintknapping, and flaking included long spearpoints, cutting and scraping implements, and engraving items. Some of their spear and piercing tools are called Clovis, Gainey, Barnes, Cumberland, Holcombe, Quad, Plainview, Hi-Lo, and Agate Basin points.

Evidence of these peoples is often found in Indiana on land near water sources like major rivers and springs, and where chert is found. Little is known about the Paleoindians since they moved around a lot and did not occupy any one place for a very long time. Therefore, they did not leave behind much evidence of their lives in any one place.

Archaic Indians:

American Indians known as the Archaic peoples lived here for a long time: some 6-7,000 years. Although these people did change over time, increasing in population and using new tool types and food preparation techniques, they did share certain general characteristics. These included new types of spear points and knives, with various types of notches and stems for hafting to wooden handles and shafts. Some of the projectile point types of the Archaic Period are called Kirk, Thebes, MacCorkle, LeCroy, Faulkner, Godar, Karnak, Matanzas, Brewerton, Riverton, and Terminal Archaic Barbed points.

They also used ground stone tools such as stone axes, woodworking tools, and grinding stones. The grinding stones were used to pound, crush, and grind wild nuts, berries, seeds, and other plant foods. They were hunters and gatherers of wild plants and animals, and moved around in their natural environments by season, often scheduling their movements to coincide with the appearance of foods like nuts, fish, deer, and wild seeds. Over time, they became very selective in what kind of resource they were pursuing.

During the Archaic Period, the spearthrower was used. This consisted of a shaft with a handle, weighted for balance with a ground and smoothed stone, and a hook on the end. A spear was fitted onto the hook, and was thrown with the spearthrower shaft.

Towards the end of the Archaic, more evidence of mortuary activities is found, including human burials with a red pigment coloring remains or grave goods. Burial mounds appear. During the Archaic, the cultures became more different from one another, and more types of artifacts were used. Their settlements became more permanent. One type of settlement was along large rivers, where they discarded large amounts of mussel shells. These sites are called shell middens or "mounds," although they are not really constructed, burial mounds. The general Archaic period ended at about 1,500 B.C., although some Terminal Archaic peoples lived until 700 B.C.

Woodland Peoples:

During the Woodland Period, a number of new cultural characteristics appear. A notable event was the appearance and use of ceramics and pottery vessels. Another significant occurrence was the use and increase of horticulture. A remarkable feature of some Woodland sites is earthen mounds and earthworks, such as embankments. The Woodland peoples persisted for over 1,500 years in Indiana.

During the early portion of the Woodland Period, the pottery was thick and heavy. One early Woodland culture called the Adena people had elaborate mortuary rituals, including log tombs beneath earthen mounds. Projectile points during this time included Adena, Kramer, Dickson, and Gary Contracting Stemmed types.

A little later in time, in the Middle Woodland, there were also elaborate burial rituals, but also long-range trade of exotic goods like mica, marine shells, copper, obsidian, copper axes, drilled wolf and bear teeth, and other goods from region to region throughout the Eastern Woodlands area of North America. Some of these groups were called Hopewell peoples. Their ceramics had all kinds of incised and stamped decorations. During this time, the Woodland Indians were likely organized into groups we might recognize as what we today call tribes. Projectile points from the Middle Woodland include Snyders, Lowe Flared Base, Steuben, Chesser, and Baker's Creek.

The latter part of the Woodland Period is called Late Woodland. In Late Woodland, two important events occur. One is the first appearance of agriculture; that is, intensive cultivation and modification of crops such as corn and squash. Another important occurrence is the appearance of the bow and arrow. Prior to this time, most of the chipped stone tools were either spearheads, knives, engraving tools, or scrapers. In Late Woodland, however, small, triangular points occur which are true arrowheads. One type of these arrowheads is called Madison. Other point types are termed Jack's Reef Pentagonal and Raccoon Notched. Settlement during the Late Woodland time changed from the earlier more permanent and nucleated villages to a pattern of smaller sites dispersed more over the landscape. In some regions of the state, Woodland groups may have persisted almost until historic times, although in general, the Woodland Period ends at A.D. 1,000.

Mississippian Period:

The Mississippian peoples In Indiana lived in some cases almost until contact with Early European explorers, missionaries, soldiers, and traders. They lived from about A.D. 1,000 until possibly as late as A.D. 1650. A noticeable change during this period is the nucleation of some peoples into large settlements akin to "towns," such as at the Angel Mounds site near Evansville, Indiana. These towns had large public areas such as plazas and platform mounds—like truncated or flat-topped pyramids—where influential or important public individuals lived or conducted rituals. Thus, there was social stratification and ranking of individuals in Mississippian societies. There were probably chiefs and religious leaders. The towns were supported by the harvesting of large agricultural fields growing corn, beans, and squash. People living in sites such as these are termed Middle Mississippian.

Notable artifacts indicating Mississippian settlements include large, chipped stone hoes, and pottery bowls and jars tempered with crushed shell. Straps, loops, and handles for these containers characterize this time period as well. Stone tools include point types known as Madison, Nodena, and Cahokia, and other implements such as mortars, pestles, pendants, beads, anvils, abraders, and other items.

Another less elaborate type of Mississippian society called Upper Mississippian was present in the state, with people living in hamlets and villages. Many of these people lived in northern and southeastern Indiana. They also grew and harvested maize, beans, and squash. One group to the southeast was called Fort Ancient, and lots of shell-tempered vessels with straps are found at these sites. In northern Indiana, incised shell-tempered pottery fragments are found on Upper Mississippian sites that are often located near the beds or former beds of lakes.