# INVESTIGATING EARLY MISSISSIPPIAN COMMUNITY PATTERNING IN THE MID-SOUTH THROUGH MULTIPLE-METHOD SURVEY OF THE AMES SITE (40FY7) IN FAYETTE COUNTY, TENNESSEE

by

Eric Goddard

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**Abstract**

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The settlement patterns of small, Early Mississippian sites located in upland locations of the Mid-South remain poorly understood despite decades of research in the area. A multi-stage research design was implemented to determine the settlement system used in the region by applying multiple discovery methods to study the Ames Mound Complex (40FY7), an Early Mississippian site in Western Tennessee that has been considered a vacant ceremonial center since its discovery. Ames underwent surface collection, shovel testing, magnetometry survey and excavation to determine if the site was indeed a vacant center, or if it contained a habitation area associated with the mounds. Analyzing the combined results in a GIS revealed that despite extremely low artifact densities, a substantial habitation component comprised of 18-24 structures surrounding a plaza and encompassed by a palisade was located adjacent to the mounds. The results refute the vacant center hypothesis and have far-reaching implications for other unobtrusive Mississippian mound centers in the region classified as vacant centers.

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# 1. Introduction

Prehistoric societies are often categorized based on time period, geographic distribution, and shared material culture. One such Native American culture is known as Mississippian. Prehistoric societies that emerged in the river valleys of the Southeastern United States from A.D. 750 to A.D. 1050 with shared traits such as shell-tempered pottery, iconography, maize agriculture, mound construction, and social ranking are known as Mississippian (Griffin 1990; Milner and Schroeder 1999:95; Smith 1990).

Even though Mississippian people possessed many shared traits, settlement patterns—how populations were organized on the landscape—varied significantly throughout the Mississippian region. Mississippian mound centers located within the Mississippi River floodplain are characterized by more densely populated settlements than in upland regions. Many of the West Tennessee mound centers are located in upland regions and lack evidence for associated large-scale habitation sites (Mainfort 1992). Mound centers that lack an adjacent settlement have often been described as vacant centers.

The purpose of this research is to obtain a greater understanding of the settlement patterns of the Mississippian period in the upland Mid-South through survey and excavation of the Ames Mound Complex. Ames is an Early Mississippian mound complex located in Fayette County, Tennessee at the headwaters of the North Fork of the Wolf River (Figure 1). It consists of four mounds: three platform mounds and one low, rectangular mound (Figure 2) (Mainfort 1992; Mickelson 2008). Due to the scant quantity of artifacts recovered from Ames, it was classified as a vacant center (Mainfort 1992; Mickelson 2008; Peterson 1979). The term vacant center has also been employed at other regional mound groups including Denmark and Owl Creek because no village-scale settlements were discovered through surface collections, shovel testing, or small-scale test excavations.

The settlement patterns in the region were tested at Ames by evaluating two contrasting models through a multi-staged research program. The first model is known as the Vacant Center Model. The second model is the Nucleated Sedentary Model. The predominant characteristics of the Vacant Center and Nucleated Sedentary Models are reviewed below.

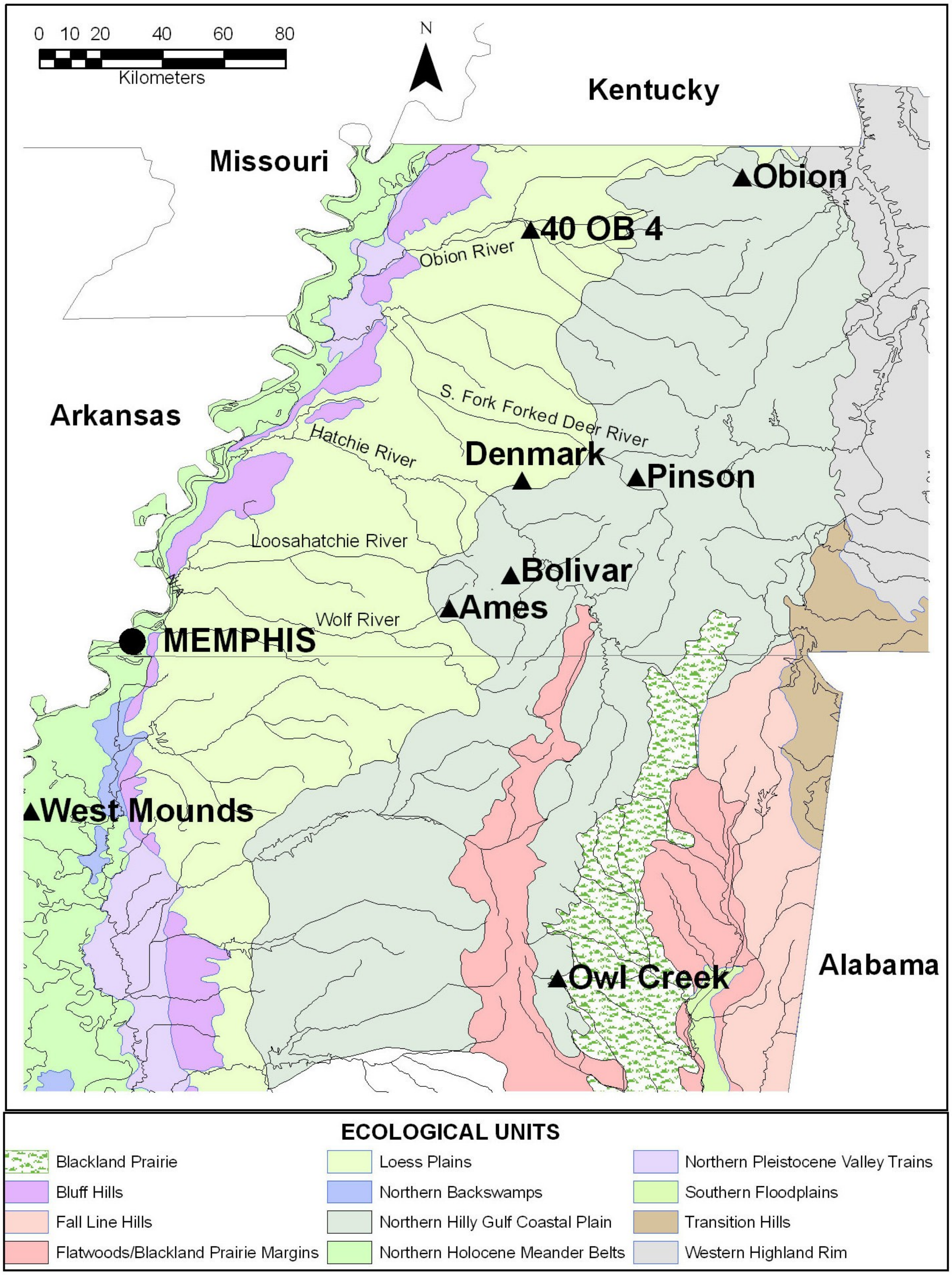


Figure 1. The Ames Mound Center in regional context.

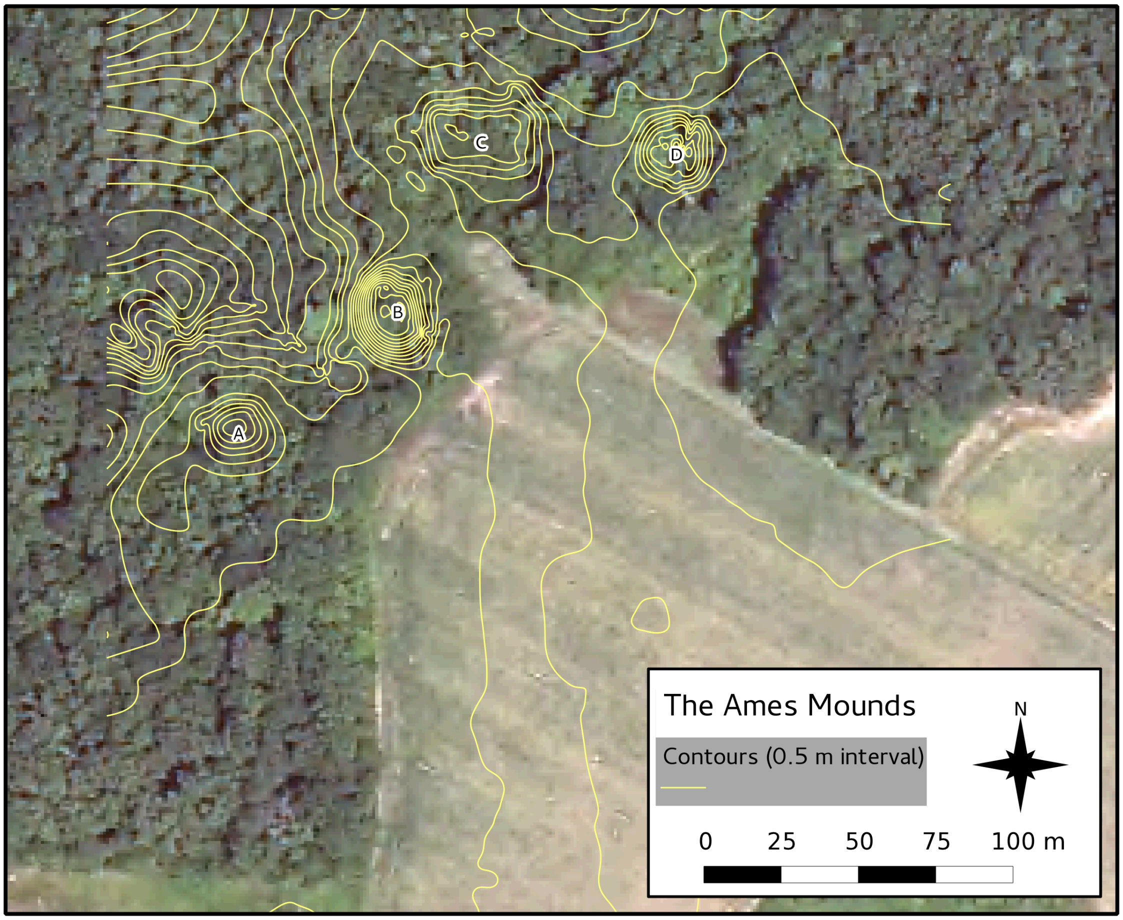


Figure 2. The Ames mounds.

*Settlement Models*

The Vacant Center Model is an adaptation of the Mesoamerican Vacant Ceremonial Center-Dispersed Agricultural Hamlet pattern adapted by Prufer and applied to Ohio Hopewell settlement patterns and elsewhere in the 1960s (Dancey and Pacheco 1997). In the Mayan Vacant Center Model, ceremonial centers were places "to which the people repaired for religious ceremonies, civic functions, and markets," and at the end of the day most of the people would return to their dwellings in dispersed settlements, leaving the center "deserted except for those who swept the courts and buildings or stored the masks and vestments, and for priests on tour of duty. Then at the next market day the city would come alive again." (Thompson 1966:66-69). Prufer's model was refined by Dancey and Pacheco (1997) and referred to as the Dispersed Sedentary Model. The Vacant Center Model's defining trait is that populations lived in hamlets or farmsteads dispersed across the landscape surrounding the mound centers which functioned as "focal points for the periodic social and economic activities of the group" (Figure 3a) (Larson 1980:31). In addition to hamlets and mound centers, specialized camps such as for craft production can also be found in the Vacant Center Model (Dancey and Pacheco 1997; Morse and Morse 1983:283; Prufer 1964). The Vacant Center could have had a very low degree of habitation made up of only a few elite households, or it could have been altogether unoccupied much of the year.

Though the Vacant Center Model has been applied to Middle Woodland Hopewell sites in the Midwest, Mayan sites in Mesoamerica, and in several other areas in the Americas, it has also been applied to Mississippian sites (Mainfort 1992; Morse and Morse 1983; Rafferty 1995). Smith (1978) notes that dispersing populations across the landscape in small settlements represents the most efficient utilization of biotic resources within the environmental niche to which Mississippian culture adapted. Within the Mississippian period vacant centers are considered to be early developments, possibly as a relic of the Late Woodland populations that underwent a "Mississippianization" (Pauketat 2007).

The Nucleated Sedentary Model is characterized by mound centers possessing a significant habitation area in the immediate vicinity of the mounds (Figure 3b). Sites that are organized according to the Nucleated Sedentary Model sometimes occur as a hierarchy of settlements, with hamlets at the bottom, followed by the local political center, and culminating with a large administrative center at the top of the hierarchy (Figure 3c) (Blitz 1999; Maxham 2000). Not all levels of the hierarchy must be used for the Nucleated Sedentary Model to apply. Mississippian societies often appear as one-level chiefdoms, or simple chiefdoms whose settlement hierarchy culminates with the local center (Smith 1978; Steponaitis 1978).

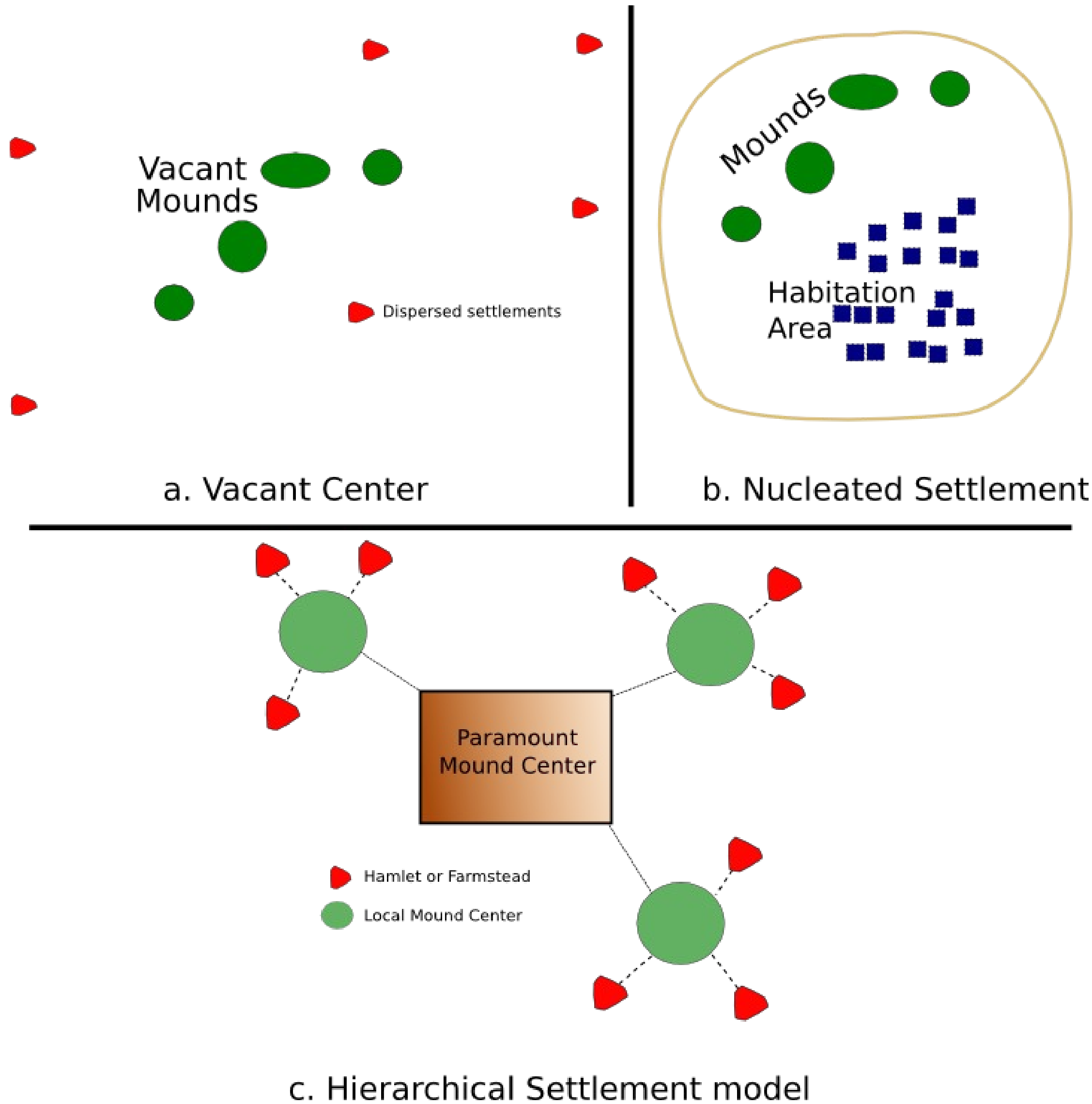


Figure 3. The potential settlement patterns at Ames: a) the Vacant Center; b) the Nucleated Settlement; and c) the Hierarchical Model.

The typical Mississippian local center was a fortified settlement that represented the location of public ceremonial areas such as plazas and mounds as well as a habitation area (Griffin 1990; Lewis et al. 1998; Smith 1978). In a three-tier hierarchy, the local centers were often single-mound sites that paid tribute to the larger paramount mound centers (Blitz 1993; Maxham 2000). The fortified area of the local center was located adjacent to high quality soils to allow for inhabitants' horticultural gardens within the fortifications. The fortified local center was large enough for the total population living in the surrounding hamlets to retreat to during times of conflict (Smith 1978:490). Compared to contemporary vacant centers, the local mound center had fewer mounds. For example, the Lubbub Creek site, a local center in the Tombigbee River drainage, has only one mound while Owl Creek possesses five mounds (Blitz 1993; Rafferty 1995). Indeed, Rafferty (1995:139) mentions that Owl Creek, with its five mounds, is "the largest Early Mississippian mound group within a very large region. Contemporary Moundville probably only had two or three mounds."

*Research Questions*

Was Ames a vacant center, or did a substantial population live at the mound center? If Ames has a habitation component, how many people lived there? How was the settlement organized? The multi-stage research program at Ames consisted of geophysical prospecting, surface collection, and shovel testing in the field to the south of the mound complex to answer these questions. Extrapolating from the results of the Ames data, comparisons were made to other sites in the region including the Owl Creek site in Mississippi and to the Denmark site in Western Tennessee.

Ames and other Mississippian sites in the West Tennessee region share certain geographical and physiographical characteristics that differentiate them from other Mississippian sites. West Tennessee Mississippian sites such as Obion, Ames, Denmark, and Bolivar are located in upland areas at the headwaters of smaller river systems in the Northern Hilly Gulf Coastal Plain and Loess Hills ecotones (Mickelson 2008). Results of past surface collections at these sites, with the exception of Obion (Garland 1992), suggests they are vacant centers with household, not village, level occupations with the majority of the population living in dispersed hamlets (Mainfort 1992; Mickelson 2008; Rafferty 1995; Peterson 1979). The major research goal then is to determine how populations utilizing Ames were organized on the landscape through several complimentary survey methods. The outcome of this research resulted in an increased understanding of the nature of Mississippian settlement patterns and is a step forward in understanding the nature of settlement systems of Upland Mississippian groups which Smith (1979:44) refers to as “one of the major archaeological problems of the Wolf River drainage.”

*Hypotheses*

Three hypotheses in addition to the null hypothesis were tested at Ames. The null hypothesis ($H_0$) is that given the available data, the settlement system in use at Ames cannot be determined. Low artifact densities and negative geophysical prospecting results in the vicinity of the mounds as well as a lack of dispersed settlements detectable through the survey methods employed would support this hypothesis.

The first hypothesis ($H_1$) states that the Vacant Center Model was used at Ames. The majority of the population lived in hamlets surrounding the vacant mound center, while a few specialists or site managers lived adjacent to the mounds. Low artifact densities from the surface collections and shovel testing would support this hypothesis, as would the absence of large quantities of cultural features such as wall trenches, postmolds, and hearths revealed in the magnetometry data.

The second hypothesis ($H_2$) states that the nucleated sedentary settlement system was in use at Ames. Under this model settlements could be dispersed across the landscape, however significant habitation would also exist in the vicinity of the mound complex. In order to confirm this hypothesis, survey results should yield much larger artifact densities adjacent to the mound group. Also, magnetometry survey should detect intensive prehistoric activity through evidence for cultural features such as palisades, hearths, and wall trenches. Confirmation of these cultural features through targeted excavation of the magnetic anomalies would support this hypothesis.

The third hypothesis ($H_3$) is that Ames followed a trajectory perhaps similar to Moundville during the middle Moundville II phase (Knight 2010:362) where it began as an inhabited mound center, but at some point morphed into a vacant ceremonial center and necropolis for the hinterland population. Extensive excavation along with many dates would be needed to show that a significant population had at one time lived at Ames but dispersed leaving only a few elite households. Many burials and extensive grave goods would also be expected at the site. The opposite may also be true; Ames may have begun as a vacant center, only to have a town constructed later. If this were the case the dates from potential houses would be relatively late.

Due to the sparse artifact densities identified at Ames during previous research and the lack of confirmed nucleated settlements in the region, the research program expected to confirm interpretations that Ames is a vacant center. However, additional surface and shovel test surveys combined with magnetometry data integrated in a

Geographic Information System (GIS) show that habitation areas around mound complexes have been overlooked.  The data provide irrefutable evidence for a nucleated settlement system during the Early Mississippian period in Upland regions.

## 2. Background And Setting

*Environmental Background*

The Ames Mound Complex (Figure 2) is located on the border of the Northern Hilly Gulf Coastal Plain and the Mississippi Valley Loess Plains levels III and IV ecoregions (Griffith et al. 1998a). The location of Ames and other upland mound sites within such an area provides different subsistence challenges than are present for mound complexes located in the Central Mississippi Valley (Mickelson 2008). The Southeastern Plains and Hills are characterized as having "Dissected irregular plains, some low hill with broad tops; fairly wide stream bottoms with broad, level to undulating terraces; low to moderate gradient mostly sandy bottomed streams" (Griffith et al. 1998b). The natural vegetation of the Southeastern Plains and Hills is deciduous forest consisting mostly of oak-hickory and oak-hickory-pine forests (Griffith et al. 1998b). The Mississippi Valley Loess Plains consist of plains that are "level to gently rolling, with wide, flat bottomlands and floodplains" (Griffith et al. 1998b). The vegetation in the Loess Plains consists of oak-hickory forests and southern floodplain/bottomland forests (Griffith et al. 1998b). Deciduous forests are known for their abundant food supply and Ames's location in the upland deciduous forest along the North Fork of the Wolf River would have provided the inhabitants with a diverse range of resources to exploit. The oak-hickory and oak-hickory-pine forests characteristic of those surrounding Ames were inhabited by white-tailed deer, opossum, raccoon, rabbit, fox, beaver, black bear, wolf, bobcat, otter, turtles, squirrels, turkey, ducks, geese and other waterfowl (Oster et al. 2006:7). The many rivers and streams surrounding Ames would have provided plenty of aquatic resources to utilize, including bass, catfish, sunfish, crappie, drum, and gar (Oster et al. 2006:8). In addition to these animal resources, the deciduous forests also provided plentiful nut harvests during the fall. In short, the environment provided abundant resources for populations residing in the area of Ames and along the Wolf River. Though available biotic resources were abundant, the paltry lithic resources found in this area are limited to chert pebbles found in streams and small veins of iron-bearing sandstone deposits eroding out of the hillsides.

The lack of tool stone combined with dusty loess-covered agricultural fields result in a nearly unobtrusive archaeological landscape without the implementation of archaeogeophysical techniques. Without understanding these two variables, site discovery techniques that archaeologists have relied on for decades, such as controlled surface collection and test pitting, will be inadequate for locating archaeological materials because of low rates of recovery.

*Cultural Overview*

Blitz (1999:3) notes that "Definitions of Mississippian have changed along with the goals and methods of archaeology." The term Mississippian was first used to describe a pottery style found in the Eastern United States and centered in the Mississippi Valley (Griffin 1966:257; Holmes 1903). Deuel (1935:429) first defined the "Mississippi Basic Culture" based on an early draft of McKern's (1939) Midwestern Taxonomic System. Some of Deuel's (1935:436) Mississippian types included rectangular, semi-permanent houses; pyramidal substructure mounds; simple extended burials with profuse grave goods; shell-tempered pottery; and simple, small isosceles triangle projectile points. Griffin (1967:189) defined Mississippian as "the wide variety of adaptations made by societies which developed a dependence upon agriculture for their basic, storable food supply." Smith (1978:480) defined Mississippian as a "cultural adaptation to a specific habitat situation, and as a particular level of sociocultural integration." Milner (1998) characterizes Mississippian cultures as those societies located in the Southeastern United States that date to between A.D. 1000 and A.D. 1500 and possess certain similarities in their material culture, architecture, and social systems. Other shared characteristics of Mississippian societies include a ranked social organization, maize-based horticulture, and shared lithic and ceramic technologies, iconography, and ideology (Griffin 1990; Milner 1998; Smith 1978). However, according to Pauketat (2007:85), the focus should be understanding "Mississippianization—an uneven historical process in which people politicized maize-based agricultural landscapes and cosmologies in ways contingent on their pasts and each other."

Mississippian expansion occurred first along the tributaries of the Mississippi River due to the specific niche to which they adapted. Most settlements are found within the river valleys of major rivers. Upland locations often contain less fertile soil that is more difficult to prepare for agricultural activities as well as fewer biotic resources to exploit. Upland areas with loess soils, such as at Ames, do not have this resource disadvantage and are well suited to agricultural use (Smith 1978).

*Previous Research*

Drexel Peterson (1979:25-27) reported on an extensive survey of the Wolf River Watershed in 1979, documenting 139 sites. Peterson mentions that "The Wolf Watershed has yielded a great deal of data beginning with the Paleoindian period and continuing through the last century." Pre-ceramic sites (before Woodland according to Peterson's report) were identified based on projectile point typology. "Very little" pre-ceramic sites were discovered on the North Fork of the Wolf River, along which the Ames Mound Complex is located. Peterson found few major sites or villages during the course of the survey, except for the "empty ceremonial center at 40FY7." He characterized most sites as consisting of "scatterings of materials that are best explained as hamlets, as farmsteads, or earlier as camps" (Peterson 1979:27). Of the sites documented in Peterson's survey, few were found in the currently active floodplain; the terraces were utilized much more frequently, while sites in upland locations were not used until the introduction of ceramics (Peterson 1979:27). Occupation dates for the Wolf River Watershed range from the Paleoindian period (pre-7500 B.C.) up to the historic period.

Smith (1979) notes that ceramics from the Wolf River drainage represent Early and Middle Woodland, and Early and Late Mississippian period occupations. Smith (1979:42) breaks down occupation levels based on the amount of sherds found at the site into bivouacs (<5 sherds), long term camps or farmsteads (5-24 sherds), hamlets (25-49 sherds), and small villages (>50 sherds) .

At the time of Peterson's survey the Ames Mound Complex had yet to be systematically excavated, though test units were excavated from 40FY7 that "produced virtually nothing" (Peterson 1979:28). Relatively few ceramics dating to the Early Mississippian period were uncovered at sites along the North Fork of the Wolf, which "are probably related to the ceremonial center (40FY7) on Ames Plantation" (Smith 1979:44). Smith concludes his pottery analysis by stating that there should be much more material from the North Fork of the Wolf, and "the location of the hamlets or villages for which 40FY7 served as the center remains one of the major archaeological problems of the Wolf River drainage" (Smith 1979:44).

Ames was probably misidentified as a Woodland rather than Mississippian site because of the lack of shell tempered pottery (Mainfort 1992; Mickelson 2008:204). However, detailed analysis of 241 sherds from Mound D identify Ames as a Mississippian site (Mickelson and Goddard 2011). Ceramics analyzed from Mound D are generally eroded and poorly preserved. Surface treatments include plain (12%), cordmarked (13%), fabric impressed (.4%), incised (.8%), and eroded (74%). Tempering agents include clay (25%), sand (21%), sand/bone (6%), quartz (24%), shell (22%), and combinations thereof.

During Peterson's survey subsurface testing was conducted at six locations. The tests consisted of .5 m deep units of unknown dimensions. Four test units were excavated at the Ames Mound Complex (Peterson 1979:65). Tests 1, 2, and 4 "yielded nothing of significance" and test unit 3 provided a mixed, early ceramic assemblage (Peterson 1979:65). The location of test unit 3, "in 'front' of the largest mound" (Peterson 1979:65) appears to correlate in space with the cluster of Mississippian ceramics reported in Mickelson's (2008) surface collections.

Peterson also uncovered some other interesting features around the Ames Mound Complex. In a cornfield near the mound center, "a small charcoal area was seen eroding out in a small gully" that was approximately 5 cm thick and 4 m long that could have been a burned structure. He also says "there are even indications in pothunters' holes of clay floors in mounds 1 and 2" (Peterson 1979:65). Peterson's account in this case is problematic—in his maps the mounds are labeled A – D, so it is not clear which mounds "1" and "2" refer to.

Research at the Ames Mound Complex resumed in the summer of 2007 and continued during the summer of 2011 with field schools run by the University of Memphis. The main goal of the 2007-2008 research was to acquire accurate dates of the mound complex, though mapping and surface collection were also important objectives (Mickelson 2008:206). Excavation focused on the mounds; a looter's backhoe trench was taken advantage of on Mound D and systematically excavated and a large pit in the side of Mound B, also caused by a backhoe, was turned into a 2 m x 2 m excavation unit (Mickelson 2008).

Radiocarbon dates from mound contexts place the occupation between A.D. 1020 and A.D. 1240. Burned thatching from Mound D dated to cal. A.D. 1150 to A.D. 1270. The structure on top of the buried clay floor appears to have burned, collapsed, and then while still smoldering, a clay cap was placed over the mound (Mickelson 2008:210). From Mound B, two samples were taken for dating; one from stratum VI (2.5 m below the summit), providing a date between cal A.D. 1020 to A.D. 1210, and another from the lower stratum XI (3.75 m below summit), providing a date between cal A.D. 640 to A.D. 770 (Mickelson 2008:213). The early basal date from Mound B is indicative of either a previous Woodland period mound being expanded upon by Mississippian populations, or Woodland sites were "mined" by the Mississippian builders and used in the construction of Mound B (Mickelson 2008:214).

An accurate topographic map of the mound complex was also completed during the 2007-2008 research. The only map available previously was Smith's sketch map. Smith's "L" shaped configuration is inaccurate, but because of the thick vegetation it would be extremely difficult to see the inaccuracy while drawing the sketch map. The mounds were mapped with centimeter level precision using a total station. Though mapping of the mounds is complete, mapping of the surrounding terrain continues as a result of new research interests into the relationships between the mounds and the surrounding gullies.

The initial surface collection data used to reveal habitation data at the mound complex was acquired in 2007. It showed a relatively low artifact density (< 46 artifacts per hectare) for the field the south of the mounds (Mickelson 2008:214). The low artifact density and absence of middens strengthened the hypothesis of the mound complex acting as a vacant center with only a small resident "maintenance" population residing at the mounds while the rest of the people were dispersed across the landscape in farmsteads or hamlets (Mickelson 2008).

In 2009 research began at Ames with surface collections, magnetometry, and shovel tests in the vicinity of the mound complex. Due to superb ground conditions, substantially more artifacts were mapped on the surface compared to previous surface surveys. Magnetometry survey was conducted in seventy-eight 20 m x 20 m grids south of the mounds that revealed numerous anomalies, some of which were tested through excavation. Test excavation uncovered two classic Mississippian wall trench houses encircled by a palisade. During the summer of 2010 excavation efforts were concentrated on one of the houses resulting in the complete exposure of its floor plan. In 2011, during the summer field school the exposed house was excavated and dated to approximately cal. A.D. 1290 (Mickelson and Goddard 2011). The palisade was also excavated in several locations to acquire material for a radiocarbon date.

## 3. Research Design, Data Collection Methods, and Results

Settlement patterns at Ames were evaluated through a probabilistic research design (Binford 1964) employing three complimentary survey techniques: surface collection, shovel testing, and magnetometry. Cultural features uncovered through these survey methods were further investigated with targeted excavations. The extent and details of the employed methods are discussed below. After completion, the data sets can be combined and analyzed in a Geographic Information System (GIS). Before discussing each survey method, an overview of GIS will be given.

GIS represents a collection of tools that aid in "data acquisition, spatial data management, database management, data visualization and spatial analysis" (Conolly and Lake 2006:11). GIS allows various types of spatial data to be integrated together and their spatial relationships analyzed.

There are two primary data models used to store spatial data; these are the vector data structure and raster data structure. Vector data emphasizes topology, or the geometrical relationships between objects. The vector structure represents spatial data as either points, lines, or polygons (Conolly and Lake 2006). Which type is used depends both on the feature that is being mapped and the scale. For example, large scale maps show a small area in great detail, so an archaeological site may be represented as a polygon that delineates the maximum extent of a site. However, on a small scale map a large area is shown in lesser detail, so the same site that was just represented as a polygon may be shown as a point in relation to many other sites in the region, also represented as points.

The second common data structure used in GIS is the raster format. Raster data is represented as a grid of cells, or pixels (Conolly and Lake 2006). Raster data is defined in terms of the pixel size, the amount of area represented by a single pixel. Unlike vector data which can store practically an unlimited number of attributes for each object, each cell in a raster data set has only one value. Data commonly stored in the raster format includes elevation, land cover information, or artifact densities. Because the raster format is much simpler than the vector format, it is easier to manipulate mathematically and so is the preferred format when creating derived surfaces (Conolly and Lake 2006).

GIS was used in this study to georeference data, perform spatial analysis, and to output maps. The georeferencing aspect was used to transform field data collected based on the Ames site grid to a projected coordinate system so that the data can be overlaid on base maps such as Digital Elevation Models (DEMs) and aerial imagery. All of the spatial data gathered throughout the course of this research was georectified to the Tennessee State Plane coordinate system, North American Datum 1983, with units recorded in meters. Spatial analysis functions were used to create the artifact density estimates for the surface collection and shovel test surveys. Finally, GIS was used to create maps symbolizing the various data in ways that show the complimentary nature of the results of surface collection, shovel testing, magnetometry, and excavation.

*Surface Collection*

Surface collection surveys are traditionally used in archaeology as a means of locating sites to excavate (Binford 1964; Dunnell and Dancey 1983). Surface collection data has historically been mistrusted due to the perceived ease with which surface displacement can occur, whereas subsurface deposits are usually thought of as representing pristine, undisturbed cultural features. Unfortunately, subsurface deposits began on the surface and are subjected not only to subsurface processes, but also to surface processes that can alter the original context. Surface deposits can provide information about the archaeological record as reliable as subsurface deposits and are invaluable for examining the archaeological record on a regional scale (Binford 1964; Dunnell and Dancey 1983; Schiffer 1972).

Surface collection at Ames was conducted at 5 m transect intervals during the 2007 and 2009 field schools. Precise spatial control was maintained by mapping artifact locations with a sub-meter accuracy Trimble GPS unit. Artifacts were assigned a unique ID and their temporal traits were assessed in the field and were bagged for further laboratory processing.

A total of 283 artifacts was recovered during the 2007 surface collection over approximately 3 ha (7.4 acres) in the field south of the mounds (Mickelson 2008). The 2009 surface collection included a re-survey of the field south of the mounds but was expanded to include several other agricultural fields up to 1.5 km away over a total area of 23 ha (56.8 acres) (Figure 4). Approximately four times as many surface artifacts were recorded during the 2009 survey. The increased recovery rates are attributed to greater precipitation in May 2009 when 4.75 times more rain fell than in May 2007 (Mickelson and Goddard 2011). In total 1,416 prehistoric artifacts were collected during the 2007 and 2009 surface collections. The largest cluster is comprised of 946 artifacts (66.8%) immediately south of the mounds.

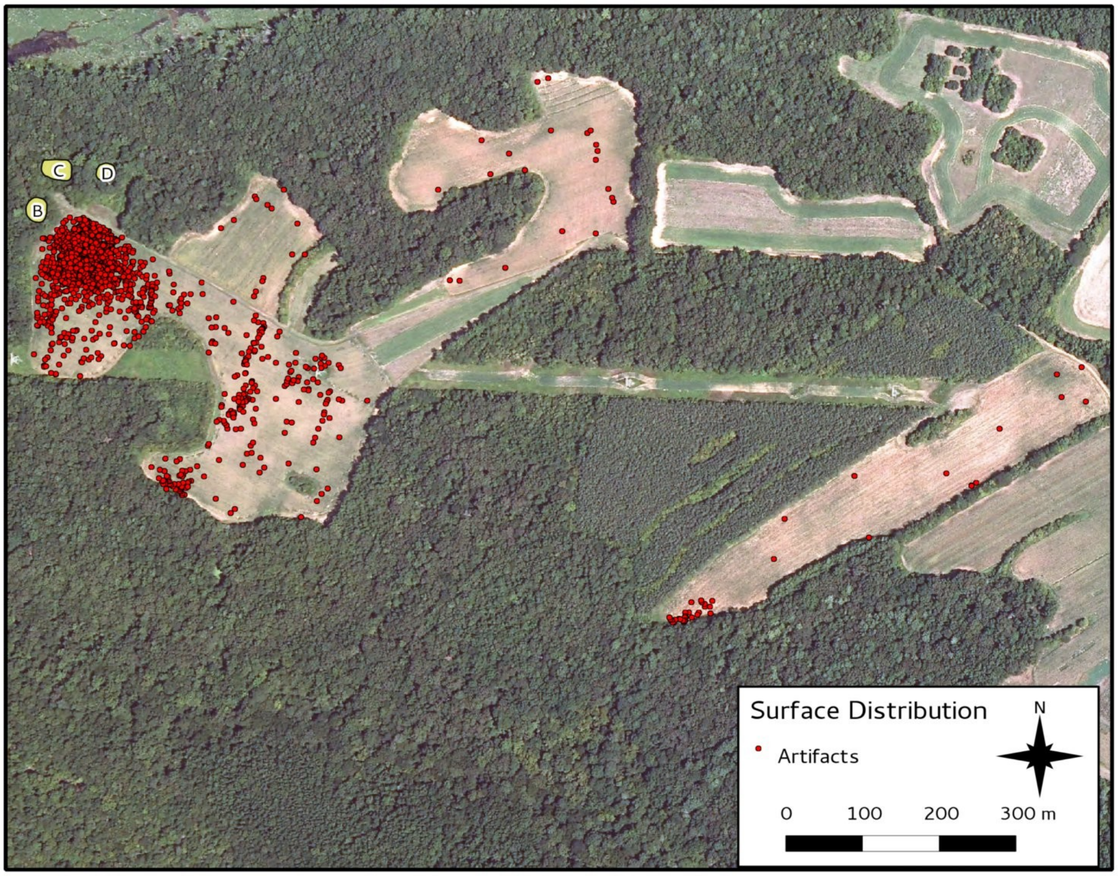


Figure 4. Surface collection around the Ames Mound Complex.

Artifact densities were calculated based on the combined 2007 and 2009 surface collection surveys. The minimum and maximum artifact densities were zero artifacts per square meter and 0.255 artifacts per square meter, respectively and the mean was 0.006 artifacts per square meter. When the sample is limited to the field south of the mounds the minimum and maximum remain the same but the mean increases to 0.007 artifacts per square meter, an increase of 16.67% (Figure 5).

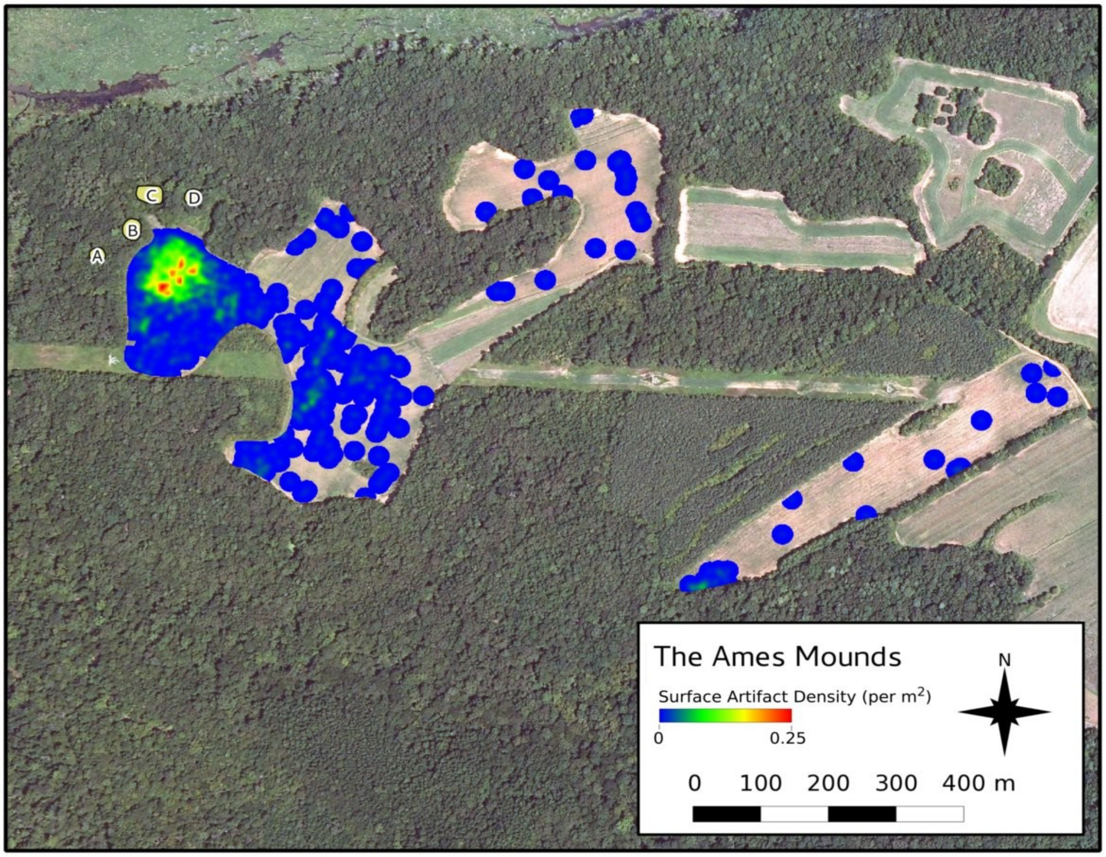


Figure 5. Artifact density estimates at Ames.

The artifact density map was generated with the Geographic Resources Analysis Support System (GRASS) GIS software's v.kernel tool using a 1 m x 1 m cell size and a search radius of 4 m. The density map shows a large, well-defined cluster adjacent to the mounds with several smaller, higher density clusters situated within. Beyond the large cluster, artifact densities are relatively low with only minimal clustering.

*Shovel Testing*

Shovel testing is a method of searching for evidence of past human activity by excavating many small test units across the landscape. Shovel testing is especially useful when visibility is less than ideal (Roskams 2001). Though there has been considerable controversy regarding the effectiveness of shovel test sampling in discovering archaeological sites, it has become a standard surveying methodology (Krakker et al. 1983; Nance and Ball 1986; Shott 1989). At Ames shovel testing was employed to estimate the plow zone artifact density across the approximately 3 ha field south of the mounds. A systematic random sample was employed based on 40 m quadrats (Figure 6). Coordinates were generated at random within each 40 m quadrat using GIS software and located in the field with a sub-meter GPS unit.

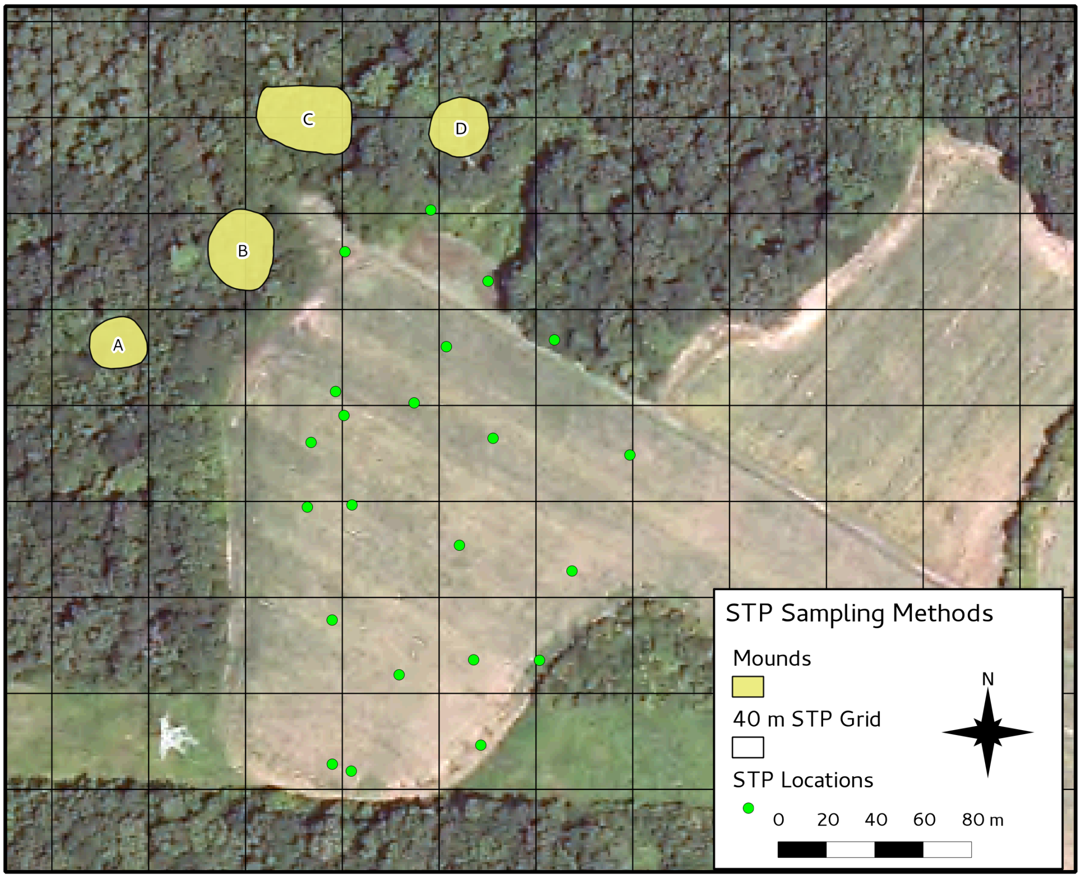


Figure 6. Shovel test sampling methodology at Ames. Shovel tests were located within 40 m quadrats.

Twenty-two .3 m diameter by .2 m deep shovel test pits (STPs) were excavated at Ames to estimate the plow zone artifact density. The STPs were placed according to a systematic random sampling methodology as discussed in the methods section. The STPs resulted in the recovery of 19 artifacts, 13 of which were prehistoric in origin. Seven STPs were positive and 15 negative for prehistoric artifacts (Figure 7). Artifacts per STP ranged from a minimum of zero to a maximum of four. Density estimates were calculated for each STP. A STP with 1 artifact resulted in a density of 70.74 artifacts per cubic meter, while a STP with four artifacts resulted in a density of 282.94 artifacts per cubic meter.  The mean artifact density was 41.80 artifacts per cubic meter. Extrapolating from the density estimate of one artifact per STP, a 40 m x 40 m block contains approximately 2,240 artifacts within the plow zone; a STP from which four artifacts were recovered has a plow zone density of roughly 8,960 artifacts. Extrapolation of the STP data to the entire 3 ha site  indicates the existence of approximately 173,600 artifacts.

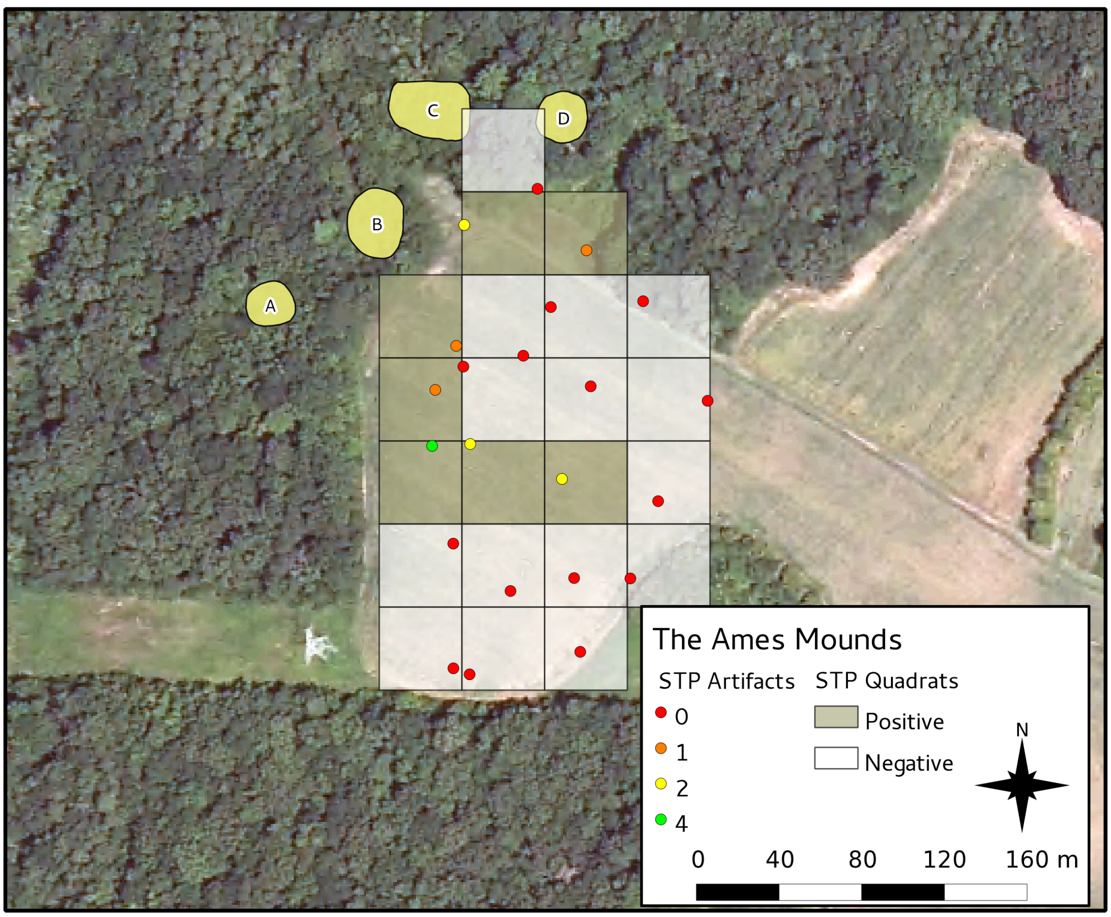


Figure 7.  Shovel test results by artifact count.

*Magnetometry*

Magnetometry is a passive geophysical prospecting method that detects changes in the magnetic properties of subsurface deposits (Kvamme 2006a). Magnetometry data can be acquired rapidly and at relatively high spatial detail making it one of the best methods for large scale surveys. Indeed, magnetometry data is most valuable when used on a large scale because only then can geometric patterns be detected and accurately interpreted. Such features rarely occur on their own in nature and are most often caused by anthropogenic activity (Kvamme 2006a).

Materials obtain magnetic properties only in the presence of a magnetic field. There are two types of magnetism that can cause this – remanent magnetism and induced magnetism (Kvamme 2006a). Remanent magnetism occurs when materials are subjected to some magnetic process, after which the magnetism remains with the material. One of the most common forms is thermoremanent magnetism, which occurs when a material is heated to a sufficiently high temperature causing the magnetic domains to break down and permanently realign with the current direction of the Earth's magnetic field. Objects within a magnetic field possess an induced magnetism only when in the presence of the field that is a function of their magnetic susceptibility which is based on the mineral content of the material (Aspinall et al. 2008; Kvamme 2006a).

Magnetic variations occur through natural processes that can be hindered or exacerbated through cultural processes. Kvamme (2006a:216-221) lists seven ways in which humans create magnetic variation and leave behind signatures that are detectable through magnetometry which can be boiled down to the following: (1) people make use of fire, (2) human activity results in the accumulation and removal of magnetically enriched topsoil in patterned ways, and (3) people make use of iron. Because of these changes human activities such as building structures, creating firepits or hearths, constructing palisades, and discarding material culture create certain patterns in the magnetic properties of subsurface deposits that can be discovered and interpreted.

Magnetometers measure the strength of the magnetic field in nanoteslas (nT). Typical North American prehistoric archaeological features have magnetic field strengths in the range of ± 3 nT. By comparison the Earth's magnetic field is approximately 46,500 nT. To detect such faint signatures a type of magnetometer known as a gradiometer is employed. A gradiometer is a magnetometer with two sensors vertically spaced .5 m to 1 m apart. The upper sensor detects the ambient magnetic field, while the lower sensor detects the subsurface magnetic field. Taking the difference, or gradient, of the two readings eliminates high frequency background noise allowing for the detection of subtle archaeological features. Even with the increased sensor sensitivity of a gradiometer, archaeological features can only be detected if there is sufficient contrast between the surrounding soil matrix and and the feature. Magnetometry works as an archaeological prospection method because the net magnetic effect of subsurface material is usually close to zero. As humans modify the landscape by building mounds, digging ditches, or repeatedly walking a certain path, soil and rocks are displaced, dug up, and redeposited. These activities create a magnetic contrast against the surrounding deposits that magnetometers are able to detect. For example, digging a ditch removes topsoil which contains more magnetic material than the subsoils, resulting in a lowering of the magnetic field which would be detected as a negative anomaly (Kvamme 2008:80).

Magnetometry was conducted in 20 m quadrats over approximately 2.9 ha south of the mound complex (Figure 8). Magnetometry data were collected at a .5 m transect interval with four readings per meter along each transect with a Bartington 601-2 dual fluxgate gradiometer. Following collection the data were assembled and processed in ArcheoSurveyor, a software package specifically designed to work with near surface geophysical data as commonly employed by archaeologists (DW Consulting 2011) and then georeferenced into a GIS. The goal of magnetometry is to locate cultural features; however, geophysical instruments detect anomalies that could be representative of many different types of phenomena. Kvamme (2006b:236-237) defines noise as “everything else that is measured and that obscures the targeted features” while signal is used to refer to the cultural features one for which one is surveying. The data must be processed to remove noise that can obscure the relevant signal in the survey.

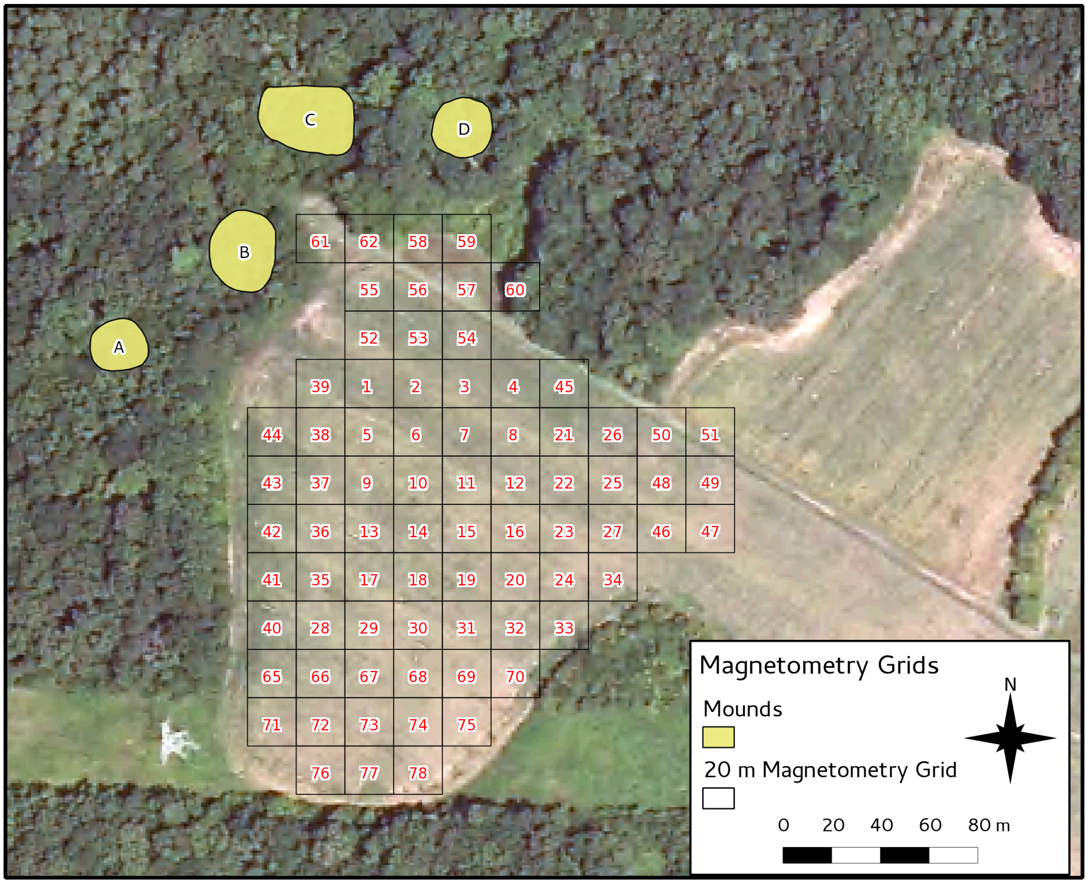


Figure 8. The extent of the magnetometry survey at Ames. The numbered grids show the areas where magnetometry data were collected as well as the order in which the survey progressed.

The raw magnetometry data (Figure 9) had a range of ± 3000 nT, indicating that there were some ferrous metal objects in the survey data. Since prehistoric archaeological features typically are in the ± 3 nT range, several processes were needed to clean up the data. Five processes were applied to the data and will be explained below.

A destriping process was applied first. Destriping is used to remove artifacts in the data caused by the regular variations in the instrument height above the surface due to the surveyor's gait. The process gets its name from the "stripe" patterns that appear in the survey data. This source of noise is found especially when data is collected at high sampling rates and the signal range is small (Kvamme 2006b). While not immediately apparent in the Ames data because of the large signal range, after further processing to reduce the signal range striping is clearly visible.

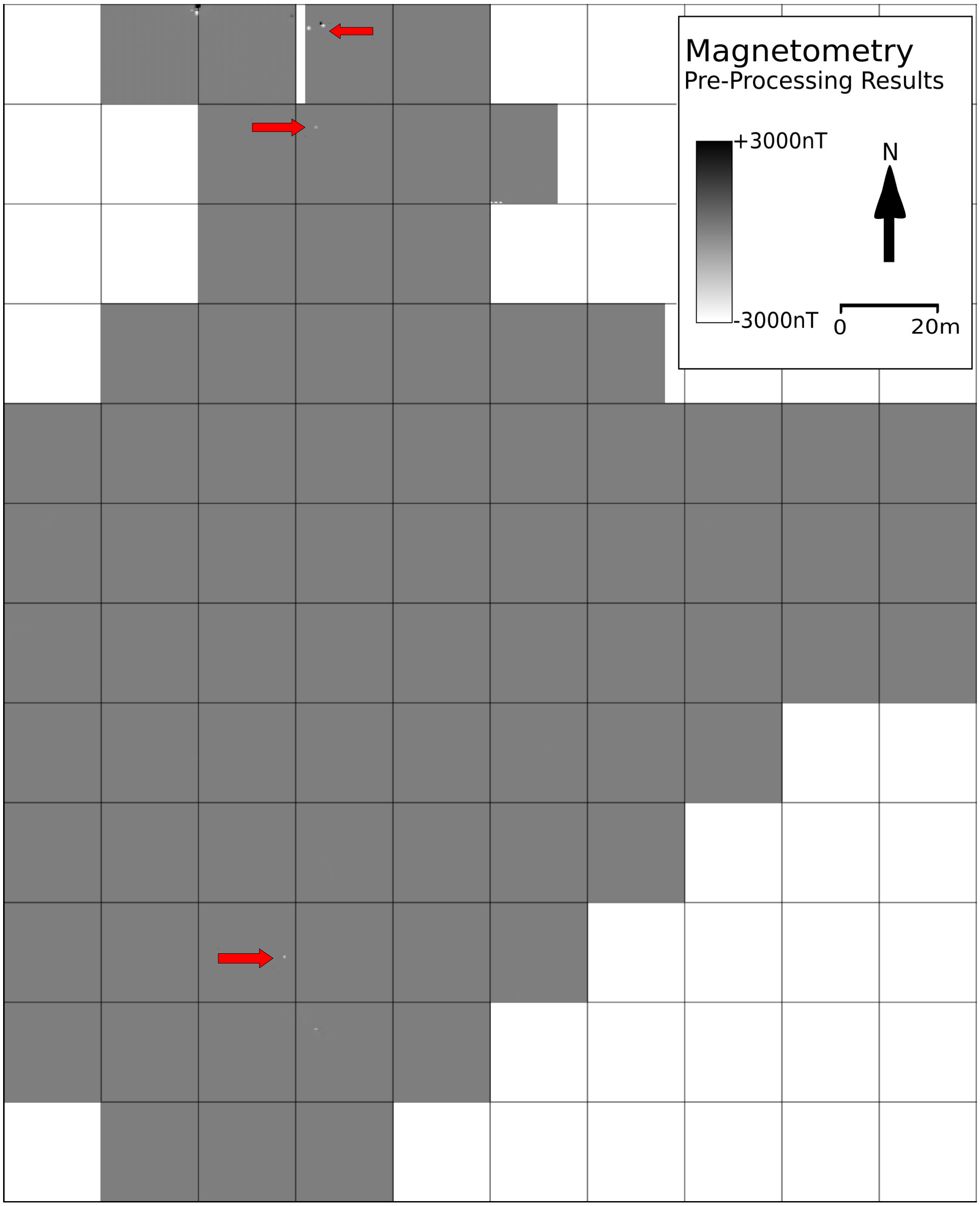


Figure 9. The unprocessed magnetometry data at Ames. In this gray-scale image the small black and white anomalies represent ferrous metal objects in the survey whose magnetic signatures mask the much weaker cultural anomalies that may be present.

A destaggering process was then applied to the magnetometry data. Destaggering processes are often needed when data is collected with a device that acquires data at timed intervals that require the operator to walk at a constant pace along the transect (Kvamme 2006b). If the operator's pace is off even by a small amount, the data has a characteristic "herringbone" appearance that is corrected by sliding the transects a set distance, either in meters or a set number of interval readings (Kvamme 2006b:241). The appearance of the Ames data was improved by destaggering in both directions by - 1 intervals.

A despiking process was applied next to reduce the impact of extreme measurements, such as from ferrous metal objects on the magnetic data. Data spikes are removed by replacing the extreme measurements with the average value of a window of cells surrounding the extreme (Kvamme 2006b). A 3 x 3 window was used in the despiking process of the Ames data.

The magnetometry data was then enhanced through interpolation. Interpolation improves image appearance by eliminating rectangular pixels caused by unequal sampling rates. The base pixel size was .25 m x .5 m, which was interpolated to a .25 m x .25 m pixel resolution. Interpolated images help reduce the blocky appearance of data and allow for easier pattern recognition (Kvamme 2006b).

Finally, the magnetometry data were clipped to ± 3 nT. The clipping process is essentially a linear contrast stretch that causes the selected color map to be applied to a small range of data (Kvamme 2006b). In Figure 8 the majority of the data is gray with only the extreme measurements visible because the available shades of gray must be stretched across all values between - 3000 nT and + 3000 nT. The clipping process enhances the weaker signals by stretching the same number of shades across all values between - 3 nT and + 3 nT, while anything above or below the ± 3 nT threshold is saturated.

After all processes are applied many anomalies are visible in the data including several geometric patterns that are indicative of prehistoric cultural processes (Figure 10). The data can be saved, features of interest can be ground truthed, and the data can be imported into a GIS (Figure 11).

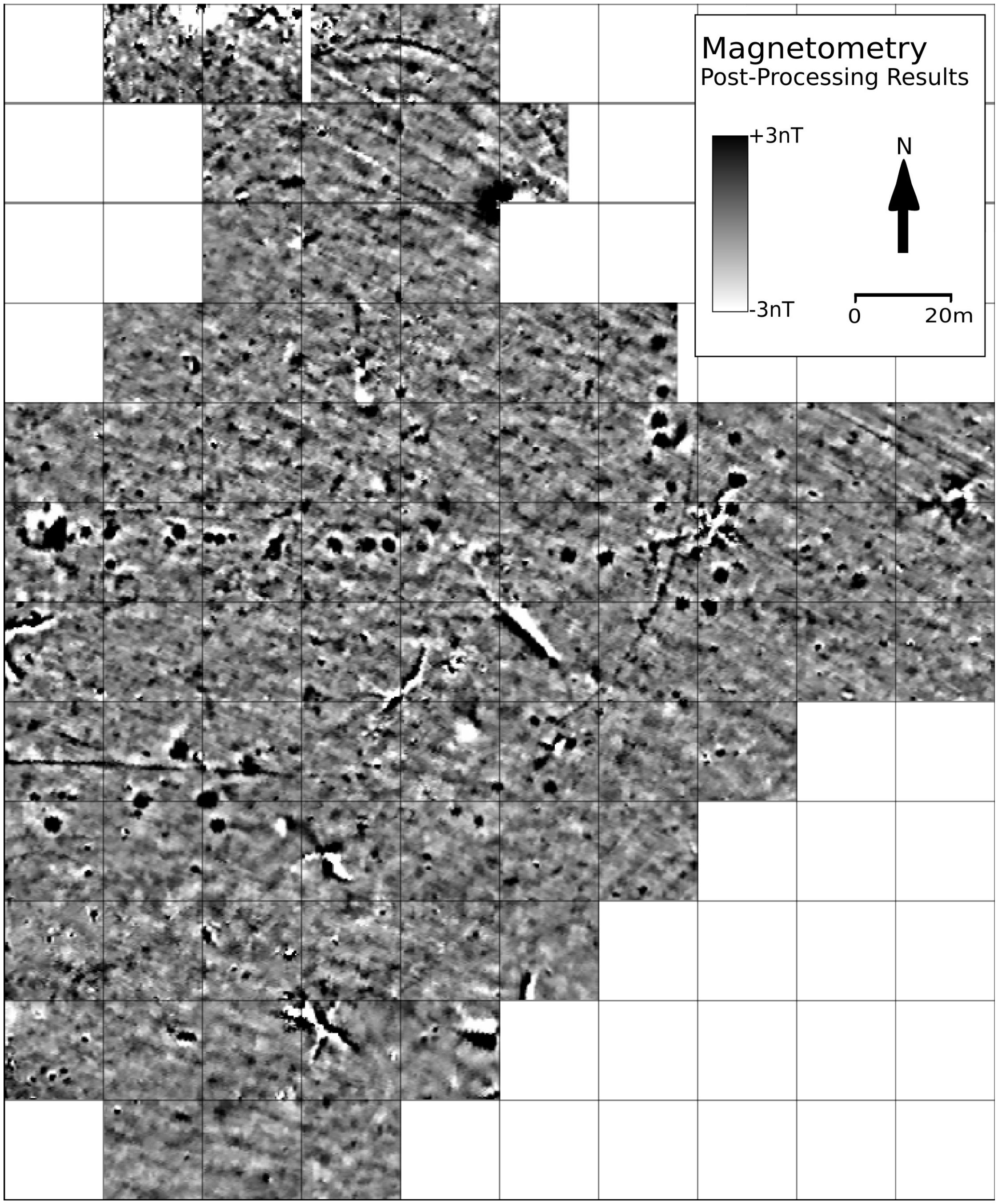


Figure 10. The processed magnetometry data.

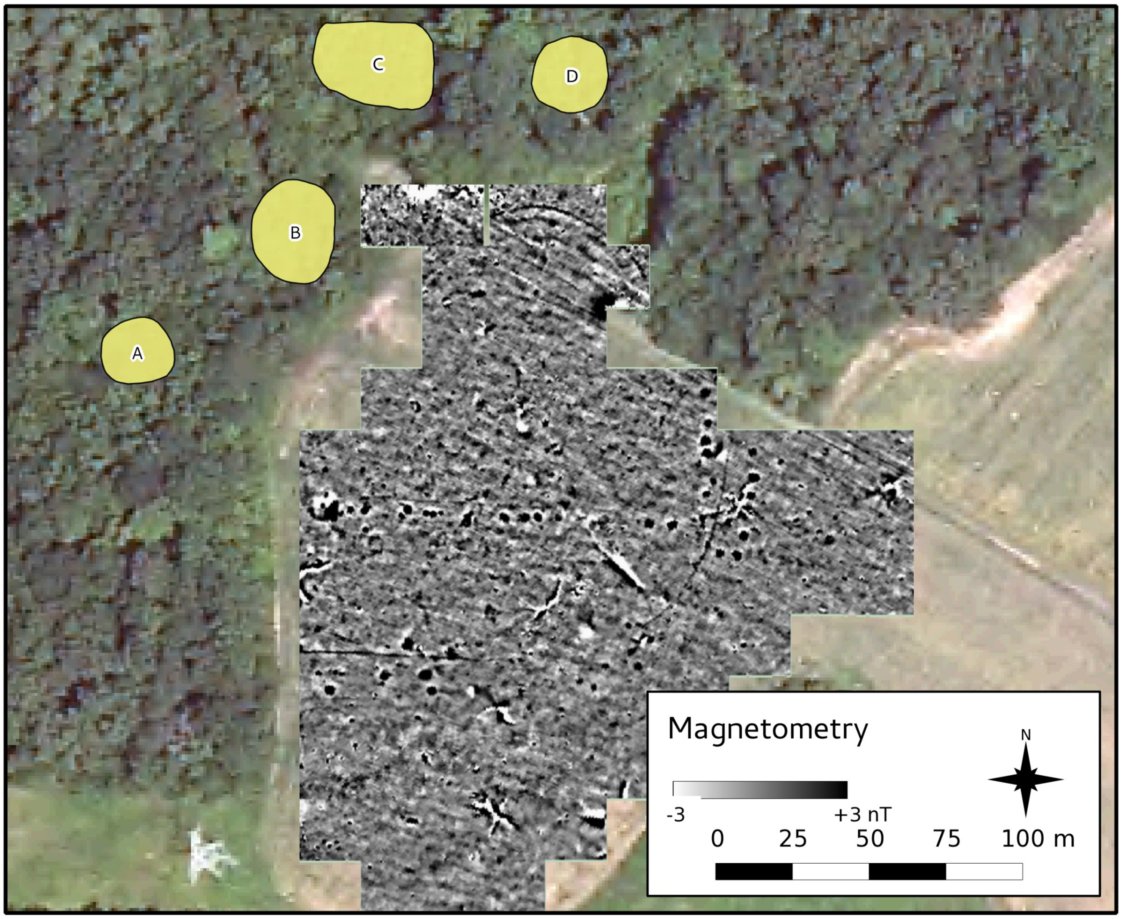


Figure 11. The magnetometry data georeferenced and imported into a GIS.

The most recognizable features in the magnetometry data include a line of positive circular anomalies in a backwards "L" shaped pattern, a positive linear anomaly enclosing the circular anomalies, and several wedge-shaped anomalies located throughout the magnetometry survey. These features were tested through excavation and will be discussed in the following section.

*Excavation*

As mentioned in the magnetometry section, human activity modifies the physical properties of subsurface deposits that are discoverable in part due to their geometric shapes. Areas of interest are referred to as “anomalies” until they can be confirmed through corroborative techniques such as excavation. When promising anomalies are found in the magnetometry data, they were excavated to determine if they represent cultural or geologic features. A total of ten excavation units was placed throughout the survey area to test the anomalies.

*Circular Anomalies*. Some of the most prominent features in the magnetometry data include approximately 20 positive circular anomalies 2.5 m - 3 m in diameter arranged in a backwards “L” shaped pattern. The circular anomalies were thought to represent prehistoric houses and two were chosen for excavation with unit numbers F1-U1 and F1-U2 as shown in Figure 12.

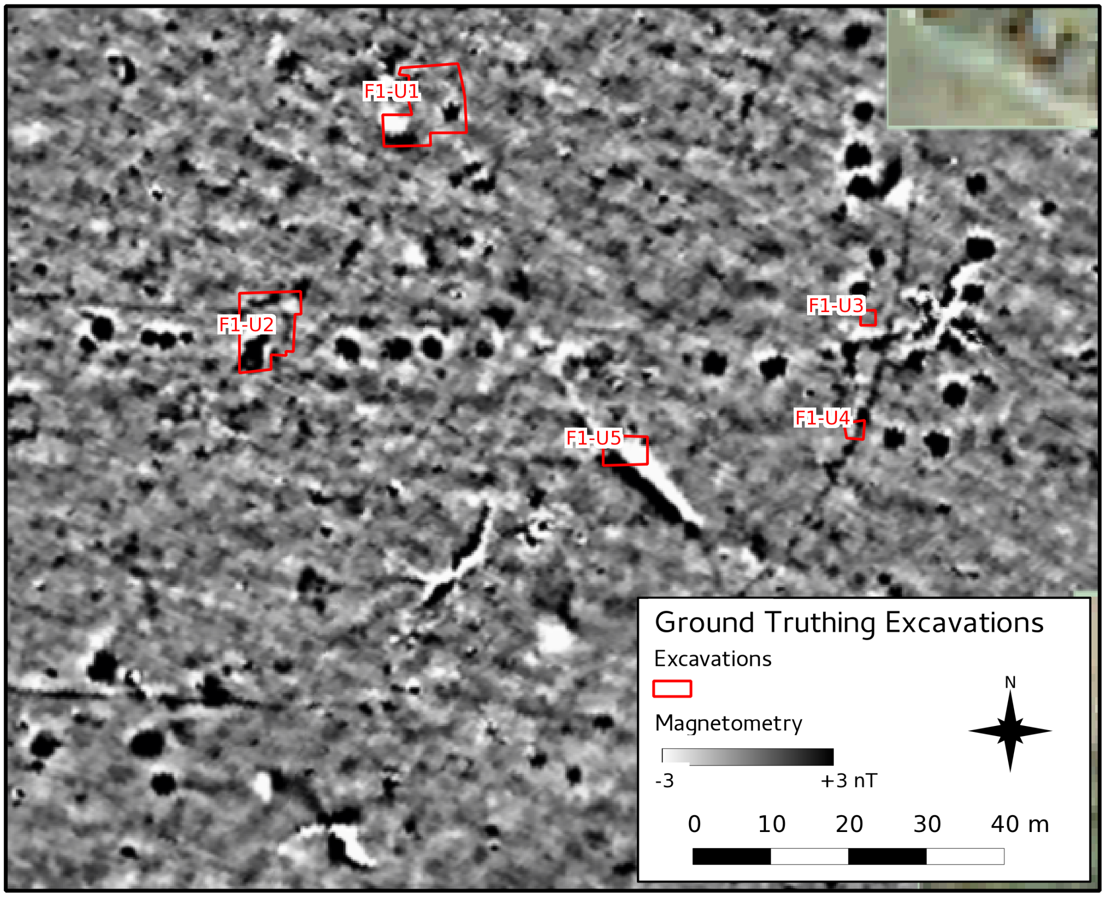


Figure 12. Locations of ground truthing excavations over the magnetometry data.

Structures featuring wall trench construction were uncovered in units F1-U1 and F1-U2. After both excavations revealed Mississippian structures, efforts focused on examining Structure 1 (unit F1-U2) in detail. Structure 1 was chosen for investigation because its magnetic signature is representative of approximately 20 anomalies across the site.

A 4 m x 2 m excavation unit was initially placed over the large positive anomaly in unit designated F1-U2. Approximately .2 m of plow zone was stripped, revealing the southwest corner of a structure with open corners and a midden south of the wall trench. The unit was expanded to the entire structure, after which multiple building episodes were evident through the overlapping wall trenches (Figure 13). The last building episode represents a 7 m x 7 m square Mississippian house with a central hearth containing abundant ash and wood charcoal. The large midden behind the house (Feature 100) was approximately 3 m in diameter and .4 m deep. The midden contained daub, ceramics, and carbonized materials in addition to a portion of a wall trench at its base.

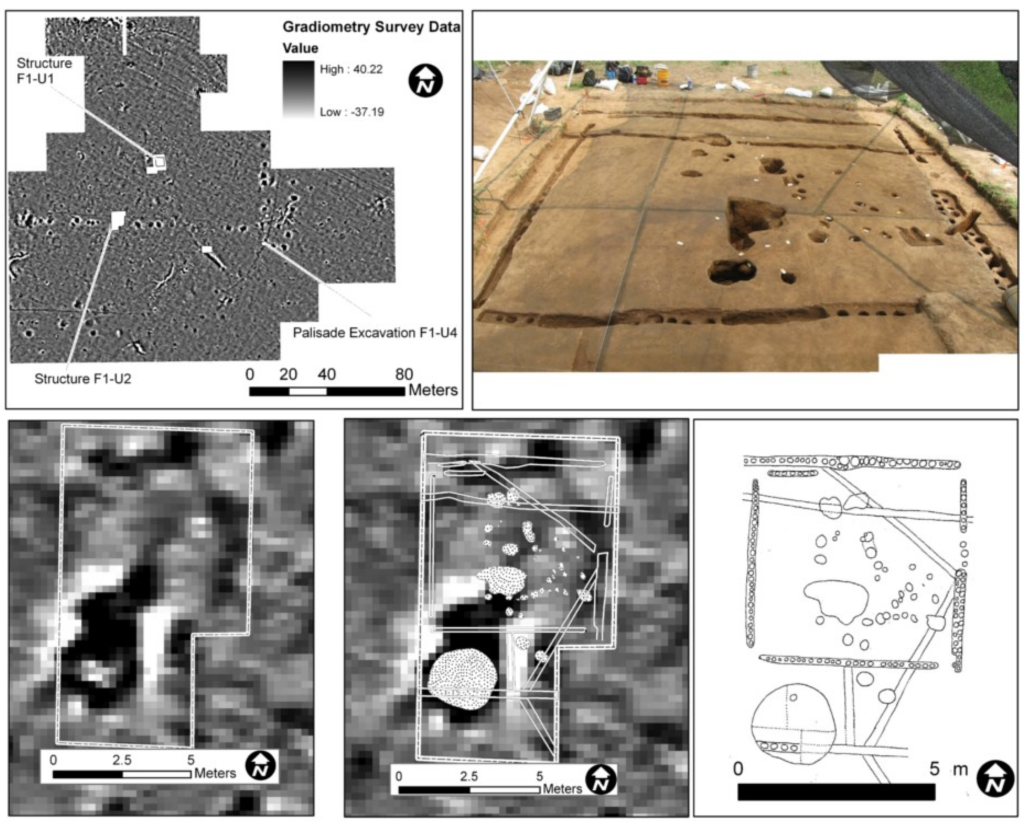


Figure 13. Rectangular wall trench house and associated features from unit F1-U2.

*Linear Anomaly.* Units F1-U3 and F1-U4 were placed to ground truth the positive linear anomaly. The linear anomaly was further tested in units F1-U6, F1-U8, F1-U9 and F1-U10 (Figure 14). A calculation error in translating magnetometry intervals to site coordinates resulted in unit F1-U3 being placed about 2 m west of the linear anomaly in an area devoid of any magnetic anomalies. Though the unit was placed in error, it had a positive benefit in that it functioned as a test unit and showed that excavating an area with no magnetic anomalies will result in negative subsurface findings.

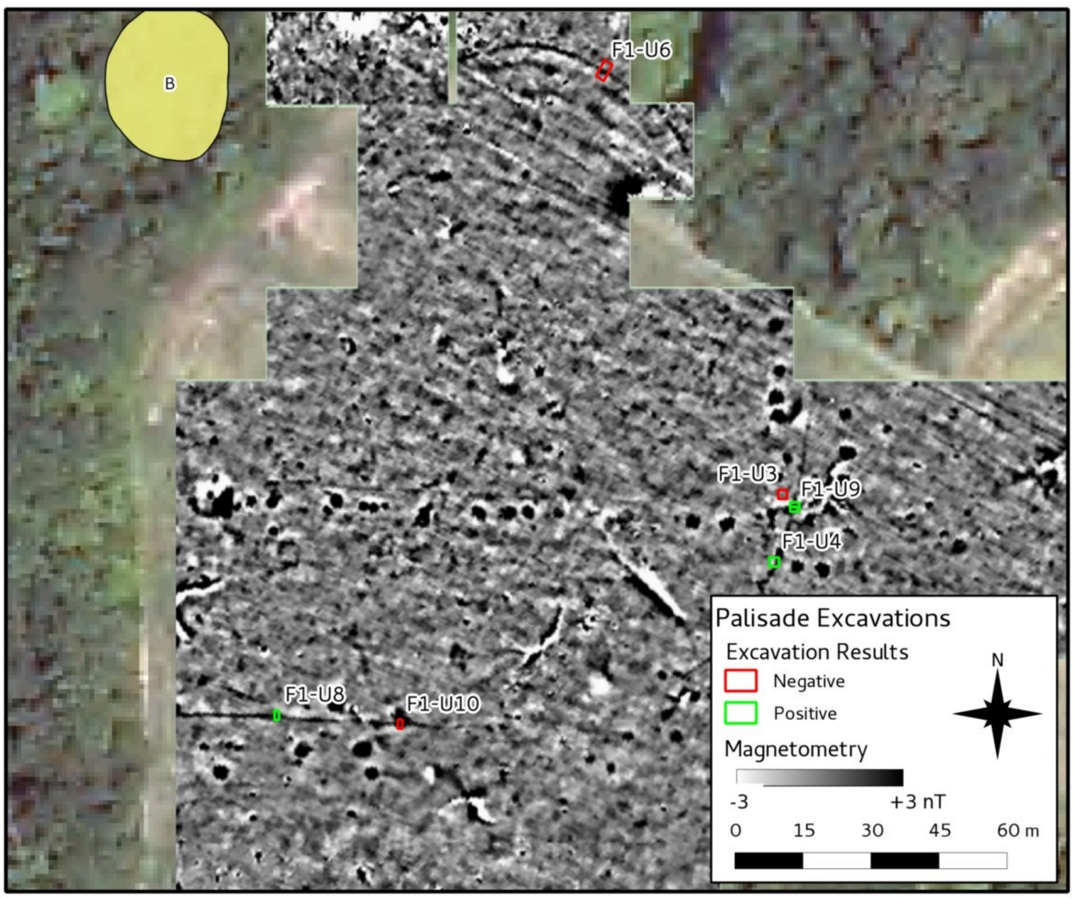


Figure 14. Test excavations showing presence or absence of palisade features along the linear anomaly.

A trench and three posts were uncovered in F1-U4 (Figure 15) which provided the first evidence for a palisade surrounding the site. The trench and post molds were first visible approximately .5 m below the surface beneath a double plow zone. Four posts were visible in the trench ranging in size from .15 m to .4 m in diameter. Because only trace amounts of charcoal were found in the post molds, the unit was expanded 1 m to the south, revealing an additional post (Figure 16) which also contained only small amounts of charcoal.


Figure 15. Palisade trench and post molds in unit F1-U4.

Figure 16. Postmold excavation in progress in unit F1-U4.

A portion of what was thought to be the northern section of the palisade was excavated in F1-U6. The area was chosen for two reasons. First, the magnetic signatures were stronger than in other areas across the site. Second, a noticeable hump and ditch is visible on the surface that corresponds to the magnetic signature and is outside the modern agricultural field boundary and, which was thought to be undisturbed. About .1

m below the surface a feature was visible but upon cleanup and further excavation disappeared. Excavation continued through the plow zone to the subsoil, however the feature never reappeared (Figure 17). This area contained a test plot for crops in the 1980s and the magnetic signature probably is not due to a palisade, but rather due to a modern fire break that was plowed at this location for prescribed burning (Evans, personal communication 2010).


Figure 17. F1-U6 excavated to subsoil with no evidence for a palisade.

After evidence for a palisade was negative in unit F1-U6, a 1 m x 2 m excavation unit (F1-U8) was placed over the southern portion of the linear anomaly to test for evidence for the palisade and, if present, attempt to recover sufficient material from a postmold for radiocarbon analysis. After the plow zone was stripped a trench was visible .2 m below the surface, but no posts. About .3 m of fill had to be removed from the trench before three postmolds were visible (Figure 18). Just as in F1-U4, the postmolds yielded only small amounts of charcoal which were not significant enough to date.


Figure 18. Palisade posts and trench in unit F1-U8.

Unit F1-U9 began as a 4 m x 2 m excavation. The palisade trench and three postmolds, designated one through three from south to north, were uncovered after the plow zone was removed to a depth approximately .3 m below the surface (Figure 19).

The postsmolds ranged in size between .17 m and .25 m.  The unit was expanded 2 m to the north, revealing three more postmolds designated four through six from south to north with approximately the same dimensions as posts one through three.


Figure 19.  Three palisade posts and trench visible in unit F1-U9.

The final excavation over the palisade feature was unit F1-U10, placed 26 m east of unit F1-U8 over the linear anomaly and a positive circular anomaly 3 m in diameter. This location was chosen because it was hypothesized that the association of the circular anomaly to the linear anomaly was a result of higher activity in that area of the palisade, possibly due to fire or the presence of a bastion. After removal of the plow zone no evidence of the palisade could be seen. Excavation continued to .5 m below the surface, the same level that post molds appeared in unit F1-U8 to the west, however a trench or posts were still not visible. Since the palisade appeared on all of the other excavation units south and east of the habitation area, it is likely that the palisade could not be seen in this unit because of natural processes.

*Wedge Anomalies.* Two excavation units, F1-U5 and F1-U7, were placed over a wedge anomaly between the row of houses and the southern palisade (Figure 20). No features were recorded in either excavation. Because of their distribution across the survey area and the absence of cultural features, the wedge anomalies are thought to be ephemeral gullies. Ephemeral gullies are small gullies that result from modern agricultural practices and can be filled through further plowing or by filling with sheetwash. The strong magnetic gradients are likely the result of magnetically enriched topsoil filling in the gullies and contrasting against the magnetically weaker subsoils.

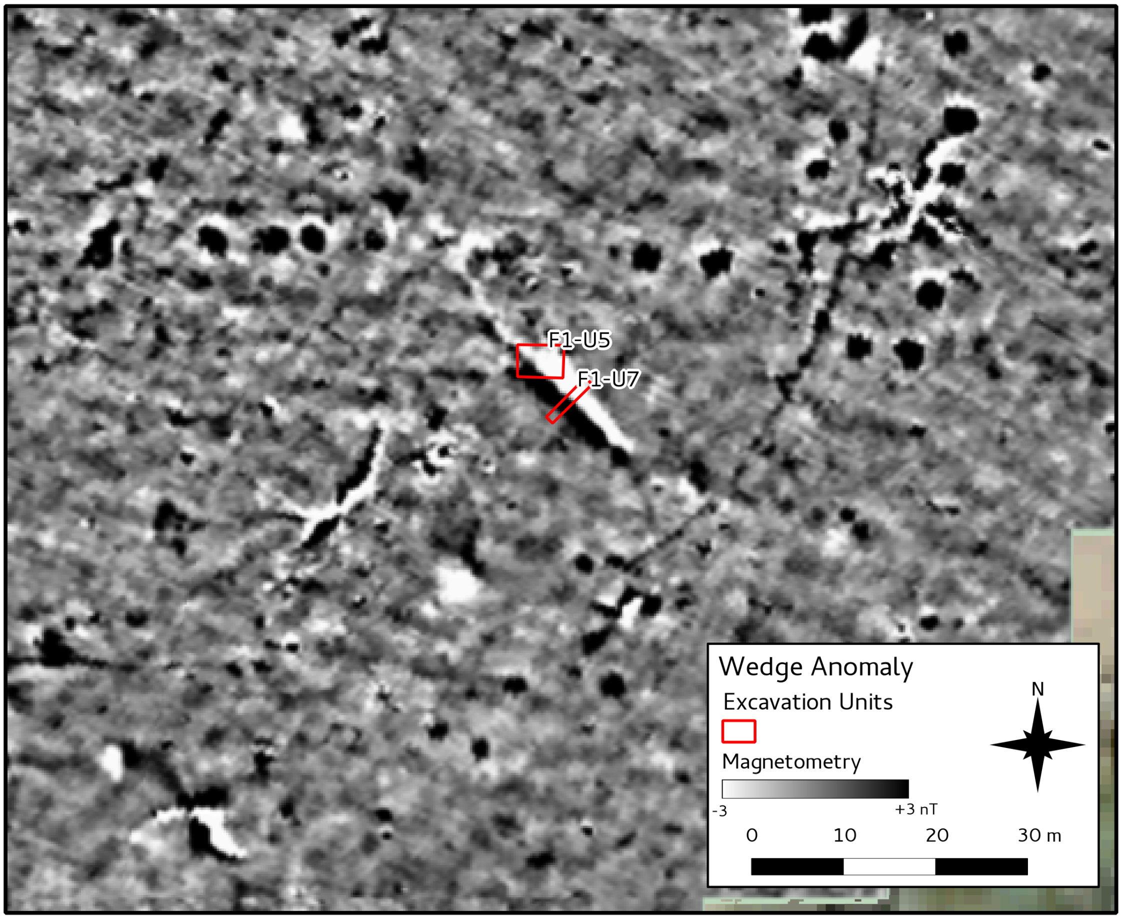


Figure 20. Excavation locations over the wedge-shaped anomaly.

## 4. Analysis and Discussion

*Ames Community Plan*

Based on survey data, some aspects of the Ames community plan can be discerned. Ames appears to consist of mound, plaza, and residential areas enclosed within a palisade. A central plaza separates the mounds on the northern side of the town from the residential area on the south side (Figure 21).

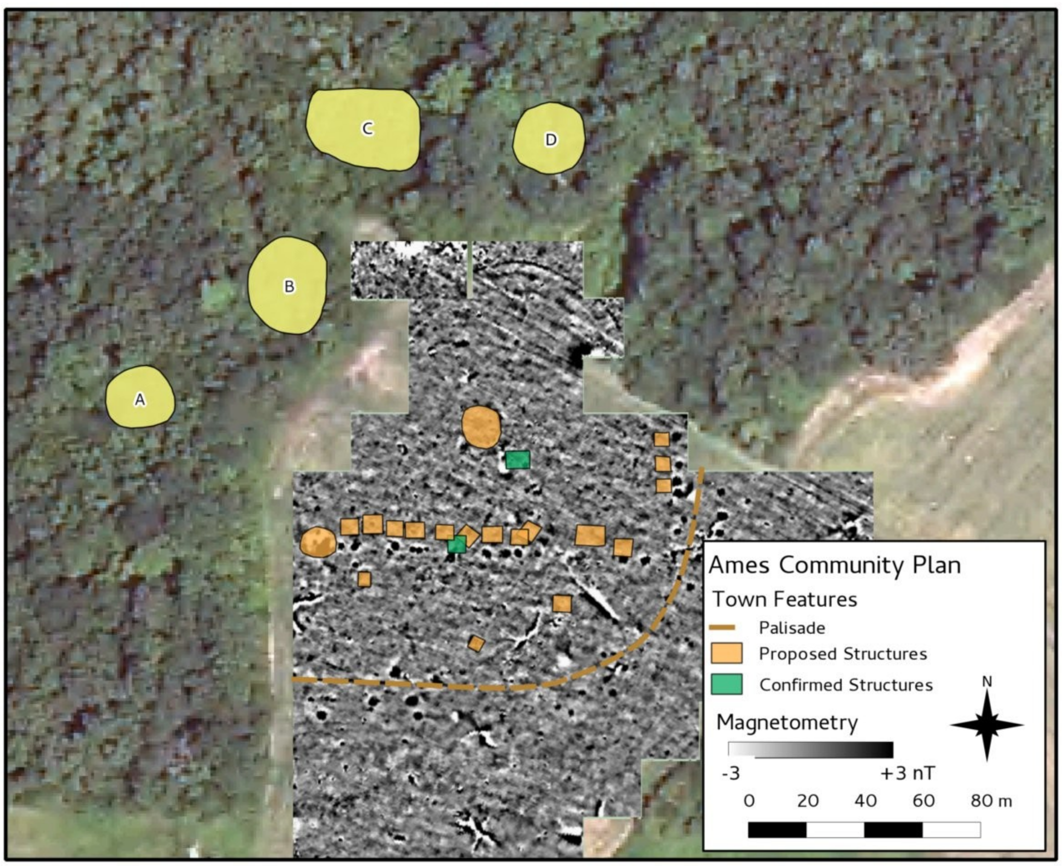


Figure 21. The layout of the Ames town and mound center.

The residential area is shaped in a "L" pattern on the south and east side of the plaza and is visible in the magnetometry data as a series of positive circular anomalies. At first it was thought that each circular anomaly represented a house; upon excavation, however, the circular anomalies were discovered to be middens whose stronger magnetic signatures masked the adjacent wall trenches. Each midden is probably associated with a house, representing between 18 and 24 structures. The middens, and probably the houses, cluster in groups of three or four and are representative of household-level social organization. Households were likely organized along the lines of extended families, as documented at the nearly completely excavated King site (Hally 2008). Mississippian house-midden associations have been documented at other sites, including at Jonathan Creek (Figure 22) along Kentucky Lake in southwestern Kentucky (Webb 1952:62).

Figure 22. Midden pits associated with a Mississippian structure at the Jonathan Creek site in southwestern Kentucky (Courtesy of the William S. Webb Museum of Anthropology, University of Kentucky, negative number 07318).

Artifact Densities are highest around the habitation areas and the circular structure in the middle of the proposed plaza (Figure 23). The most intense artifact densities appear in the locations of midden pits identified through the magnetometry survey or adjacent to structures. Though the spatial relationship between artifact densities and structures is to be expected, confirming the relationship between the magnetometry, the surface artifact densities, and structure locations is useful because it allows settlement patterns for sites which may have only been evaluated with surface surveys but not geophysical surveys to be re-evaluated.

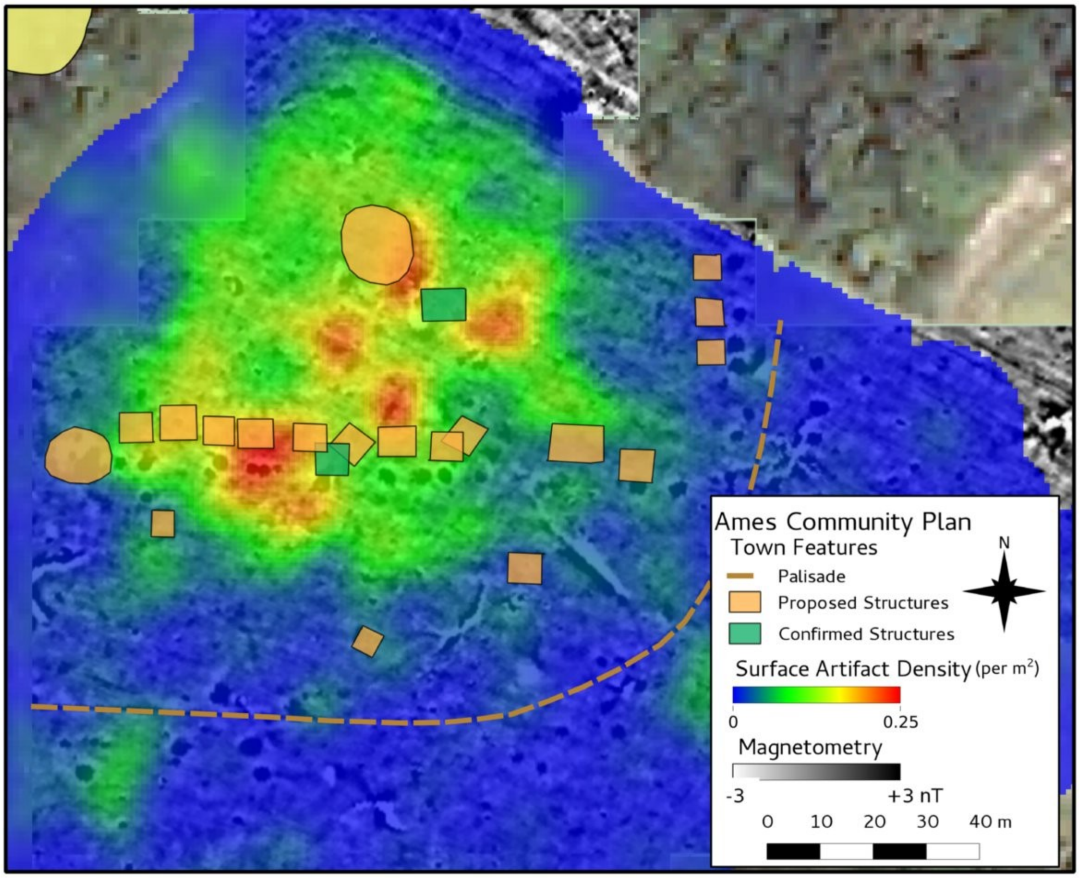


Figure 23. Ames community plan overlaid on surface collection and magnetometry data showing relationships between structures, magnetic anomalies, and surface artifact densities.

The STP results provide a different picture of discard patterns across the town that also inform on the community plan. While the surface survey revealed the highest artifact concentrations in the center of the palisade-enclosed area, the highest plow zone artifact densities occur along the outskirts of the survey area (Figure 24). The plow zone density patterning is probably due to a combination of cultural and natural processes. It is possible that higher artifact densities occur along the periphery of the town against the palisade because the inhabitants tried to avoid leaving the safety of the palisade whenever possible due to conflict in the region. The limited charcoal from palisade contexts and the increased artifact densities next to the palisade support the possibility that the palisade was a means of protecting inhabitants from rival chiefs' raiding parties instead of as a defensive measure against a large-scale assault on the town. Natural processes such as erosion could also be responsible for moving artifacts down slope and towards the field boundary, though this is doubtful because two of the shovel tests with the higher artifact counts occur in the middle of the field.

Based on the current STP results indicating higher artifact accumulations on the north, west, and south sides of the town, it would appear that the east side housed the entrance to the town. With that said, interpretations could be improved by conducting a second systematic random sample of the area, reducing the quadrat size, or expanding the survey to the north and west.

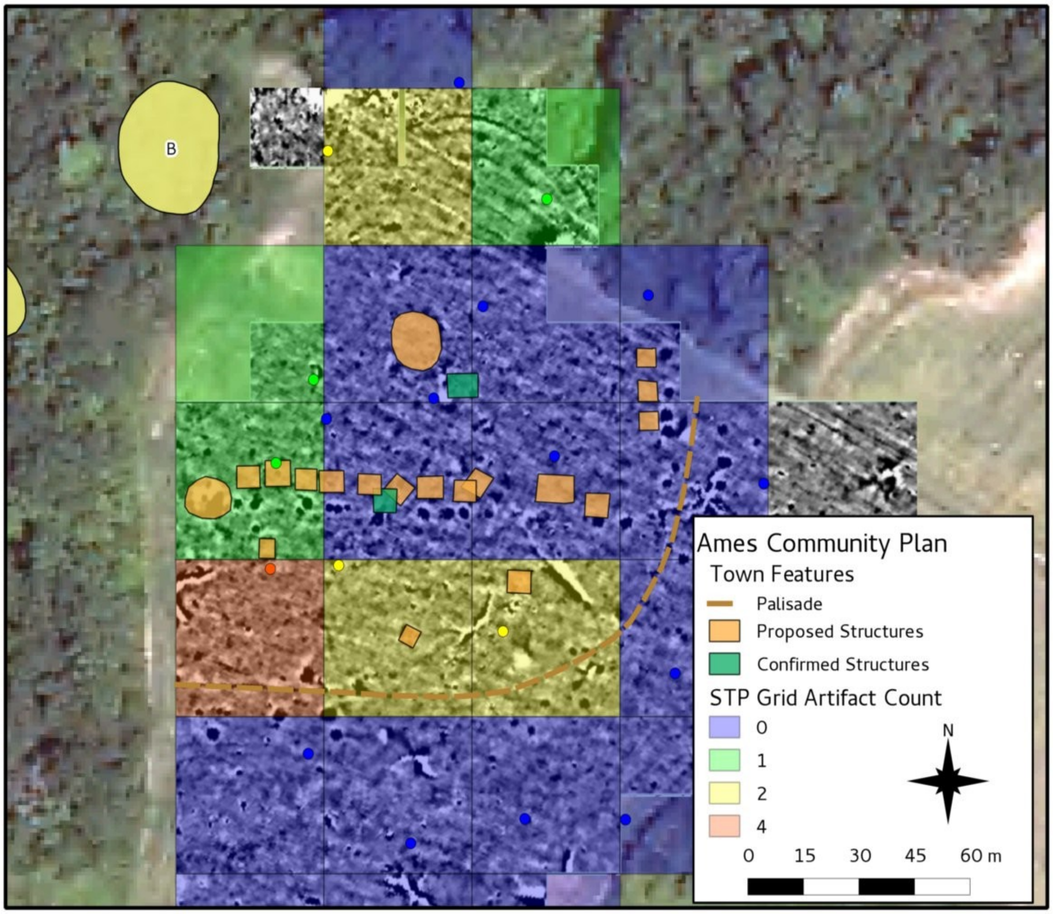


Figure 24. Plow zone artifact density in relation to magnetometry survey and structure locations. The highest artifact densities occur along the perimeter of the town.

*Regional Comparisons*

Ames has several similarities to the Owl Creek Mounds site (22CS502) located in Northern Mississippi including size, dimensions, and temporal characteristics. Owl Creek is a multi-component site consisting of five platform mounds arranged around a plaza. Like Ames, Owl Creek has also been called a vacant mound center due to low artifact recovery rates from surface collection and shovel testing (Figure 25) (Rafferty 1995:108). The Mississippian component dates between A.D. 816 to A.D. 1219 based on radiocarbon dates taken from mound contexts (Rafferty 1995).

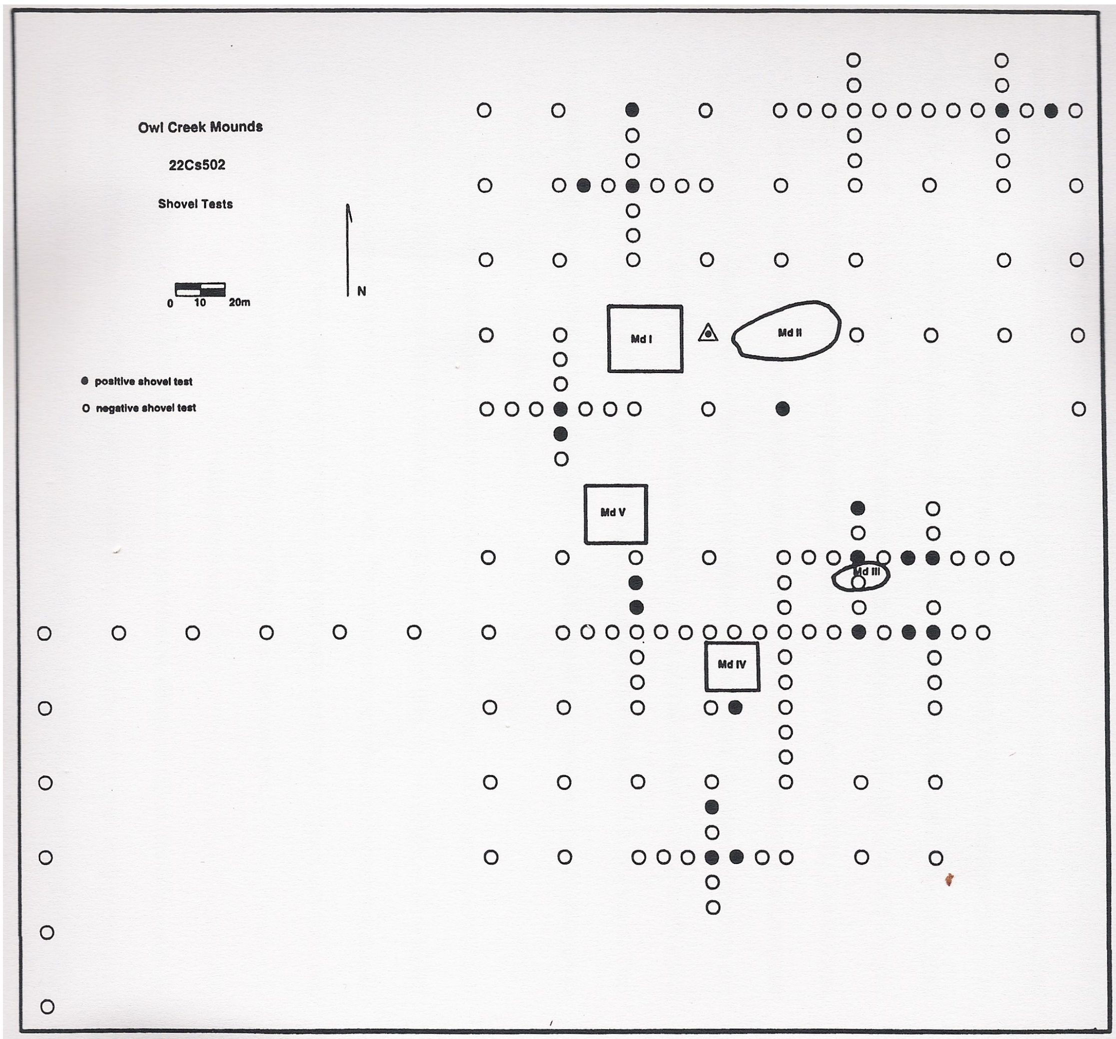


Figure 25. STP results from Rafferty's Owl Creek Mounds excavations (1995:Figure 38).

Several surface surveys were conducted during Owl Creek's research history, recovering less than 200 artifacts total (Rafferty 1995:137). Owl Creek was also extensively shovel tested, with 161 STPs dug systematically across the site at 30 m intervals; when a positive STP was encountered two additional STPs were placed in each cardinal direction at 10 m intervals (Rafferty 1995:107). Of the 161 STPs, 20 were positive; of these, ten STPs yielded 12 shell or grog/shell-tempered sherds (Rafferty 1995:108).

While Ames underwent extensive geophysical testing that was essential to locating the habitation area, Rafferty (1995:114-117) conducted a soil analysis on STP fill examining phosphates and soil acidity around Owl Creek and compared the results with the STP findings. The areas with high phosphate levels and a high pH level were encountered around historic artifact concentrations (Rafferty 1995:114). However, elevated phosphate and pH levels were also encountered around mounds III and IV, areas which also featured a concentration of positive STPs with prehistoric artifacts. Rafferty (1995:114-117) notes that "elevated phosphate and pH levels in a few areas at Owl Creek show that prehistoric activity levels that produced relatively few artifacts can affect soil chemistry in a manner detectable 1000-1500 years later" and concludes, "It seems doubtful that there ever were any non-mound areas with high artifact density at the site in prehistoric times."

Based on recent research at Ames, Owl Creek may not be a vacant center. Ames and Owl Creek shovel test artifact counts per STP are similar, with mostly negative STP results interspersed with a few STPs containing between one and four artifacts. Even the surface collections are similar; the first year Ames was surveyed only 283 artifacts were recovered; that number increased significantly the following year due to a "perfect storm" of collecting conditions. Despite the low numbers of artifacts recovered, a settlement lurked beneath the plow zone, undetectable until geophysical methods were employed. Instead of a geophysical survey to reveal the community plan, the chemical soil analysis at Owl Creek likely shows the location of the habitation area.

The misclassification of sites as vacant centers stems from a misunderstanding of what surface and shovel testing reveals. In the Owl Creek report, artifact "densities" are used to describe artifact counts; the volume is never taken into consideration. This is clearly demonstrated in the Ames shovel tests, where an STP with a count of four artifacts and a volume of .014 $m^3$ has a density of 282.9 artifacts per cubic meter of fill—a significant increase over the artifact count. Even when taking volume into account for shovel tests, surface collection densities still remain quite low. At Ames the peak surface artifact densities were only .25 artifacts per square meter.

Early Mississippian sites such as Ames and Owl Creek, as well as other sites in the region are not very obtrusive when evaluated using traditional survey methods. Denmark (40MD85) and Bolivar (40HM2) in Western Tennessee have also been "characterized by an extremely low density of artifacts on the ground surface" according to Mainfort (1992:204). However, an extensive magnetometry survey conducted at Denmark, a site near the Forked Deer River southwest of Jackson, Tennessee has revealed numerous houses around three mounds (Scott Hadley, personal communication 2011). Clearly, low artifact densities alone cannot be used to rule out the presence or absence of habitation areas.

The presence of a palisade and numerous structures at Ames provides the necessary evidence to confirm the hypothesis that Ames represents a classic Mississippian nucleated settlement. Ames joins a growing list of Mississippian towns in the Southeast including the Obion site in Northwest Tennessee (Garland 1992) and the Lubbub Creek site along the Tombigbee River in Northern Alabama (Blitz 1993). Just as Pauketat (2007:89) notes, as vacant centers continue to be examined most of them turn out to not be vacant at all. Further research is still needed needed to gain a better understanding of Mississippian settlement patterns in the region, but as other vacant centers are investigated they will likely turn out to be nucleated settlements similar to Ames.

## 5. Conclusions and Future Research Directions

The hypothesis that Ames was a Vacant Ceremonial Center has been refuted based on results of surface collection, shovel tests, magnetometry surveys, and excavation. The Nucleated Sedentary Model has been confirmed. Ames inhabitants constructed a small fortified town consisting of 18-24 houses adjacent to the mound center within the palisade. The town was most likely organized with dwellings clustered in extended family groups. The Ames research indicates other sites in the region may also be similarly misclassified as Vacant Ceremonial Centers.

The integration of traditional survey techniques with geophysical methods has brought attention to the unobtrusiveness of Mississippian settlements and how easily they can be missed because of a common misconception of the data. Surface survey at Ames resulted in the collection of 1,416 artifacts over approximately 23 ha with an average artifact density of .006 artifacts per square meter—well below what one would expect if settlements were present in the study area. Even when limited to the field south of the mounds with a confirmed town, the mean artifact density increases to only .007 artifacts per square meter, with a maximum of .25 artifacts per square meter.

Shovel test surveys have a similar problem in that they are usually presented as positive or negative with artifact counts in the single digits which can misrepresent the data by making the results appear artificially low. However, a negative shovel test does not mean the absence of material culture; it simply means the material culture is below a detectable threshold given the method employed. Presenting the artifacts per unit of volume from the shovel tests provides a more accurate representation of the data.

Comparing traditional survey techniques to geophysical data indicate that traditional techniques are still valuable tools for locating areas of intense prehistoric activity when the above considerations are taken into account. The techniques are also beneficial as a complementary data source to geophysical survey because they each measure different signatures of the archaeological record. While shovel tests and surface collection provide information about *artifact* discard patterns, magnetometry, at least on prehistoric sites, detects features across the landscape that are due to anthropogenic activity.

Though the Vacant Center Model has been refuted, much work remains to be completed to increase our understanding of settlement patterns in the region. A brief overview of some research goals both at the Ames mounds and at a regional scale is outlined below.

At the site level one important objective is to determine the temporal relationship between the mounds and the town at Ames. Several radiocarbon assays have been acquired from mound contexts that securely place the mounds in the Early Mississippian period between A.D. 1020-1270 (Mickelson 2008:Table 1). One radiocarbon assay has been acquired from Structure 1 that yielded a date between A.D. 1270-1320, at the upper end of the mound context date (Mickelson and Goddard 2011). Further dating of the superposed wall trenches of Structure 1 could provide an occupational time frame for the habitation portion of the site. A radiocarbon assay from the palisade would also help determine whether the mounds and town are contemporaneous and provide additional insight into the construction sequence of the town.

Moving beyond chronological considerations, only the extent of the southeastern portion of the Ames settlement is known; no surveys were conducted in the wooded area west and north of the mounds. Re-testing the area around the mounds through an expanded systematic random sample shovel test survey can provide data about the site extent in the heavily wooded areas that make magnetometry survey impractical. Because the wooded conditions rule out surface survey and magnetometry, reducing the quadrat size from 40 m to 20 m or 30 m would provide more precise results.

The town discovered adjacent to the mound complex at Ames represents one type of site within the Nucleated Sedentary Model. Other habitation areas such as hamlets and farmsteads should be present on the surrounding landscape which would have been affiliated with the Ames mounds. Continuing the large-scale multiple method survey is required to identify such sites. Because of the time investment required to conduct three different surveys over large areas, one practical method would be to first survey using traditional methods such as shovel tests and surface collections depending on surface visibility, and follow up with targeted geophysical survey.

Finally, the large-scale surveys will further clarify the settlement patterns by identifying how many tiers are present in the hierarchical model. Do the Ames, Denmark, and Bolivar mound sites represent the second tier as local mound centers, or are they the paramount mound centers of the region that collect tribute from local mound centers and the surrounding hamlets and farmsteads? After mapping the smaller settlements a site catchment analysis could be conducted in a GIS to identify the influence of each mound center. An added benefit of this type of analysis is that it could serve as a model for locating previously unknown sites on the landscape by identifying the catchments with conspicuously few sites.

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