Footprints

In the Footprints of Squier and Davis:
Archeological Fieldwork in Ross County, Ohio

Lynott

FOOTPRINTS

IN THE FOOTPRINTS OF SQUIER AND DAVIS: ARCHEOLOGICAL FIELDWORK IN ROSS COUNTY, OHIO

LYNOTT

Midwest Archeological Center
Special Report No. 5

NATIONAL PARK SERVICE
Midwest Archeological Center

United States Department of the Interior
National Park Service
Midwest Archeological Center
Lincoln, Nebraska
2009

This report has been reviewed against the criteria contained in 43CFR Part 7, Subpart A, Section 7.18 (a) (1) and, upon recommendation of the Midwest Regional Office and the Midwest Archeological Center, has been classified as

Available

Making the report available meets the criteria of 43CFR Part 7, Subpart A, Section 7.18 (a) (1).

ACKNOWLEDGEMENTS

The papers in this volume were originally prepared for presentation at a symposium titled "In the Footprints of Squier and Davis: Hopewell Archaeology in Ross County, Ohio" at the 68th Annual Meeting of the Society for American Archaeology in Milwaukee, WI (April 11, 2003). We regret the long delay in making these papers available to a wider audience, but hope that the data and ideas in this volume will be a useful contribution to Ohio Hopewell archeology.

Much of the research presented in this volume has benefitted from the support and encouragement of the staff at Hopewell Culture National Historical Park. Superintendents John Neal and Dean Alexander provided much support and encouragement for the research and papers presented here. Park Archeologists Dr. Bret Ruby and Dr. Jennifer Pederson Weinberger helped coordinate and organize many of the projects in this volume, and any success we may have achieved is also due to the interest and assistance provided by Dr. Jarrod Burks and Dr. Kathy Brady. We also appreciate the cheerful assistance of Jon Casson, Phil Egan, William Jones, Laura Long, Bonnie Murray, Rick Perkins and Rebecca Jones.

We appreciate the efforts of the staff of the Chillicothe Veterans Administration Medical Center to provide housing for various field teams working on projects at Hopewell Culture National Historical Park. The VA staff made the archeology teams feel welcome and showed interest in their research. We truly appreciate the support of Directors Mike Walton and Douglas Moorman, Associate Director Keith Sullivan, and Jay Wilkins, Engineer. Their cooperation in providing housing for the field teams made the research more convenient and effective.

The staff of the Midwest Archeological Center provided important assistance during all aspects of this project. Carrol Moxham, John Andresen, Jeff Larson, Anna Loach and Cynthia Wiley all helped prepare various parts of the manuscript for publication. Erin Dempsey provided a much needed dose of energy and enthusiasm during the final preparation of this volume. Allan Weber used his skill and creativity to put the papers into a pleasant format and worked with the authors in getting papers into final form.

On behalf of all the contributors to this volume, we want to thank our colleagues, friends and families for encouraging and supporting our study of the archeological record relating to the ancient society we call Ohio Hopewell. Those of us who have had the privilege of conducting archeological research in Ross County, Ohio truly appreciate the pioneering efforts of Ephraim G. Squier and Edwin H. Davis. More than a century and a half later, their work on the great earthen monuments in this area continues to inspire and encourage our fascination with Ohio Hopewell archeology. While the technological, methodological and theoretical advances presented in this volume offer great promise for future investigations, more fieldwork is urgently needed. Squier and Davis commented on the degradation of the mounds and earthworks in the mid-nineteenth century, and the situation only becomes more urgent with time.

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CHAPTER 1

IN THE FOOTPRINTS OF SQUIER AND DAVIS: ARCHEOLOGICAL FIELDWORK IN ROSS COUNTY, OHIO

By
Mark J. Lynott

Public perception about the archeological record has been built over time largely by great and exciting archeological discoveries. The discovery of Tutankhamen's tomb and the Rosetta Stone in Egypt, excavation of the tombs of Mayan and Incan rulers, and even the discovery of Paleolithic cave art at Lascaux and Altamira have generated knowledge and interest in the archeological record. The mystery associated with archeological discoveries has always fascinated the general public. Public interest and knowledge about the archeological record of North America took a giant step forward in 1848 when the newly created Smithsonian Institution published *Ancient Monuments of the Mississippi Valley* by E.G. Squier and E. H. Davis.

Aboriginal earthen mound and enclosure sites have been reported from every corner of Eastern North America and the age, nature, and character these earthen monuments has been the subject of speculation and academic debate for more than two centuries. Most of the early speculation about the mounds and earthworks encountered by European explorers and settlers was based on second- or third-hand accounts of these mysterious features. More accurate descriptions of these massive earthen monuments began to appear as Euroamerican settlers moved west into the Ohio River Valley.

Previous Studies In Ohio

In the first half of the nineteenth century, Caleb Atwater (1820) published a detailed and systematic account of mounds and earthworks in Ohio. Atwater devoted much of his life to the study of the Ohio mounds and he believed the mounds were not built by American Indians. Atwater's work in Ohio, and a limited number of other first-hand reports of mounds in other parts of Eastern North America (e.g., Bartram 1996; Brackenridge 1962), fueled considerable speculation about the origin and nature of the earthen monuments in this part of the continent. Most of the speculation came from writers who had never seen the earthen monuments and led to the development of theories about a lost race of mound builders who were variously identified as migrating Polynesians, Egyptians, Greeks, Romans, Israelites, Vikings, Welsh, Scots, and Chinese (Silverberg 1968).

In the midst of these speculations, two men in Chillicothe, Ohio launched into the fledgling field of North American archeology in 1845 with an ambitious and extensive study of mounds and earthen enclosure sites. The publication of *Ancient Monuments of the Mississippi Valley* by E.G. Squier and E.H. Davis in 1848 demonstrated the importance of fieldwork in North American archeology and established this volume as a landmark in the development of American archeology that is still regularly cited by researchers today. Squier was born in Bethlehem, New York and worked as a writer and editor in Albany

before coming to Chillicothe as editor of the weekly *Scioto Gazette*. Davis was born in Hillsboro, Ohio and educated at Kenyon College where he was trained as a physician. The two met in Chillicothe and shared an interest in archeology and the Ohio mounds. Through their partnership, the pair excavated nearly 150 mounds and surveyed nearly 100 earthworks in the vicinity of Chillicothe, Ohio and despite considerable squabbles over authorship, published their research in 1848 (Barnhart 1980, 1985, 2005; Griffin 1973; Meltzer 1998).

The publication of *Ancient Monuments of the Mississippi Valley* was a landmark in American archeology for two reasons. As the first publication by the newly established Smithsonian Institution, this book clearly established the government's commitment to the study and understanding of the prehistoric heritage of the nation. Although the research reported by Squier and Davis was accomplished with private funding, the publication of this book by the National Museum of the United States was one of the first government acts in support of American archeology. By establishing the Smithsonian Institution and later funding research through the Bureau of Ethnology, the United States government further demonstrated its commitment to the study of the archeological record.

Ancient Monuments of the Mississippi Valley was the first volume in the Smithsonian Institution's Contributions to Knowledge series and it represents the first scientific effort to catalog and document the distribution, nature, and scope of the prehistoric earthen monuments of the United States. Although Squier and Davis' methods of mapping with a chain and compass seem primitive by modern standards, the maps they produced and their observations about mounds and earthworks in Ross County, Ohio are still regularly cited today. Their work is important because it was conducted at a time before agriculture and urban development had greatly impacted many of the mounds and earthworks. The maps and drawings in *Ancient Monuments of the Mississippi Valley* provide us with a glimpse of the original nature of these great earthen monuments.

Although Squier and Davis incorporated maps and observations provided by colleagues and correspondents across the Eastern United States into their book, the focus of their work was in the Scioto River valley in which they lived. Subsequent studies have revealed the limitations of their mapping work (Thomas 1894, 1889) and their technique of digging vertical shafts into the center of mounds is highly discredited today. However, their observations about sites in Ross County led later generations of archeologists to undertake further field investigations in the region (e.g., Gerard Fowke, William C. Mills, Warren K. Moorehead, and Henry C. Shetrone). The field data that they generated made an important contribution to the development of modern archeology and their maps and observations are essential records of earthen monuments that have subsequently been severely damaged by years of agriculture.

It is not surprising that two men from Chillicothe, Ohio would write the first comprehensive work on the mounds and earthworks of the Eastern United States. Chillicothe, located about 80 km south of Columbus in the Scioto River valley, was the first capital of the state of Ohio. It is also the center of the greatest concentration of mounds and geometric earthworks in the United States. Within fifty miles of Chillicothe,

Squier and Davis were able to visit and map hundreds of mounds and earthwork sites. Although they did not map every mound and enclosure site in Ross and the surrounding counties, their work forms the basis for many interpretive models of Ohio Hopewell culture (e.g., Byers 2004; DeBoer 1997; Romain 2000).

Travel in Squier and Davis' time was certainly slower and more difficult than today, but they still could easily travel northeast to Newark, southwest to Fort Ancient, and south to the Serpent Mound. In close proximity to Chillicothe, they found numerous large geometric earthworks like Mound City, Seip, Hopewell, High Bank, Hopeton, Cedar Bank, Liberty, Junction, Baum, Dunlap's, and Frankfort. They also had easy access to numerous mounds and small earthwork sites. This proximity allowed them to map and catalog a large number of important sites and their work provides modern archeologists with early observations about sites that have been greatly altered by years of cultivation and development.

The damage caused by agriculture and urban development is well documented throughout *Ancient Monuments of the Mississippi Valley*. Squier and Davis (1848:73) noted in regard to the earthworks at Marietta, the "town of Marietta is laid out over them; and in the progress of improvement, the walls have been considerably reduced and otherwise much obliterated." The authors noted similar impacts from the development of towns at earthwork sites in Chillicothe, Frankfort, Portsmouth, and throughout the Ohio River valley. In describing the Great Circle at Hopeton, Squier and Davis (1848:51) noted that the wall "although it has been much reduced of late years by the plough, it is still about five feet in average height."

Since the publication of *Ancient Monuments of the Mississippi Valley*, many additional studies have cataloged and described the number and extent of mound and earthwork sites in Eastern North America (e.g., Hinsdale 1931; Lapham 1855; Lily 1937; Mills 1914; Thomas 1894). These are becoming increasingly important, because the archeological record in general, and mounds and earthworks in particular, have been and are being damaged and destroyed at an alarming rate.

The effect of long-term agriculture on mounds and earthworks is intuitively obvious, but it has also been documented through the study of aerial photographs and agricultural practices (Blank 1985). Cultivation in Ross County, Ohio was conducted largely with horse drawn plows until at least the mid-1920s. Cultivation with this equipment rarely exceeded 6 in deep. Small gasoline powered tractors began appearing in the mid-1920s, but did not become common until 1937 when rubber tired tractors were introduced in the region. These small tractors permitted cultivation to an average depth of only about 8 in but they also permitted farmers to begin using chemical fertilizers. The introduction of more powerful tractors in the mid-1950s permitted farmers to use larger plows and cultivate to depths of 12 in.

John Blank (1985) examined all known aerial photographs of the Hopeton Earthworks north of Chillicothe, Ohio and saw that most of the earthen walls, as illustrated in *Ancient Monuments of the Mississippi Valley* were still intact when the first photograph was taken in 1938. Degeneration of the earthen walls occurred mainly by lowering and widening the walls through repeated cultivation. The rate of degeneration

was very slow until tractors became common about 1937. Degeneration increased markedly in the mid-1950s with the introduction of larger and more powerful tractors. Blank (1985:59) observed that after 1957, the width of the earthwork walls increased at a rate of 30 cm (1.0 ft) per year and the height of the walls were lowered at a rate of 30 cm (1.0 ft) per year. Blank's study and analysis indicated that if cultivation had continued at Hopeton, the earthwork walls would be undetectable today.

Blank's (1985) observations from the photogrammetric study of the Hopeton Earthworks are probably applicable to most earthwork sites that have been exposed to cultivation in southern Ohio. Most mound and earthwork sites that are visible today have either been intentionally preserved or they have been incorporated into historic cemeteries, fence rows, or other features that have not been exposed to annual cultivation. Although these aboriginal earthen monuments were once impressive and numerous throughout southern Ohio, they are becoming increasingly rare. Archeological study is needed before what remains is lost forever.

Hopewell Studies Today

For more than a century and a half, archeological investigation of Ohio Hopewell sites focused largely on mounds and mortuary features. The nature of Ohio Hopewell research began to change in the 1960s when Olaf Prufer (1965) proposed that the great earthen enclosures of southern Ohio were vacant ceremonial centers and that the people who built them lived nearby in small hamlets or villages. In the 1980s and 1990s, Ohio Hopewell archeological studies shifted focus from mounds and mortuary events to habitation sites, settlement patterns, and subsistence practices. Gradually, more detailed models of the Hopewell world began to emerge. This has led to the development of additional models regarding astronomical alignment of earthworks and construction of ceremonial roads (Hively and Horn 1982, 1984, 2006; Lepper 1995, 2005, 2006; Romain 2000). Unfortunately, there have been far too few recent field studies, so most of the interpretive models relating to Ohio Hopewell are based on limited data or data collected many years ago without modern collection and analytical techniques.

Contemporary Ohio Hopewell field research falls into two general categories: earthen enclosure studies and settlement/subsistence studies. The basic goal of research on earthen enclosures is to learn when they were built, how they were built, and how they were used. Due to the vast size and nature of many of the earthen enclosures, these studies tend to focus on how prehistoric people modified the natural landscape to create unique prehistoric cultural landscapes. Settlement/subsistence studies are aimed at identifying the places where Hopewell people lived and how they used the landscape. These two areas of study are not mutually exclusive and some papers in this volume address both areas of study.

Earthen enclosure sites have a very long history in Eastern North America. Joe Saunders and his colleagues (2005) have documented the presence of minor earthworks in association with Middle Archaic mound complexes in northeast Louisiana about 3500 B.C. Two thousand years later, the builders of Poverty Point established a scale of monumental earthen architecture that dwarfs all but a handful of sites in North American prehistory (Gibson 2000).

For many years, interpretations about the function of monumental earthen architecture were largely speculative. Today, archeologists are utilizing a wide range of scientific tools and techniques to explain these ancient structures. The new scientific data from these studies in combination with ethnographic and oral history information are generating new and useful interpretations about the social and sacred character of Ohio Hopewell earthen monuments (Byers 2004; DeBoer 1997; Hall 1997; Mainfort and Sullivan 1998).

Although archeologists have long speculated about the nature of the large and unique Hopewell geometric earthen enclosures in southern Ohio, individual sites have received relatively little attention. Many large enclosure sites have never been carefully mapped or excavated, due in part to the great size of these sites and the difficulty in answering questions with traditional excavations and sampling techniques. Although archeologists have visited these sites for many years and offered settlement models to explain the relationship between sites, traditional studies have failed to answer the most basic questions about the earthworks themselves: when were they built, how were they built, and how were they used? Our inability to answer these questions about even one large earthwork site has seriously limited our ability to address the more sophisticated anthropological questions associated with Ohio Hopewell.

Congressional support for the preservation and study of the great Hopewell earthworks in southern Ohio was demonstrated in 1992 with the passage of legislation that expanded Mound City Group National Monument and changed its name to Hopewell Culture National Historical Park (Public Law 102-294). That legislation authorized the National Park Service to purchase the Hopewell Mound Group, High Bank Works, Seip Earthwork, and additional lands surrounding the Hopeton Earthworks. This legislative support, combined with research funds from the National Park Service, launched an expanded effort to increase knowledge about Ohio Hopewell earthen monuments.

While mounds and earthworks are the most visible aspect of the Ohio Hopewell archeological record, current researchers are also investing substantial energy toward identifying and interpreting Hopewell habitation localities. William Dancey and his students have generated a model that builds upon Prufer's (1964) vacant ceremonial center model (Dancey 1991a, 2005; Dancey and Pacheco 1997; Pacheco and Dancey 2006). This model proposes that Ohio Hopewell people lived in dispersed sedentary communities. The primary sites associated with this settlement pattern were dispersed sedentary households comprised of single or extended families occupied over multiple generations. These household sites were clustered around earthworks or mound centers and spaced along major river valleys. The people living around the earthworks and mound centers practiced hunting and gathering and cultivation of native, starchy seed plants.

Not all scholars support the dispersed sedentary community model. Richard Yerkes (2005, 2006) has argued that Ohio Hopewell were complex but mobile tribal societies. Yerkes proposes that the Hopewell achieved considerable cultural complexity through organizational flexibility without food surpluses, specialized production, or permanent residences. In his view, the Hopewell relied on a diverse range of subsistence resources including the use of starchy seeds supplemented by other wild

foods. Yerkes suggests the construction and use of earthen enclosures served to bind dispersed members of mobile societies.

Frank Cowan (2006) also believes that Ohio Hopewell was comprised of mobile populations. Cowan observes that if bladelets are removed from Ohio Hopewell lithic assemblages, what remains are largely the products of bifacial reduction technology, which is commonly found in association with mobile hunting and gathering societies. He notes that while bifaces represent a greater initial effort, they are multi-function tools that effectively serve mobile hunting and gathering groups. Cowan also notes that numerous structures have been excavated around the enclosures at Fort Ancient and Stubbs Earthworks reflecting a variety of different structural forms. Excavation of these structures exhibits limited refuse and little or no storage associated with the buildings. He believes the specialized bladelets, bladelet cores, and structures with little refuse reflect the gathering of mobile populations at earthen enclosure sites.

The lively debate about the nature and meaning of Ohio Hopewell archeology will likely continue for many years and both sides of this argument may prove to be correct. Since we have only limited knowledge about the chronological relationship between Ohio Hopewell sites, the character of settlement-subsistence practices may have changed over the course of the Hopewell era. Answering current and future questions about Ohio Hopewell societies will require new data that can only be collected from future field investigations.

Recent Field Research

Curiosity about the nature and contents of the mounds around Chillicothe, Ohio led Squier and Davis to conduct the first major archeological field study in North America. Field research is still the foundation of all archeological inquiry and contemporary scholars are using new and exciting methods and equipment to continue to explore the archeological record. This research is extremely important, because modern land-use practices are gradually destroying the archeological record. The purpose of this volume is to summarize the nature and results of recent research conducted at or near several large earthwork sites in Ross County, Ohio, the area that was the focus of Squier and Davis' (1848) field research (Figure 1-1). Improvements in digital technology and geophysical survey instruments have led many of the archeologists contributing to this volume to use geophysical survey methods to cover large areas and to identify anomalies that may represent subsurface features. Advances in geophysical survey equipment and survey methods have permitted archeologists to survey large areas and to focus their excavations on strategic locations. Consequently, some of the authors in this volume have used strategic testing to study subsurface features and to avoid random and large-scale excavations.

The use of geophysical survey instruments to map archeological sites is becoming a fairly standard practice in archeological research. Depending upon the subsurface character of the archeological record and the environmental setting of the site being studied, several instruments have proven useful in identifying subsurface features on relatively flat ground surfaces. The study and interpretation of the subsurface character of mounds and earthen walls has proven more challenging; the combination of

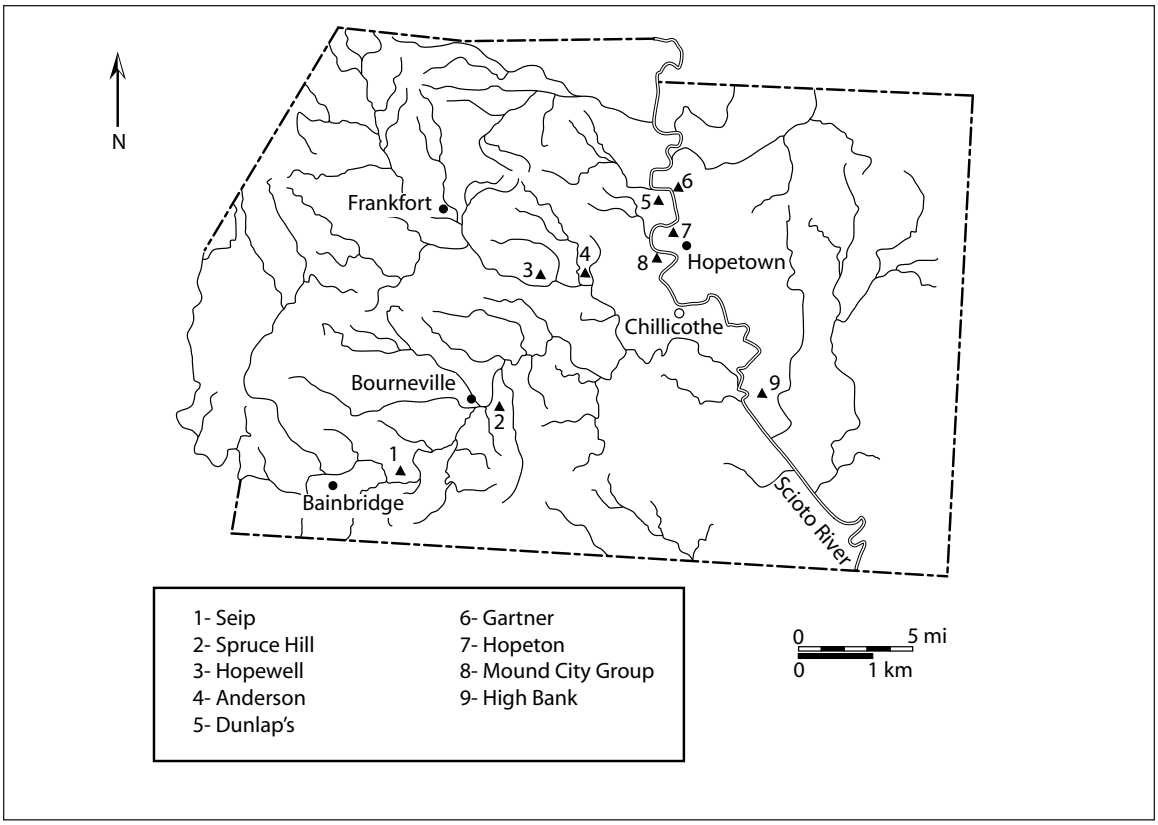


Figure 1-1. Site locations, Ross County, Ohio.

complex internal stratigraphy and topographic variation generated by the creation and degradation of the earthwork features makes the interpretation of surface geophysical data more complex.

A major component of this volume consists of papers reporting research that was conducted as part of a multi-year study of the Hopeton Earthworks. One of the goals for the Hopeton Earthworks project was to develop a methodology for mapping and studying the large geometric earthen enclosure sites in southern Ohio. In Chapter 10, Weymouth, Bevan, and Dalan describe the results of their geophysical studies of the rectangular enclosure at Hopeton. In addition to large-scale surface geophysical survey, they report on geophysical study of excavation profiles. Geophysical study of excavation units is not routine in archeology. While increasing numbers of archeologists are using surface geophysical data to plan excavations, few studies have been conducted to relate surface geophysical data to subsurface archeological deposits. These three authors bring their vast experience to address the challenge of using geophysical equipment and methods to interpret earthwork features. This chapter represents an important first step in understanding why geophysical survey instruments can be used to study the subsurface character of earthen walls and mounds. Their leadership in this field has encouraged many other scholars to incorporate geophysics into their study of the archeological record.

Prior to the development of digital geophysical instruments, the vast size of the geometric earthen enclosure sites in southern Ohio made it too time consuming and

expensive for archeologists to conduct meaningful scientific research on these sites. Trenches to examine the contents of earthen walls have been excavated at a number of sites (e.g., Hopewell, Newark, Turner) but only the efforts of Robert Riordan at the Pollock Works (1995, 2006) and Robert Connolly at Fort Ancient (Connolly and Lepper 2004) have produced sufficient information to begin to understand when and how the earthen walls were built. In this volume, three chapters provide important new information about earthen enclosure sites in Ross County, Ohio. Chapters by Greber and Shane on the High Bank Works, Pickard and Weinberger on the Anderson Works, and Lynott and Mandel on the Hopeton Earthworks provide the first substantive published accounts of research on these important sites. They also provide new insights into the complex character of the earthen walls that were built to form these geometric enclosures.

The earthworks at the High Bank Works include a large circle and octagon, smaller circular enclosures, and long linear walls. The circle and octagon combination is unique in the Scioto River valley but it is remarkably similar in configuration to the enclosures on the western end of the Newark earthwork complex (Romain 2000). Bradley Lepper (1995, 2006) has noted the similarity of these two sites in presenting his hypothesis that a road connected the Newark earthworks with the earthworks in the Chillicothe area during the Hopewell period.

In Chapter 3, Greber and Shane present the results of research conducted at High Bank. Excavation of five trenches by Shane and three trenches by Greber generated ample evidence about the methods and materials of wall construction for the Great Circle and the Octagon. Their paper documents the complex combinations of soils and gravels used in the construction of embankment walls. They also present compelling arguments for the importance of color in the selection of soils and gravels that were incorporated into the walls.

Greber and Shane's work at High Bank documented that prior to the construction of the embankment walls, the topsoil or "A" horizon was removed from the areas where the walls were to be constructed. In Chapter 11, Lynott and Mandel document a similar practice at the Hopeton Earthworks. Hopeton is about 11 km north of High Bank on the opposite side of Chillicothe. Radiocarbon dates associated with wall building activities at the two sites suggest they are roughly contemporary but the limited number of dates and the relative imprecision of radiocarbon dating makes it impossible to determine if they were actually contemporaneous.

The earthworks at Hopeton consist of a large circle connected to a large rectangle, plus two smaller circles and a pair of long parallel walls (Squier and Davis 1848). In Chapter 11, Lynott and Mandel describe the results of four trenches they excavated in the walls forming the rectangular enclosure. They observed that soil materials to build the embankment walls were derived from the landform upon which the enclosures are built and that different combinations of soil colors were used in large homogenous deposits to form the embankment walls.

Wall construction activities at Hopeton appear to have routinely included rituals involving burning wood with remnants of these rituals being incorporated in the soils

of the walls. Lynott and Mandel report that the evidence for the rituals is often found at the base of the wall with evidence of burning being found on top of the exposed subsoil or at the interface between two different soils within the embankment walls. The radiocarbon dates they report indicate that most of the rectangular enclosure was built between A.D. 100 and A.D. 250. However, one of the trenches they excavated produced substantial evidence that at least that part of the rectangular enclosure was built, or more likely modified, about A.D. 1000.

It is widely assumed that the great earthen enclosure sites in the Scioto River valley were built during the Hopewell episode of prehistory (e.g., Byers 2004; Romain 2000). It is not surprising that these great landmarks continued to be visited and used by later people, but the work at Hopeton suggests we may have to view these sites as dynamic cultural landscapes rather than static Middle Woodland monuments. This possibility has major impacts on the astronomical interpretation of enclosure sites and is consistent with the dynamic character of Old World monuments like Stonehenge (Cleal et al. 1995) and Avebury (Ucko et al. 1990), where monuments were modified over long periods of time.

The reports on High Bank and Hopeton present examples of earthen embankment that were built using a fairly complex combination of materials. Not all earthen enclosure sites in the Scioto River valley are as large or complex as Hopeton and High Bank. In Chapter 5, Pickard and Weinberger describe the walls at the Anderson Earthworks. This roughly square enclosure was reported after being observed in aerial photographs (Anderson 1980). Unfortunately, the enclosure was severely damaged in 1993 during the construction of a housing development. Pickard and Weinberger were able to excavate two trenches across different sections of embankment wall before the walls were flattened. As noted at High Bank and Hopeton, wall construction apparently started with removal of the topsoil or "A" horizon. Then a stratum of gravel and silty clay was deposited on top of the subsoil with bright red sandy clay being placed on top of this to form the core of the wall. The lone AMS date from within the walls at Anderson is slightly earlier than the dates from High Bank and Hopeton but not different enough that we can be certain that they were not contemporaneous.

In Chapter 4, Ruby reports the results of survey and testing at Spruce Hill. This important site on the south side of Paint Creek is one of the few hilltop enclosures in the Scioto River drainage. Although hilltop enclosure sites are fairly common in the Miami River drainage to the west, these types of sites are limited in Ross County. Ruby's work presents evidence that the stone walls that form hilltop enclosure are anthropogenic in character and he describes burned features that are similar to the burned remains of timber-laced structures at Iron Age sites in Europe. Ruby's work at Spruce Hill verifies the prehistoric character of the enclosure and supports the importance of preserving the site for future research.

Chapters on the construction of the enclosure walls at High Bank, Hopeton, Anderson, and Spruce Hill present new evidence about when and how the walls at these sites were built. The remaining chapters in this volume discuss evidence for types of activities that were conducted within and around earthen enclosures.

The Hopewell Mound Group on the north side of Paint Creek is one of the most important archeological sites in the United States. The site was partly excavated and mapped by Squier and Davis (1848) but really rose to prominence following excavations by Warren K. Moorehead (1922) in 1891-92. The excavations by these archeologists focused on the structure and contents of the mounds inside this giant enclosure site. Further excavations by the Ohio Historical Society (Shetrone 1926) included a trench across one of the embankment walls but also focused on excavation of mounds inside the enclosure.

In Chapter 2, Pederson Weinberger presents the results of her research to examine some of the non-mound areas within this giant enclosure. Using a combination of geophysical survey, surface examination, and subsurface testing, she discovered a previously unrecorded circular enclosure within the large enclosure. Pederson Weinberger's research also provided evidence that village or habitation debris within the large enclosure at the Hopewell site appear to be from the Late Woodland period. Hopewellian activities in the non-mound spaces within the enclosure appear to be ritual or ceremonial in nature.

During the last decade, the National Park Service has become very active in the study of Ohio Hopewell earthen enclosure sites in Ross County. The Hopeton Earthworks has been the focus of a number of different studies. In addition to the studies of the large rectangular enclosure reported by Lynott and Mandel and Weymouth, Bevan, and Dalan, there have been several studies of archeological remains near the large earthen enclosures.

Much of the recent research on Ohio Hopewell settlement and subsistence practices have been led by William Dancey and his students at The Ohio State University. They have argued that Ohio Hopewell people lived in dispersed sedentary farmsteads or hamlets in the general proximity of the larger earthen enclosure sites (Pacheco and Dancey 2006). As originally proposed by Prufer (1964, 1965), the larger earthen enclosure sites are thought to have been vacant except when smaller groups from the region gathered there for mortuary, ritual, or ceremonial activities.

Unfortunately, very few habitation sites that can be clearly attributed to Ohio Hopewell occupation have been excavated and reported. With the exception of a limited number of sites like Murphy in the Licking drainage (Dancey 1991a) and McGraw (Prufer 1965) and Brown's Bottom #1 (Pacheco et al. 2006) in the Scioto drainage, most of our knowledge is generated from surface data. The nature and character of Ohio Hopewell settlements is an exciting and fascinating subject and in Chapter 6 Dancey reports on his research at the Overly site. The Overly site is located on the same Pleistocene landform as the Hopeton Earthworks. The site is at the north edge of a large horseshoe-shaped bend in the Scioto River. Dancey and his students conducted salvage excavations at the site just before it was destroyed by gravel quarry operations. In his paper, Dancey argues that the archeological record at Overly represents permanent settlements occupied by household-scale horticulturalists. No single publication can settle the debate about the character of Ohio Hopewell settlement but this is an important contribution to that debate and will certainly stimulate further discussion.

The National Park Service purchased the Hopeton Earthworks and the lands immediately surrounding the earthen enclosures between 1988 and 1995. In 1995, the Midwest Archeological Center began test excavations along the edge of the Pleistocene terrace in the area where the parallel walls entered the floodplain. Interviews with artifact collectors and avocational archeologists had indicated that occupational debris was present on the surface when the area was in cultivation (Brose 1976). Consequently, the initial field investigations at the Hopeton Earthworks were intended to discover if there was evidence of Middle Woodland occupation in the area adjacent to the parallel walls.

In Chapter 9, Lynott describes geophysical survey and subsequent test excavations in an area of Hopeton called the Triangle site. The work at the Triangle site demonstrated that geophysical survey could be effective in identifying the location of possible subsurface features, which led to the larger scale geophysical survey effort described by Weymouth, Bevan, and Dalan in Chapter 10.

The test excavations reported on in Chapter 9 resulted in the identification of a moderate number of small- and medium-sized features and associated artifacts. Careful excavation and subsequent analysis indicated that only two of the features can reasonably be attributed to the Middle Woodland period and are likely associated with the Hopewell construction or use of the parallel walls. Neither of these features appears to be associated with habitation activities. The majority of subsurface features, fire-cracked rock, and occupational debris appear to be from Late Archaic and Late Woodland habitation of the area.

During a systematic surface survey of the land surrounding the Hopeton enclosures, National Park Service archeologists found a large number of lamellar bladelets in an area midway between the Triangle site and the rectangular enclosure. These highly specialized lithic tools are a diagnostic characteristic of the Hopewell Culture in southern Ohio (Genheimer 1996; Pi-Sunyer 1965). In 1996, Ruby directed excavations at the Redwing site to better understand what types of activities might have been conducted at this location in close proximity to a large earthen enclosure. Ruby reports on these data in Chapter 8.

Ruby's excavations at the Redwing site demonstrate that the area was not used for Middle Woodland habitation. Although excavators recovered a fair number of chipped stone artifacts, other artifacts that would be expected at a habitation site from this period (e.g., ceramics, fire-cracked rock, food remains, and subsurface features) were rare or absent. A radiocarbon date from the Redwing site indicates that the Middle Woodland activities at the site are contemporaneous with wall construction at the Hopeton rectangle. However, like the Triangle site, the Redwing site was also occupied by later people. When data from Redwing is viewed in combination with those from the Overly and Triangle sites at Hopeton, the specialized nature of Middle Woodland activities in association with the large earthen enclosure is increasingly clear.

In Chapter 7, Burks and Walter report the results of a large-scale, systematic surface survey at Hopeton. In this survey, they effectively used GPS technology to accurately plot more than 12,000 artifacts. Their data show that very few artifacts are

present within the two large geometric enclosures. Artifacts characteristic of the Middle Woodland period, or Hopewell occupation of this region, occur mainly to the west and southwest of the rectangular enclosure. Surface material indicative of Archaic and Late Woodland use of the landform serves to remind us that this was a dynamic and complex cultural landscape. The combination of systematic surface and geophysical survey provides complementary evidence about the distribution of artifacts and features in association with the Hopeton enclosures. However, interpretation of the Hopeton Earthworks and the other great enclosure sites in Ross County will likely require years of sustained and systematic field research.

In the final chapter of this volume, Katherine Spielmann discusses the ritual character of material culture disposal as seen at Ohio Hopewell sites. Her paper explores the ritual role that exotic raw materials have in small-scale societies. She describes how cut-out mica pieces, ceramics and stone tools were carefully interred in a pit outside the embankment wall at Hopeton. Her paper provides valuable insight into the long distance quest for exotic raw materials that is recognized as a hallmark of Ohio Hopewell archeology.

GOAL OF THIS VOLUME

One of the enduring values of *Ancient Monuments of the Mississippi Valley* is the large number of site maps and site descriptions from Ross County and adjacent areas of southern Ohio. These maps and descriptions were the product of field investigations by the authors and they have been used and reused by subsequent generations of archeologists to interpret the archeological record in this region.

Today, just as in Squier and Davis' day, appropriately reported systematic field investigations are the basic foundation of archeology. Several recent volumes have made valuable contributions to the interpretation of Ohio Hopewell by re-examining data from past investigations (e.g., Byers 2004; Carr and Case 2005; Romain 2000). However, our ability to use these data is limited by the nature, scope and accuracy of the field records and collections produced by past generations of archeologists.

One of the goals of this volume is to encourage more scholars to undertake studies of Ohio Hopewell sites. Although Ohio Hopewell sites are very well represented in the archeological literature, only a relatively small number of archeologists have worked in this important area. Since there is little likelihood that the rate of site destruction from agricultural activities and urban development will slow, it is essential that the archeological community increase its efforts to record and interpret sites while they still exist. New methods, technology, and ideas are needed to answer questions about the archeological record of the Hopewell people. It is hoped that this volume will stimulate further discussion and research on this fascinating area of North American archeology.

CHAPTER 2

GEOPHYSICAL EXPLORATIONS IN NON-MOUND SPACE AT THE HOPEWELL MOUND GROUP

By
Jennifer Pederson Weinberger

Archeological research at Ohio Hopewell earthworks has traditionally focused on the visible portions of these sites resulting in knowledge about ceremonial and mortuary activities. More recently, archeological excavations of embankments have begun to answer questions pertaining to construction techniques. However, earthworks consist of more than earthen architecture. The physical space between embankments and mounds, termed non-mound space, is often a flat expanse that may have staged a variety of political, social, ceremonial, or economic activities. Archeological research in non-mound space has been limited. Reasons for this lack of research have been attributed to fewer artifacts in non-mound space as compared to mounds, the scarcity of investigations to guide new research, and the great size of non-mound space (Mainfort and Sullivan 1998). The functionality and speed of geophysical equipment holds great promise in resolving the last issue. This chapter reports on geophysical explorations in non-mound space at the Hopewell Mound Group. This field work was conducted as part of a larger study that utilized geophysical and traditional archeological techniques to determine the nature and extent of non-mound activities.

The Hopewell Mound Group, the "type site" of the Hopewell culture, is a large earthwork complex located amidst the rolling hills of Ross County. The site consists of a large enclosure that is slightly similar to a parallelogram, a square enclosure, a small semi-circular enclosure, a small circular enclosure, and dozens of mounds (Figure 2-1). The earthwork is primarily located on a broad second terrace overlooking the North Fork Paint Creek. The northern wall of the largest enclosure ascends to the third terrace thereby enclosing two springs located along the slope. Several mounds are also located on the second and third terrace, outside the enclosure walls.

Caleb Atwater (1820) was among the first to map and describe the site, but his map did not depict many of the site's forty plus mounds. A slightly more detailed map, albeit skewed in the north-south direction, and description of the site that includes details of mound excavations was given by Ephraim Squier and Edwin Davis (1848). At that time, the Hopewell site was referred to as the "Clark's Works" or "North Fork Works." In their writings, Squier and Davis describe the largest of the enclosures as covering 45 ha, walls varying in height between 1.2 to 1.8 m, and having an exterior ditch on three sides of the main enclosure. Lengths of the walls of the square enclosure were reported as 259 m on each side. In total, the length of the embankments was approximately 5 km and the volume of mound fill was estimated at 1 million cu. m. Additional insights about the site's ceremonial nature were provided by their descriptions of the smaller enclosures, gateways, and mounds.

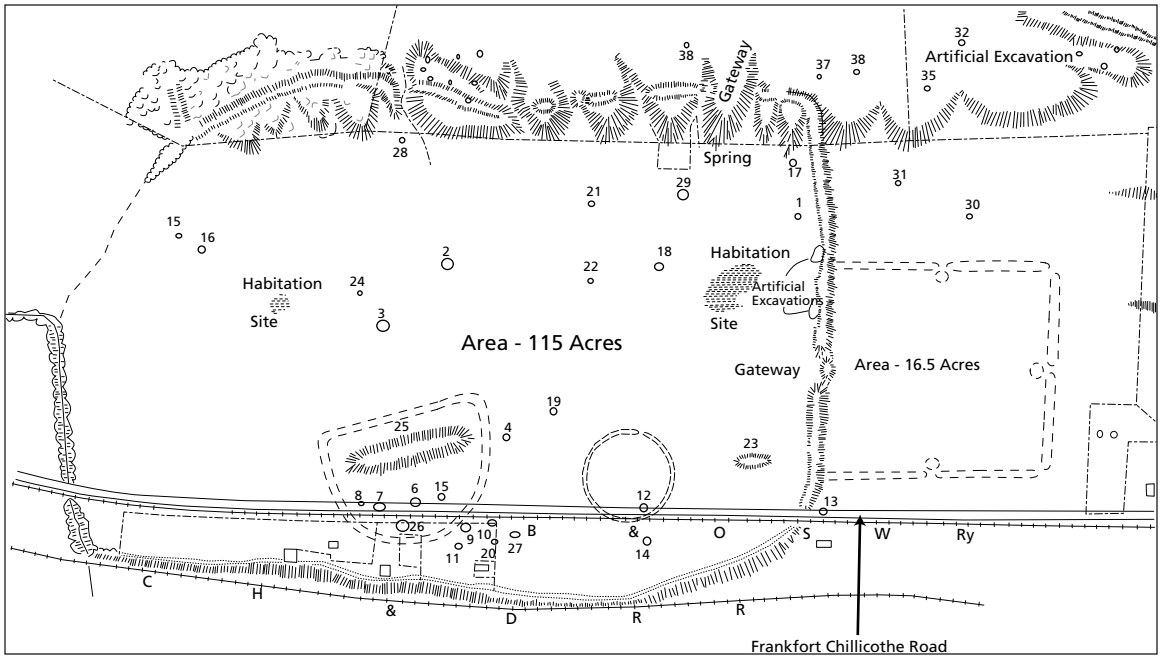


Figure 2-1. The Hopewell Mound Group as mapped by Henry C. Shetrone (1926).

Based on the configuration of the enclosures, contents of the mounds, local topography, and presence of springs within the enclosures, Squier and Davis (1848:29) concluded that the site was "a fortified town or city of ancient people." If correct, then settlement debris should be found in non-mound space. The only possible mention by Squier and Davis of this type of debris is a notation on their map in the northeast corner of the largest enclosure in an area labeled "16." At this same location in the 1890s Warren K. Moorehead noted the presence of a village site. Moorehead (1922) stated that this settlement, as well as another to the west, was occupied by a select group of people, such as skilled craftspeople or principle traders. Additional research at these two settlement locations was conducted by Henry Shetrone in the 1920s. The presence of darkened soil, fire-cracked rocks, potsherds, chert tools, and mica flecks led Shetrone (1926) to designate the areas as habitation sites. He implied, however, that the general lack of domestic debris meant long-term settlement occurred someplace other than within the enclosures.

Research during the last quarter of the twentieth century examined non-mound space at Hopewell Mound Group using contemporary field methods. Surface collections and limited excavations were carried out by Mark Seeman (1981) as he investigated the possibility of settlements within the enclosures. Several artifact clusters were found indicative of "manufacturing areas and/or the residences of societal leaders," including at the two aforementioned locales (Seeman 1981:45). Further examination of the eastern locale began in the late 1990s under the direction of Bret Ruby when the National Park Service acquired a large portion of the site from the Archaeological Conservancy. A series of shovel test pits was excavated but no evidence of long-term habitation was found.

The nature and extent of non-mound activities at many earthworks, including Hopewell Mound Group, is largely unknown. Surface collection and limited excavation at several earthworks in the Scioto Valley documented some evidence of habitation, craft manufacture and ceremony, but most studies found scant evidence for non-mound activities (Baby and Langlois 1979; Brown 1994; Burks et al. 2002; Coughlin and Seeman 1997; Lazazzera 2004; Seeman 1981). More intensive research is needed to sort out activity types and duration (e.g., short-term versus long-term and recurring) (see DeBoer 1997; Griffin 1997; Riordan 1998). The use of geophysical techniques, while not directly addressing problems of occupation duration, provides a general view of the archeological record that can be used to understand site organization, locate cultural features for excavation, and relocate plowed down embankments and mounds.

Geophysical Survey

Examination of non-mound space at Hopewell Mound Group using geophysical survey was conducted intermittently between 2001 and 2003. The area contained within the two main enclosures at the site is well over 40 ha. Time constraints during field seasons did not permit total coverage; instead, a 10 percent random sample of non-mound space resulted in the testing of 18 40 x 40 m blocks. The block size was selected to maximize interpretation of the geophysical data given the potential to locate structures that may be related to craft manufacture, habitation, or other activities.

Two geophysical instruments that measure different physical properties were used to produce a more comprehensive interpretation of the geophysical data (see Clay 2001; Kvamme 2003). The Geoscan FM-36 fluxgate gradiometer and the RM-15 resistance meter collect very different types of data that when combined can detect a wide range of cultural features, including earth ovens, crematory basins, middens, compacted floors, ditches, and embankments.

The spacing of transects was selected to locate recognizable patterns of prehistoric cultural features while maximizing field time. Transect spacing for the fluxgate gradiometer was 0.5 m for a total of 25,600 readings per 40 x 40 m block. Transect spacing for the electrical resistance meter was 1 m for a total of 3,200 readings per block.

The resulting geophysical data were examined to determine if anomalies were more likely to represent natural or cultural features. Geophysical anomalies that are indicative of prehistoric cultural features may display particular characteristics regarding shape, range of measurements, and topography. For example, magnetic anomalies of prehistoric cultural features typical of the Eastern Woodlands are usually symmetrical, round or ovate shaped, and range to ±20 nT.

Analysis identified 88 magnetic and 39 resistance anomalies indicative of prehistoric cultural features for the sample. After comparisons between the two sets of geophysical data, a total of 101 individual geophysical anomalies was identified. All but one of the blocks had at least one geophysical anomaly of probable prehistoric cultural origin. Figure 2-2 is a map of Hopewell Mound Group showing the total number of geophysical anomalies identified for each block. In most cases, these anomalies probably

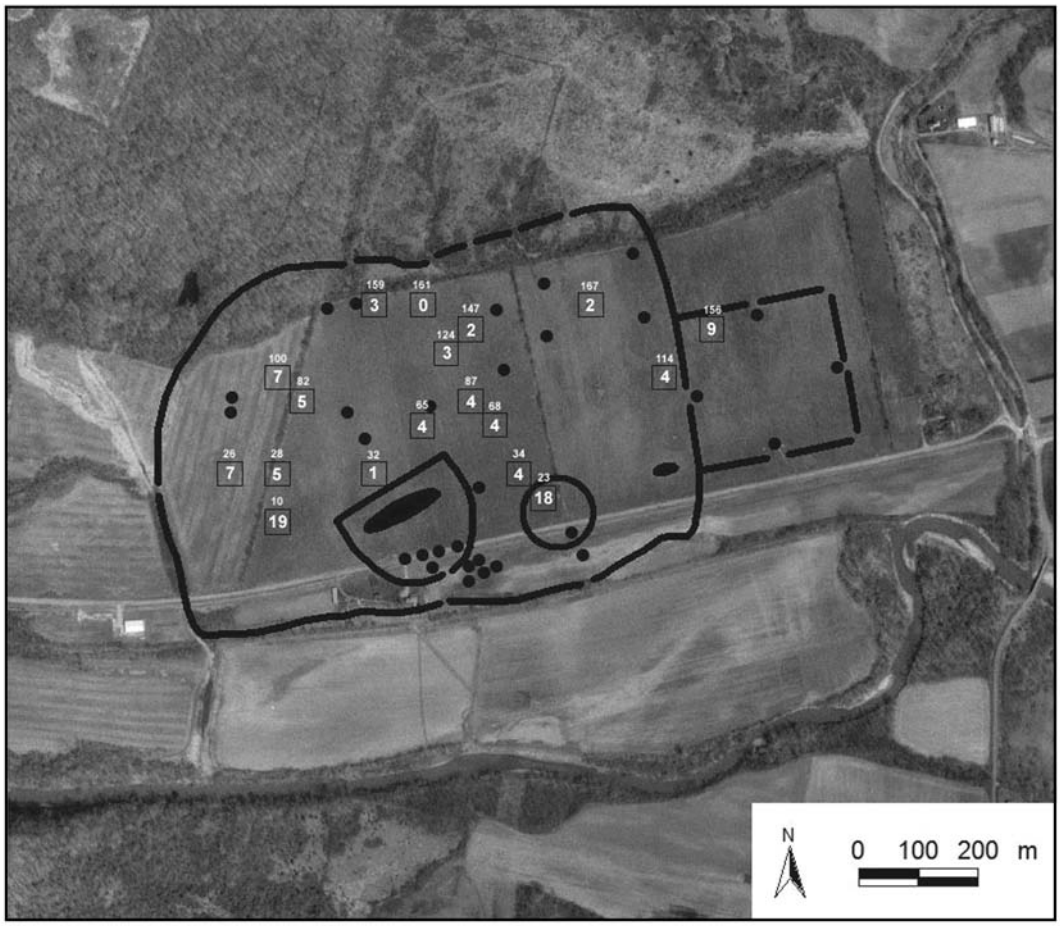


Figure 2-2 . Geophysical anomalies per block representing probable prehistoric cultural features. Block identifier given above each block.

represent heating events or filled-in pits that generally produce strong geophysical signatures. Excavation of some of these anomalies, for example an earth oven ringed with fire-cracked rock from Block 124, bore out this prediction. A radiocarbon date from this feature dated to the Early Woodland period, 910-520 B.C. (Beta-177653) at two sigma calibration. Results from three general areas of non-mound space are now presented.

Western Village Area

This area is located in the southwestern portion of the largest enclosure at Hopewell Mound Group. No earthen architecture has been documented in the immediate area but reports over the last century have described the remnants of a settlement as a village, habitation, or possible elite housing area (Moorehead 1922; Seeman 1981; Shetrone 1926). Geophysical survey of this area covered 4,800 sq. m in Blocks 10, 26, and 28. A total of 31 geophysical anomalies were found, representing 30 percent of all anomalies located during the project.

Most anomalies were clustered in Block 10, a location that corresponded to the western village locale. Artifacts gathered here during prior surface collections included

bladelets and projectile points diagnostic of the Middle Woodland period (Seeman 1981). The magnetic anomalies, most likely pit features, appear to cluster around a large resistance anomaly measuring 20 m in diameter. In keeping with the possibility of a settlement, this anomaly may represent a compacted open area or several structure floors.

To learn more about this area, test excavations of anomalies were begun and subsequently two deep pits filled with debris were found. One feature was a pit originally used for the cooking of shellfish. Upper layers of the pit were filled with assorted trash, including flakes, potsherds, and fire-cracked rocks as well as fragments of a shell-tempered elbow pipe. A sample of charcoal (Beta-177650) from 90-100 cm below plowzone returned a date at two sigma calibration of A.D. 890-1150. The other feature was a cooking pit with fire-cracked rocks and charcoal at its base. Feature fill contained animal bones, flakes, and potsherds. A sample of charcoal (Beta-177651) recovered at 75-80 centimeters below plowzone was calibrated at the two sigma range as A.D. 790-1030. Both pits date to the Late Woodland-Late Prehistoric interface yet surface collections found evidence of Middle Woodland occupation. Shovel testing of this area conducted in 2001 as part of the larger project recovered a couple pieces of quartz crystal debitage and one obsidian flake.

At least two episodes of occupation occurred in this area. The Middle Woodland occupation may have been related to specialized activities in association with use of the earthwork, instead of craft manufacture or habitation. The later occupation is indicative of habitation and many of the geophysical anomalies are likely associated with this use. As a result, the western village as envisioned by Moorehead (1922) and Griffin (1996) is not a Hopewell village site.

A number of geophysical anomalies were identified within the northern confines of the western village area. The magnetic anomalies appear to represent pit features, such as a large feature containing many fire-cracked rocks atop a layer of burned logs from Block 28. This feature measured 5.5 m in length, 1.5 m in width, and 20 cm in depth. A sample of charcoal (Beta-177652) returned a date at two sigma calibration of 750-210 B.C. This date precedes those associated with the Hopewell culture and as such this feature may be indicative of an Adena presence at the site prior to the large-scale earthwork construction of the Middle Woodland period. Other magnetic anomalies located further west in Block 26 may be associated with a nearby Middle Woodland habitation site named the Turtle Shell Locale, with some sort of specialized heat-related activities of unknown origin, or with the Late Woodland-Late Prehistoric habitation.

The resistance data from Block 28 shows a large area of higher resistance that corresponds with a low, broad rise. To determine if this area represented a natural rise, a prehistoric mound that was never mapped, or overburden from historic mound excavations, a series of 1 x 1 m units were excavated. The plowzone and first level below plowzone contained artifacts similar to those found in the mound fill of the Seip-Pricer Mound (Greber 1997), yet the second and third levels below plowzone appear to represent an historic plowzone. The analysis to date determined that this feature is likely overburden from historic excavations of the nearby Mound 25. A passing reference from Moorehead (1922:103) provides supporting evidence: “I find in the field-notes that the

owner, Mr. M. C. Hopewell, was exceedingly kind and courteous. Our teams dropped earth about his clover fields and destroyed crops, yet he entered no complaint."

Near The East Village

A settlement amid a number of mounds in the main enclosure's northeast quadrant was recorded by Moorehead (1922) as a village site and by Shetrone (1926) as a habitation site. Settlement debris may have also been found by Squier and Davis (1848). Nonetheless, a surface collection of the vicinity found no clear evidence of habitation (Seeman 1981). One block in the sample (Block 167) was located just north of the reported locations for this settlement.

Geophysical survey only identified several weak magnetic anomalies suggestive of prehistoric cultural features in the block and no resistance anomalies were identified in the data. Due to the close proximity of the reported settlements, two of the magnetic anomalies were tested to determine their origin.

The first anomaly was a fairly weak positive monopole. Removal of the plowzone in a 2.5 sq. m area recovered several bladelets and grit-tempered sherds, a Late Prehistoric biface fragment, flakes and shatter, and some fire-cracked rocks. At the base of the plowzone, a small posthole was excavated. The feature was 16 cm in diameter and contained four pieces of fire-cracked rock that refit. In addition, another possible posthole was found nearby.

The other magnetic anomaly tested was a large positive monopole. A total of 7.5 sq. m of plowzone was removed in which 507 artifacts were found, including bladelets. Under the plowzone, a large area of feature fill was mottled with subsoil. The total extent of this area is unknown, although diffuse boundaries marked the eastern and western limits at nearly four meters apart. Inside this area was a large oval pit feature containing a concentration of artifacts in an organic-rich soil matrix. Dimensions are approximately 2 m in length, 1.5 m in width, and 50 cm in depth. Artifacts indicative of a Middle Woodland occupation were four bladelets, a projectile point, and a small piece of cut mica. Lithic debitage, pot sherds, and fire-cracked rocks were also recovered. Immediately adjacent to this feature was another posthole. This feature had a diameter of 30 cm and contained five pieces of fire-cracked rock. A sample of charcoal from a layer at the base was sent for radiocarbon dating (Beta-177654). Calibration at two sigma yielded a date of A.D. 90-420.

From the east village area, excavations of two geophysical anomalies located several features. Two, possibly three, postholes were spaced less than 1 m apart suggesting the presence of a structure. The large diffuse feature may represent a floor with an associated oval pit in the center. A single radiocarbon date overlaps dates from the site's Mounds 11, 17, and 25 (Cowan and Greber 2002; Crane and Griffin 1972; Greber 2003; Libby 1955). As such, these features appear related to earthwork use. Perhaps this area was used for manufacturing or ceremonial activities, such as documented for the structures inside Seip, or for short-term habitation by those who were participating in earthwork activities. A somewhat similar midden feature with postholes found at Mound City was suggestive of habitation (Brown 1994).

Central Area

The central area of the largest enclosure has several mounds located just north of the semi-circular enclosure. Several blocks were surveyed here (Blocks 32, 34, 65, 68, and 87), but few geophysical anomalies indicative of prehistoric cultural features were identified. The geophysical data thus agree with results from a surface collection that reported little in the way of artifacts in this area (Seeman 1981). However, one large geophysical anomaly was easily located on both the magnetic and resistance data.

A large semi-circular arc in the southern half of Block 87 was evident in the data (Figure 2-3). This anomaly appeared to continue to the south and thus the block was extended an additional 20 m. The anomaly was circular in shape, 30 m in diameter, and 1.5 m in width. A small gap in the anomaly faced the east. The anomaly itself was a strong positive magnetic monopole of higher resistance. The interior of the circle was of slightly lower resistance than the exterior. A possible mound was mapped near this location by James Marshall. The location of this rise was confirmed in a surface collection, but its cultural significance could not be determined (Seeman 1981). Excavation of a 1 x 4 m trench bisecting a southern portion of the anomaly revealed a shallow ditch that was 2.5 m in width and 20 cm in depth. The only artifact found in the feature fill was one piece of fire-cracked rock. Perhaps the slight elevation differences associated with this ditch feature were previously mistaken for a mound.

Circular ditches, although sometimes accompanying small Hopewell circular embankments, may be more prominent during the Early Woodland period. Yet, perhaps some ditch features represent but one step in the construction process of circular enclosures. Excavations at the Peter site in Kentucky, an Adena circular enclosure, document a sequence of construction beginning with a stockade and later reconfigured to a ditch and embankment earthwork (Clay 1987). Recent work at the Stubbs site, a Hopewell earthwork in southwestern Ohio, found a ring of large postholes underneath the location of a circular earthwork; it appears that at Stubbs at least two phases of construction occurred (Cowan et al. 1999).

Discussion

In terms of non-mound space at Hopewell Mound Group, the geophysical survey and subsequent anomaly tests found very little evidence of intense or long-term activities during the Middle Woodland period. Of the two areas previously identified as settlements, one appears to consist primarily of the remnants of a Late Woodland-Late Prehistoric occupation and the other may have been used for ceremonial activities, craft manufacture, or short-term habitation. There is no evidence to suggest long-term or large-scale Hopewell settlement as suggested by Moorehead (1922) or Griffin (1996, 1997). Instead, Middle Woodland activities were limited in nature and extent to those related to the construction, use, or maintenance of the earthworks.

Geophysical survey is immensely beneficial for Eastern Woodland archeology given the right research question, physical environment, and survey design. Successful applications include studying construction techniques of prehistoric earthworks at the Hopeton Earthworks and High Bank Earthworks (Lynott 2004, this volume; Greber and

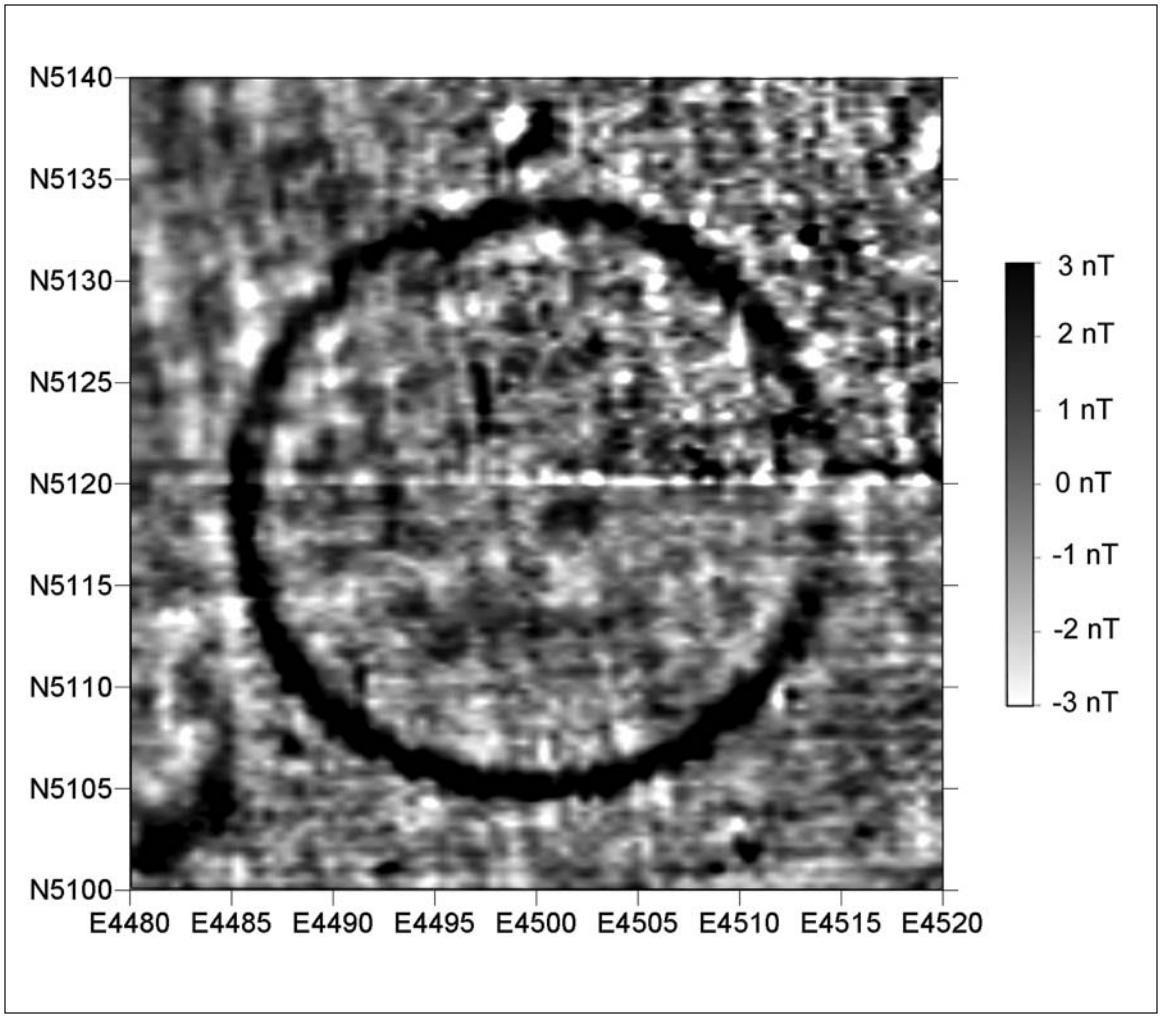


Figure 2-3. Circular earthwork visible in processed magnetic data, Hopewell Mound Group.

Shane this volume), as well as locating eroded remnants of the semi-circular and circular enclosures at Hopewell Mound Group during the 2001-2003 geophysical explorations. In addition, geophysical survey can locate isolated, more transient features, such as pit features or posthole patterns.

This research demonstrates three main advantages of using geophysical techniques. First, large areas can be quickly surveyed by a field crew of one to three people. The agricultural fields of the Midwest are particularly good candidates for research given their fairly even and open terrain. Second, geophysical survey provides continuous data coverage versus conventional survey methods thereby improving the chance of locating features. For example, nine shovel tests conducted during the larger research project in Block 87 recovered only one piece of lithic debitage that would not have warranted further research, but the discovery of a large circular earthwork in the magnetic and resistance data underscore the value of continuous coverage. Third, geophysical survey is a non-destructive technique that provides data while leaving the archeological record intact. Less site disturbance also occurs when the geophysical data is used to pinpoint excavations rather than stripping large areas to locate cultural

features. These benefits outweigh disadvantages such as cost and learning curve, especially when conducting research in non-mound space at Ohio Hopewell earthworks.

Acknowledgments

I gratefully acknowledge the guidance and support provided by William Dancey, N'omi Greber, Mark Lynott, John Neal, Dean Alexander, Jarrod Burks, Kathy Brady, Dawn Walter Gagliano, and Jeff Weinberger. Students in the 2001 Ohio State University Archaeological Field School, teachers participating in Hopewell Culture National Historical Park's Archeology for Teachers Workshops, and numerous volunteers provided much hard labor in all weather conditions. I also wish to thank Charles Zickafoos for mowing the site during the multiple field seasons.

CHAPTER 3

FIELD STUDIES OF THE OCTAGON AND GREAT CIRCLE, HIGH BANK EARTHWORKS ROSS COUNTY, OHIO

BY
N'omi B. Greber and Orrin C. Shane III

Many enclosure walls that were part of the unique ancient planned landscape in southern Ohio have been mapped and recorded in writings since late in the eighteenth century but they were seldom excavated (Figure 3-1). Interpretations of the function, chronology, and socio-cultural activities associated with these walls were mainly based on size and ground plan. More recently, field projects focused on construction methods and materials have added significant new types of data including radiocarbon assays that estimate dates of site use and wall construction.

The High Bank Earthworks (Figures 3-1, 3-2) are one of the more complexly designed sets of enclosures among the numerous enclosure sites in the region. They stretch more than 50 ha across a glacial terrace, known locally as the High Bank, 17 m above the active floodplain of the Central Scioto. The major sections include a relatively rare octagonal enclosure, small and large circular features, and linear walls. In the mid-nineteenth century, the walls of the Octagon were some 3.7 m (ca 12 ft) high and the Great Circle about 1.5 m (ca 5 ft). By the end of the century the walls were degraded and a farm lane cut across the embankments. This wagon path was widened and is used today by trucks and large farm equipment. When ground cover and weather conditions are suitable, the Octagon walls, now about a meter high, can be seen. Only portions of the Great Circle are as clearly seen but geophysical maps show its location. Many walls south of the Octagon are no longer visible on the ground but might be found by geophysical survey. The complex ground plan design is very similar to that at Hopeton, a few kilometers to the north (Figure 3-1).

At sites such as High Bank, the builders and users did not leave quantities of diagnostic artifacts to date their work. They were frustratingly tidy and took tools and other portable objects away with them. In any case, objects may be physically near a wall but still not reflect a construction date. Even objects found within a wall fill do not necessarily reflect a construction date. Knowing the architectural context of such objects within the wall is essential. Data, obtained using traditional and geophysical field techniques, on the internal construction of the Octagon and Great Circle walls, provide both a framework for interpretations and an illustration of the complexities found in the ancient Ross County landscape.

Areas studied from 1972 to 2002 at High Bank are shown in Figure 3-3. All work prior to 2002 was conducted on private farm land. In 2002 major portions of the site became part of Hopewell Culture National Historical Park. In 1972 Orrin Shane, then at Kent State University (KSU), directed field work cutting three trenches across sections of

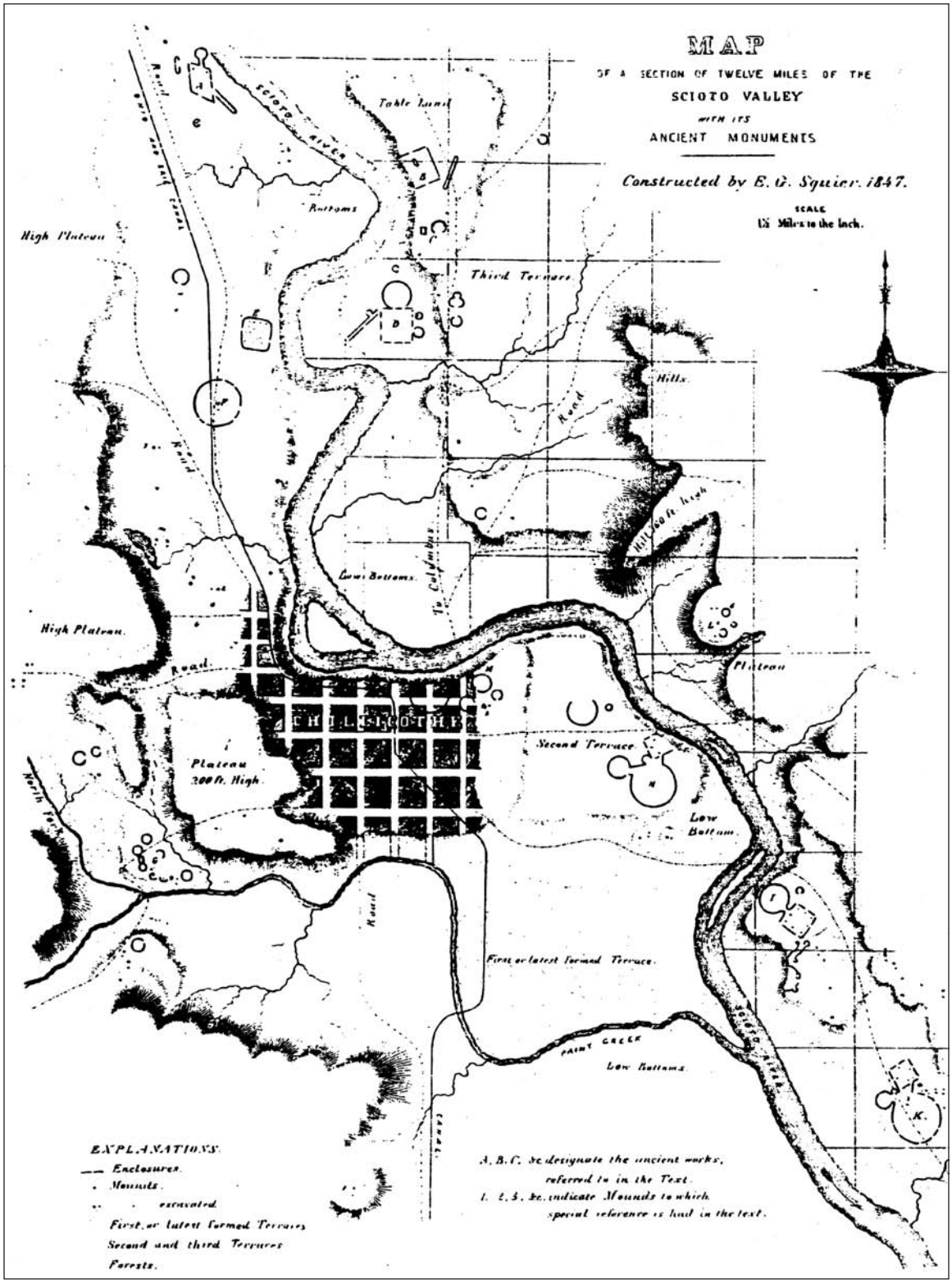


Figure 3-1. The many enclosures in the Central Scioto region as mapped by Squier and Davis (1848: Plate 11). High Bank is labeled "I".

Figure 3-2. Aerial photograph of the High Bank Great Circle and Octagon taken by the Soils Conservation Service 1976. Note the farm lane that cuts through the walls from the rail road spur on the right to the yard of the private residence near the terrace edge on the left.

the Octagon and two across the Great Circle (Shane 1973). From 1994 through 2002, work under the direction of N'omi Greber has combined several geophysical techniques and traditional field methods (Greber 1998, 1999, 2002). Interpretations of geophysical maps and ground truthing have been intertwined, each step giving refinement for the work that followed. In 1997 two trenches were excavated south of the lane. A third was cut directly across from the center point of the neck joining the Great Circle and Octagon in 2002. The primary goals of all these operations were to better understand the nature of earthwork construction and to recover organic materials suitable for radiocarbon dating. We have gained some understanding of composition and construction, but organics suitable for dating come only from the circle. A brief summary of all these field studies follows. In drawing any conclusions it must be kept in mind that only a very small percentage of the earthwork has been excavated.

EXCAVATIONS AT THE OCTAGON

As part of a KSU archeological field school conducted during June and July 1972, two hand-excavated trenches and three backhoe-excavated strata-cuts were made through wall sections of the High Bank Octagon and Great Circle (Figure 3-3). The center point of the excavation grid was at a working datum point established near the geometric center of the Octagon and arbitrarily assigned the coordinates N1000 E1000 in feet. A grid North-South baseline was surveyed by transit along the long axis of the Octagon and Great Circle between the working datum at N1000 E1000 and a point near the middle of the opening between the Octagon and Circle. A grid East-West baseline was established by surveying a line perpendicular to the grid North-South line at the working datum.

KSU Trenches I, III

Local control for Trench I was established from a grid East-West baseline at N1115. A 3 x 18.3 m (10 x 60 ft) area between N1105 and N1115 was cleared of plow zone and a narrower 1.5 m (5 ft) wide trench bounded by coordinates N1112.5 E470, N1007.5 E470, N1112.5 E530 and N1007.5 E530 was excavated by hand in 10.2 cm (4 in) arbitrary levels from the base of the plow zone to a level approximately 30 cm (12 in) into the undisturbed subsoil below the land surface on which the earthen embankment was constructed. This

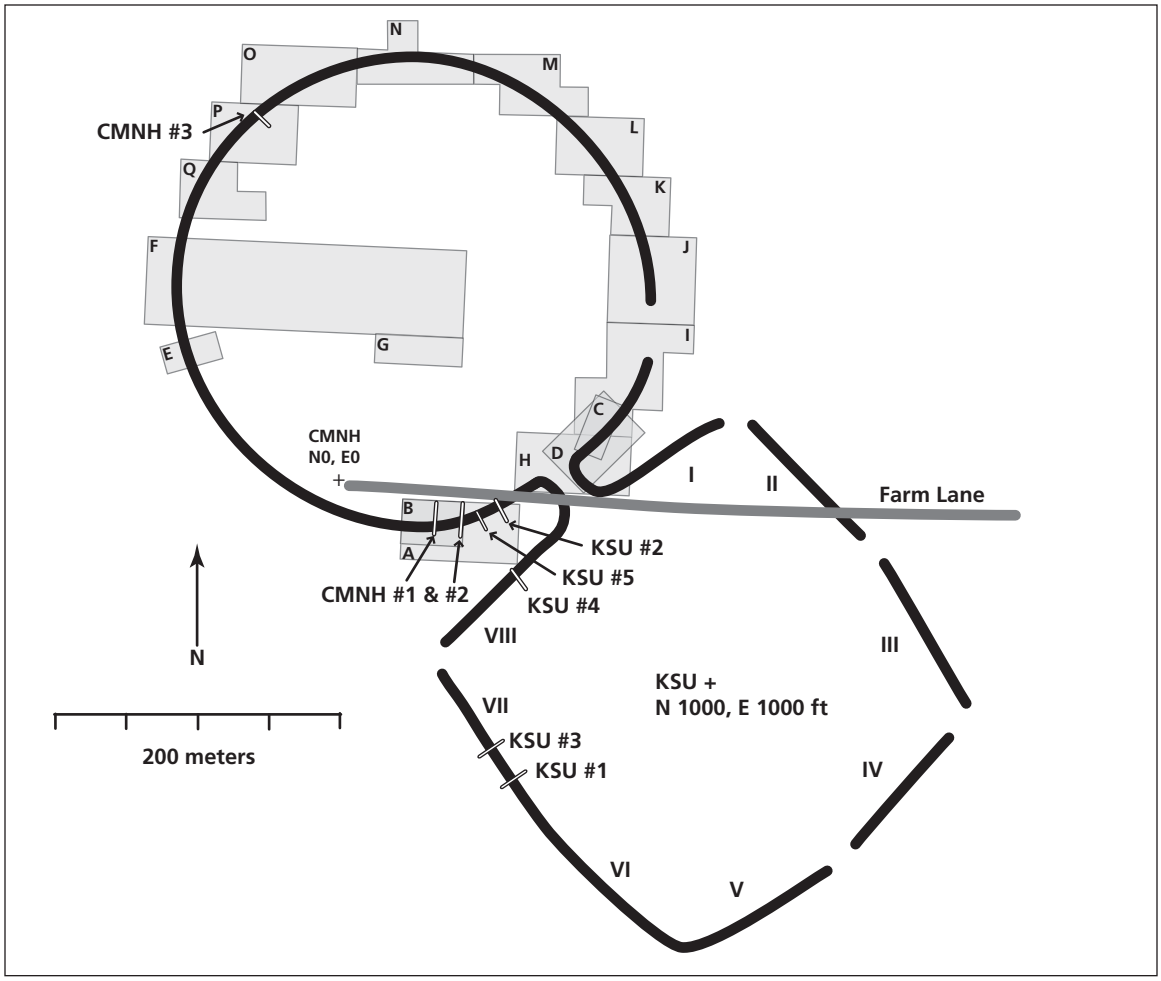


Figure 3-3. Diagram of areas studied at High Bank 1972-2002.

method left a 0.8 m (2.5 ft) work way, clear of loose plow zone, on either side of the trench. Earth was removed by shovel and trowel and all excavated material was sieved through suspended ¼-inch mesh hardware cloth screens.

Figure 3-4A is a diagrammatic profile through Octagon segment VII as revealed in Trench I. The contact between embankment fills and the ancient land surface was meticulously examined throughout the trench and was found to be clean of macroscopic organic debris and artifacts. A litter layer at the base of the embankment fills was anticipated as a source of organic materials for radiocarbon determinations. Unfortunately, although the exposed sub-embankment surfaces were painstakingly examined, no organics sufficient for radiocarbon determination were observed or recovered. The very few artifacts found all came from wall fill: a small number of chert flakes, one cordmarked grit-tempered body sherd, probably McGraw Cordmarked, one small plain grit-tempered rim sherd, and fragments of three projectile points or knives, probably of Late Archaic age.

As the profiles of KSU Trench I show, the pre-construction land surface had been substantially modified before wall construction began. The soil underlying the

wall was truncated by removal of an indeterminate portion of the A horizon. Wall fill deposits were laid down on this clean prepared surface and the contact was sharply defined in profile. The embankment here was built up by the simple accumulation of earth collected from the surrounding terrace and deposited in spread and unspread basket loads along the long axis of the wall. This construction is clearly evident in the diagrammatic profiles at N1107.5 E500 (Figure 3-4B). E500 is near the long axis of the embankment, and this diagram documents the progressive layering of fills as the embankment was built up. There is some evidence from our admittedly short profiles that this Octagon wall segment may have been constructed as several short segments of fill that were then covered by subsequent deposits that raised the wall to its ultimate height. Loading consists of earth from all parts of the High Bank terrace, including sandy loams, clays, sandy clays, sands, gravelly-sands, and loose gravels. These materials were probably excavated from the "dug holes" or borrow pits noted by Squier and Davis (1848), one of which is located just west of Octagon wall segment VII. The height of the wall measured as 3.7 m (12 ft) in the 1840s had decreased to only 1.5 m (57 in) by 1972.

Based on information gained from KSU Trench I and hoping to find datable organic material at the contact between embankment fills and the original land surface, a strata-cut, KSU Trench III, was excavated by backhoe between N1195-N1200 and E480-E540. The profiles and the contact between wall fills and the underlying subsoil were cleaned by hand. No features, organic material, or artifacts were found on the subsoil and the profiles showed basket-loaded layering of earth similar to the layering observed in KSU Trench I.

KSU Trench IV

This strata-cut was made by backhoe between N1370-N1430 and E745-E750 through Octagon wall segment VIII. The strata-cut was widened by hand to a width of 1.5 m (60 in) and the floor excavated by hand to approximately 30 cm (12 in) below the top of the undisturbed subsoil beneath the embankment. The profiles and the contact between wall fills and undisturbed subsoil were cleaned by hand and recorded. No cultural features, organic material suitable for radiocarbon dating, or artifacts were found on the subsoil.

A striking feature of the KSU Trench IV profiles is the very clear and sharp contact between wall fill basket-loading and the underlying subsoil. As was also seen in KSU Trenches I and III, the original solum was truncated by removal of an undeterminable portion of the humic zone or A horizon and the truncated surface was prepared by cleaning and smoothing before wall construction began. The initial basket loads of fill placed on this prepared surface are clearly evident in the profiles and the width of the base of wall segment VIII is well defined. The wall was constructed in much the same manner as wall segment VII, i.e., by the progressive accumulation of earth deposited in spread and unspread basket loads collected from the surrounding High Bank terrace. The observed fills had a higher clay and sand content than the fills of wall segment VII. These clays were more brightly colored reddish and yellowish hues, suggesting that these fills came from a different terrace deposit than the fills of wall segment VII. However, the 'dug hole' just west of wall segment VII is the largest borrow pit noted by Squier and Davis. It is large enough to have provided the fill for the entire

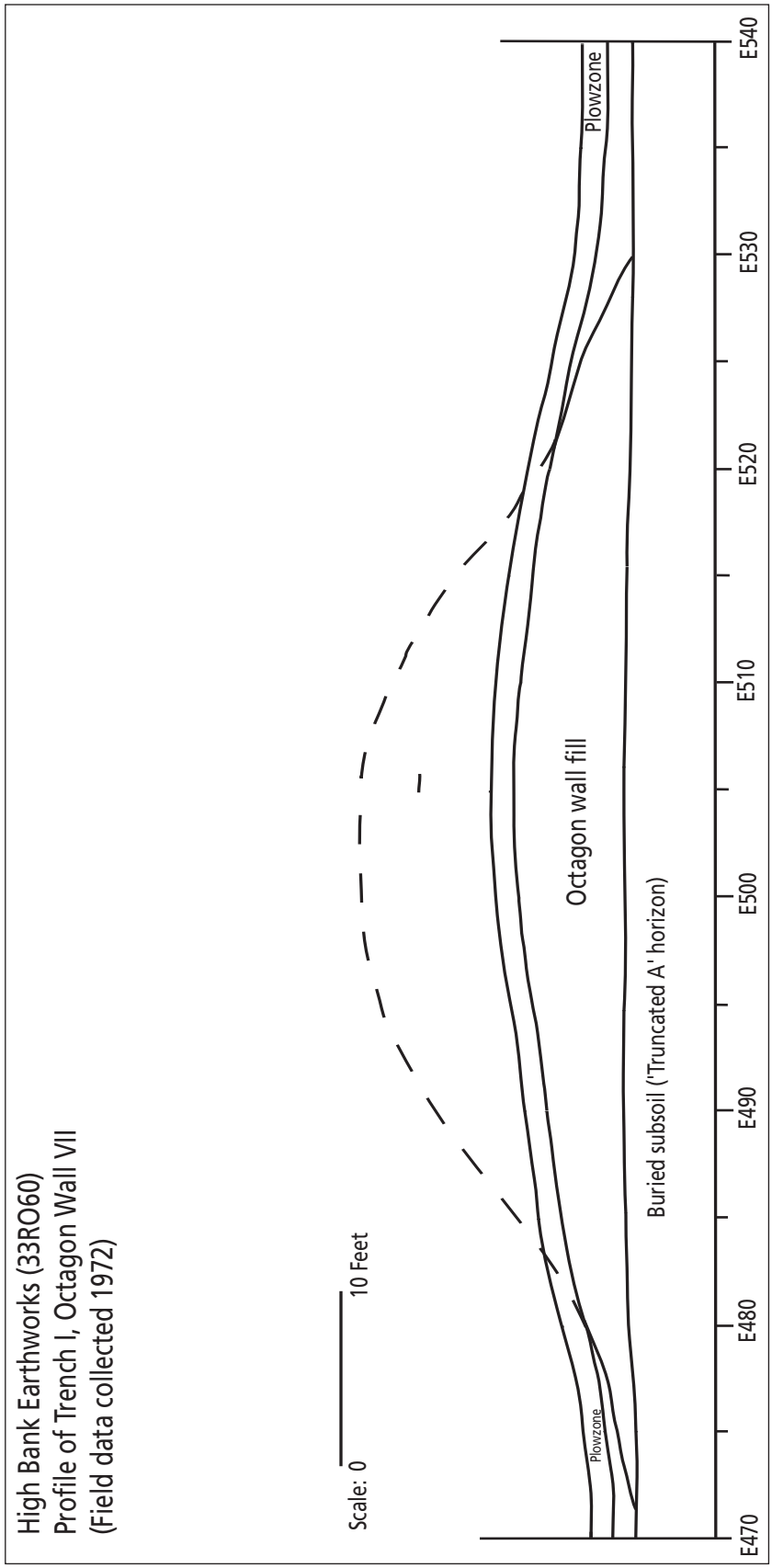


Figure 3-4A. KSU composite profile of Octagon wall segment VII. See Figure 3-3 for location of the segment.

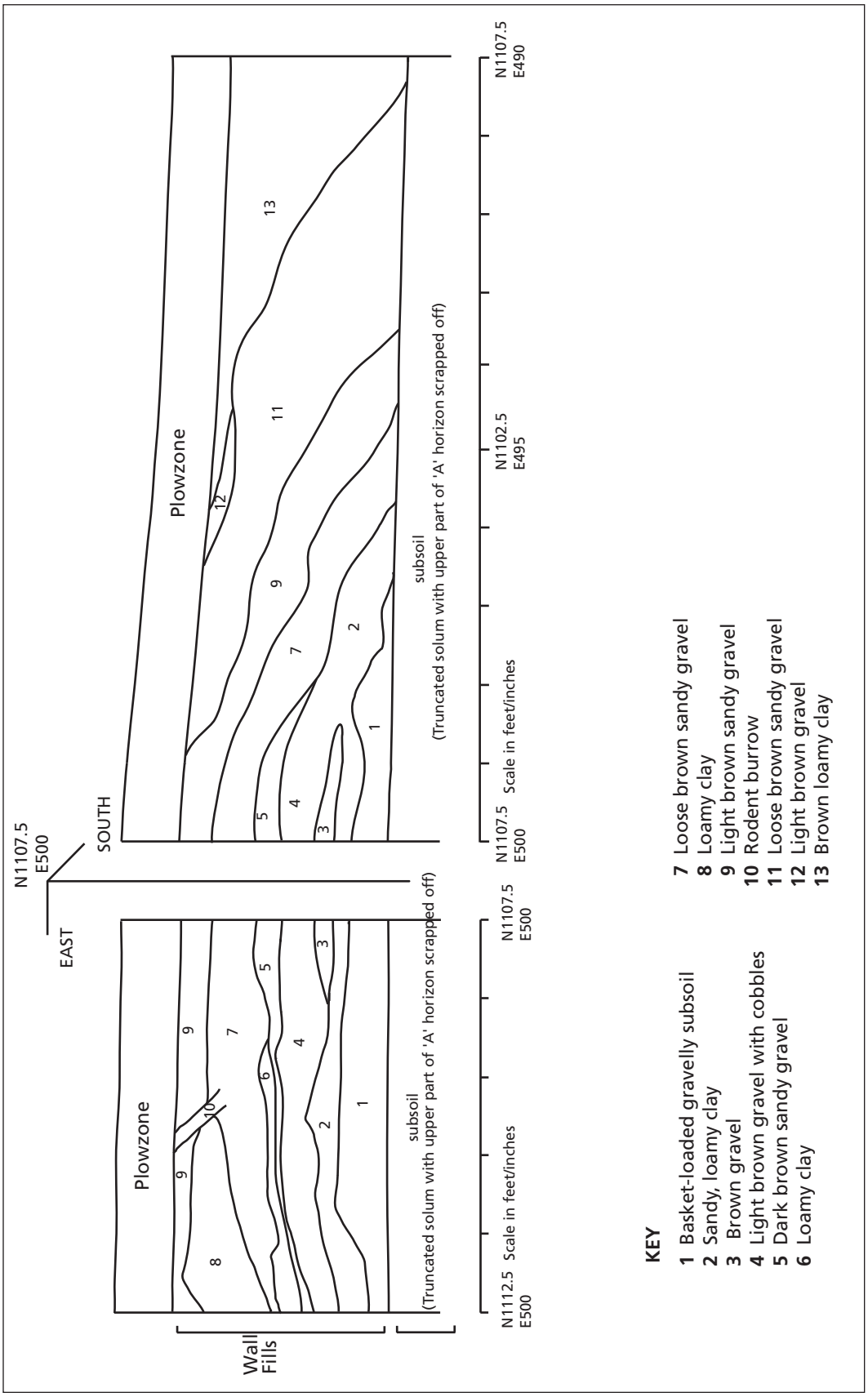


Figure 3-4B. East and south profiles of a 10-foot (3 m) section of KSU Trench I. This diagram documents the method of wall construction of the Octagon in which layers of basket loaded earth were built up from a prepared floor. See Figure 3-3 for location of the trench.

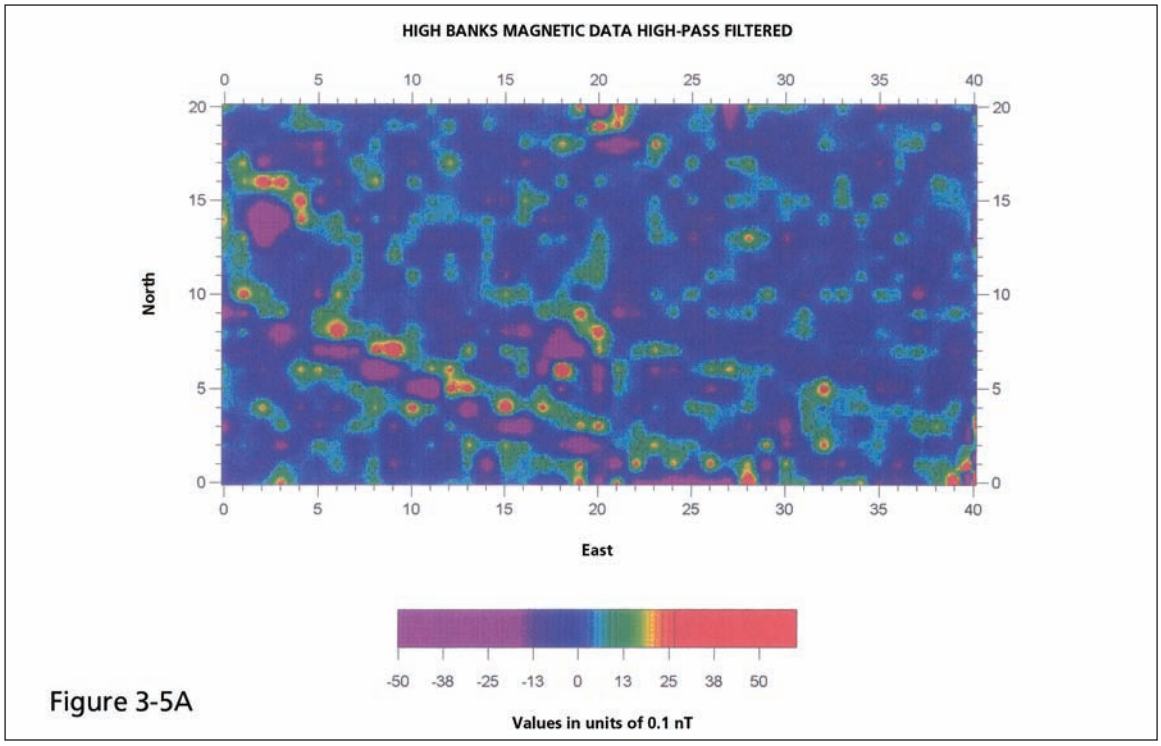
west side of the High Bank Octagon and there is no evidence to suggest that the wall segment VIII fills came from some place other than this nearby source.

GEOPHYSICS AT THE GREAT CIRCLE

Geophysical surveys have been an essential part of the research plan in part because of their non-destructive nature (Greber 1998, 1999). In addition, at sites as extensive as High Bank, they can provide information from large areas that, even if it were permissible, should not be excavated without serious cause. By July 2001, geophysical maps were completed for much of the 1000 m long circle wall and some interior areas (Figure 3-3, Blocks A-Q). A short conductivity survey was conducted over a portion of the wall within a private yard in 1994. No additional work has been allowed in this south-westerly section of the wall and the area is not marked on the grid map. Combining archeological and geophysical data is a cross discipline endeavor that can accomplish more than either discipline can alone. The success of the geophysical surveys at High Bank is due in large part to geophysicist John Weymouth of the Department of Astronomy and Physics at the University of Nebraska. A summary of some results follows.

The East-West baseline of the Cleveland Museum of Natural History (CMNH) site grid is parallel to the lane along the line that includes the southern boundary of Block H. The grid origin is on this line, 120 m west of the southwest corner of Block H. The grid North-South lines are perpendicular to the grid East-West base line and are five degrees east of north. The first survey was conducted by R. Berle Clay using a Geonics EM 38 conductivity meter in the 40 x 80 m Block A (Figure 3-3). Transects were spaced one meter apart. The major purpose of the survey was to better define the location of the Great Circle wall and the 1972 excavation units. A Geoscan RM 15 resistance meter was used to resurvey a 30 x 40 m area away from the KSU disturbance (Figure 3-3, Block B). It was hoped that the survey might locate an undisturbed portion of the extensive stone stratum found in 1972. As detailed below, ground truthing showed that the stratum was too narrow, steep, and diffuse in this area to be detected, even though readings were taken at half meter intervals as suggested by John Weymouth.

The results from Block C emphasize the difficulty in locating the wall on the ground, particularly on the eastern side. Based on apparent surface contours, this unit was set to allow transects to be taken perpendicular to the wall. Such a placement tends to produce a clearer result. The results of magnetic and resistance surveys show the wall angled across the block. The resistance data show a wider spread to the wall. This difference frequently occurs when comparing resistance and magnetic data from eroded features. The resistance data include both the wall itself and erosional wash. The magnetic map shows the inner and outer edges of the wall (Figure 3-5A). A higher magnetic value is associated with the outer edge than with the inner. This pattern has generally been found in the surveys through all blocks. John Weymouth has interpreted the "string of pearls" at the outer edge in Figure 3-5B as reflecting discrete collections of rock. This is consistent with the ground truth findings where mantles of gravelly soils were deposited over the features found towards the outer edge at the base of the wall, for example Feature 5 in CMNH Trench I. The stratum towards the inner edge gives a lower magnetic reading. These strata are described in more detail below.



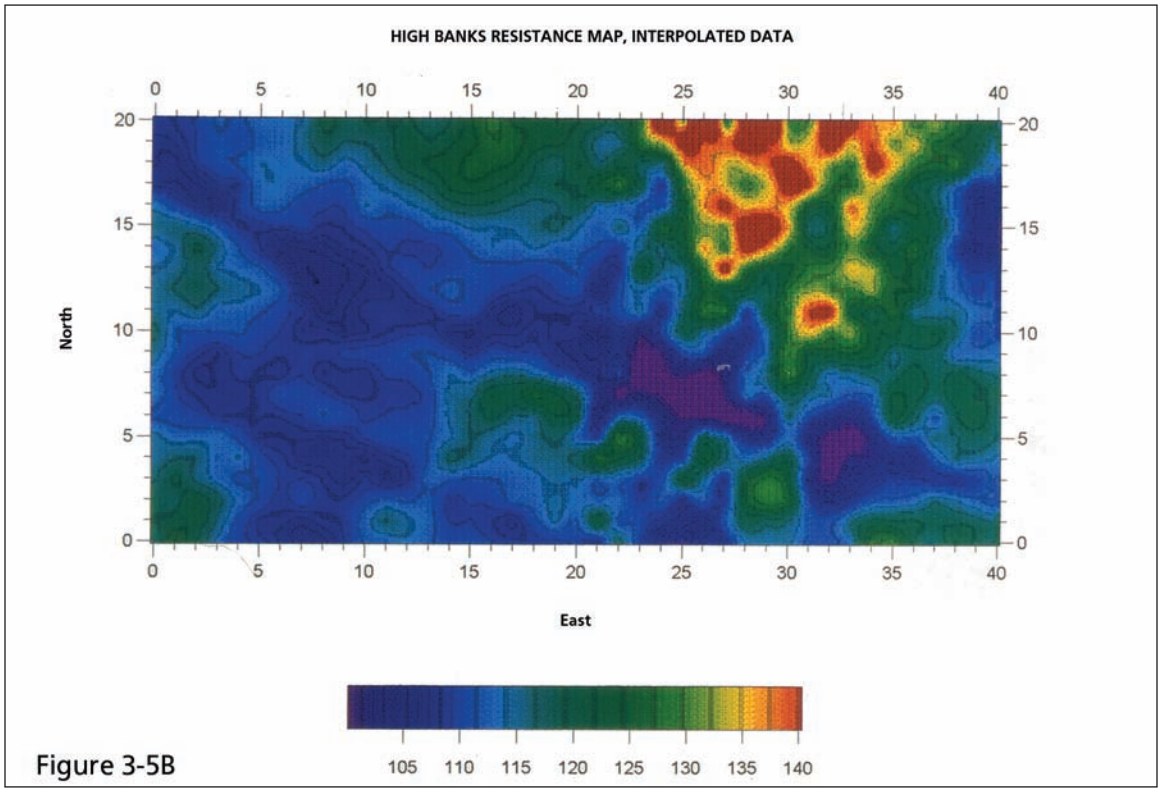


Figure 3-5. Geophysical maps from CMNH Block C (A) magnetic (B) resistance, courtesy of John Weymouth. The wall of the Great Circle is angled from the middle of the block (on the left) to the lower edge of the block (on the right). The individual loads of glacial gravels used to mantle the outer edge of the lowest wall strata are seen as discrete short segments in the magnetic pattern defining the outer wall edge. See Figure 3-3 for location of the block.

A particularly rewarding survey in Block H located the corners of the neck joining the Great Circle and Octagon. The walls in this area are heavily impacted by the lane and by farming and it is difficult, if not impossible, to find them on the ground surface. The block was placed as close to the lane as feasible. Being able to locate the center of the neck on the ground was (and is) significant in interpreting later surveys and ground truthing (Figure 3-6).

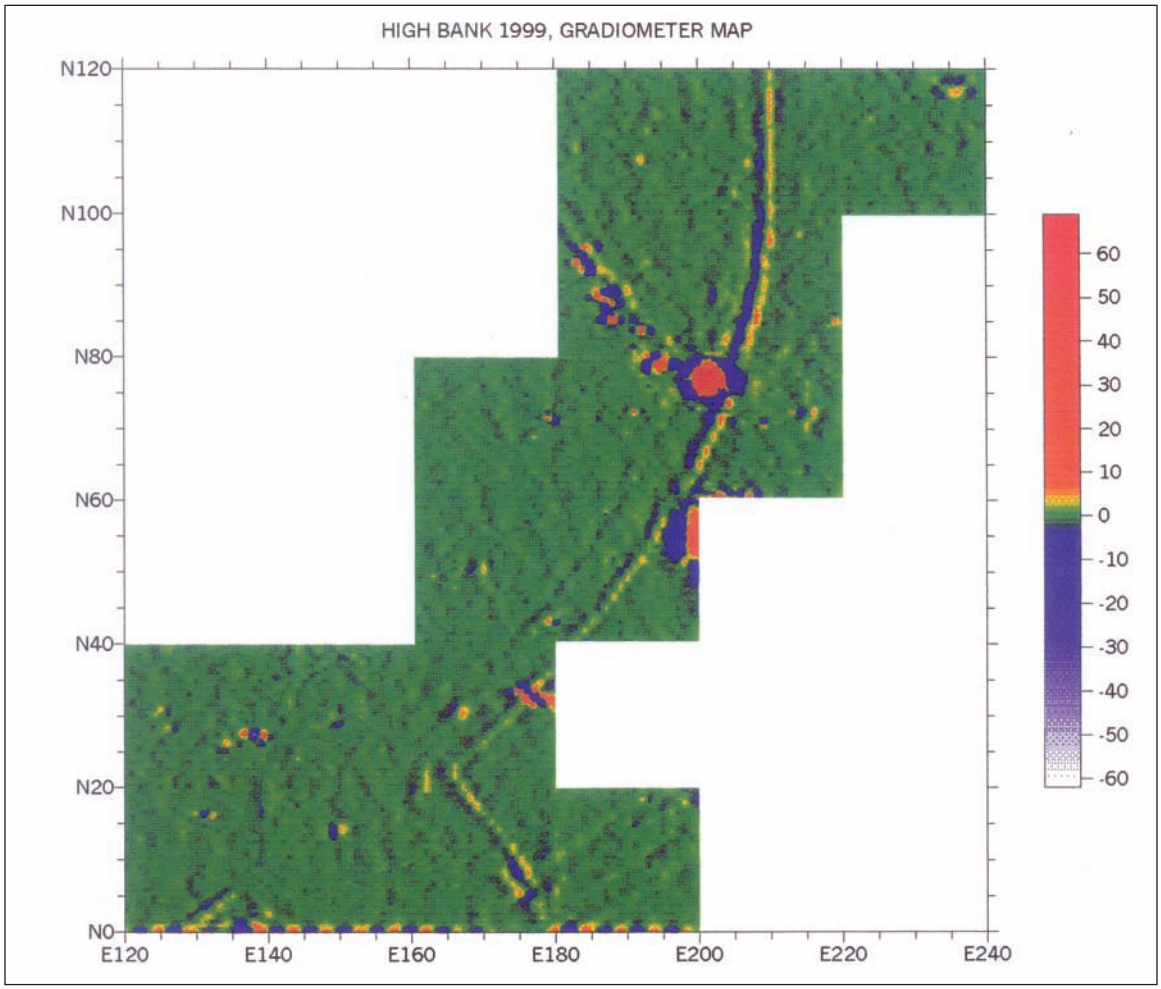


Figure 3-6. Geophysical magnetic map of CMNH Block H courtesy of John Weymouth. Both sides of the short neck that joins the Great Circle and the Octagon are visible. Near N75 the remnants of a buried modern fence intersect the trace of the Great Circle. The dotted line at the bottom of the map is due to the edge of the farm lane that cuts across the earthwork. See Figure 3-3 for location of the block and also Figure 3-2.

No precolumbian features were delineated by the FM 36 fluxgate surveys in Blocks F and G covering the central area of the enclosure. Using old aerial photographs, a linear anomaly that crossed these blocks and Block N has been identified as the remains of a buried modern fence.

The last example focuses on the anomaly found in Block P. The work in this block demonstrates the usefulness of geophysical data in locating small scale test excavations

that obtain ground truth with the least disturbance to the wall (or other archeological features). Details are given in the discussion of CMNH Trench III below.

EXCAVATIONS AT THE GREAT CIRCLE

South of the Lane

Figure 3-7 shows the locations of the four trenches excavated south of the lane. The field methods for KSU Trench II were the same as those used for excavating KSU Trench I, except that screening was abandoned due to the lack of artifacts recovered in Trench I. KSU Trench V was a strata-cut excavated in the same manner as KSU Trench III. CMNH Trench I was excavated by backhoe to a relatively level floor 150 to 190 cm below the contoured ground surface. This depth clearly exposed the remnant wall and associated features, as well as a useful representative profile of the natural subsurface soils. Profiles and features were cleared by hand. For CMNH Trench II, the plowzone was removed by backhoe. The remaining levels were hand-excavated deep enough to expose the entire construction profile. Depths ranged from 80 to 180 cm below the contoured ground surface.

The strata of the Great Circle wall seen in the four trenches are consistent with each other and demonstrate variations along the wall (Figures 3-8 through 3-11). The trenches cut the wall at different angles; that is, they are not all perpendicular to the wall

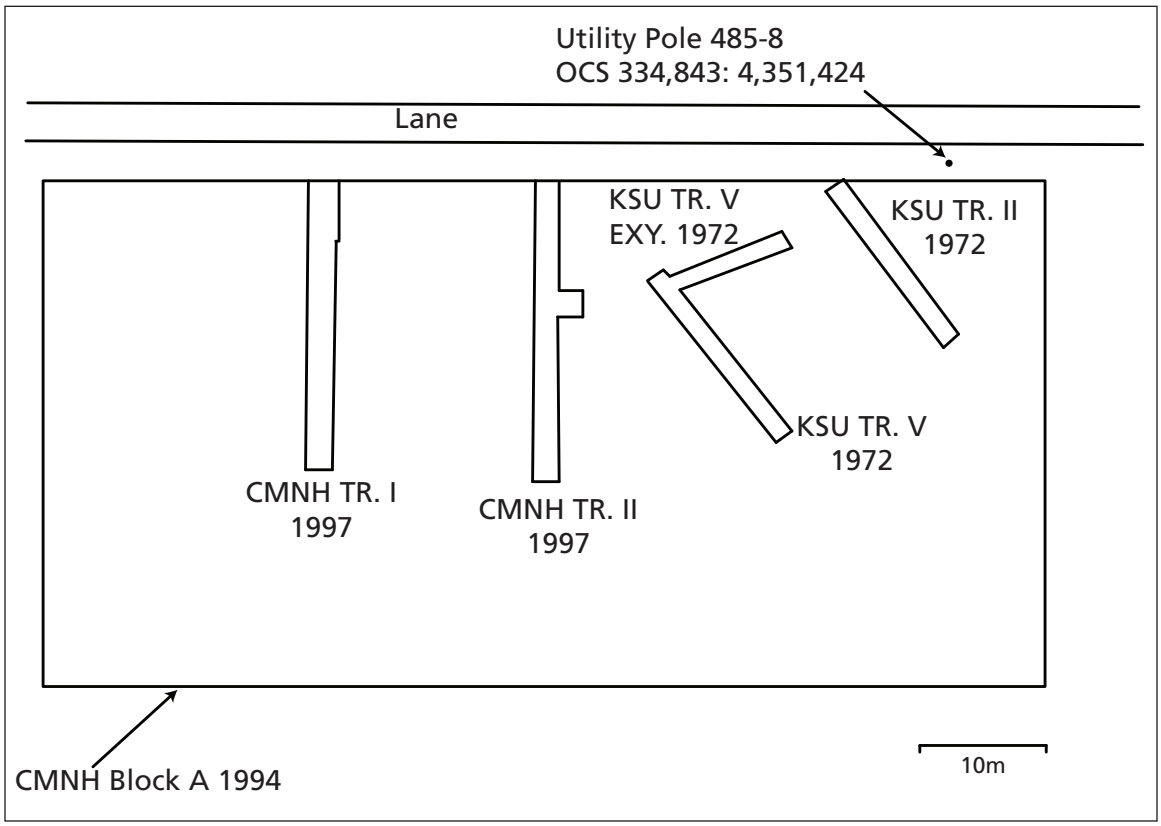


Figure 3-7. Location of the excavations south of the lane in and across the Great Circle wall.

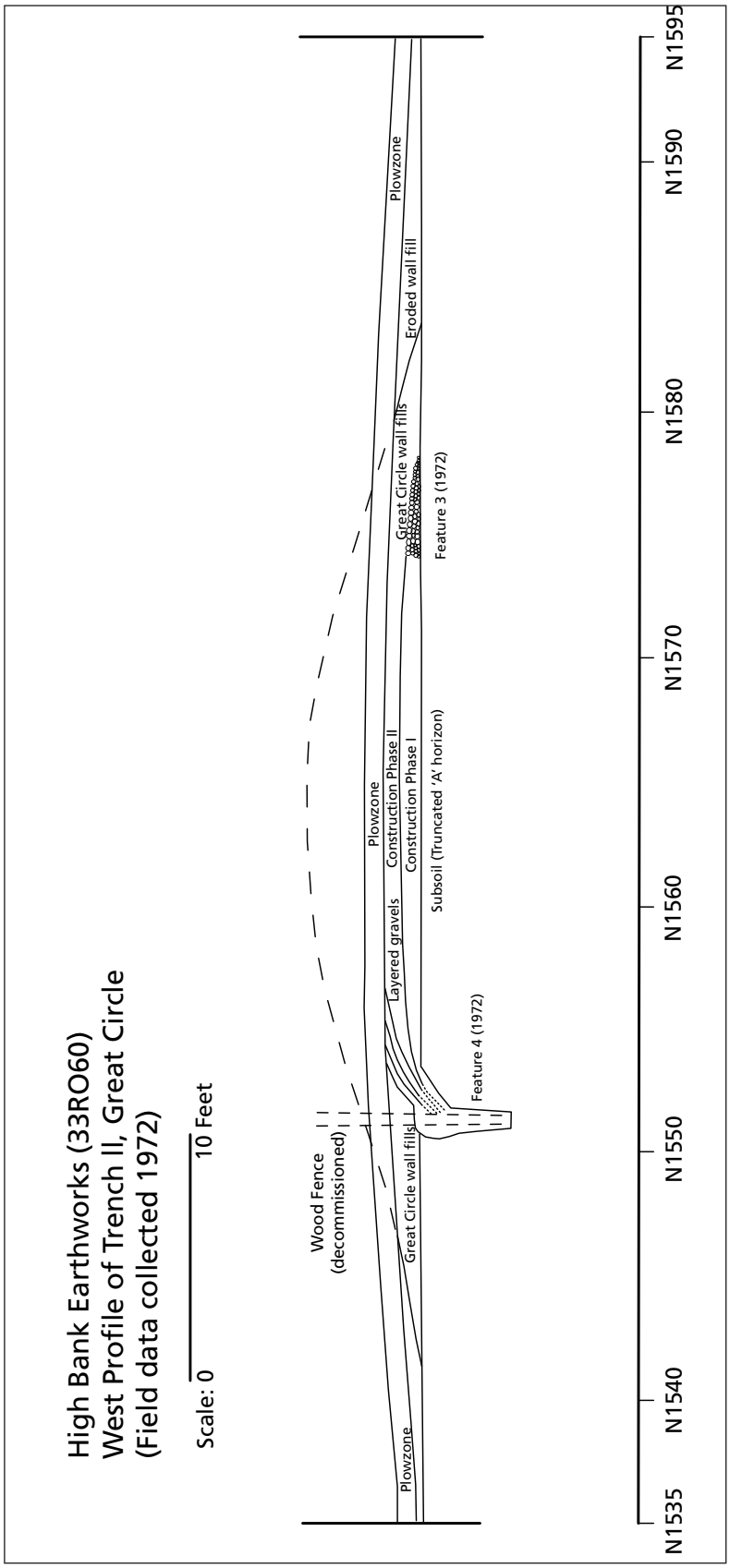
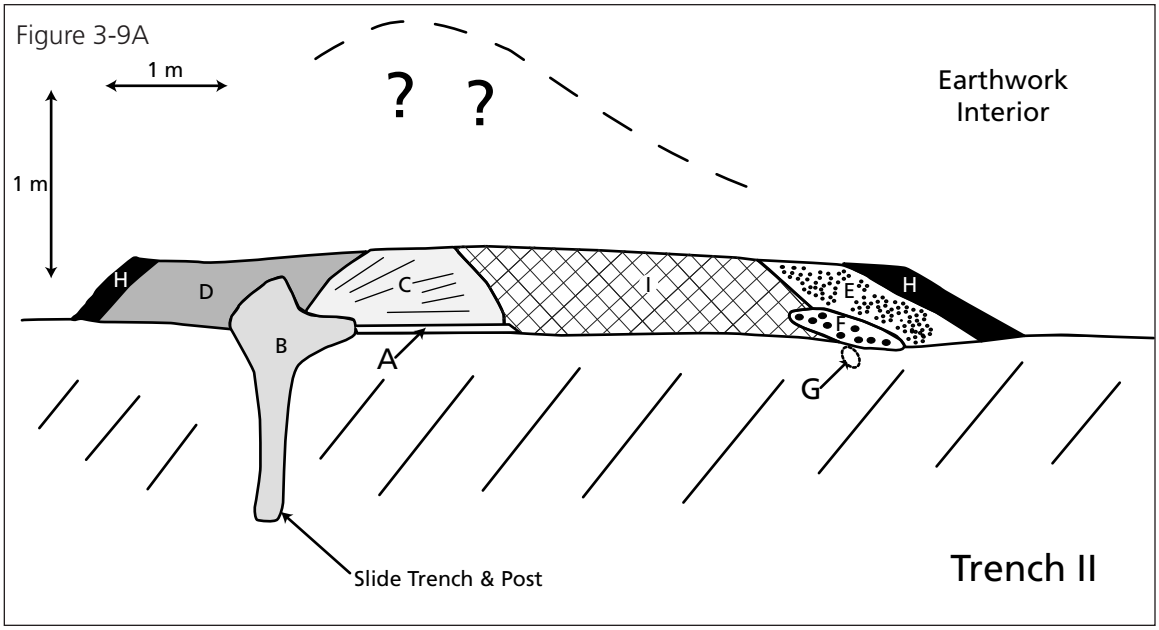
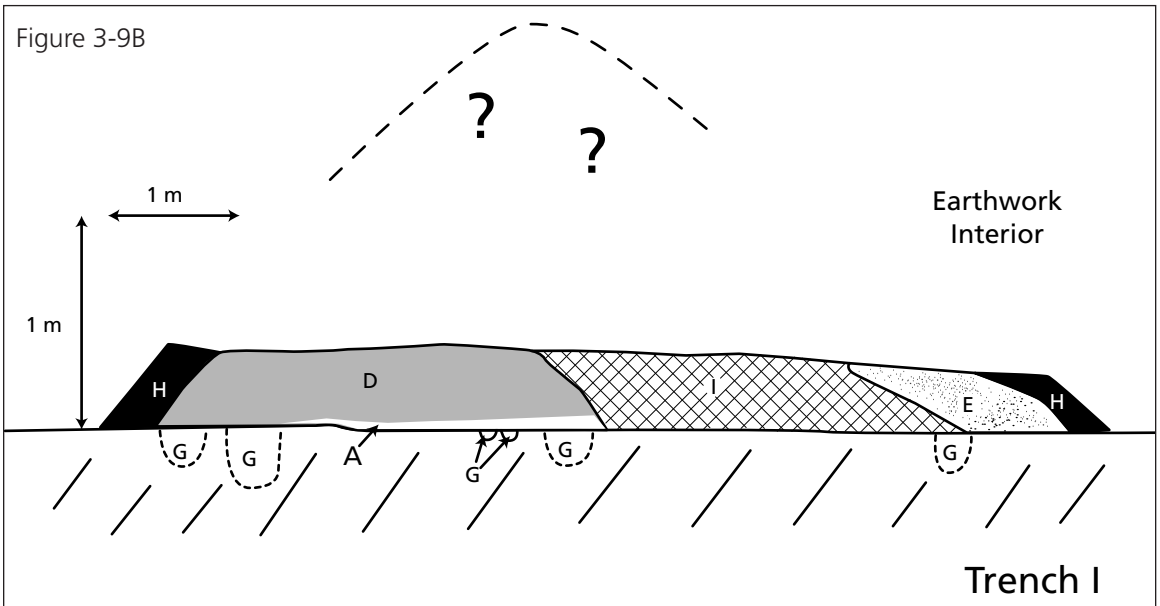


Figure 3-8. Profile of the Great Circle wall as seen on the west wall of KSU Trench II. See Figure 3-3 for location of the trench.





Key (Figure 3-9A & 3-9B)

A Clayey soil, very thin layers alternating black and yellow (Features 1, 16).
B Dismantled fence, oak posts and slip trench (Features 18, 20).
C Thin layers of gravels, alternating in color (Feature 17).
D Coarse materials, gravels, sands, many pebbles.
E Yellow silty clay loess (Feature 3).
F Single layer of cobbles (Feature 14).
G Post holes, posts removed.
H Silty clay loam, capping layer.
I Reddish clay soil (Feature 2).

Figure 3-9 Schematic profiles of the Great Circle wall (A) as seen on the west wall of CMNH Trench II. (B) as seen on the west wall of CMNH Trench I. The strata are composed of materials available on the terrace or in the flood plain below, each apparently chosen to be part of the complex design. See Figure 3-3 for locations of the trenches.

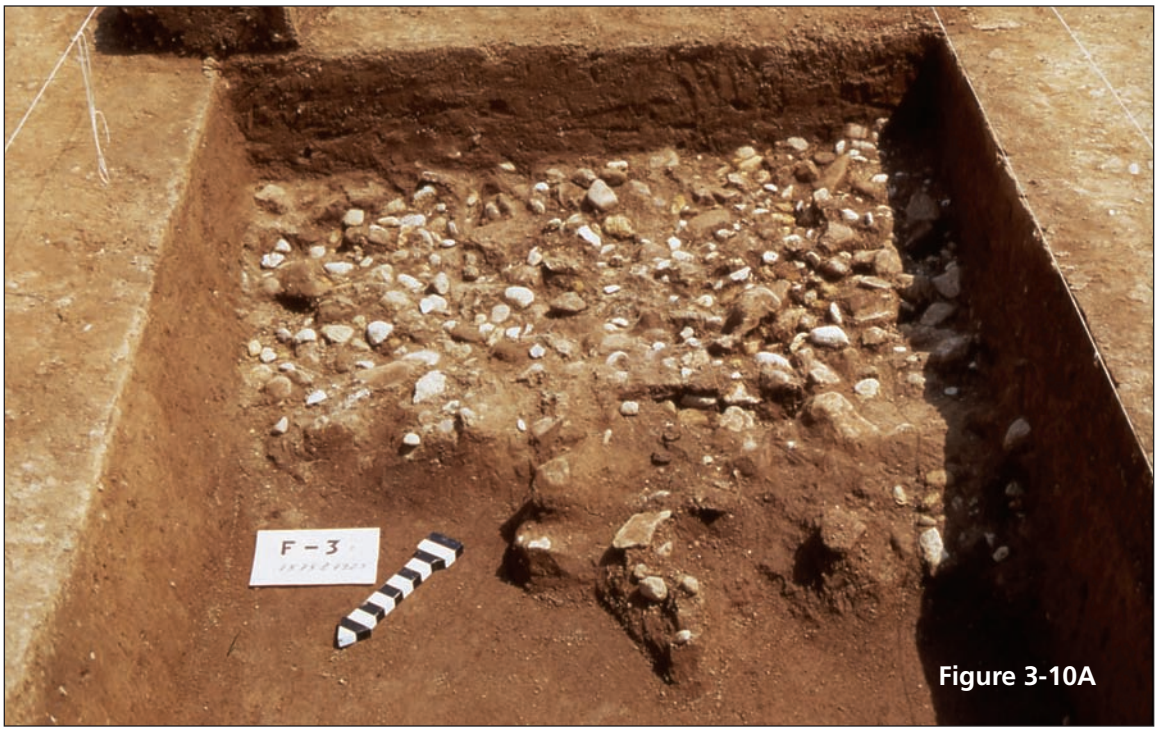


Figure 3-10A

Figure 3-10B

Figure 3-10C

Figure 3-10. Field photographs of the cobble layer, (A) KSU Trench II, Feature 3 (1972), unit stake N1575 E792.5 (B) CMNH Trench II looking south, Feature 14 (1997). Note the slant of the stratum in the CMNH trench. (C) CMNH Trench II looking south towards outer edge of the Great Circle wall, showing Feature 14 (1997) between Feature 3 (foreground, yellowish silty clay) and Feature 2 (background, reddish clay) as Feature 14 was first uncovered.

Figure 3-11. Field photographs of the decommissioned fence that lay beneath a portion of the Great Circle wall. (A) The top of the aboriginal trench, Feature 4 (1972), that held the fence posts as first uncovered in KSU Trench II. (B) A profile view of the dismantled fence posts and aboriginal slip trench and a section of the bottom of the aboriginal trench showing the base of the row of posts as uncovered in CMNH Trench II.

and thus may show different wall lengths. The height of the wall remnant recorded in 1972 was 58.42 cm (23 in). Due to agricultural activities and erosion, the height recorded in 1997, at 40 cm, was nearly 20 cm less. Still, continuity in the construction design of the aboriginal wall was seen across the excavation trenches. All the materials used in building the wall could have been found on the terrace or in the adjacent floodplain. The wall was constructed upon a prepared surface made by stripping the A horizon (top soils) and exposing the underlying B horizon. The amount of stripping apparently varied but the resulting surface was consistently smooth. This type of construction is a common feature of many Ohio Hopewell wooden structures and ritual areas where the clayey nature of the exposed subsoil makes a useable activity floor such as that found beneath Hopewell Mound 25 (Shetrone 1926:60) and within the Seip Earthworks (Greber 1997:210; Greber et al. 2002). Two of the earthen strata that were part of the initial construction of the Great Circle wall extended across the excavations. Construction Phase I (1972) apparently correlates with Feature 2 (1997) and the overlying construction Phase II (1972) with Feature 3 (1997) (Figures 3-8, 3-9). The two strata differed in color and texture and the boundary between them was clear (Figure 3-10C).

The relationship of these strata with a layer composed of mixed granitic, sandstone, and decaying limestone cobbles and pebbles, Feature 3 (1972), and Feature 14 (1997) is more complex. This is due, at least in part, to the variations in width, depth, and angle of the cobble layer. The width was 1 m from CMNH Trench I into KSU Trench 5-Extention where it began to widen to the 1-1.5 m seen in KSU Trench II. The depth ranged from a loosely packed, single layer of cobbles towards the west to several layers, 15 cm thick, in KSU Trench II. The angle varied in a monotonic fashion from quite steep (ca 35 degrees) in the west to approximately 20 degrees in KSU Trench V to a nearly horizontal position farther east in KSU Trench II (Figures 3-8, 3-9, 3-10). Stratigraphically, in the CMNH trenches the cobble layer was placed on the lower slope of Feature 2 (1997) and the adjacent construction floor. Both were overlain by Feature 3 (1997) located towards the inner edge of the Great Circle wall. This order continued into KSU Trench V where the stones lapped up and over construction Phase I (1972) and both were overlain by construction Phase II (1972). However, at this point, a very dark brown humic soil containing snail shell fragments, minute flecks of carbonized organic material, and occasional chert flakes lay between the cobble stratum and the top of Phase I. This earth appears to be an accumulation of humic topsoil collected from the ancient terrace surface. The deposit continues under Feature 3 through the KSU Trench V-extension. Farther east in KSU Trench II the feature was constructed directly on the prepared terrace subsoil (Figure 3-8). Probing with an iron rod suggests that the cobble layer ends about a meter east of KSU Trench II.

The layer was not seen in the western wall of CMNH Trench I. A 1 x 1 m window trench was hand excavated adjacent to the western wall to expose more of the join of Features 2 and 3 (1997). The contrasting reddish and yellowish colors of the strata were clear, although they do fade relatively quickly when exposed to the air. No cobbles were found. It is possible that a single sparse layer had originally been between Features 2 and 3 (1997) at this point but at a higher level in the wall than was found towards the east. Such a level would have been destroyed by the deep plowing that reduced the remnant between 1972 and 1997. As seen in all CMNH wall profiles, posts were placed on the construction surface towards the inner side of the wall near the join of Features 2 and 3

and then apparently removed prior to building up the wall. In CMNH Trench II, three small refilled post holes were found equally spaced beneath the rock stratum that lay at the join. In at least the section of the circle wall intersected by CMNH Trenches I and II, the cobbles may have demarcated a line of posts that was removed prior to building the wall. The cobble layer is a unique, apparently cambered, stratum of the Great Circle wall.

A second major feature that crossed three of the four excavation trenches was a fence, Feature 4 (1972), and Feature 18 (1997), located towards the outer side of the wall (Figures 3-8, 3-9A, 3-11). An angled slide area was used to set closely packed oak posts into a narrow trench that extended more than a meter below the cleared construction surface into the glacial sands. Reddish clay and occasional stones were used for additional support. Prior to completion of the wall, the fence was decommissioned: dismantled, partially burned, and covered. The surface of the slide area where the builders had stood to place the posts and the adjacent section of the construction floor were mantled by distinct, relatively thin (4-8 cm) layers that alternated in color and texture. Remnants of at least one stratum lay over the decommissioned fence and adjoining wall section. This stratum was composed of loadings of loamy soils containing varying amounts of sand, clays, and silts that likely reflect local differences in source areas.

Also, towards the outer edge of the wall, beginning west of the fence, pre-construction activities as seen in CMNH Trench I included the placement of several posts on the cleared floor. These were removed before four to five layers of clayey soil, apparently from the floodplain, were placed on the floor (Feature 1 (1997)). The layers alternated yellow (10YR 5/4 yellowish brown) and black (10YR 2/2 very dark brown) in color. Their thickness ranged from 0.5-2 cm. The number of layers decreased towards the east. A coarse, pebbly stratum (Feature 5 (1997)) composed of materials matching glacial outwash subsoils found beneath the wall covered Feature 1. It appears likely that some elements of Feature 1 continued into Feature 16 in CMNH Trench II. Figures 3-8 and 3-9 summarize the relationship of these features and the remaining wall strata.

Northern Wall Section

The third CMNH trench was located to determine the source of an anomaly first identified in 2000 using a fluxgate FM36 gradiometer. Surveys using the same instrument in 2001 and 2002 and resistivity pseudo-sections taken using the Geohm C earth resistance meter in 2001 corroborated the location and pattern of the anomaly. This pattern is generally circular in outline and approximately 14 m across. It begins near the outer edge of the wall and extends some 6 m beyond the usual wall width (Figure 3-12). A 2 x 18 m test trench was placed perpendicular to the wall in the central area of the anomaly. The northwesterly corner of the trench was at N253.88 E-71.42 and the southwesterly at N241.38 E-58.81 in the general site grid. The excavations revealed the remnant of the wall itself and a different sequence of construction from that found south of the lane. Consistent with the initial construction seen in both 1997 trenches, the builders apparently cleared the original ground surface to about 20 cm above the underlying natural glacial sandy gravels. The degree of leveling or smoothing differed. A more uneven surface occurred towards the grid south end of the trench. An unexpected finding was that more than 200 generally circular features of varying diameters

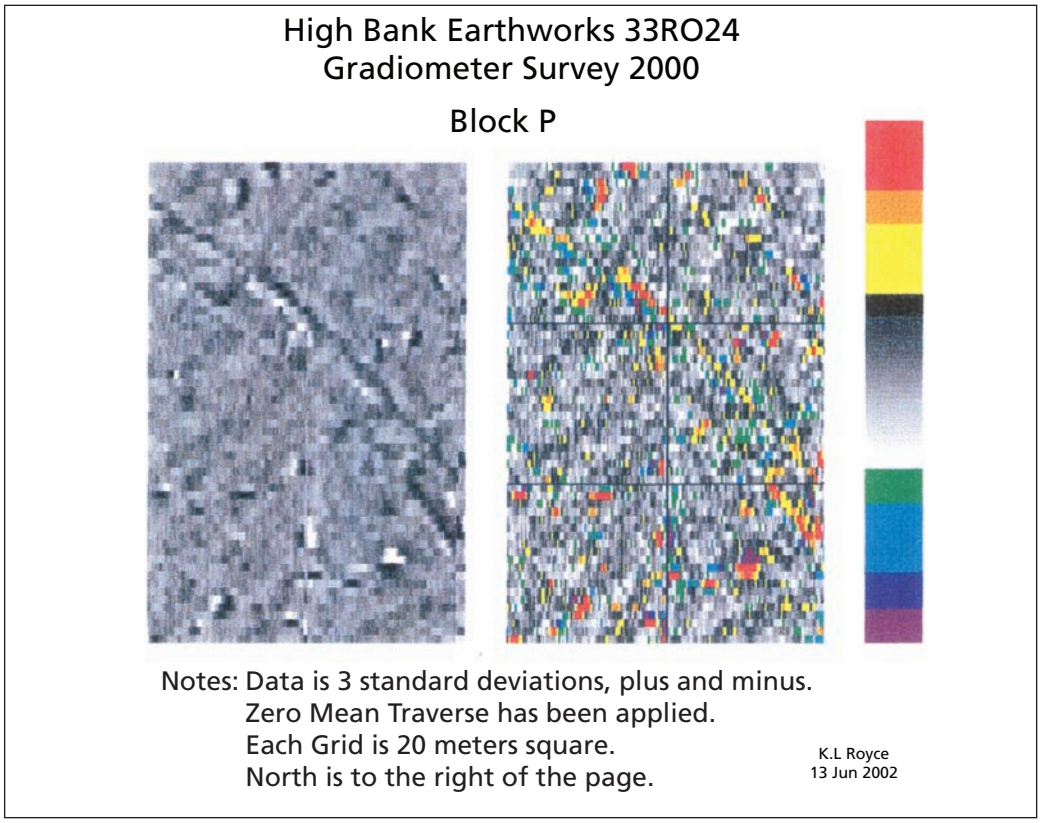


Figure 3-12A. Magnetic map showing a circular anomaly cutting across the trace of the Great Circle wall in CMNH Block P. Map prepared by Karen Royce.

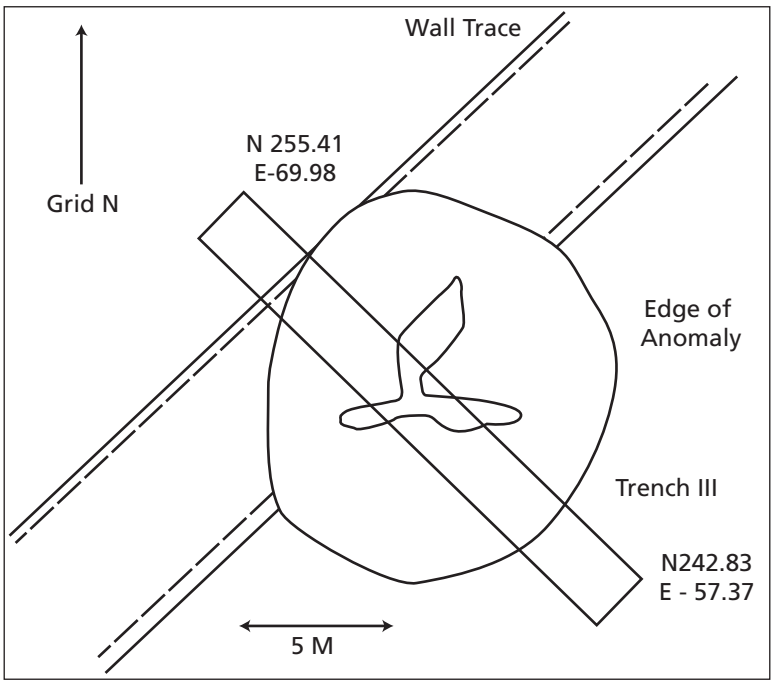


Figure 3-12B. Diagram showing the relative location of CMNH Trench III and the anomaly in CMNH Block P shown in Figure 3-12A. The goal was to cut the trench across the central area of the anomaly.

Figure 3-13. Field photograph: flagging the multitude of circular post hole sized features on the floor of CMNH Trench III at 50 cm below the base of site reference stake N0E120.

apparently originated on the cleared construction floor (Figures 3-13, 3-14). No pattern in their placement is obvious and other such features are likely outside the excavated area. It appears possible that numerous posts were placed on the cleared construction floor and apparently removed shortly thereafter. Soils of the same type (but without soil structure) that formed the construction floor itself filled the holes after the posts were removed. Removing posts and refilling the empty post holes is a relatively common Hopewellian custom. Frequently the fill is fine gravels, colored clays, or other materials that contrast with the floors holding the posts, for example see Mound 2, Hopewell Site (Shetrone 1926:22) and Capitolium Mound, Marietta Earthworks (Greber 1991). The High Bank features were easily identified as the top of the natural gravels was exposed. When the features were in contact with an excavated unit wall their origins could be seen in wall profiles (e.g., Figure 3-15).

Near the outer edge of the aboriginal wall, a line of small decayed posts and an adjoining slide trench ended in the underlying natural gravels (Feature 2 (2002)). The separate covering of this feature was truncated by the plowzone. The wall profile in Figure 3-15 shows a portion of this small fence or screen and other construction strata. A sandy clay layer with a few small pebble inclusions was placed at the grid north end of the floor (Feature 232). An apparent bank or wall, rectangular in cross section, was cut through the cleared floor between 5-6 m grid south of Feature 232. A mantle composed of a layer of heavy gravels in a clayey matrix (Feature 5 (2002)) covered these features and the remaining extent of the activity floor. Infrequently, small areas of reddened soils and/or burnt pebbles were found in the loadings that formed this stratum, but no evidence for *in situ* burning was found. One large post intruded into this stratum and possibly a line of shallow posts near the inner edge of the circle wall (Feature 1 (2002)). The first stratum of the wall itself, found immediately below the plowzone, was reddish, sandy clay placed over a portion of the gravelly layer (Feature 4 (2002)). The southern end of this layer apparently indicates the inner edge of the wall. This edge and variations in the placement of the heavy gravel layer correspond to patterns within the anomaly. Note the many possible post holes at the bottom of the profile. Due to the lack of contrast between the feature fill and the adjoining soils, no geophysical field instrument can, as yet, differentiate these features from the surrounding natural soils (Greber 2002).

RADIOCARBON ASSAYS

The results of seven radiocarbon assays from charred wood recovered in CMNH excavations are given in Table 3-1. Three of the dates come from a charred post, Feature

Table 3-1. Radiocarbon dates from the Great Circle, High Bank Works.

Museum Number	Material	Lab Number	Measured Radiocarbon Age 1 sigma	13C/12C	Conventional Radiocarbon Age 1 sigma	Context
TrenIIICC#01	charred oak	Beta 170562	1930+/-40BP	-28.5	1870+/-40BP	Feature 2 (2002), slide trench
TrenIIICC#11	charred oak	Beta 170564	1890+/-40BP	-27.3	1850+/-40BP	Feature 2 (2002), slide trench
TrenIIICC#03	charred oak	Beta 170563	5150+/-40BP	-26.4	5130+/-40BP	Feature 6 (2002), post
TrenIIICC#03	charred oak	Beta 170563*	5150+/-50BP	-26.4	5130+/-50BP	Feature 6 (2002), post
TrenIICC#35A	charred oak	Beta 109207	1790+/-70BP	-28	1740+/-60BP	Feature 20D (1997), in situ post
TrenIICC#36A	charred oak	Beta 109208	2020+/-40BP	-28.6	1960+/-40BP	Feature 20D (1997), in situ post
TrenIICC#35A1	charred oak	Beta 110640	1860+/-30BP	-27.2	1830+/-30BP	Feature 20D (1997), in situ post
TrenIICC#050	charred oak	Beta 124044	1880+/-40BP	-23.9	1900+/-40BP	Feature 18 (1997). slide trench

*second run

20D (1997), found *in situ* near the bottom of the decommissioned fence in Trench II. The late Frances King, a research associate with CMNH, identified the wood as oak from a probably 50-60 year old tree. The fourth date comes from a piece of charred wood found in the tangle above the *in situ* posts (Feature 18 (1997), Figure 3-11). Dr. King described this piece as having a weathered outer surface prior to being burned. The average of the four dates at two sigma is 1860 ± 80 BP.

Three AMS radiocarbon assays come from Trench III. Two dates, Beta-170562 and Beta-170564, come from bits of charred oak recovered from the line of small posts (Feature 2 (2002)). They are consistent with the dates obtained from the larger posts that composed the decommissioned fence found in Trench II. The average at two sigma for the two dates is also 1860 ± 80 BP. This falls slightly on the older side of the peak of Middle Woodland dates available from the Scioto region in 2001 (Greber 2002:99-109).

The third date, Beta-170563, is apparently not associated with Hopewell wall construction. It was based on fragments of charred oak found at the edge of a post hole directly north of the slide trench (Feature 6 (2002)). Beta Analytic conducted a second independent run based on materials selected from the remaining pre-treated portion of the original sample. The resulting date is the same, many millennia before the Hopewell era (Table 3-1). Feature 6, a post hole that originated on the activity floor, contained a humic soil (7.5YR 3/4 dark brown). It tapered downward some 40 cm into the underlying natural gravels. Tiny flecks of charcoal occurred in parts of the fill. The charred wood found on the activity floor at the edge of the post hole appears to have been the remains of some earlier use of the site. The only portable artifact recovered in 2002, is a small,

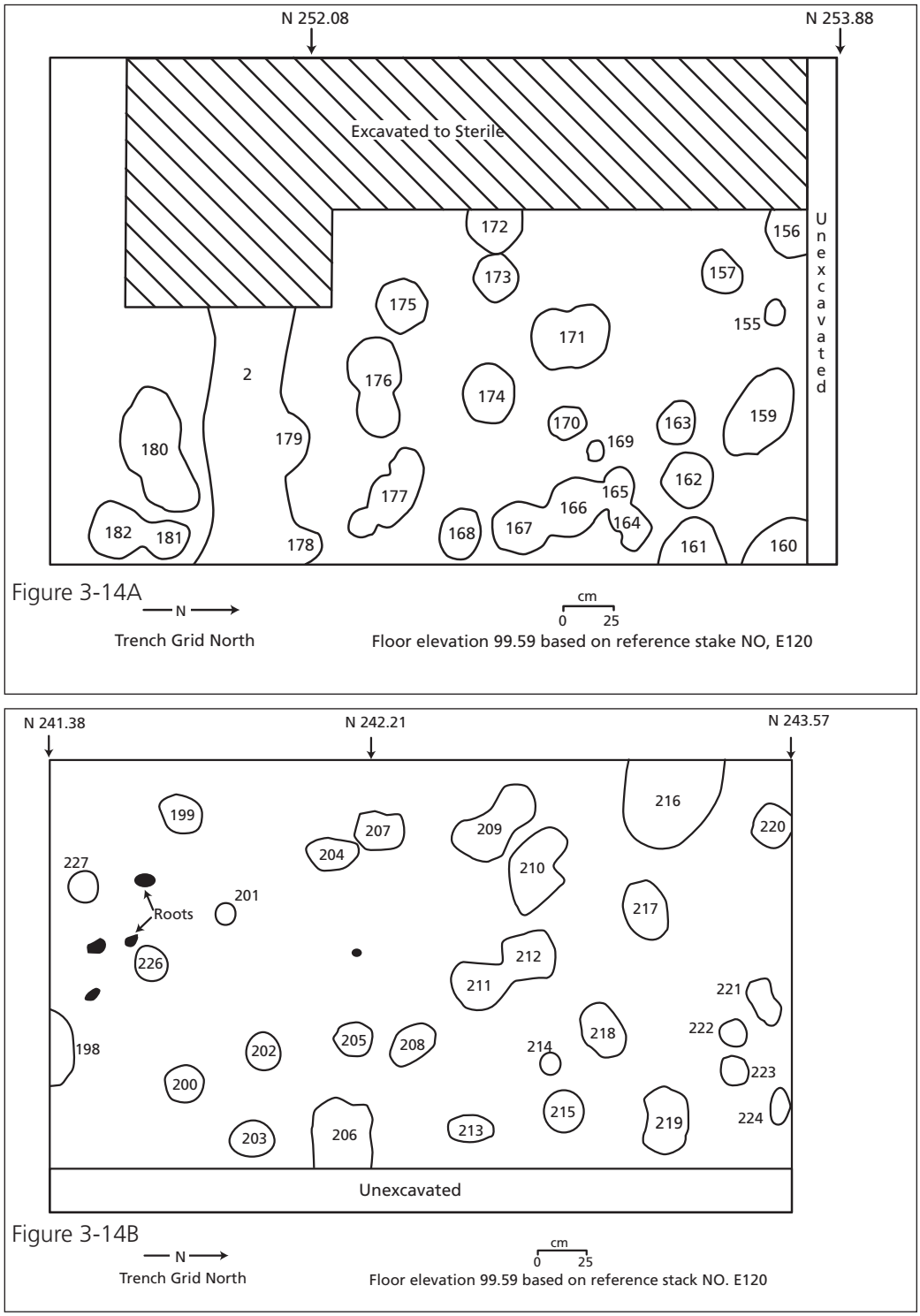
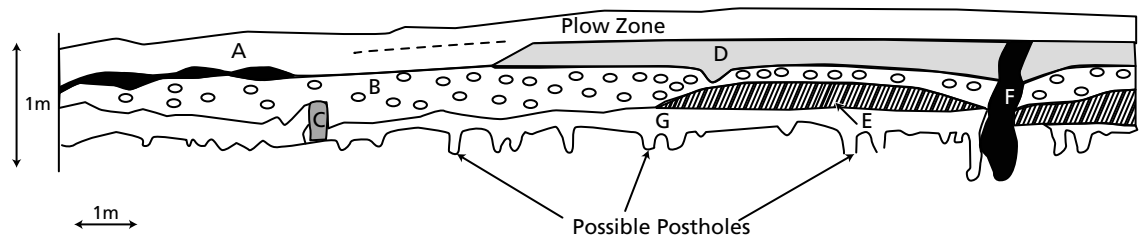


Figure 3-14. Floor plans of sections of CMNH Trench III at 50 cm below the base of site reference stake N0 E120. These show the outline of possible single and conjoined post holes that apparently originated on the cleared construction floor. (A) The northerly end of CMNH Trench III showing the narrow aboriginal trench, Feature 2 (2002), that held a line of small oak posts (see Figure 3-15) (B) The units at the southerly end of CMNH Trench III beyond the inner edge of the Great Circle wall (see Figure 3-12B).



KEY
A Silty loam with traces of gravel, perhaps an aboriginal feature (Feature 233)
B Forty to sixty percent cobbles in a silty clay matrix, occasional redden areas (Feature 5).
C Sandy clay loam, aboriginal trench that cut across Trench III (Feature 231).
D Silty pebble free clay, remnant of Great Circle wall (Feature 4).
E Sandy clay with less than twenty-five percent rocks (one cm or less) cut by Feature 2, the aboriginal trench (Feature 232, 232A).
F Narrow aboriginal trench holding a line of small oak posts (Feature 2).
G Cleared natural soil stratum, sandy clay with some pebbles (Feature 228).

Figure 3-15. Profile of the west wall of CMNH Trench III.

burnt, worked flint flake that was probably an accidental inclusion in the soils used for wall construction. It is possible that a second accidental inclusion of charcoal bits occurred during Hopewell earth moving. Unfortunately, Beta-170563 is not useful for dating the original building time of the Great Circle wall.

The overlap in the averaged dates from essentially opposite sides of the circle suggests a relatively short time, in terms of human generations, for initial construction of the wall. This is consistent with the condition of the lower strata where the top surfaces showed no signs of exposure. The total construction time that left a significantly higher wall is still not known; only basal edges of the upper layers are extant.

COMMENTS

A color contrast in adjoining strata appears to be a deliberate element in the design of the Great Circle wall. As seen in the CMNH trenches, the reddish, clayey soil on which the cobble layer was placed is overlain by yellow, silty clay loess that occurs in local spots as a result of Wisconsin glaciation. In KSU Trench II and CMNH Trench II a similar contrast was seen in the alternating colors of the gravel layers that mantled the floor just north of the decommissioned fence. Bright reddish and yellowish clays were also used in the construction of the Octagon wall segment VIII, although there was no evidence for the deliberate layering of contrasting colors noted in the Great Circle wall. The use of a color contrast occurs in other types of Ohio Hopewell constructions including deposits of artifacts and the design of wooden structures where the contrast may be as pairs chosen from the Hopewell pallet of red, yellow, black, and white (Greber 1996). As a more direct comparison, it is also recorded at other enclosure sites including the Great Circle at Newark (Lepper 1996; Wymer et al. 1992) and at the nearby Hopeton Earthworks (Lynott 2001, 2002; Lynott and Weymouth 2002). In these enclosure walls, the pattern is consistent with the lighter color on the outer side and the darker adjacent

layer towards the middle. When natural soils are used as a building material, the hue of a "red" or "yellow" soil may, by necessity, vary in sections of a wall as extensive as High Bank. This has been clearly demonstrated at Hopeton where a range of "reds" has been found in trenches cut across separate segments of the polygonal walls. As at High Bank, this range apparently reflects the variation in the subsoil colors found in different areas of the local outwash terrace. The overarching design criteria appears to be a light versus dark contrast (or complement) repeated in mantles over features and in wall strata themselves.

The inner wall construction at High Bank is at the complex end of the range of wall constructions seen to date in other geometric enclosures (Greber 2000). The single stratum at Anderson, though composed of a carefully chosen soil, is at the simple end of the range (Pickard and Pahdopony 1995). The wall at Mound City also appears to be one stratum but composed of a mix of surface and subsoils found in the adjacent borrow pits. Thus, the Mound City enclosure is another variation of a simple wall design. There is a similar range in the complexity of ground plans, with High Bank again at the more complex end of the range. It is not yet known whether such differences in inner wall design and/or ground plans reflect temporal and functional differences, or both.

Prior to wall construction, appropriate Hopewell architects and engineers determined a ground plan, wall design, and construction techniques that appear to differ for the Octagon and the Great Circle. Prior to raising the Great Circle wall, activities took place at the site that emphasize the importance of the initiation of the building process and perhaps of the planning phase. The remains of the activities found at the base of the wall differ near the neck and across the circle. The decommissioning and then mantling of wooden structures, either buildings or lines of posts, is a relatively common occurrence within Ohio Hopewell cultural remains as is the mantling of apparently ceremonially or ritually used floor areas. The plethora of possible posts found associated with the construction of the Great Circle wall adds new, and as yet unexplained, elements to possible interpretations of all the pre-construction activities at this great monumental marker of Hopewell knowledge, skills, and social commitment.

Acknowledgments

On behalf of ourselves and all professional and avocational archeologists who have worked in Ross County during more than forty years, we gratefully acknowledge the support of the late Alva McGraw. His support of the 1972 and 1997 excavations at High Bank is only part of the many ways he helped "look for the answers" that were and are to be found in the archaeological sites of his Ross County.

We also wish to acknowledge the diligent efforts and contributions of the participants in the 1972 Kent State University Archaeological Field School at Highbank: Sarah Brdar, Kathy Falcon, Bruce Ferrini, Eric Langhirt, George Reymond, Christine Roysdon,Douglas Roysdon, Franco Rufifini, Barbara West, and Molly Williamson. Special thanks are due to Dr. Linda C. K. Shane, who managed logistics for the field camp.

Permission for the geophysical surveys 1994-2001 was granted by the Archaeological Conservancy and Alva McGraw. Permission for the 2002 field work came from the United States Department of the Interior and Hopewell Culture National Historical Park. Funding for CMNH field work was provided by the Kirtlandia Society of the Cleveland Museum of Natural History, the NPS Challenge Cost Share Program, the Robert M. Utley Research Fund, the Laub Foundation, Hopewell Culture National Historical Park, and private donations to CMNH. Services in kind came from Hopewell Culture National Historical Park, the Midwest Archeological Center, the Milton Hershey School, Hocking College, and the Cleveland Museum of Natural History. Special thanks to all the field crews who patiently carried instruments and moved ropes: Ben Burcham, Jarrod Burks, Michael DiPaolo, Jack Eley, Robert Fletcher, Lisa Huston, Laura Pahdopony, Jennifer Pederson, William Pickard, Karen Royce, Jennifer Simpson, David Towell, Dawn Walter, Jeffrey Weinberger, and John Woodward. R. Berle Clay ran both conductivity and magnetic instruments. Bruce Bevan taught us how to obtain resistivity pseudo-sections. John Weymouth has been teacher, field supervisor, and chief analyst. Coring was done by Robert Connolly, William Pickard, and Ted Sunderhaus. Members of the 1997 crew were William Pickard, Kevin Lippe, Jennifer Pederson, Tori Saneda, Jeffrey Weinberger, Larry Wickliff, and Deborah Wood. Members of the 2002 crew were Karen Royce, Jules Angel, Randall Denlinger, Nadia Fortman, Ryan Jackson, and Brooke Thompson. Assistance also came from Jarrod Burks, William Pickard, Dawn Walter, and Jeffery Weinberger. The backhoe operator for both seasons was Michael Butts. Dee Anne Wymer identified the 2002 charcoal samples. Our appreciation and many thanks go to all.

Addendum:
A Brief Summary of Additional Field work at High Bank Earthworks since 2002.

In considering the multitude of apparent post holes found in Trench III a question arose concerning the possibility that these were a natural geological phenomenon known as frost wedges or clay fingers. This possibility came to my attention after the salvage work conducted at the Shriver Circle by Gray and Pape, Inc uncovered subsurface features that were interpreted as such (Picklesimer et al 2006:64-65). I then consulted with Gordon Gilmore, at that time he had just become the Ross County Soils Agent after the retirement of Danny Lemaster. His conclusion was that the recorded data from Trench III was inconclusive. I also consulted with Rolfe D. Mandel, Kansas Geological Survey, University of Kansas. Dr. Mandel has worked for several years with Mark Lynott at the Hopeton Earthworks in studying the sources of the materials used to build the walls. He kindly reviewed the 2002 data. His opinion is that based on the data collected, particularly the size and complex horizontal pattern of these features (e.g. Figure 3-14) these are not frost wedges. A final explanation for these clear, but still difficult to interpret features, might come from additional ground truth in the areas adjoining Trench III.

The additional areas of the earthwork complex where Cleveland Museum of Natural History field work has taken place since 2002 are noted in Figure 3-16. Magnetic and resistance surveys continued over Octagon segments I and II (see Figure 3-3). The results are consistent with the KSU 1972 descriptions of wall construction and fill. For

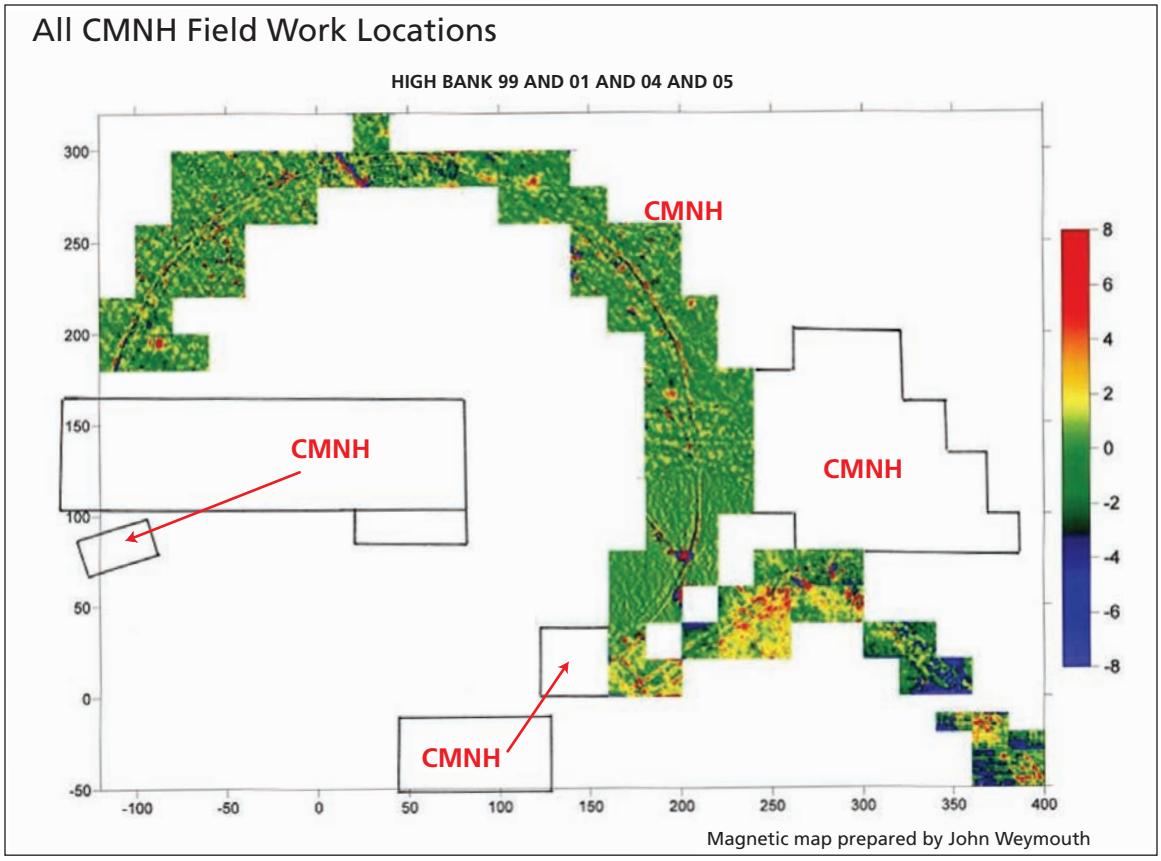


Figure 3-16. Areas studied by Cleveland Museum of Natural History 1994-2008. Magnetic map courtesy of John Weymouth. See Addendum for summary of results from 2003-2008.

example, in the magnetic traces of the Octagon walls the edges of both sides of the wall patterns in Figure 3-16 are similar and the interior fill appears to be more jumbled than is seen in the magnetic trace of the Great Circle wall where layered strata appear (e.g. Figure 3-6). In Figure 3-16 the break in the pattern of wall segment II is due to the presence of the farm lane. South of the lane an additional unpaved pathway used by farm equipment has impacted the ground surface and interfered with the geophysical survey. However, the same basic pattern of the wall edges and interior as seen north of the lane appears to continue (Greber 2004, 2005).

In 2006 as part of a joint project with Professors Robert Horn and Ray Hively of Earlham College (Hively and Horn 1984), students from Earlham College excavated Trench IV, a small test trench set over a portion of an anomaly found at the point where a vertex of a complete octagon would fall if wall segments I and II were extended to close the actual gap between them (Figures 3-3, 3-16). As has been found beneath all embankment walls examined thus far, and across the entire area within the Great Circle as determined by Danny Lemaster, Ross County Soils Service in 1997, the A-horizon in this area had been removed and the ground surface leveled. Several broken bladelets were recovered from an apparent cultural layer; these are the first artifacts recovered by CMNH excavations. An empty post hole was also encountered, but no clear stratum or feature that explained the anomaly (Greber 2006).

Field work continued in 2007 with additional magnetic and resistance geophysical surveys east of the Great Circle. The season's goal was to locate the small circle shown east of the Great Circle in the maps published by Squier and Davis in 1848 (Figure 3-1: I). Possible locations of the circle were made in independent assessments by Dr. Robert Horn, Earlham College and by myself. The western boundary of the survey was set to continue the area covered by earlier surveys. The eastern boundary was determined by the edge of the stone embankment constructed for the railroad side track (see Figure 3-2). Based on the survey results to date, it appears possible that there were a number of small enclosures in this area rather than the single 250 foot circular wall depicted in the Squier and Davis map. Circular patterns seen in the geophysical data appear to be consistent with the sketch map of High Bank drawn by Charles Whittlesey in the 1830s and also with his comments on the enclosures east of the Great Circle. The note book containing this sketch and accompanying text is now in the archives of the Western Reserve Historical Society (Whittlesey 1838-1872).

An anomaly similar to ones that at other sites in the region have been shown to mark pre-Columbian features such as earth ovens, was found within a circular magnetic pattern just over 20 m in diameter (Greber 2007,Greber et al 2007). In 2008 a short trench was placed over the anomaly. The excavation (Trench V) uncovered an area of bright red clay soil (the brightest red yet seen at High Bank) that matches the apparent end and edges of the magnetic anomaly as the magnetic values dropped to 4nT from the peak central value. The extent of the yellowish clay soils surrounding the red soils is not known, as these continue beyond the excavated area. Neither burned organic matter, such as charred wood, nor fire damaged rocks were found. Technical studies of the soil samples recovered are continuing. Results to date suggest that the soils may have been affected by fire although no significant organic materials have been recovered from or near the soils (Greber 2008).

Acknowledgments.

Continued support for the field seasons came from Hopewell Culture National Historical Park and the Midwest Archeological Center and their staffs. The Cleveland Museum of Natural History Kirtlandia Society supported CMNH interns. Additional support came from the Robert Utley Research Fund, a Ford-Earlham Fund grant to Ray Hively and Robert Horn, and an NPS Challenge Cost Share Program grant. Kezia Van Meter Sprout provided contributions in kind, as did the University of Akron. Field crews included Caitlin Baiduc, Adam Blanford, Jamison Brizendine, Erin Dempsey, Dawn Walter Gagilano, Maggie Hallowell, Laura Havernac, Robert Horn, Lucy Huffman, Mandy Murray, Choya Mansfield, Stuart Nealis, Karen Royce, Ben Self, Jessi Stewart, James Sutter, and Laney Varaljay. Jeb Bowen, Jarrod Burks, Kevin Coleman, Michael Greer, Arlo McKee, Sara Matthews, and Dawn Munger volunteered. Kathleen Brady and Jennifer Pederson Weinberger have continued to support and participate in the work both in the field and at the Park headquarters. I thank them all.

CHAPTER 4

SPRUCE HILL EARTHWORKS: THE 1995-1996 NATIONAL PARK SERVICE INVESTIGATIONS

BY
BRET J. RUBY

Spruce Hill has long been recognized as one of the most intriguing archeological localities in the southern Ohio area. Since the early nineteenth century, local residents and some of the most renowned figures in American archeology have sought to explain the nature and origin of the curious stone walls and intensely burned rock and soil found atop this prominent hilltop in the Paint Creek valley, 19 km west of Chillicothe in Ross County, Ohio. Various observers have interpreted the site as a prehistoric stone fort built by some lost people, a Viking stronghold and iron works, and as an entirely natural feature.

This report describes a re-evaluation of the Spruce Hill Earthworks undertaken by the National Park Service during 1995 and 1996. This work was prompted by 1992 legislation (Public Law 102-294) that directed the Secretary of the Interior to conduct archeological studies of the Spruce Hill Earthworks and other sites to evaluate the desirability of adding them to the newly renamed and expanded Hopewell Culture National Historical Park.

Background

The hilltop enclosures of southern Ohio received a great deal of archeological attention in the mid- to late nineteenth century (see Atwater 1820; McFarland 1888; Moorehead 1890; Overman 1888, Putnam 1891; Squier and Davis 1848). The early writers universally interpreted the hilltop works as military fortifications. However, these early investigators often expressed disappointment that the hilltop works produced few treasures to compare with the exotic raw materials and works of art commonly recovered from mounds associated with the lowland geometric enclosures in southern Ohio. The high level of interest in unusual and beautiful artifacts, in part, led professional archeologists to halt further study of the hilltop enclosures of southern Ohio for more than half a century. Current opinion remains divided with respect to the function of the hilltop enclosures of southern Ohio. Prufer remains the most ardent supporter of the "military hypothesis" (see Prufer 1997). Others champion more complex multifunctional models in which the hilltop enclosures may have served simultaneously or sequentially as places of defense and centers of habitation or ceremony (Connolly 1996, 1997; Essenpreis and Moseley 1984; Riordan 1995, 1996, 2002).

The Spruce Hill Earthworks

The Spruce Hill Earthworks occupy a prominent mesa-like hill jutting northward into the Paint Creek Valley, along the northwestern escarpment of the Appalachian Plateau. Spruce Hill is capped by 7.6-12 m of relatively level and resistant sandstone

bedrock (Berea sandstone). This stratum is underlain by almost 122 m of more easily eroded shales (Quinn and Goldthwait 1985: Table 1). More than two million years ago, preglacial streams and erosion cut deep incisions through the Berea sandstone and left prominent flat-topped "mesas" and ridges perched above deep valleys below. The hill was likely glaciated during Illinoisan times but not during Wisconsinan times. Surface soils consist of Avonburg and Rossmoyne silt loams that formed in glacial tills and loess (Petro et al. 1967). Both of these soil series have a fine textured upper solum that is free or nearly free of stones: this observation will be important in evaluating the nature and origin of the stone "wall" at Spruce Hill.

Early Descriptions of "Ancient Works" on Spruce Hill

The earliest references to "ancient works" atop Spruce Hill are attributable to Foster (1814) and Atwater (1820) in the early nineteenth century. Both describe the site as an ancient "fortification" enclosed by a ruined stone wall built of undressed sandstone drawn from the natural outcrop along the brow of the hill. Both also describe as many as 30 "furnaces" marked by burned clay and cinders thought to be by-product of brickmaking or ironworking.

Squier and Davis (1848) published a much more detailed map and description in their *Ancient Monuments of the Mississippi Valley*. Their more careful work of description discerned additional important details. First, Squier and Davis were quick to point out that the "wall" probably never resembled anything like a regularly laid up or mortared wall, and the casual visitor might well mistake the wall for a natural stone outcrop; this impression "is speedily corrected upon reaching the points where the supposed line of *debris*, rising upon the spurs, forms curved gateways, and then resumes its course as before" (Squier and Davis 1848:11). Squier and Davis describe three such reentrant gateways (marked A, B, and C on their plan) located where ridge spurs afford points of easy ascent. At these points, the stones clearly rise above the brow of the hill and onto the summit, *above* the level of the natural sandstone outcrop. They also observe "[a]t the gateways, the amount of stones is more than quadruple the quantity at other points, constituting broad, mound-shaped heaps" (Squier and Davis 1848:12). Squier and Davis identify the heaviest portion of the wall as that point described as "the Isthmus" (D on the plan). Here, the stones are carried up and over the level summit of the hill for a distance of 213 m, broken by four reentrant gateways.

Another important observation recorded by Squier and Davis can be seen in their plan and in their statement that "[m]ost of the wall, and a large portion of the area [within], are still covered with a heavy primitive forest" (Squier and Davis 1848:12; also see Fowke 1902:244). This observation contradicts later observers (e.g., Pacheco 1988a) who suggest that the wall simply represents the secondary consequence of Euroamerican farmers clearing fields of stones in order to facilitate plowing and cultivation.

Finally, Squier and Davis, in concert with all of the earlier investigators, describe evidence of intense burning at numerous locations along the wall. They describe piles of stones that "exhibit the marks of intense heat, which has in some instances vitrified their surfaces, and fused them together. Light, porous scoriae are abundant in the centres of some of these piles" (Squier and Davis 1848:12). Squier and Davis dismiss out of hand

the idea that these represent "ancient furnaces," but seem more willing to entertain the notion that the burning resulted from "signal fires," or the destruction of some sort of wooden superstructure surmounting the stones.

After Squier and Davis, several writers provide descriptions of the stone works atop Spruce Hill but without adding materially to the earlier observations (see Anonymous 1927; Fowke 1902; Moorehead 1890:103-104; Randall 1908; Randall and Ryan 1912).

In 1934, Emerson Greenman conducted the first professional archeological investigations at the Spruce Hill Earthwork. He found that "[e]xcavation of the wall of the gateways at the south end of Spruce Hill in Ross County revealed quantities of "slag" apparently resulting from an intense fire which reduced the earth forming the roof and sides of some sort of log structure to glass, in some instances" (Greenman 1935).

Vikings and Bloomeries

The site again drifted into obscurity until 1948 when Captain Arlington Mallery—an Army officer, engineer, sailor, navigator, mason, and student of ancient metallurgy—followed to Spruce Hill his conviction that Vikings and other Iron Age peoples from northern Europe settled in North America up to 1000 years before the voyages of Columbus (Mallery 1951, 1958; Mallery and Harrison 1979). The reports of "furnaces" and "slag" atop Spruce Hill suggested to Mallery that perhaps he might find there solid archeological evidence of a northern European Iron Age occupation in southern Ohio.

Mallery visited Spruce Hill on several occasions in 1948. He claimed to have found several simple "bloomery"[1] furnaces similar to Iron Age examples from northern Europe. In addition, he reports finding evidence of stone-lined graves and burial chambers, one marked by a stone engraved with "Norse runes." However, the "rune stone" cannot now be relocated for study and there is no indication in the published photographs of any formal burial pits, tombs, or human remains. He also describes finding charred stockade posts beneath the encircling stone wall.

While engaged in these investigations, Mallery explored at least four other supposed iron furnace sites in the Deer Creek valley just north of Chillicothe in Ross County, Ohio. Two of these sites, the George Arledge Mound and the Haskins Mound No. 1, were marked by conical mounds similar to thousands of other Adena and Hopewell mounds found throughout Ross County and elsewhere. Mallery opened both mounds and reported finding pit furnaces, two cast iron bars, bog ore, cinders, charcoal, and rocks with a distinctive green, fayalitic glaze, a common byproduct of bloomery process iron smelting. Human remains, believed by Mallery to be those of ironsmiths, were found in association with the furnaces. Similar furnaces were found at a third site, the Overly furnace near the village of Austin, Ross County, Ohio (see Conner 1997). The fourth site, the Deer Creek furnace, was a heavily-fired, brick-lined pit filled with burned limestone found eroding from the banks of Deer Creek.

Mallery invited a number of specialists in archeology, American history and prehistory, metallurgy, and other disciplines to examine the supposed iron furnaces and artifacts. Reactions to the idea that these represented northern European ironworks ranged from outright dismissal to reserved equivocation. The Smithsonian Institution sent staff archeologist Ralph Solecki[2] to evaluate Mallery's claims in late 1949. Solecki concluded the Deer Creek features were most likely the remains of historic period lime kilns used to prepare lime for use in agriculture or masonry (Solecki n.d.). This conclusion is almost certainly warranted in the case of the limestone-filled "Deer Creek furnace," but may not apply to every case, as discussed below. Solecki also visited Spruce Hill and examined two burned areas identified as iron furnaces by Mallery. Solecki apparently considered the Spruce Hill features to be a phenomenon distinct from the lowland features he examined along Deer Creek, but offered no assessment of their purpose or cultural affiliation.

Whatever the nature or purpose of the features encountered by Mallery, professional opinion today is essentially unanimous regarding the nature and extent of precolumbian transatlantic contacts in North America. Norse settlements were established at least occasionally at L'Anse aux Meadows and probably other locations in Newfoundland and Labrador between about AD 1000 and AD 1400 (Ingstad 1977). However, there is no credible evidence to suggest that Norse contacts in Native North America were either sustained or extended for any great distance into the continental interior and certainly not into the Ohio Valley (McKusick and Wahlgren 1980; Thomas 1894:183-192).

Mallery's claims and the intensely burned features he was exploring failed to attract sustained professional archeological interest[3]. A 1980 survey of the Deer Creek area did document and discuss several supposed furnace sites (Piotrowski 1980). These were thought to be related to ceramic production by early Euroamerican settlers. However, the report includes no specific comparisons with the archeological signature of historically documented ceramic production centers and fails to make a convincing case for this interpretation. Most notably, there is no mention of the excessive quantities of broken ceramics (production failures) that should be associated with a ceramic manufactory.

Nevertheless, there have been significant developments in the investigation of these features, largely due to the efforts of dedicated avocational archeologists. In particular, William Conner and David Orr formed the Archaeo-Pyrogenics Society (APG Society) in 1992 to investigate them systematically (see Conner 1997; Conner et al. 1995; Orr 1992, Keeler n.d.a, n.d.b, n.d.c; Keeler and Kelley n.d.a, n.d.b, n.d.c; McGraw et al. n.d.). The APG Society has documented at least 33 locations in Ross, Pickaway, and Franklin counties with evidence of high-temperature phenomena. Careful attention to the associated artifacts (including historic ceramics and bricks, cast iron bars, milled wood, and wrought iron nails and shovel blades), along with experimental replications and a series of radiocarbon and thermoluminescence dates, has allowed Orr and the APG Society to build a strong case that the heavily burned pit features associated with green-glazed cobbles mark simple natural draft bloomeries constructed by Euroamerican prospectors during the late eighteenth century. These individuals were presumably testing the quality of local iron ores and evaluating the economic potential of the area in

anticipation of the opening of the trans-Appalachian west to Euroamerican settlement. The apparent association between some of these features and prehistoric Native American earthen mounds is believed to be purely coincidental: simply the result of later peoples taking advantage of these elevated landforms to facilitate furnace construction.

Importantly, the APG Society also investigated several locations on Spruce Hill marked by glazed and vitrified sandstones and burned soil. However, the burned stone and soil found here is readily distinguishable from the green-glazed cobbles and deep pits characteristic of the lowland examples along Deer Creek. Accordingly, David Orr concludes that the intense burning observed on Spruce Hill is distinct from and unrelated to the lowland pit bloomeries (David Orr, personal communication 1997).

Spruce Hill Revisited

In 1988 the Archaeological Conservancy considered acquiring the Spruce Hill locality and engaged Paul J. Pacheco to conduct a modern reconnaissance. After a brief surface survey, Pacheco (1988) concluded that for much of its length the "stone wall" at Spruce Hill Earthworks is not a man-made feature at all but simply a natural geological feature: talus and break-down eroding from the Berea sandstone outcrop just below the brow of the hill. Pacheco did conclude that the areas mapped as "gateways" by Squier and Davis might be man-made features, but considered the areas too damaged to determine their purpose, age, or cultural affiliation (also see Dancey 1991b). The Archaeological Conservancy abandoned its plans to acquire the site.

When legislation expanding and renaming Mound City Group National Monument was finally passed in 1992, Spruce Hill Earthworks was no longer included in the group of sites to be included in the expanded park. Instead the legislation directed the Secretary of the Interior to conduct archeological studies of the Spruce Hill Earthworks and other sites to evaluate the desirability of adding them to the park (Public Law 102-294, 16 USC 410uu-3).

The following section describes recent archeological investigations undertaken by the National Park Service during 1995 and 1996 in order to satisfy the 1992 legislation. The recent investigations are intended to re-evaluate the nature and significance of natural and cultural resources at the Spruce Hill Earthworks, and to consider the suitability of the site as a unit of the National Park System.

The 1995-1996 National Park Service Investigations

The National Park Service conducted limited archeological investigations at the Spruce Hill Earthworks during 1995 and 1996. The project research design addressed two primary goals. The first was to survey, describe, and map the present condition and integrity of the Spruce Hill Earthworks in comparison to the earliest nineteenth century descriptions. This goal was addressed through pedestrian reconnaissance and mapping using both optical surveying methods (transit, tape, and stadia) and Global Positioning System (GPS) technologies. The entire survey area was heavily vegetated; many artifacts and some larger features undoubtedly went undetected. The second goal was to determine whether any part of the "stone wall" is in fact man-made and,

if so, determine the age and cultural affiliation of the feature. This goal was addressed through systematic subsurface shovel testing and limited test excavations in two areas identified as likely man-made during the pedestrian reconnaissance and mapping phase ("Area D, the Isthmus" and "Gate C").

Observations and results recorded at notable archeological features will be described under individual headings following the designations employed by Squier and Davis whenever possible. Traces of nineteenth and twentieth century occupations were noted at four locations but these are not discussed further herein.

The Stone Wall

The entire stone wall as mapped by Squier and Davis was examined. For much of its length, the stone wall today appears as a broad (10-15 m) band or low heap of undressed sandstone blocks running just below the brow of the hill. The stones average about 20-30 cm in maximum dimension. The feature is difficult to trace in places and rarely, if ever, attains the "three to four feet in height" cited by Squier and Davis (1848:11). However, as one nears the areas identified as "gateways" at A, B, C, and D on the Squier and Davis map, the line of the feature rises above the brow of the hill and the density of stones increases markedly. At A, C, and D the stones form quite noticeable heaps, in places displaying more than a meter of positive relief.

For much of its length, the stone wall as mapped by Squier and Davis does lie stratigraphically at, or slightly below, the natural Berea sandstone outcrop. The feature may be entirely natural in these areas. Two geologists, C. Scott Brockman and Gregory A. Schumacher of the Division of Geological Survey, Ohio Department of Natural Resources, visited the site on one occasion during the late winter of 1995-96. They formed the opinion that while much of the feature may be natural in origin, the areas displaying positive relief near the "gateways" and "Isthmus" noted on the Squier and Davis map were certainly anthropogenic (Brockman and Schumacher, personal communication 1996).

It is important to also note that the Spruce Hill landform and the natural Berea sandstone outcrop continue south well beyond the southern extreme of the stone enclosure mapped by Squier and Davis. If the stone enclosure is purely a natural feature, then it is difficult to explain why it should enclose only the northern portion of the hill or why similar features are not observed on nearby hills of similar geology. Stones can be found sporadically along the hillside south of the enclosure but at a much lower density and in a much more loosely defined band. It may be that the loose stones from the natural sandstone outcrop have been gathered together and consolidated in the area identified as a stone enclosure by Squier and Davis. It should also be noted that those who have plowed this ground in recent years report that the soils inside the enclosure are entirely devoid of stone (Edward Steel, personal communication 1995; Max Shoemaker, personal communication 1995). This indicates the enclosure cannot be the result of historic agricultural field clearing.

Area F

Recent damage resulting from the construction of a logging road was noted just below the brow of the hill in the vicinity of the burned stone piles labeled "F" on the Squier and Davis map. Several individuals reported that at least four features characterized by intensely burned and reddened soil were exposed within a 100 m stretch when this road was constructed about 1990 (Conner 1997; David Orr, personal communication 1995; Max Shoemaker, personal communication 1995; Edward Steel, personal communication 1995).

Area D: "The Isthmus"

The most interesting area shown on the Squier and Davis plan is the complex series of four reentrant gateways running over the top of Spruce Hill at D, "the Isthmus," a narrow neck separating the broad enclosed plateau to the north from the narrower southern portion of the hill. The area remains wooded today and was apparently never plowed due to the dense concentration of stone there.

Figure 4-1 shows a detailed contour map and plan of "the Isthmus" prepared during the late fall and early winter of 1995. This is the heaviest and most easily traced portion of the wall today, as it was at the time of the Squier and Davis survey (1848:11-12). The entire wall and each of the four gateways can be traced, though with difficulty in places. The area labeled "Gate 2" on the plan is much more prominent than the others and displays up to 1 m of positive relief.

The area surrounding "the Isthmus" was the primary focus of the subsurface investigations undertaken by the National Park Service in 1995 and 1996. A series of 36 shovel probes and five small test units (Units 1-5) were excavated at 5-15 m intervals in the vicinity of Gates 1, 2, and 3. All of the prehistoric artifacts were found in close association with the gate features proper. The limited data available here suggest that these areas were focal points for human use of the site. Two additional small test units (Test A and Test B) were targeted at surface concentrations of burned and vitrified soil and rock. In both cases the areas proved to have been greatly disturbed by earlier investigators or looters. A final 1 x 10 m trench (Trench 1) was excavated across the western re-entrant wall defining "Gate 2."

Surface Artifacts

Most of the artifacts recovered from the surface in the vicinity of Area D consist of burned soil (soil reddened and hardened, presumably by oxidation), vitrified soil (rocky, porous material resembling pumice or cinders), burned or fire-cracked rock (reddened, darkened, or thermally-fractured rock), and fused or glazed rock (rock fragments fused together by vitrification and rock fragments with glassy, vitrified surfaces). In all cases, the materials from Spruce Hill are readily distinguishable from the green-glazed cobbles found in association with the "Deer Creek type" furnaces documented by the APG Society.

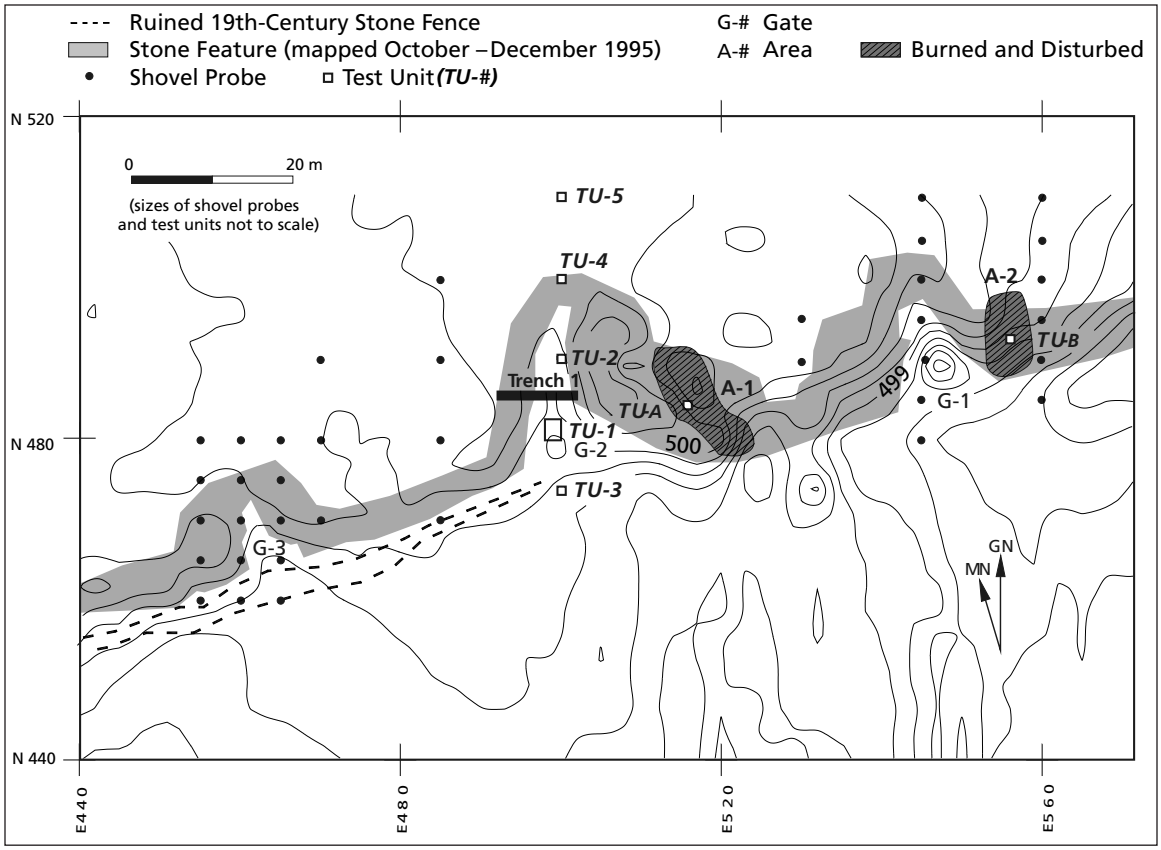


Figure 4-1. Area D, "The Isthmus".

The most significant artifact recovered from the surface is a fragmentary prismatic blade struck from a prepared core (FS122, near N520 E500). This artifact is an unmistakable hallmark of Ohio Hopewell manufacture; no other prehistoric culture in the Ohio Valley utilized this distinctive lithic technology (see Greber et al. 1981; Pi-Sunyer 1965). The raw material is Flint Ridge flint derived from bedrock sources in east-central Ohio centered on the famous quarries in Licking County, Ohio, more than 100 km distant to the northeast. A non-diagnostic nutting stone was also recovered from the surface near "the Isthmus."

Stratigraphy

Units 1-5 and the 36 shovel probes are each 50 x 50 cm square and display a redundant stratigraphy throughout the sampled area. The upper 15-30 cm of each unit is a fine-textured dark gray or grayish brown silt loam. Units located away from the stone feature are essentially devoid of fragmentary sandstone throughout their profile. In units located in or near the stone feature, this upper soil horizon was capped by, or incorporated, up to 50 cm or more of tabular sandstone slabs and rubble. At about 15-30 cm below surface, all units encountered a lighter colored culturally sterile silt loam (an eluviated A2 horizon). All but the uppermost portion of this deeper soil horizon is entirely devoid of stone. A portion of Unit 1 was excavated to a total depth of about 80 cm where it terminated in a fine-textured silty clay loam entirely devoid of stone.

The soils encountered in and around "the Isthmus" conform quite closely to the Rossmoyne and Avonburg silt loam soils described from nearby hilltop settings. Rossmoyne and Avonburg soils are soils that formed in a 51-102 cm mantle of fine-textured windblown sediments (loess) of Wisconsin age (Petro et al. 1967). Owing to their windblown origins, these soils are entirely devoid of stone in their upper solum. The lower solum may contain some weathered stone owing to an origin in moderately fine-textured glacial till of Illinoisan age. None of the test units reached this lower solum.

Figure 4-2 depicts a profile drawn along the south wall of Trench 1, a 1 x 10 m trench placed perpendicular to "Gate 2." This profile clearly illustrates the nature of the stone wall and gateways. The wall consists of mostly rubble-sized fragments of Berea sandstone heaped on top of the natural silt loam ground surface. The nonrandom size distribution of stones within the wall provides further evidence of an anthropogenic origin. The largest stones, often tabular, line the outer surfaces of the feature, particularly along the interior edges of the gateway. This may reflect an intentional design intended either to shore up the wall and prevent collapse or for aesthetic purposes. As discussed below, the use of stone in this manner is not unique to the Spruce Hill Earthworks.

Occasional fragments of burned or vitrified stone occurred throughout the wall, particularly on the east side of the gateway. There was no evidence of *in situ* burning underneath the wall, i.e., the underlying soil was not reddened, hardened, or otherwise obviously heated. A low density of charcoal fragments was observed at several locations throughout the trench but not in any readily identifiable primary context such as a post hole, pit, or horizontal timber.

The stratigraphy documented in Trench 1 and each of the test units and shovel probes clearly establishes the anthropogenic origins of the stone wall and gateways across "the Isthmus." These investigations provide clear documentation that the Berea sandstone slabs and rubble comprising these features occurs stratigraphically above much younger soils formed in loess, a situation that cannot occur in nature. That this rock is often burned is further evidence of human activity.

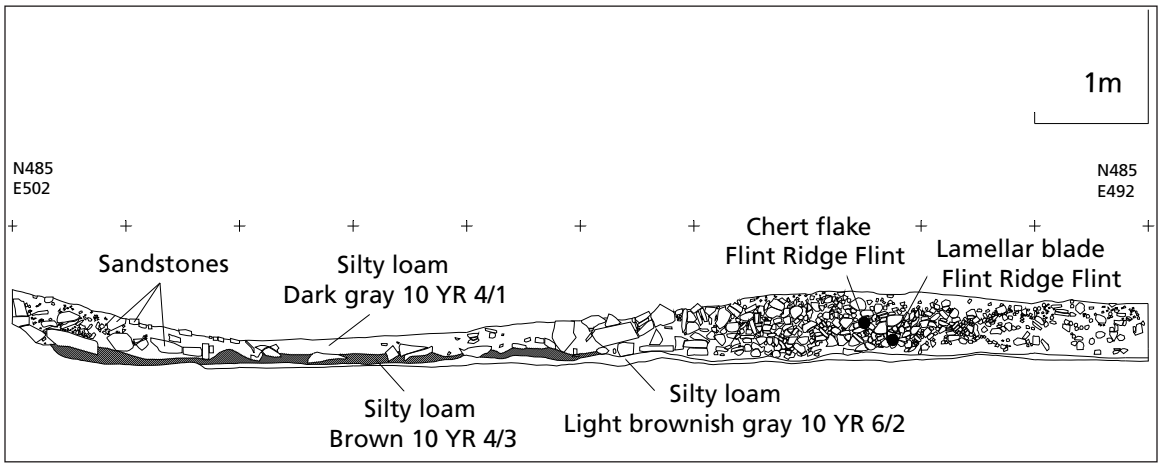


Figure 4-2. Profile across Gate 2.

Excavated Artifacts

A range of artifacts from excavated contexts provides further evidence of prehistoric human activity near "the Isthmus." The most significant artifact is a classic Hopewellian prismatic blade of Flint Ridge flint. This artifact was buried 40 cm deep within the sandstone rubble comprising the western wall of Gate 2, strongly suggesting that it was deposited during construction (see Figure 4-2).

A total of seven pieces of chert debitage was recovered from five locations (Unit 1, Unit 4, Trench 1, and two of the shovel tests). Chert types include Flint Ridge (n=4), unidentified "pebble" cherts (n=2), and one mottled blue-gray specimen, perhaps derived from the Upper Mercer/Zaleski sources located more than 60 km to the east.

Prehistoric ceramics were recovered from Unit 1, located near the "mouth" of Gate 2. This unit, originally 50 x 50 cm square, was expanded to 2 x 2.5 m in order to maximize the sample of ceramics. In all, 163 sherds were recovered from this location. All are plain-surfaced (smoothed) and tempered with crushed crystalline rock (grit). All are potentially from a single vessel. A random sample of 80 body sherds ranges in thickness from 4.1 to 8.7 mm with a mean of 6.3 mm and a standard deviation of 1.0 mm. Only three small (< ~6 cm^2) rim sherds are included in the sample. All three display a slightly thickened flat lip: thickness at the lip ranges from 8.3 to 8.7 mm and thickness below the lip ranges from 5.4 to 7.2 mm. The small size of the sherds makes it difficult to confidently identify the lip and rim orientation but the largest sherd (HOCU-7336) appears to have an inslanting rim profile and a horizontal flat lip.

Without more information about vessel size and shape or assemblage characteristics, little can be said with confidence regarding the cultural affiliation of the ceramics. Plain, grit-tempered, flat-lipped vessels are more common in Early and Middle Woodland period ceramic assemblages in central and southern Ohio than in later contexts but at least some vessels answering to this description were manufactured throughout the prehistoric sequence (see esp. Dancey 1991a; Prufer 1965, 1968). The fragments recovered at Spruce Hill fit comfortably within the Middle Woodland period McGraw Plain type (Prufer 1965, 1968) but other identifications are possible.

Burned soil and rock is the most frequently encountered artifact category. Burned soil and rock was recovered from widely scattered locations in the vicinity of Gates 1 and 2; none was recovered from either surface or excavated contexts west of the E490 line. In no case was there evidence in the investigated area of any subsurface pit, hearth, or furnace associated with the burned materials. Three examples of burned soil from Test A display cylindrical impressions, apparently representing wooden branches. In one case, impressions on opposite sides of the specimen follow perpendicular orientations. In another case, a small area on the interior of one of the impressions displays a glassy, vitrified surface that is indicative of exposure to high temperatures. It is not clear from the available fragmentary evidence whether these remains represent some sort of plastered wooden structure (e.g., a wattle-and-daub building or palisade, a "beehive" furnace or oven, etc.), or simply a wood-fueled fire in fortuitous contact with clay-rich sediments.

A small amount of terrestrial snail shell and animal bone was recovered from surface and near-surface contexts in Trench 1. There is no particular reason to believe this material is of any great antiquity or that it is necessarily reflective of any human activity.

A very few historic artifacts were recovered from near-surface excavated contexts (one bottle glass fragment, one glazed crockery sherd, and one zinc canning jar lid). All likely result from intermittent historic period refuse disposal in the area, none apparently pre-dating the mid-nineteenth century and all could potentially have been deposited very recently.

Gate C

The second area selected for intensive investigations including systematic shovel probes and limited test excavations focuses on the area identified as "Gate C" on the Squier and Davis map. A broad heap of stone can be traced for a distance of about 50 meters in either direction from a narrow defile that apparently represents the re-entrant gateway mapped by Squier and Davis. Beyond this stone feature the "wall" drops below the summit and becomes difficult to distinguish from the natural sandstone outcrop. A surface concentration of intensely burned, glazed, and fused stones about 2 m in diameter is located about 20 m northwest of the gateway, directly on top of the stone wall where it rests upon the brow of the hill. Unlike comparable areas in the vicinity of "the Isthmus," there is no evidence of previous disturbance. A series of six 50 x 50 cm shovel tests excavated at 10 m intervals centered on this burned area produced no artifacts other than burned rock and soil and a similar stratigraphy to that documented near "the Isthmus." The two shovel tests located on the wall itself were capped by 40-90+ cm of angular rubble-sized sandstone fragments. A series of smaller tests excavated with a 4" bucket auger served to better define the areal extent of the concentration of intensely burned, glazed, and fused stones. The concentration is a maximum of about 10 m in diameter and is underlain by culturally-sterile silt loam soils at about 30 cm below surface.

A 1 x 4 m excavation trench was laid out over the concentration of intensely burned, glazed, and fused stones. The excavation revealed an upper stratum ranging from 25-45 cm in thickness and composed of very dark gray silt loam containing a profusion of rubble-sized angular, reddish sandstone fragments (most <10 cm in diameter) with occasional glazed and fused examples interspersed. Below this stratum is a culturally sterile, light, yellowish-brown silt loam. The lower stratum contains brown and yellowish sandstone fragments but none of the reddened, glazed, fused or otherwise obviously burned fragments that characterize the upper horizon. There is no evidence of *in situ* burning in the lower horizon. A low density of charcoal fragments was observed at several locations throughout the trench. As in the case of the Gate 2 excavations, charcoal was not observed in any readily identifiable primary context, such as a post hole, pit, or horizontal timber. There is no evidence of any subsurface pit, hearth, or furnace. The scattered distribution of intensely burned, glazed, and fused rocks in the upper horizon suggests that the material may be redeposited from another location, jumbled together with less-intensely burned stone. Alternatively, this same pattern of

burning might result if fuel were interspersed with the stone above ground level, as in the case of the European "vitrified forts" or "timber-laced forts" discussed below.

Burned rock and soil and a single recent shotgun shell constitute the only artifacts recovered in the Gate C area.

Gate A

Squier and Davis illustrate a well-defined reentrant gateway at this point. Two heaps of stone are found at this location today. The eastern side of the "gate" displays a maximum positive relief of about 0.75 m and appears to follow a reentrant course, but is difficult to trace. The western side of the "gate" displays much more positive relief, up to about 1.5 m, but appears as a deeply pockmarked heap of stone rather than a reentrant wall, presumably the result of past "relic hunting." This is believed to be one of the areas investigated by Arlington Mallery (Edward Steel, personal communication 1995). The band or low heap of stone defining the enclosure wall can be easily traced southeast and southwest from the "gateway" for a distance of about 50 meters. Beyond that distance the "wall" drops below the summit and becomes difficult to distinguish from the natural sandstone outcrop.

Gate B

This feature, figured as a closed-off reentrant gateway by Squier and Davis, could not be positively relocated during the present survey. The location indicated on the Squier and Davis map, when georeferenced to modern topographic maps, places this feature well down along a fairly steep slope and no spur is evident as indicated on the Squier and Davis map.

Area E

Squier and Davis report that the stone wall is broken for a distance in the area labeled "E" on the 1848 map where the hill presents a precipitous face over Paint Creek. Thick, brushy vegetation at the time of the present survey prevented confirmation of this observation.

Area F

Squier and Davis (1848:12) describe the area labeled "F" on the 1848 map as follows: "strong traces of fire are visible at many places on the line of the wall, particularly at F, the point commanding the broadest extent of country. Here are two or three small mounds of stone, which seem burned throughout." Two small stone mounds are located here today upon the very brink of the hill, very close to the location shown on the georeferenced Squier and Davis map. The northern mound is approximately 5 m in diameter at the base and about 1 m tall. The mound to the south is approximately 3 m in diameter and about 0.5 m tall. Intensely burned stones with vitrified and glazed surfaces were collected from each mound during the present survey. Samples of burned soil

and burned stones were collected from the northern mound by members of the APG Society in 1994.

Discussion And Conclusions

The 1995-1996 National Park Service investigations strongly suggest that the site was built and used by Ohio Hopewell populations between about AD 1 and AD 400. This conclusion is supported by the discovery of diagnostic Hopewellian stone tools, prehistoric ceramics, and chert debitage both *in* and around the complex of stone walls and gateways in the area of "the Isthmus." The recent excavations in this area have also provided conclusive evidence that this section of the stone feature is clearly anthropogenic in origin. Similarities in form and location between this site and other better documented examples of Hopewellian hilltop enclosures provide further support. Furthermore, the recent investigations lead to the conclusion that despite localized areas disturbed by looting, vandalism, and incompatible land use, the site is largely in a condition similar to that described by the earliest observers.

Associated Artifacts

The discovery of prehistoric ceramics, chert debitage, and diagnostic Hopewellian prismatic blades in direct association with the stone embankment at "the Isthmus" is among the strongest and most unambiguous evidence of a Hopewellian cultural affiliation for the southern Ohio hilltop enclosures yet documented. Of all the best-known hilltop enclosures—Spruce Hill, Fort Ancient, Fort Hill, Fort Miami, Foster's Crossing, Four Mile Creek (Milford Township) and Pollock—only Fort Ancient and Spruce Hill have produced diagnostic Hopewellian artifacts in direct association with the earthworks (see Prufer 1997:314; Riordan 1996).

Form and Construction

The fact that much of the "wall" at Spruce Hill may be natural in origin or only slightly modified by consolidating the band of outcropping Berea sandstone is not unique among Ohio hilltop enclosures. Riordan (1996:253) suggests that the initial construction event at the Pollock Works consisted of a low earthen embankment that separated and isolated a plateau from its surroundings, but never completely enclosed the elevation (also see Fowke 1902:Figure 52). The Spruce Hill Earthworks may embody similar principles of design in the construction of "sacred space." The works across "the Isthmus" and the other major points of access (Gates A, C, and perhaps B) may have been sufficient to symbolize or create a "functional hilltop enclosure" (see Riordan 1996:250) without actually constructing a continuous or imposing enclosing embankment. It is also interesting to note that the architectural design of the reentrant gateways across "the Isthmus" at Spruce Hill is virtually duplicated at the Pollock Works (see Fowke 1902:Figure 52).

The use of tabular stone slabs to face and pave the inside of the gateways at Spruce Hill is not unique. Stone slabs used as a supporting facing or ballast are reported for several other Ohio hilltop enclosures. Prufer (1997:314-315) recounts earlier descriptions

of stone slabs used to cover the outer surface of some earthwork segments at Fort Ancient. Fowke (1902:254) describes the use of stone as a revetment at one point along the otherwise earthen wall at Fort Miami. At Fort Hill, Prufer found that large sandstone slabs were used as stabilizing ballast over the surface of both an inner earthen core wall and over the surface of the final earthen wall (Prufer 1997:317-325). Stones were also used to form a retaining wall or revetment between the primary and final embankments at Fort Hill (Prufer 1997:318-325). Most recently, Riordan (2002) has described a very substantial limestone "pavement" centered on one of the three reentrant gateways at the Pollock Works. This finding further extends the architectural similarity between the Spruce Hill and Pollock works noted above. Significantly, the gateways at both the Spruce Hill and Pollock works are associated with substantial quantities of burned stone and soil (see Riordan 1995, 1996, 2002).

Burning and Vitrification

The occurrence of intensely burned rock and soil on Spruce Hill remains, since its first description in 1811, one of the most intriguing aspects of the site. The recent National Park Service investigations were not able to establish the origin of these materials with certainty but additional study may narrow the range of possibilities and point to some promising avenues for further study.

The materials found on Spruce Hill do not correspond closely to historic Euroamerican high temperature technologies such as ceramic or brick manufacture, ironmaking, blacksmithing, charcoaling, or lime manufacture. Each of these has a well-defined archeological signature that is not clearly evident on Spruce Hill. For example, historic ceramic and brick manufactories are invariably marked by easily identified kilns and waster piles, ironmaking and blacksmithing are associated with distinctive slags and facilities (hearth pits, tuyeres, flues, etc.), and charcoaling and lime manufacture each leave readily identifiable marks upon the land (see Rolando 1992).

The Spruce Hill materials also appear to represent a phenomenon distinct from the putative early Colonial period bloomery furnaces best known from the Deer Creek area in Ross County. The numerous examples of burned and vitrified soil and rock found on Spruce Hill are readily distinguishable from the distinctive green-glazed cobbles found in association with the Deer Creek sites and other comparable locales (see Conner et al. 1995; Orr 1992). The very large hearth pits characteristic of the "Deer Creek furnaces" have not been identified on Spruce Hill.

However, intense burning is not unique to Spruce Hill. In fact, evidence of intense burning even to the point of vitrification has been found in association with almost all southern Ohio hilltop enclosures. Examples include Foster's Crossing (Fowke 1902:256-257; Moorehead 1890:91), Fort Miami (Moorehead 1890:103), and Fort Ancient (Sheppard, cited in Moorehead 1890:68). Stockade-type features have been described at Pollock Works (Riordan 1995, 1996, 2002) and Four Mile Creek (a.k.a., Milford Township Earthworks, Butler County) (McFarland 1887). Squier and Davis (1848:181-183) and Turner (2000) describe burned and vitrified rock piles or "fire cairns" on many of the most prominent hilltops overlooking the lowland mounds and earthworks.

In the case of the hilltop "fire cairns" and at Fort Ancient, the evidence of burning is associated with stone piles or mounds, perhaps relating to ceremonial activity or serving as signals or foresights. In most cases, the burning appears to be related to the architecture of Hopewellian hilltop enclosures: there are instances where the burned materials are directly associated with or incorporated within the earth and stone enclosures and in several cases (especially at the Pollock Works), burned timber structures of some kind have been documented in association with the walls. This observation leads to a connection that has not heretofore been recognized: perhaps the vitrified walls at Spruce Hill and other Hopewellian hilltop enclosures are analogous to the "vitrified forts" of Western Europe.

The "Vitrified Forts" of Western Europe

As early as the 1760s, antiquarians and natural historians described evidence of burning and vitrification remarkably similar to that found on Spruce Hill in association with ancient hilltop fortresses in Scotland. To date, more than 60 of these so called "vitrified forts" have been identified: most are found along the west coast of Scotland, but a few are known from England, Wales, France, and Germany (Cotton 1955; MacKie 1969, 1976). The early observers described masses of vitrified and fused stone in association with the stone and earth ramparts enclosing these fortifications. As in the case of Spruce Hill, there was much debate concerning whether the vitrification was intentional or accidental and many theories were put forth to account for the phenomenon. Some believed the vitrification was somehow intentionally effected to solidify the defenses, others thought the burning to be the result of volcanism or lightning strikes, and still others thought bloomeries, kilns, signal fires, sacrificial pyres, or fired wooden ramparts might be responsible (virtually the same set of theories put forth to explain the Spruce Hill case—see Cotton (1955) for an historical review of the various theories as to the causes of vitrification).

The mystery of the vitrified forts was solved on the eve of World War II by no less a figure than V. Gordon Childe[4]. By this time, careful excavations in several Scottish and Continental ramparts had led to the recognition of several different types of rampart construction. Most ramparts consist of a rubble and earth core between facing walls of dry-stone or timber spaced 10-20 feet apart. However, one type described by Julius Caesar at Avaricum ("*murus gallicus*" or Avaricum-type ramparts) used horizontal timbers to tie together the facing walls and stabilize the rubble core[5]. An example of such a timber-laced rampart is shown in Figure 4-3. Several writers suggested that if one of these timber-laced ramparts were to be set ablaze, then the cavities formed by the burning timbers might act as flues or chimneys, setting up a natural draft capable of generating temperatures sufficient to cause vitrification (at least 800-1000 degrees C).

Childe, with his colleague Wallace Thorneycroft, set out to test this theory by experiment (Childe and Thorneycroft 1938; Childe 1940). Two model Gallic walls were constructed and set ablaze by means of timber and brushwood heaped against their exteriors. In both cases, the timber-lacing within the walls caught fire and produced fused and vitrified cores exactly similar to the prehistoric examples. For all intents and

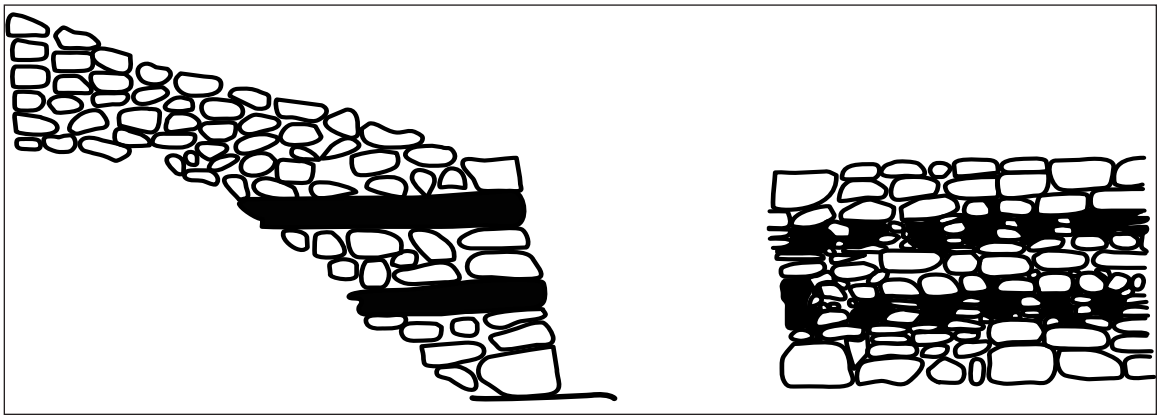


Figure 4-3. Timber-laced rampart, Scotland. Section (left) and elevation (right) of stone rampart with horizontal timber-lacing, Castle Law, Abernethy, Perthshire, Scotland. Vitrified material found in core. Section width is approx. 20 feet (Cunliffe 1978: Figure 13:5).

purposes, the "problem of the vitrified forts" was solved. Subsequent investigations (e.g., MacKie 1969) have served to further support Childe's explanation.

This explanation is consistent with the available data from Spruce Hill. The burned soil with timber impressions recovered near "the Isthmus" provide evidence that wood was an architectural element at Spruce Hill. Recall also that the interior of one of these tubular casts was partially vitrified, exactly as described in the case of the European vitrified forts. In addition, the particular pattern of burned and vitrified materials seen at Spruce Hill (vitrified materials apparently jumbled in amongst unburned materials and incorporated within the wall above the unburned ground surface) is consistent with a burned, timber-laced structure such as the Avaricum-type rampart at Castle Law (Figure 4-3). If some sort of timber-lacing was a common construction technique employed at Hopewellian hilltop enclosures, then perhaps the work of Childe and others in Britain, France, and Germany provides a ready explanation for the widespread occurrence of burned and vitrified materials in association with the Ohio enclosures. This is certainly not to suggest any direct historical connection between the American and European cases, but merely to suggest an analogous explanation.

Hopewellian hilltop enclosures remain among the least studied and least understood examples of Hopewellian monumental architecture. Their purpose, whether for habitation, defense, or ceremony, remains uncertain. Spruce Hill promises to yield additional information regarding the purpose and chronology of Hopewellian hilltop enclosures and their relationship to the better known lowland ceremonial centers and habitations and promises to contribute to the resolution of the long-standing debate over the military vs. ceremonial function of the hilltop enclosures. However, the fact that the stone walls, gateways, and mounds at the Spruce Hill Earthworks are difficult to trace today (as in the past) poses the single greatest challenge to public interpretation and protection of the Spruce Hill Earthworks.

Acknowledgments

Edward and Mary Emily Steel, owners of the Spruce Hill Works.

David Orr, William Conner, Gerald Parker, Don Thomas and other members of the Archaeo-Pyrogenic Society, David Tillis.

Park Superintendent John Neal, William Anderson, Jr., Scott Troy, Leslie Frazee, Tori Saneda and Deborah Wood. Jarrod Burks and Jennifer Pederson. Shawn Casson, Zach O'Dell, Steve Patrick, and Rev. Larry Wickliffe.

Dr. Mark Lynott and Carrol Moxham of the Midwest Archeological Center.

C. Scott Brockman and Gregory A. Schumacher of the Division of Geological Survey, Ohio Department of Natural Resources.

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[1]There are two distinct processes of ironmaking (see Craddock 1995, Harvey 1988, and Rolando 1992). In the bloomery or direct reduction process, iron ore is heated in a small hearth-pit or furnace (the "bloomery") charged with charcoal. Air is introduced by natural draft through a flue at the base of the hearth or by means of a simple bellows. The temperatures achieved in the bloomery process (ca. 1150°C) are sufficient to melt the sand, rock, and clay components of the ore; but are not sufficient to melt the iron component. The rocky component of the ore ("gangue") melts to form a glassy siliceous waste product called "slag." The iron component of the ore forms a spongy mass of iron, stone, slag and charcoal called a "bloom." The bloom is removed from the bloomery and repeatedly heated and hammered to force out the gas bubbles and fragments of waste, leaving a bar ("ancony") of low-carbon malleable "wrought" iron.

The blast furnace process came into use in Western Europe during the 14th century. A larger chimney and bellows (usually driven by water power) allow the furnace to operate above the melting point of iron. The molten iron produced in the blast furnace is tapped off onto a sand casting floor and cooled to form high-carbon cast iron products, or "pigs" that could be further refined in a forge to form bars of low-carbon malleable "wrought" iron.

Harvey notes that "[i]n developing an iron furnace site, it was common for the ironmaster to build a bloomery first to test the quality of the ore and the iron made from it. After constructing the blast furnace a bloomery could be converted into the forge for refining the pig iron. Thus, the small bloomeries tested the material and the market at low cost, paving the way for future capitalization if the results were promising. If blast furnaces failed, either due to bad business decisions or resource limitations, the bloomeries often returned, the size of their operations being more suited to the locale"(Harvey 1988:24).

[2]Solecki later achieved great fame as a result of his work at Shanidar Cave in Iraq (see Solecki 1971).

[3]In fact, the professional archeological community has avoided the whole issue, perhaps out of fear of a "career-killing" guilt by association with Mallery and his fantastical visions of Ohio Valley Vikings (see esp. Orr 1992). A 1987 National Park Service summary of Spruce Hill investigations makes absolutely no mention of the issue, despite the tremendous volume of published accounts (National Park Service 1987).

[4](Vere) Gordon Childe, 1892-1957, established himself as the premier archeological theorist of the early 20th century with a series of works that sought to explain human history and social change in terms of cultural diffusion and the control over technology, surplus, and the means of production.

[5]Purists (e.g., Avery 1976:13-15) would maintain that the true "murus gallicus" or Avaricum-type rampart has both longitudinal and transverse timbers fixed together at their intersections; the "devolved Avaricum type" or "Avaricum-derived type" has only transverse timbers.

CHAPTER 5

FALLING THROUGH A CRACK IN THE CORE: THE SURPRISE AND DEMISE OF ANDERSON EARTHWORK

BY
WILLIAM H. PICKARD AND JEFFREY W. WEINBERGER

As settlers pushed westward into the Ohio Territory following the passage of the Northwest Ordinance of 1787, they were greeted by a landscape covered with what were widely seen as the ruins of a civilization or a race of ancient Moundbuilders. Indeed, the earthwork complexes and isolated burial mounds found along the courses of the larger rivers of southern Ohio often seemed as mysterious to those remaining native inhabitants as they were to the newly arrived pioneers. Just who the Moundbuilders were and what happened to them was the source of controversy over the next several decades. As related by David Meltzer (Squier and Davis 1998:2-3) in his introduction to the 150th anniversary reissue of *Ancient Monuments of the Mississippi Valley*, many of the scholarly writings and romantic literature of the first half of the nineteenth century were devoted to the origins and apparent sudden demise of the ancient Moundbuilders. He went on to say that such origins were sought in a diversity of groups ranging from the Egyptians to the Atlanteans to the Lost Tribes of Israel. All of these explanations were replete with social, racial, or religious overtones and answers to a question that, in the end, was purely archeological in nature. Few places in the Trans-Appalachian west was the Moundbuilder phenomenon as visible as in present day Ross County, Ohio. Here the burial mounds and earthwork complexes stretched for miles along the low terraces of the Scioto River and into the adjoining valleys of Paint Creek. It can be argued that this area remains perhaps the single richest archeological district in North America. Recently, this heartland region surrounding the confluence of the Scioto River and Paint Creek has come to be associated with the concept of the "core" or focal area of prehistoric Hopewell culture and identity. Balanced against the core area is the periphery or those important Hopewell centers geographically-removed from the Scioto Valley region. A renewed interest in Hopewell settlement and prehistoric use of the earthworks, especially within the "Core", has also defined this same heartland region as the core or central area for current research in Ohio Hopewell archeology (Pacheco 1996a:vi-vii).

By the 1830s, farming and settlement in Ross County as well as the pedestrian curiosity of relic collectors all began to exact their toll on what once seemed to be an inexhaustible resource. It would appear that even then progress and preservation were at odds. While the founding fathers of Marietta, Ohio had taken steps in 1787 to preserve and protect many of the unique earthworks located on the site of their future town, such was not the case in Ross County. Much of our present knowledge of the prehistoric landscape there comes from the drawings and journals of dedicated individuals such as Caleb Atwater and especially Ephraim Squier and Edwin Davis. They recognized that this ancient legacy was fast disappearing and spent the next several years recording their observations for the benefit of future generations. Later surveys in the region by Warren Moorehead, William C. Mills, and Henry Shetrone considered, to some extent, the larger

picture but focused more on the material culture associated with mound burials. While they produced an impressive body of work, their overall interpretations of the Hopewell culture were hindered by inconsistent field methods and the inability to construct a firm temporal framework.

After World War II, archeological methods and research strategies were standardized and made more scientific. At the same time, advances in aerial imaging and the introduction of radiocarbon dating and remote sensing made possible the retrieval of previously unavailable data. Considering its history of inquiry, it would seem unlikely that anything of prehistoric consequence within the "core" could have been overlooked. Yet, as late as the last quarter of the twentieth century, there were still significant additions to be made to the archeological record of Ross County. A case in point is the Anderson Earthwork, a sizeable square enclosure located along the North Fork of Paint Creek on a direct line between the Hopewell Mound Group and Mound City. Although less spectacular than its more famous neighbors, a section of wall that was essentially intact and original to the time of construction was still present. Unfortunately, a proposed development of the site meant that the most well-preserved portion of the enclosure would be destroyed. Limited excavations were conducted there in 1993 just prior to the onset of development. This work resulted in a better understanding of how the earthwork was originally constructed and provided important insights that might be carried over to the interpretation of other sites. Additionally, material sufficient for a radiocarbon date was recovered to demonstrate that Anderson was in fact of Hopewell origin.

History and Setting

The Anderson Earthwork was a low-walled, slightly irregular square enclosure measuring approximately 250 m on a side(Figure 5-1), located in southern Union Township, Ross County, about 9 km northwest of Chillicothe (39°22' N x 83°03' W). It was named for the nearby unincorporated village of Anderson. The enclosure was situated on a glacial outwash terrace at about 213 m above mean sea level, bounded on the west by Biers Run and an unnamed seasonal drainage to the east. Both streams flow into the North Fork of Paint Creek, about 700 m to the south. Until about 1985, a line of the B&O Railroad bisected the site from east to west. The high, level nature of the terrace provides excellent visibility in all directions and its location between four sets of hills allows easy access between the Scioto Valley to the northeast and the Paint Creek and North Fork Valleys to the south and southwest (Anderson 1980:31).

In the late 1960s, James Marshall noticed the Anderson Earthwork on a 1938 USDA aerial photograph of the area while doing research on the Hopewell or North Fork Works about 3 km to the west. According to Marshall (personal communication 2003), he did a preliminary survey on the ground in 1970 in order to, as he put it, tie down picture points of both earthworks. His map of the Anderson Earthwork (Figure 5-2) shows a somewhat irregular four-sided enclosure with two gaps or wall openings. In a subsequent interview with 95-year old landowner Rufus Riehle, who lived in the farmhouse just west of the earthwork, Marshall learned that the farmer had long known of its existence. The old gentleman went on to say that in 1905 he had worked with

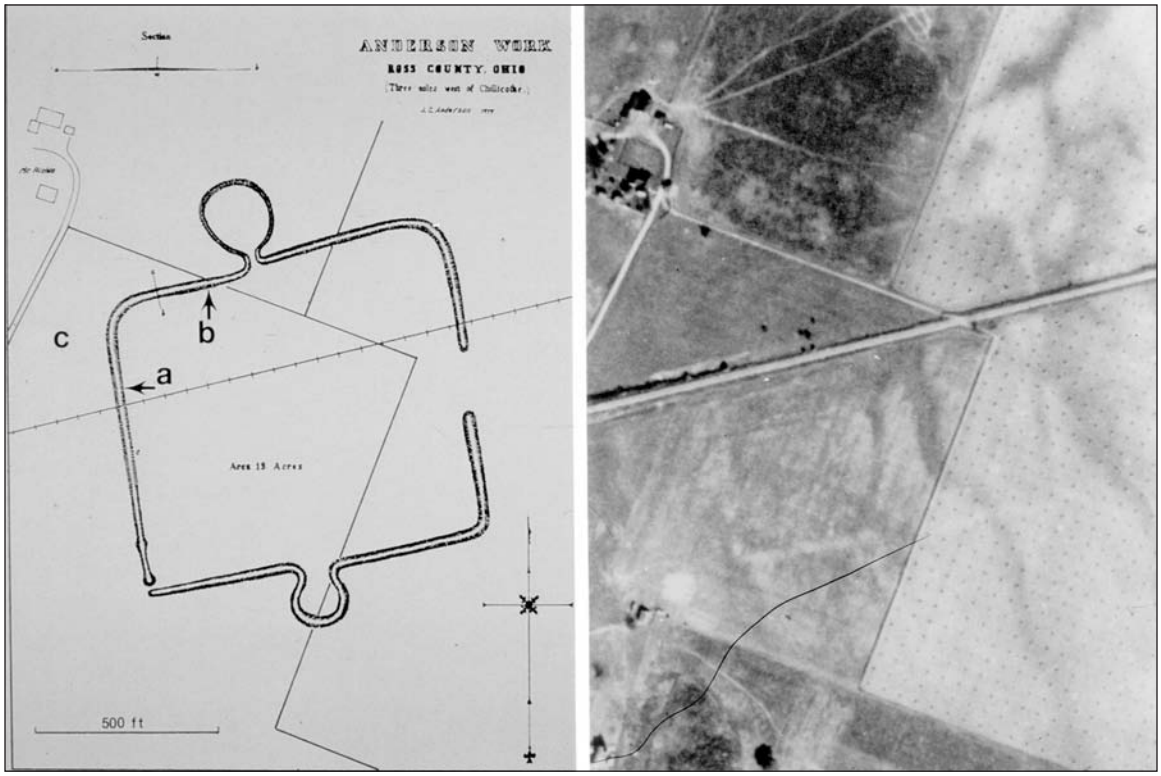

Figure 5-1. Composite image of Jerrel Anderson's 1979 map and the 1938 U.S.D.A. aerial photograph of the Anderson Earthwork.

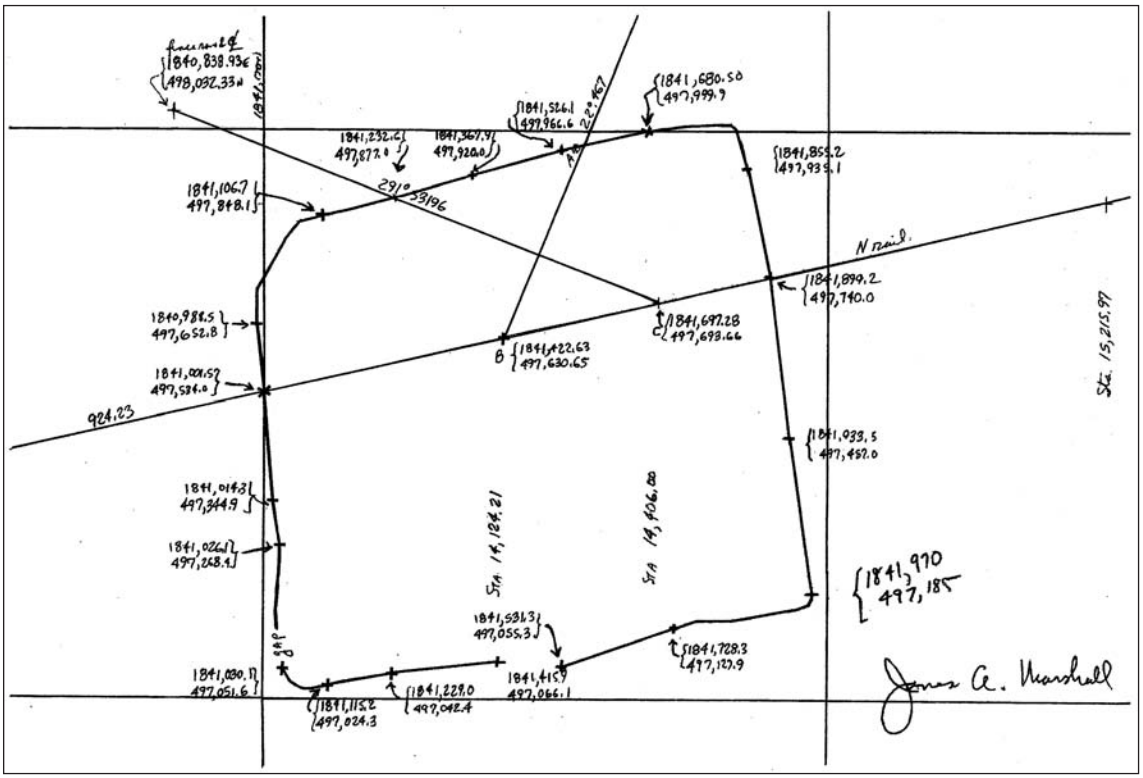

Figure 5-2. Facsimile map of James A. Marshall's 1970 survey of the Anderson Earthwork. Courtesy of James A. Marshall.

William C. Mills in compiling information for Mills' 1914 *Archaeological Atlas of Ohio* but for whatever reason the Anderson Earthwork was not included in Mills' work.

The Anderson Earthwork was first reported in the literature in 1980 by avocational archeologist Jerrel Anderson. In 1975, while examining the 1938 USDA aerial series of Ross County, he also noticed Marshall's square enclosure to the east of the Hopewell Works. To his knowledge it was then unknown and unreported. Using the USDA aerial, modern infrared aerials, and ground surveys, he produced a somewhat more stylized plan of the site, seen in (Figure 5-3), with circular enclosures on the north and south sides and a large open gap to the east.

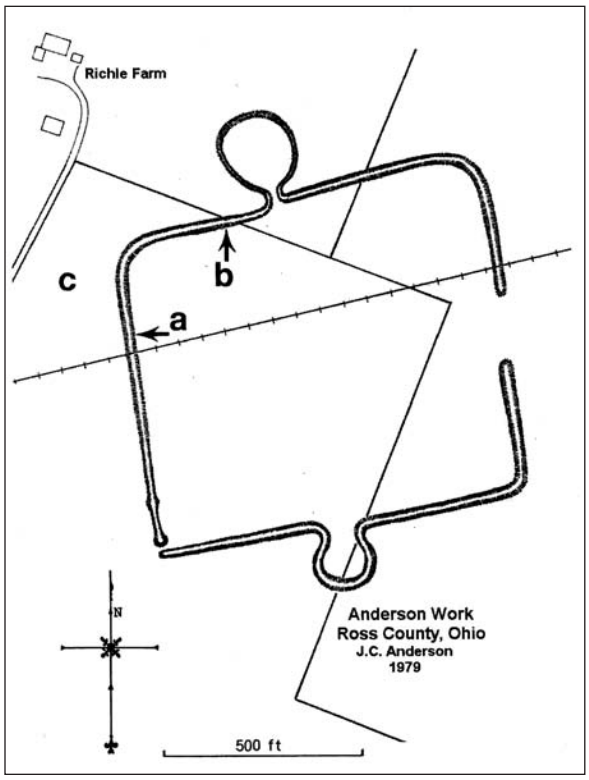

Figure 5-3. Jerrel Anderson's 1979 map of the Anderson Earthwork showing the location of the three corner field (c) and the 1993 excavation trenches (a&b).

Sections of the earthwork wall in the field south of the B&O Railroad bed were still traceable in 1993 as bright red streaks on a freshly plowed surface. North of the railroad, seasonally-wet conditions caused by poor drainage and a history of deep plowing had all but obliterated the earthwork. The only exception was the northwest corner of the earthwork located in a three-cornered field bounded by the railroad, a fence-row, and the farmer's lane (Figure 5-3c). Here the wall was visible as an elongated rise 10 to 12 m wide, 0.5 m high and about 120 m long. The wall was well preserved at this location because for all intents and purposes it had never been plowed. From an earlier conversation with Mr. Riehle, Anderson (1980:31) indicated that the farmer had kept that parcel as an orchard or in pasture for the several decades he had owned the land. This was confirmed in 1993 by Riehle's cousin, who then managed the farm. He stated that a tenant had removed the fence-row in 1989 to create a single large field that had been plowed once. According to the cousin, that was the only time he had ever known the three-cornered field area to be plowed. Aside from the wall section, no other prehistoric constructs were visible on the terrace. Also, as is common with many Hopewell earthworks, there was a distinct lack of habitation debris near the earthwork. A local collector reported a few Archaic and Early Woodland lithic scatters along Bier's Run, but there are few places in Ross County where such sites could not be found.

1993 Excavations

By 1993, the terrace north of the railroad had been purchased by developers to become a sub-division named Golf View Estates. It was soon apparent that the overall

plan of the project would destroy what was left of the earthwork. The centerline of the sub-division's main thoroughfare lay almost directly over the north wall of the square. Additionally, the best preserved section on the west wall was in the middle of one of the first lots to be developed. The developers, after a somewhat lengthy conversation, reluctantly agreed to allow limited excavations as long as they did not interfere with their construction schedule. In late July, two trenches 0.75 x 10 m (that were later extended to 20 m) were laid out across the wall in the area that had been the three cornered field. The first unit, trench "A" (Figure 5-3a), cut across the west wall 20 m north of the abandoned railroad bed. The second unit, trench "B" (Figure 5-3b), cut across the north wall about 15 m west of where the old fence row had crossed. Both trenches produced similar, straightforward profiles, differing only in detail.

It would appear the construction sequence began with the stripping of the original vegetation and A horizon soils down to the B horizon. The stripped area was, in turn, covered with a layer of fine angular gravel in a silty clay matrix. Generally, this gravel layer was between 5 and 8 cm thick and up to 7 m wide and formed a more or less continuous stratum that could be observed across all profiles (Figure 5-4e). The principal embankment fill was deposited on this prepared gravel layer (Figure 5-4b). This component was a bright red (Munsell 2.5YR 5/8) sandy clay composite 30 cm thick at the apex and tapering to about 15 cm at the ends where it became indistinctly mixed with the surrounding natural soils. In both trenches, this stratum extended approximately 5 m in both directions from the apex. At the surface immediately above the embankment fill was a thin veneer of sod (Figure 5-4a). Incorporated in the primary fill just below the surface were discrete, compacted pockets of decayed sod (Figure 5-4c), evidence of the single 1989 plowing already described. Originally, the height of the walls was probably on the order of a meter to a meter and a half. It might be further suggested that the low relief of the wall profiles at the time of excavation, even without a long history of plowing, was due to the moderately incompetent nature of the embankment fill soils. It should be further noted that these bright red clay soils do not naturally occur on the

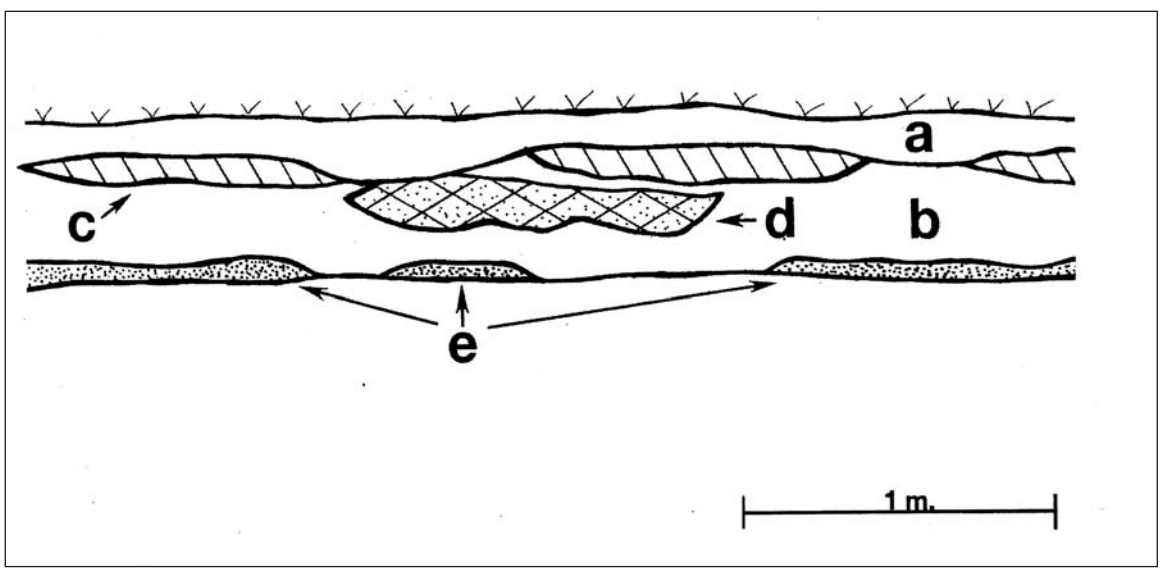

Figure 5-4. Simplified drawing of a three meter section of the south profile of 1993 excavations Trench "A", showing pertinent details.

terrace and would have been carried onto the site from some neighboring source at the time of construction.

Four features were identified during the 1993 excavations. Three of these were post molds and the fourth was a basin-like gravel loading.

Feature 1 was the charred remains of a large wooden post. It was located in the center of trench "B" directly below the apex of the wall and originated below the embankment fill. The post was 30 cm in diameter and extended 50 cm into the subsoils where it terminated in a sharp point. Dee Anne Wymer of Bloomsburg University identified the wood as hickory (*Carya*), noting that it had been subjected to rather intense burning. Charcoal from this feature returned an AMS date of 2010 ± 60 BP (Beta-68758 / CAMS 10484). This determination is slightly early but well within the generally accepted chronology for Ohio Hopewell. The use of hickory raises an interesting point. Smart and Ford (Greber 1983:54) reported that 76 percent of the posts sampled at the Edwin Harness Mound were hickory. Whether this indicates an overall selective preference for certain materials or merely reflects the use of what was available in the local environment is not known. Obviously, the recovery of more data would have been helpful but this was not possible and at present there is just not enough data available from other sites to present an argument one way or another. It does however present an avenue for further investigation

Features 2 and 4 were small post molds located in trench "A," at the western end of the gravel base layer. As with Feature 1, both originated in the subsoils below the embankment fill but these appeared only to represent pockets that had silted in after the posts had been removed. Feature 2 was 20 cm in diameter and extended 21 cm below the gravel base. Feature 4 was 15 cm in diameter and extended 15 cm below the gravels. Both features terminated in dull points and both contained the same dark, sandy silt fill with minor amounts of charcoal flecking. The purpose of any of the posts is unclear. It is doubtful that they were part of a stockade and there was nothing recovered or noted in the immediate vicinity to indicate that they were part of a domestic structure. Considering their location within the earthwork, one reasonable explanation is that they were measuring or surveying points used by the ancient builders during construction. Again, because of the limited nature of our excavations, this was another concept we were unable to pursue any further.

Feature 3 (Figure 5-4d) was a shallow, basin-like gravel lens located in the south profile of trench "A" and contained entirely within the red clay embankment fill. It was about 10 cm thick and 1.2 m across. In plan, it was somewhat irregular in shape and continued into the profile 40 to 45 cm. The fill consisted of about 90 percent fine, rounded gravels in a sandy matrix that contained a very small amount of charcoal. Its position <u>within</u> the embankment would seem to indicate Feature 3 was the result of construction loading rather than a basin per se.

Discussion

Overall, squares are not uncommon items in the vocabulary of Hopewell earthwork design. Well known examples include those at Liberty, Baum, Hopewell,

and Seip. These are geometrically true structures with rationally-spaced wall segments that share a certain degree of consistency from site to site. Typically, they are integral members of larger complexes. The Anderson Earthwork can be better described in a class of free-standing quadrangles with angular to rounded corners and one or more axial openings. Other examples are Dunlap and Cedar Bank Works and Mound City with its pair of offset axial openings. Interestingly enough, a form similar in plan and dimensions to Jerrel Anderson's map of the Anderson Earthwork but with a single circular enclosure attached can be seen on James and Charles Salisbury's highly detailed 1862 map of the Newark Earthworks (Figure 5-5). Exactly how the precise segmented squares and the more basic square enclosures related to each other, if at all, is not known. It is safe to say that they all served to separate or define spaces but their precise function in Hopewell society may never be understood.

The use of various colored soils and different materials in embankment construction raises another point: it IS construction. The process of earthen wall construction follows design and purpose using conventional themes and techniques to create a desired form. It is not just the random massing of soils to create a berm sufficient to divide spaces. Although its design is straightforward, the Anderson Earthwork shows that its builders were quite selective with regard to raw materials (type and color) as well as construction methods. The authors have personally observed the application of this concept during the excavation of major Hopewell earthworks on at least two other occasions. At the Great Circle in Newark in 1992, it was found that the embankment was

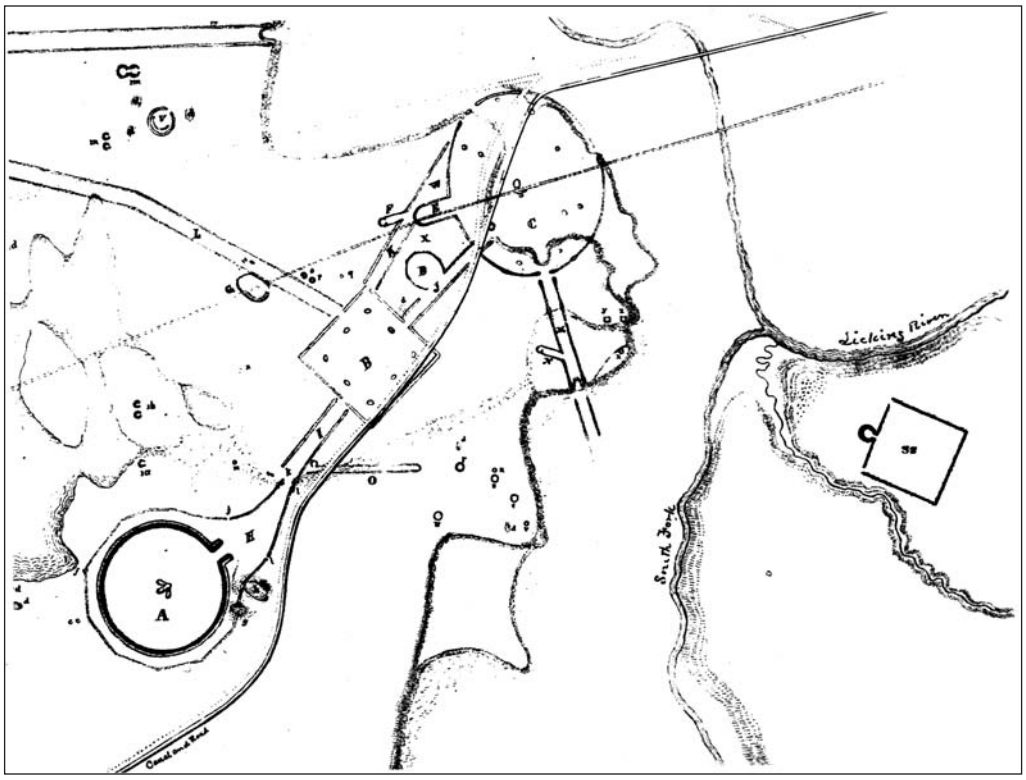

Figure 5-5. A portion of James and Charles Salisbury's detailed 1862 map of the Newark Earthworks. The square enclosure similar to the Anderson Earthwork can be seen in the lower right, opposite the Great Circle in the lower left. Courtesy, American Antiquarian Society.

composed of well-defined horizontal layers of brown and yellow gravels and erected above a prepared surface of natural soils. The gravel strata created a dramatic banding effect that would have been even more impressive and bold at the time of construction. At the Great Circle at the High Bank Earthworks in Ross County, elongated streaks of red soils easily seen on a freshly plowed surface only hinted at the complex arrangement of brightly colored soils and stone used in its construction. In 1997, two trenches were placed across the Great Circle in the vicinity of the gateway that connects it to the Octagon. The excavations revealed that the embankment was the result of a complicated and detailed construction scheme. In particular it was observed that the core of the inner slope of the Great Circle was composed of discrete deposits of uniform yellow silt-clay and compact red sandy-clay soils. Separating these two elements was a discontinuous band of small, white limestone cobbles. As at Newark, the embankment was underlain by a prepared work surface or floor. In this case however it was noted that this surface had been covered by a series of variously colored fine earthen strata in the initial phase of construction. It appeared also that the part of the Great Circle immediately adjacent to the gateway had been delimited by a fence or screen of deeply-set wood posts and that this structure was removed or "decommissioned" prior to embankment construction. This is hardly an arrangement that would be expected if the embankment had been raised by a simple dig and throw method.

Conclusion

Once development of Golf View Estates began, the destruction of the Anderson Earthwork was fast, sure, and complete. The developer's contention that our two small trenches might hinder their construction machinery turned out to be laughable to say the least. The north wall of the earthwork, on the alignment of the main thoroughfare, was dug through to a depth of about twenty feet to allow the installation of a storm sewer. The west wall, although not immediately impacted by construction, was soon pushed over the edge of the terrace and that area leveled. Nothing was done in this area for another month. One can presume this was done so that they would not be imposed upon any further or as one of the developers remarked to one of us later "that's called progress, partner." This regrettable view of the past was not restricted to prehistory. The farmhouse Mr. Riehle lived in most of his life had a well-preserved ca. 1800 log cabin at its core. Eventually, the house was burned to the ground and that area cleared, basically because it did not "fit in."

While our excavations did provide some important data, the total destruction of the Anderson Earthwork provides a more ominous lesson. The fate of this site makes it all too clear that anymore it seems that the priority of places important to archeologists is almost certain to lose out to the priority of "progress and development" at any cost. While this may seem somewhat overstated, it is important to remember that with the loss of any site it makes the ability to understand all other sites that much more difficult. Perhaps Caleb Atwater (Atwater 1820:85) was correct nearly two centuries ago when he denounced those living on the Scioto in the vicinity of Circleville as barbarians for their wanton destruction of the ancient earthworks in that district. It would seem that the Goths and Vandals still ride among us.

Acknowledgments

The authors would like to thank and acknowledge the contributions of Jerrel Anderson, N'omi Greber, Dee Anne Wymer, James Marshall, and Laurie Pahdopony as well as John Pack, Dave Towell, the Ohio Historical Society, and the American Antiquarian Society for the use of the Salisbury map. We would also like to extend special recognition to the late Mr. Alva McGraw of Chillicothe. He was a generous and thoughtful person and a tremendous friend of archeology in Ross County. He personally supported this and a number of other projects and his enthusiasm acted as a catalyst for much of the research that has taken place in Ross County since the 1960's. He will be sadly missed.

CHAPTER 6

MIDDLE WOODLAND AND OTHER SETTLEMENT REMAINS IN THE OVERLY TRACT NEAR THE HOPETON EARTHWORK, ROSS COUNTY, OHIO

BY
WILLIAM S. DANCEY

This paper describes archeological investigations conducted in 1995 and 1996 within the Overly Tract, an 8.8 ha agricultural field located on the Scioto River 0.8 km northwest of the Hopeton Earthworks (Squier and Davis 1848) in Ross County, Ohio. The project was undertaken because the parcel was slated for gravel mining in the near future and because it was known to contain artifacts of the Middle Woodland period, among others. Given its proximity to the Hopeton Earthworks, the project was seen as potentially contributing to an understanding of the relationship of domestic and ritual sites, a hot topic in Hopewellian studies. Gravel mining began in 1996 and the Overly Tract is a gapping hole today.

The Overly Tract (Figure 6-1) is located on a Wisconsin age glacial outwash terrace at the upriver position of the Hopeton Bend, approximately 6 m above the Scioto River and 4.6 m above the active floodplain. The topography is uneven and the western half is approximately 2 m higher than the eastern half. The higher western half is level, with an elevation of 195.5 m amsl; the lower eastern half is irregular, with an average elevation of 193.9 m amsl. Linear depressions on the eastern half and beyond contribute to the uneven topography and may represent relict channels of Pleistocene meltwater streams (Quinn and Goldthwait 1985). They have no modern outlet and may have been marshy before modern agriculture. Most of the terrace, however, is well-drained and the soil types are predominately Fox loam, Fox gravelly loam, and Ockley silt loam, all of which typically develop on glacial outwash (Petro, Shumate, and Tabb 1967). Gordon's (1966) reconstructed map of Ohio vegetation shows the bottomland of the Scioto River choked with hardwood forests and the terraces on either side at Hopeton covered by Oak-sugar Maple forests.

RESEARCH DESIGN

The Overly Tract research design called for a multi-stage data recovery program progressing from systematic surface collection to geophysics to plowzone testing and culminating in selective stripping of the plowzone followed by feature excavation (Dancey 1997). Table 6-1 shows the data sets acquired in keeping with this design. Distribution maps for each sample are shown in Figure 6-2. Artifacts recovered from surface collections (Samples 1, 2, 4, and 5) and shovel testing (Sample 3) during the spring of 1995 produced evidence of a nearly continuous scatter of artifacts across the field.

Artifact densities documented by the various techniques consistently suggested that at least five clusters (labeled A through E) could be demarcated (see Figure 6-1). All

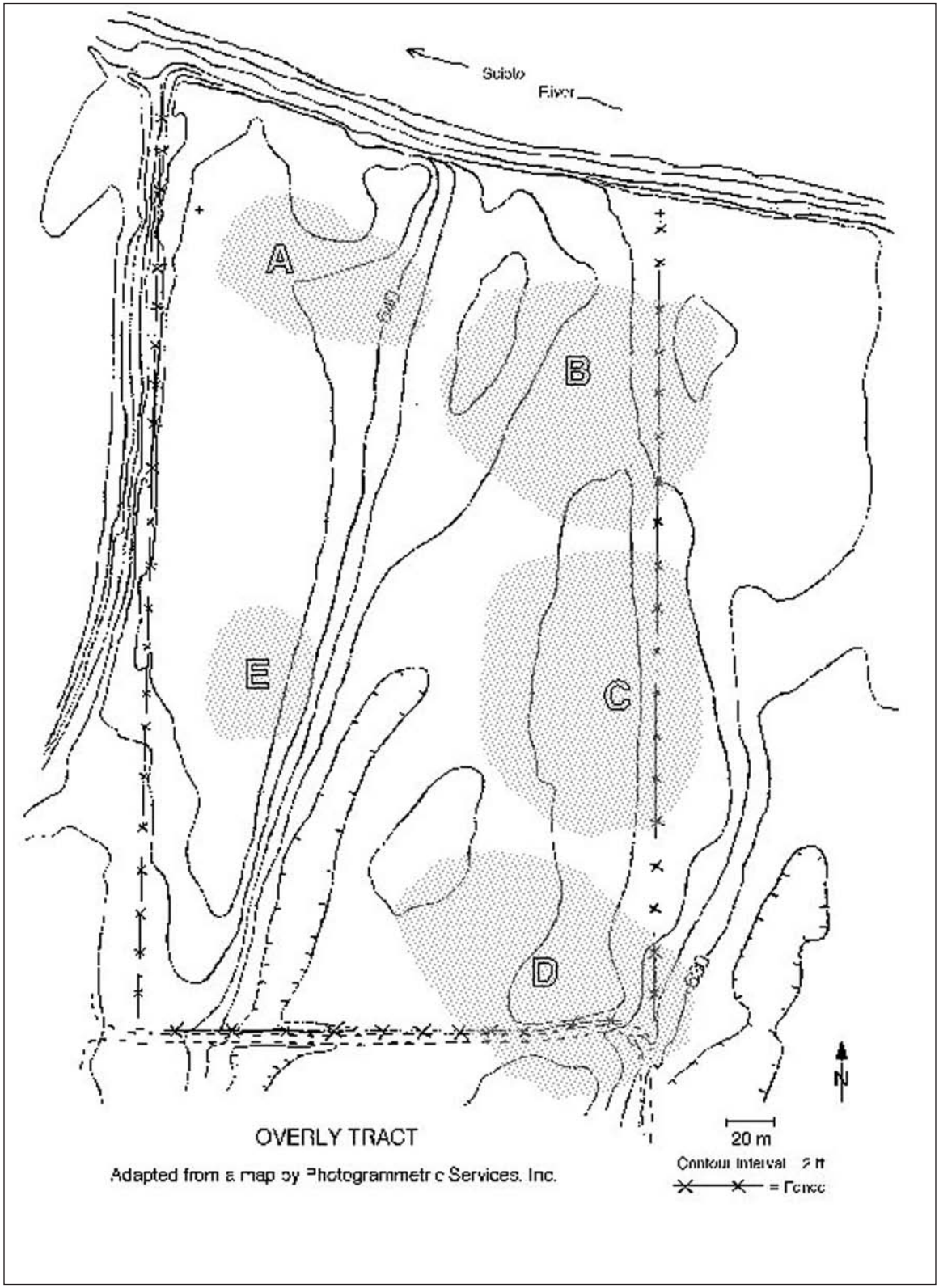

Figure 6-1. Topographic map of the Overly Tract and location of major artifact clusters. (The "+" in the upper left is grid coordinate 800E100N).

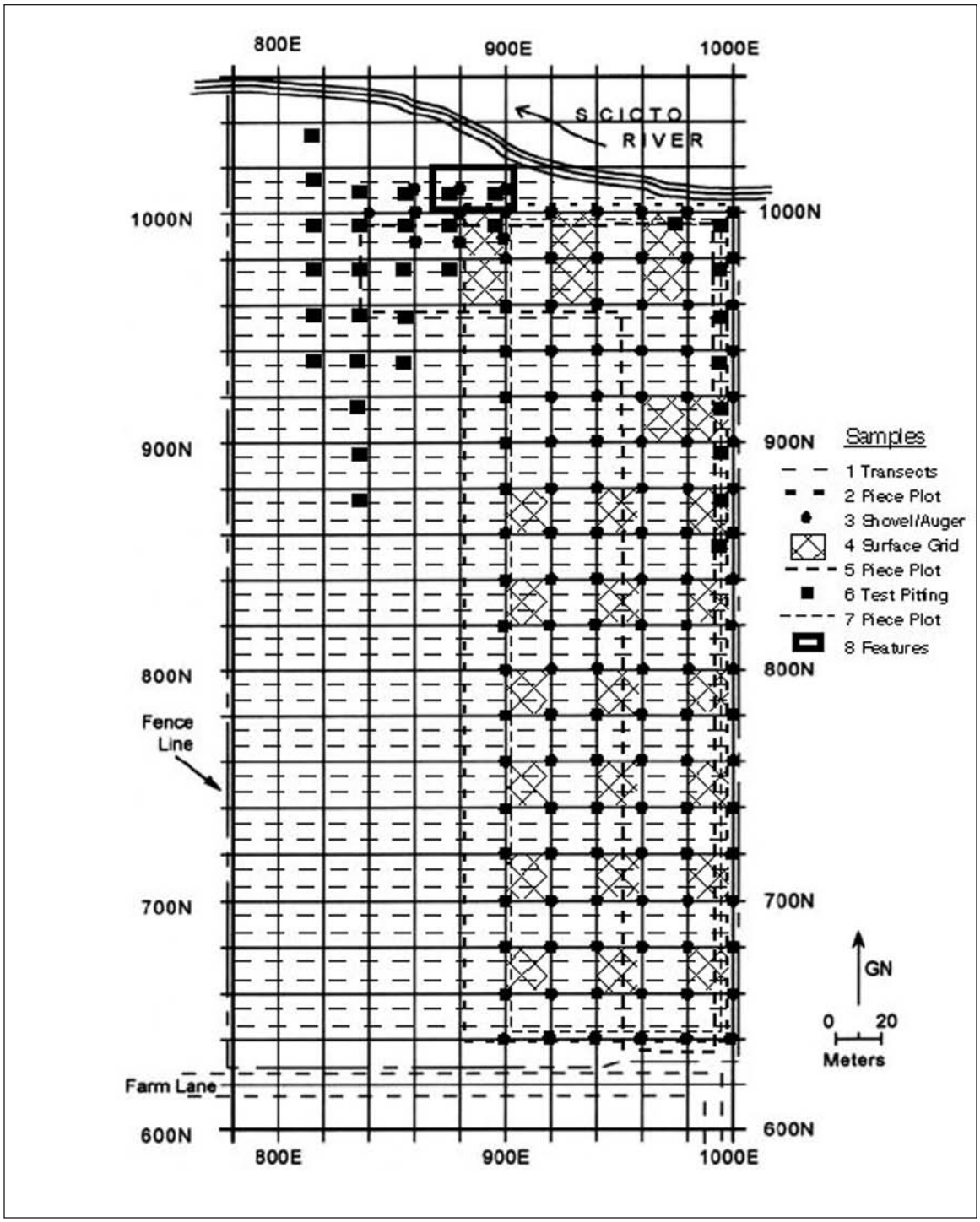

Figure 6-2. Distribution of archeological samples. (Shovel test and test pit symbols not to scale).

but Cluster E contained Middle Woodland period artifacts, among others. Geophysical surveys of Clusters A and B conducted before the beginning of a five-week summer field school in 1995 revealed evidence of possible cultural features (Weymouth 1996). Cluster A corresponds to a site recorded by Olaf Prufer in 1964 (Prufer 1975:274, 276) and designated 33RO110 today.

Table 6-1. Overly Tract artifact samples.

Sample Number	Recovery Strategy
Anthro 602.01 Spring 1995	
1	Transect Survey (East-West, 10 m spacing)
2	Piece Plot (diagnostics only)
3	Shovel Testing
4	Surface Grid Collection (20x20 m block, 16 units)
5	Piece Plot (diagnostics only)
Anthro 685 Summer 1995	
6	Test Pitting (1x1 m squares)
7	Piece Plot (diagnostics only)
8	Feature Excavation (machine stripped plow zone)

Systematic test pitting (Sample 6) was begun during the summer of 1995 by The Ohio State University (OSU) field school with the expectation that all clusters would be sampled and that machine-stripping of select portions of each cluster would follow completion of the test pitting. The ultimate goal was to locate and excavate cultural features in each cluster so as to obtain artifact and dating samples that would help determine whether the clusters were deposited sequentially or contemporaneously.

As it happened, the weather was hot and dry during the summer of 1995 with temperatures often reaching over 100 degrees Fahrenheit. This taxed the endurance of the entire crew and only Cluster A was tested according to plan. Additionally, stripping machinery was available on only one day for a few hours and subsoil exposure was limited to a 15 x 40 m area on the northeastern edge of Cluster A. Aside from the test pitting and a brief surface collection (Sample 7), three out of the five weeks of field school time were spent excavating cultural features revealed by the stripping (Sample 8). High school students from the Hershey School in Hershey, Pennsylvania joined OSU students in 1995 and returned on their own in 1996 to continue feature excavation in Cluster A.

Shortly after the field school ended, the gravel company removed the plowzone soil in a 30 m wide strip along the eastern edge of the tract through Clusters B, C, and D. The depth of panning was uneven and exposed the unplowed subsoil in only a few places. Several features were identified in those locations and volunteer student groups managed to excavate at two adjoining features at the juncture of Cluster B and Cluster C.

Artifact Categories And Their Distributions

While the final stages of the ambitious research design were not completed, some pertinent data were recovered and the remainder of the paper briefly describes the cultural materials obtained and comments on their possible significance with respect to the Middle Woodland period utilization of the tract. Table 6-2 shows the major artifact categories recovered by the eight sampling strategies. Because the data of each sample

are so different and because all samples but the one from feature excavation come from the disturbed plow zone, the analysis presented here emphasizes general patterns and possible trends.

The map of Sample 1, 2, 5, 6, and 7 diagnostic artifacts illustrates the nature of artifact distribution across the eastern and northern portions of the Overly Tract (Figure 6-3). Sample 1, 2, 5, and 6 artifacts include specimens both on the surface and in the plowzone in the machine-stripped area within Cluster A. The Sample 7 artifacts were obtained from a 100 m wide plowed strip along the eastern edge of the Tract. This map clearly shows the near continuous distribution of artifacts along the eastern half of the tract and the higher density on the bluff edge. Also evident is the ubiquity of bifaces (complete and fragmentary, hafted and not hafted) and bladelets (complete and fragmentary). Flake tools, though few in number, are widespread. Ceramics occur only in the vicinity of Clusters A and B.

Lithic Artifacts

All of the clusters containing Woodland period artifacts exhibit a full range of lithic reduction byproducts. This includes pebble cores, early stage bifaces, preforms, and lithic debris. The lithic debris includes flakes with high percentages of cortex positively correlated with large flake size and unfaceted striking platforms. The diagnostic lithic debris exhibits a wide range of flake lengths and platform angles. A study of lithics from across the Overly Tract (student projects, on file, Hopewell Culture National Historical Park) suggests that raw materials (Vickery 1983, 1996; Stout and Schoenlaub 1945) are dominated in all clusters by Columbus-Delaware chert (45 percent) and Upper Mercer Chert (25 percent). Vanport and Wyandotte cherts, high quality materials common in the Middle Woodland period, are better represented in Cluster A (11 percent and 7 percent, respectively) than in the clusters along the east edge of the tract (2 percent and 4 percent, respectively, for Cluster C). The rarity of finished tools probably derives at least in part from the popularity of this field among artifact collectors.

Bladelets are often considered a diagnostic Hopewellian artifact (Greber et al. 1981) and their presence in Clusters A through D supports the identification of Middle Woodland period components in them. Of the 107 bladelets identified, 88 were measureable and only eight were complete. Bladelets were found on the surface (n=50), in test pits (n=11), and in features (n=27). A slight majority (n=50, or 57 percent) are made from Vanport chert (Flint Ridge; Licking County, Ohio) and a significant number (n=16, or 18 percent) from Wyandotte chert (Harrison County, Indiana). Bladelet material can provide a useful temporal indicator because, depending on where the site is, Wyandotte chert is replaced by Vanport chert over time. Wyandotte chert makes up one-fifth of the set, and with Vanport chert accounting for 50 percent. It might be concluded, therefore, that Cluster A falls in the middle of the Middle Woodland period.

Triangular cross-sections account for 38 percent of the specimens while 58 percent are trapezoidal. The average width is 10.99 mm and the average thickness is 2.93 mm, well within the parameters of Ohio Hopewell bladelets (Greber et al. 1981). None are retouched to form tools such as scrapers or drills. Only one bladelet core was

Table 6-2. Overly artifact categories by sample.

Sample Number	Recovery Strategy	FCR	Macro-Debitage	Micro-Debitage	Hafted Biface	Non-Hafted Biface	Unifaces	Flake Tools	Bladelets	Ground Stone	Ceramics
1	Transects	269	444	0	3	13	0	0	4	1	11
2	Piece Plot	0	10	0	4	8	1	3	16	0	0
3	Shovel Test	85	10	719	0	0	0	0	0	0	0
4	Surface Grid	1201	524	0	5	8	4	4	4	0	0
5	Piece Plot	0	4	0	6	15	0	4	2	3	0
6	Test Pitting	*	1872	0	0	37	1	0	12	0	120
7	Piece Plot	0	23	0	4	75	4	4	40	9	24
8	Feature Ex.	*	145	0	5	5	0	1	29	1	>1552
Total		**1555**	**3032**	**719**	**27**	**161**	**10**	**16**	**107**	**14**	**>1707**

* Not Tabulated

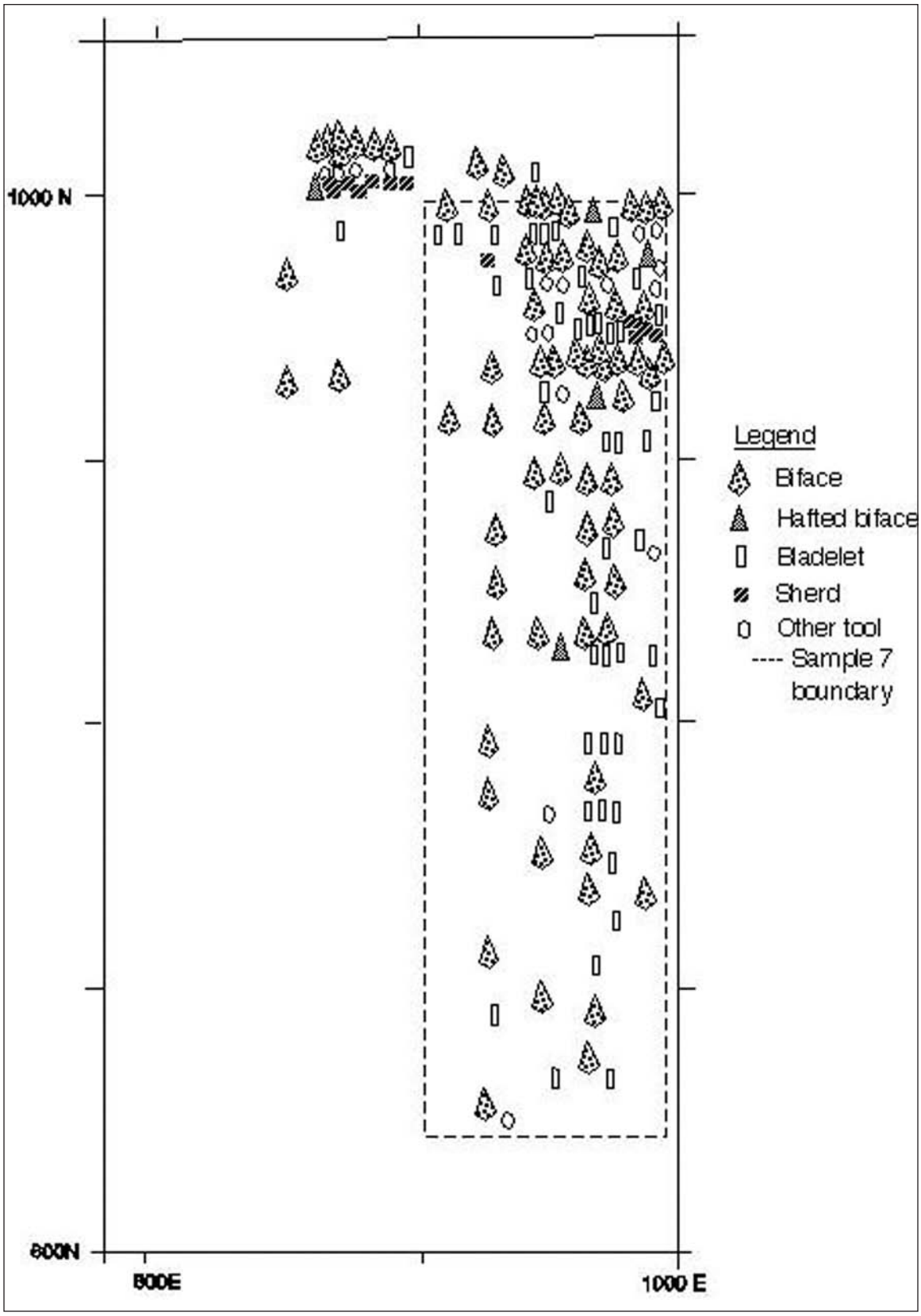

Figure 6-3. Distribution of Sample 1, 2, 5, 6, and 7 diagnostic artifacts.

recovered. Fifty-six specimens (64 percent) exhibit macroscopic edge damage that may represent usewear.

Table 6-3 shows the frequency of 43 identifiable projectile points (also see Figure 6-4) from all samples by temporal period. Most specimens belong to types (Justice 1987) that were common during the Late Archaic, Late Middle Woodland, and Early Late Woodland periods suggesting that the major occupations of the Overly Tract took place sometime between ca. 6000-3000 B.P. and ca. 1300-1800 B.P. with only incidental use at other times. Looking at the distribution of these types (Figure 6-5), several observations can be made. First, it appears that the Late Archaic, Middle Woodland, and Early Late Woodland period types are isomorphic. Types common in both periods are found across the entire occupied space. Second, Late Middle Woodland period (ca. 1400-1800 B.P.) and Early Late Woodland period (ca. 1300-1400 B.P.) projectile point types are complementary. Lowe Flared Base points occur in the southern half of the Overly Tract, and Chesser Notched points are found in the northern portion.

Table 6-3. Overly Tract projectile point types by Period.

Period	Types	N
Late Prehistoric	Madison	2
Late Late Woodland	Levanna	3
Early Late Woodland	Chesser Notched	9
Late Middle Woodland	Lowe Flared Base	6
Early Middle Woodland	Snyders	2
Late Archaic	Brewerton Eared Notched	2
	Lamoka	5
	Genesee	2
	Turkey Tail	1
	Vossburg	2
	Trimble	2
	Merom	3
	McWhinney	1
Early Archaic	MacCorkle Stemmed	1
	Kirk Corner Notched	2
	Total	**43**

Cultural Features

Figure 6-6 shows a map of the 25 excavated cultural features within the stripped area at the east edge of Cluster A. Twenty-two were excavated in 1995 and the remainder in 1996. A classification based upon size and profile produced seven classes. Classes 1 and 2 consist of small, straight-sided, circular, shallow features that may represent post molds. The six members of these two classes are scattered throughout the distribution with no apparent pattern. Classes 3, 4, and 5 consist of sloping-sided, circular-to-oval shaped, moderately deep (mean of 29 cm), flat-bottomed pits. Although essentially the same in profile, they differ in size. Two pits (Features 21 and 31) appear to have had two distinct episodes of use. The fill of most features contains charcoal and fire-cracked rock (FCR) possibly indicating that they were earth ovens. These three classes have 16 members, all but four of which include artifacts in their fill. There is no apparent spatial pattern to the distribution of Classes 3, 4, and 5 with respect to one another. Class 6 consists of two adjacent, medium-sized, shallow basins with little cultural refuse in their fill. Class 7 consists of a single deep (64 cm), expanding-base pit

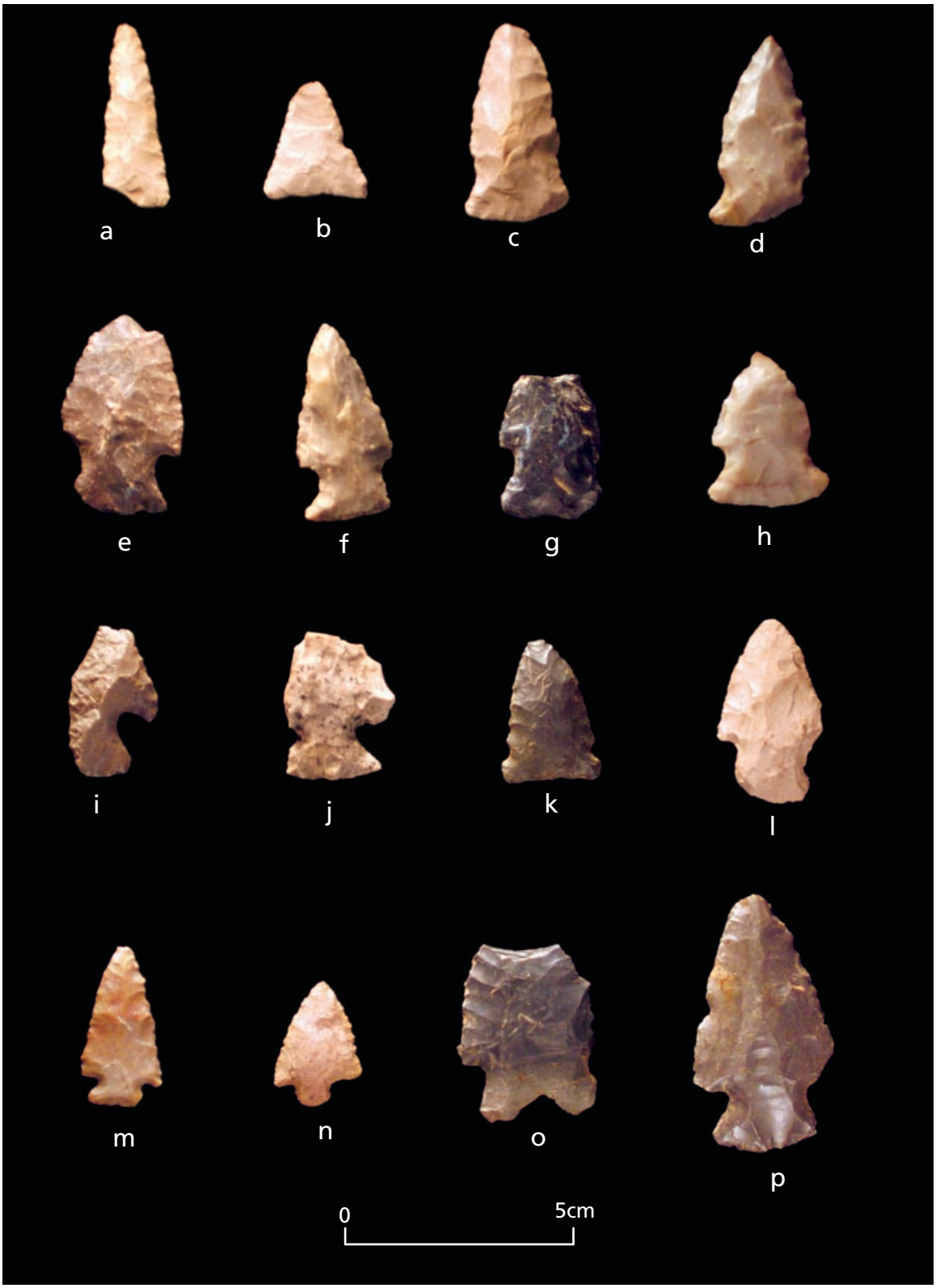

Figure 6-4. Select examples of projectile point types. (A, Madison; B Levanna; C-D,Chesser Notched; E-H, Lowe Flared Base; I-J, Snyders; K, Brewerton Eared-notched; L, Lamoka; M, Trimble; N, Meron; O, MacCorkle Stemmed; P, Kirk Corner-notched).

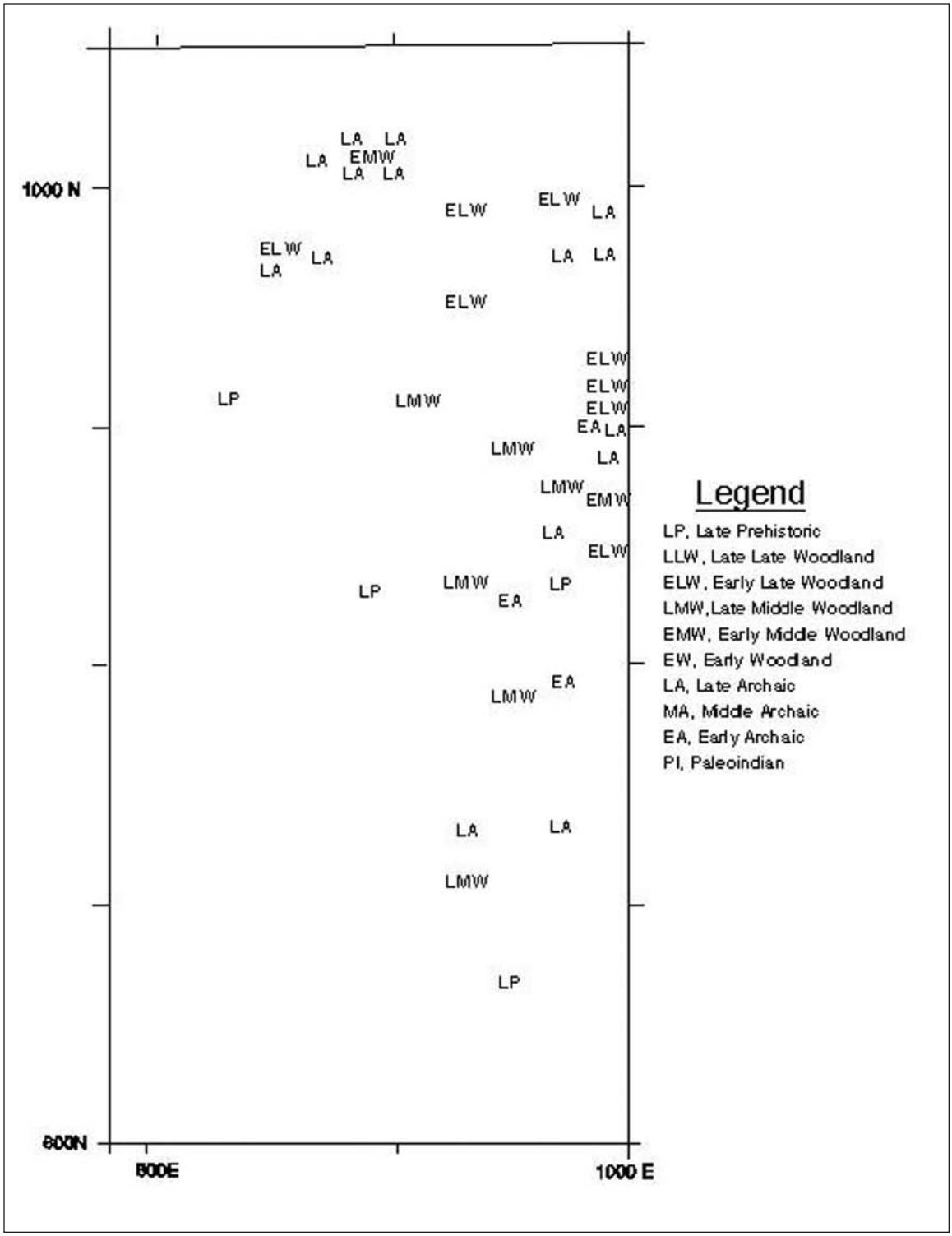

Figure 6-5. Distribution of projectile point types.

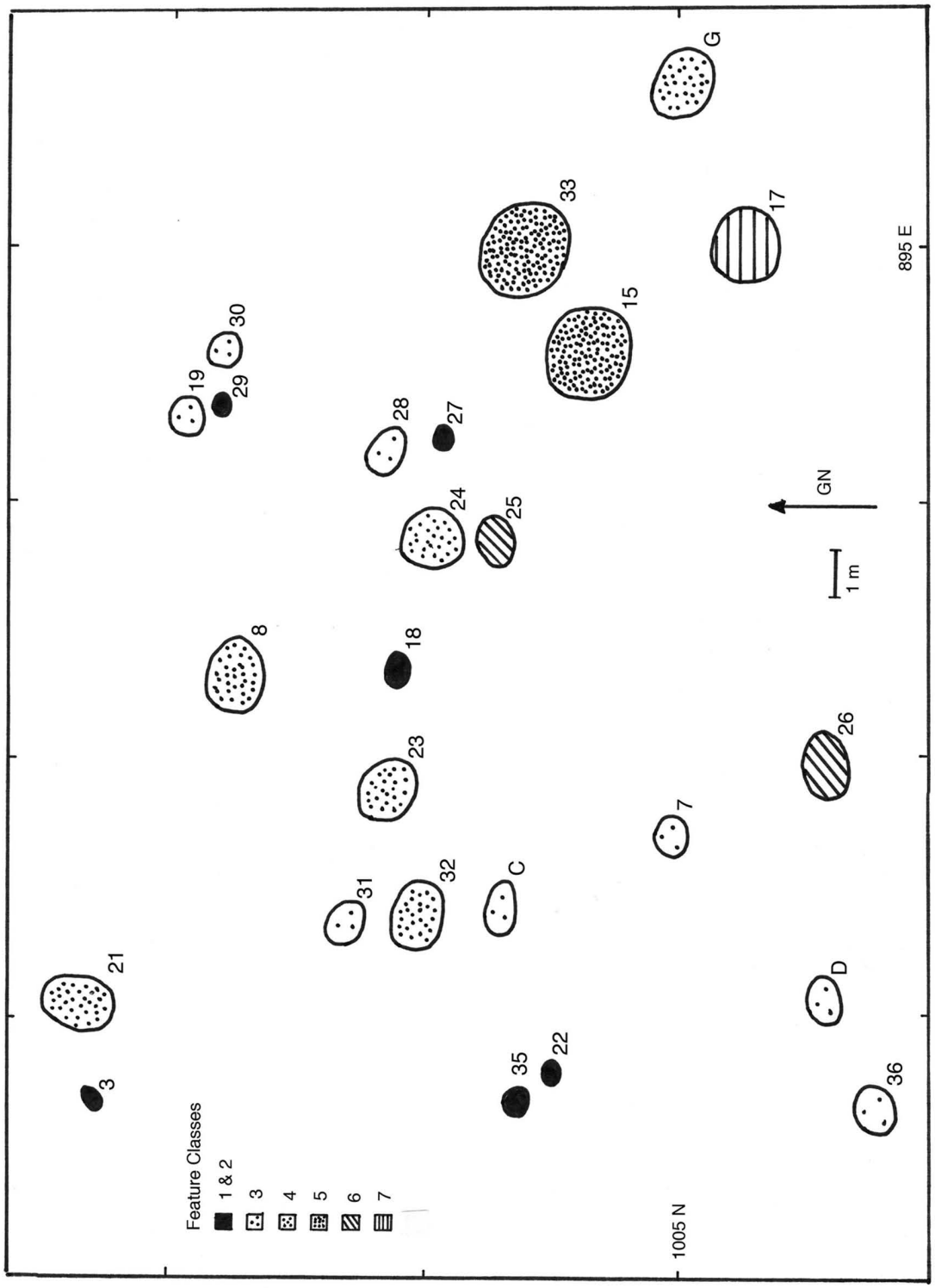

Figure 6-6. Map of excavated cultural features.

that contained the articulated skeleton of a 30-40 year old Native American male (Nancy E. Tatarek, personal communication 1996). Features 103A and 103B located at the north end of Cluster C are circular, sloping-sided, flat-bottomed pits measuring 185 cm and 135 cm in diameter, respectively; Feature 103A and Feature 103B are Class 5 and Class 4 pits, respectively.

Aside from FCR and charcoal, the Cluster A cultural features were found to contain varying quantities (usually small) of potsherds, chipped stone debitage and tool fragments, bladelets, bone (mostly small and calcined), ash, amorphous clay lumps, ground stone, mica, and shell. Potsherds are the most abundant artifact (n=1572) and the features containing them (Features 8, 21, 22, 23, 31, 32, and 33) are concentrated in the north central area of the distribution. Size-sorting of the heavy fraction sediments remaining from flotation produced evidence of moderate amounts of small (1.4-6 mm) chert debitage. Cumulatively, this debris appears to represent the product of broadcast refuse disposal.

The fill of a number of the Cluster A pit features contained decorated ceramics and bladelets relating to the Middle Woodland period so it is assumed that most of the features originated during that period. One of the pit features (Feature 21) contained fragments of a Snyders point and fragments of mica, also a common Middle Woodland period material, were found in four of the features. As is described below, the radiocarbon dates from these pits fall within the Middle Woodland period.

Ceramics

Potsherds (n=897) were recovered from the fill of nine features (Features 8, 21, 22, 23, 31, 32, 33, 103A, and 103B). Some basic facts about the sample are given in Table 6-4. Photographs of select rim and body sherds are shown in Figure 6-7. As can be seen, the pits contain fragments of all parts of appendage-free ceramic vessels. With one exception, described below, the differential distribution and frequency of body parts suggests incidental, broadcast disposal of broken vessels. Based on unique rims and unique body textures, it is estimated that the pit features contained at least 26 distinct vessels.

Feature 21 contained the only reconstructable vessel, a nearly-complete, 45 cm tall, sub-conoidal jar (Vessel 21-1) measuring 24 cm in diameter at the rim and 30 cm in diameter at the shoulder. The exterior surface exhibits three horizontal zones that are each treated differently. The narrow upper zone is plain and extends 3 cm below the plain lip, constituting the entire rim and neck portion of the vessel. The wide middle zone, including the shoulder and body, can be characterized as McGraw Cordmarked (Prufer 1965). The basal zone, ca. 15 cm wide, consists of vertical runs of short rocker-stamping that radiate out from the narrow base. The size, shape, and rim designs suggest a utilitarian function; yet, there is no observable indication that this vessel was applied directly to fire or that it had been used for indirect cooking.

Of the 20 unique rim sherds recovered from feature fill, nine are plain, five are vertically cordmarked, one is horizontally cordmarked, and five specimens exhibit

Table 6-4. Sherd data (body sherds >2 cm) by cultural feature.

Feature No.	Rim	Neck	Shoulder	Body	Base	N	Minimum Vessels	% Plain	Mean Thickness (mm)
8	4	0	0	64	1	69	4	56	4.8
21	22	6	6	517	5	556	9	13	5.6
22	0	0	0	2	0	2	?	ND	ND
23	2	0	0	57	0	59	1	58	4.8
31	0	0	0	30	0	30	?	23	4.9
32	0	0	0	22	0	22	?	50	5.1
33	0	0	0	2	0	2	2	ND	ND
103A	5	8	1	139	2	155	4	9	5.8
103B	4	3	1	45	0	53	6	9	5.6

ND = No Data

zoned decoration referred to as the Hopewell Rim (Figure 6-7). With respect to the latter, in four of the five cases the zone is defined by elongated, closely spaced punctuations. The designs within the zone include cross-hatched, vertical, diagonal, lollipop, and interrupted incised lines. The lollipop rim, also from Feature 21 (Vessel 21-4), is associated with body fragments that together suggest a thin-walled, fragile vessel less than half the size of Vessel 21-1 described above. The midsection of the body has traces of a rocker-stamped design. The contrast between the two vessels, small (21-4) and large (21-1), is seen in estimated orifice diameter (12 cm compared to 24 cm) and in average thickness (3.4 mm compared to 7 mm).

Most of the body sherds from the features are smoothed-over cordmarked (73 percent) with plain (20 percent) and unsmoothed cordmarked (7 percent) in the minority. One fabric-impressed sherd was found in the Feature 103A fill. The wide variety of decorative treatments among a small number of decorated sherds, although typical of the area, frustrates temporal placement of the assemblage solely on the basis of ceramic decoration. All of the decorative elements at Overly also occur at McGraw (Prufer et al. 1965) and at numerous other sites across southern Ohio (Prufer 1968). Some of these elements, such as the zoned-filled rim design (Hopewell Rim), are uniquely "Hopewellian" and are the diagnostic ceramic traits that confidently identify an archeological deposit as Hopewell. As with bladelets, another emblematic Ohio

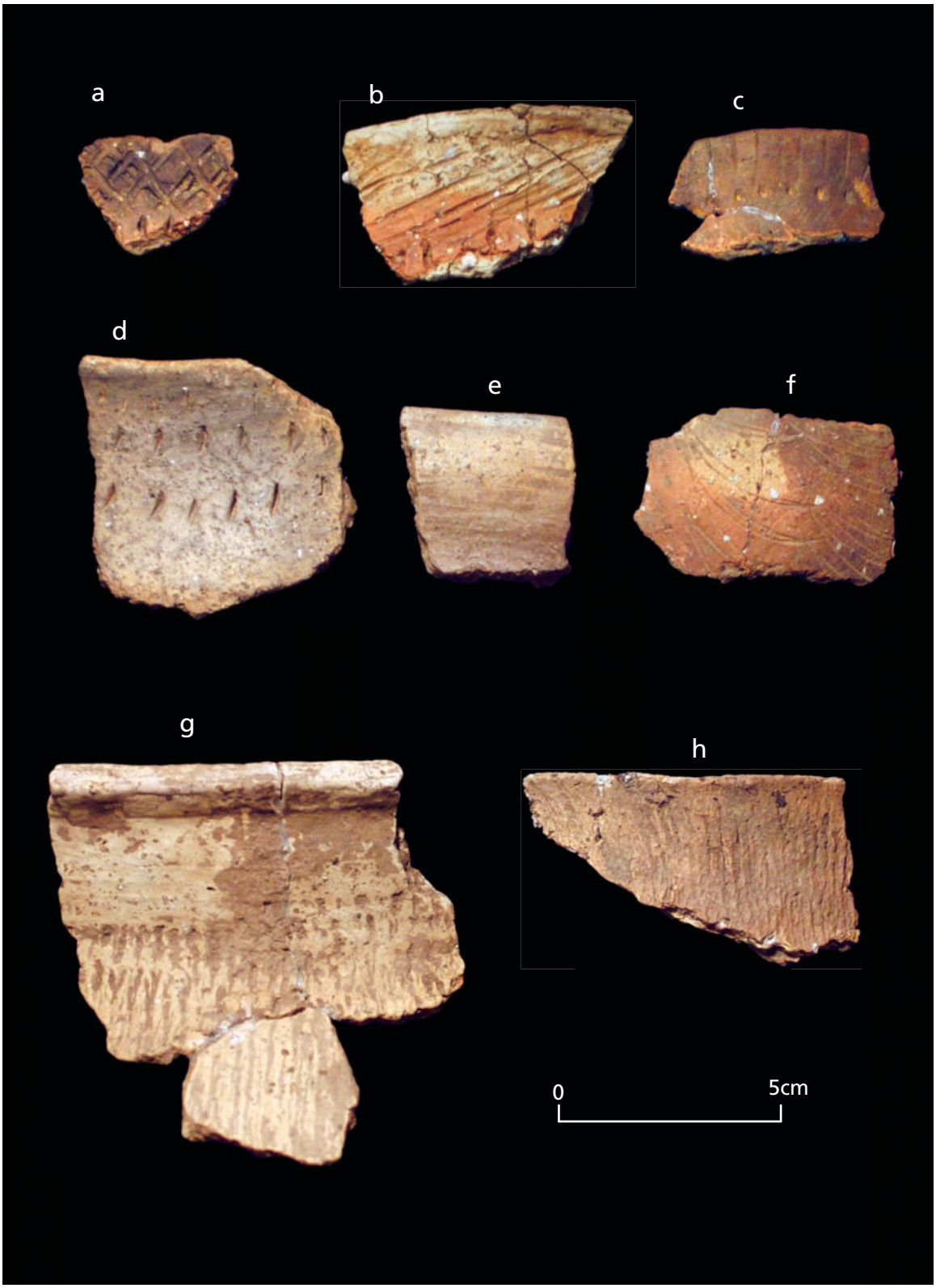

Figure 6-7. Select ceramic sherds. (A-C, Hopewell Rims; D, rim with punctations; E, Chillicothe Brushed rim; F, Rocker-stamped body sherd [same vessel as "C"]; G, McGraw Cord-marked rim; H, Newtown rim).

Hopewell artifact, temporally significant changes in ceramic design elements have not been found and we are forced to use relative proportions of mundane traits.

At the McGraw site, 9 km downriver from Overly, Prufer (1965:50-59) recovered 9,948 sherds, 71 percent of which are cordmarked and 23 percent plain, from a buried midden. Design elements on the 428 decorated sherds (19=Hopewell Rims) include rocker-stamping, cross-hatching, deep incising, and punctation. Small numbers of a trait thought to be early (simple-stamping) and late (vertical cord-marking up to lip) are present. The pottery suggests that McGraw was occupied for a longer time than Cluster A at Overly and the wide range of radiocarbon dates from the site points in that direction as well. Nevertheless, the ceramic similarities point to coeval occupation in the middle of the Middle Woodland period.

A perusal of the photographs in Prufer (1968) produced a list of seven other sites (Edwin Harness, Hopewell 25, Tremper, Mound City, Seip 1, Marriott-1, and Turner) containing pottery with rocker-stamping and Hopewell Rims. These sites were occupied at various times for variable duration yet no patterning has been detected with confidence in the temporal distribution of ceramic design elements.

One decorative element with known temporal significance is surface texture. As noted above, cordmarking replaces plain surface texture (decoration) over time. Cluster A is 80 percent cordmarked and 20 percent plain, making it a candidate for placement in the middle part of the design evolution, straddling the Early-Late Middle Woodland period boundary at 1750 B.P. (A.D. 200). Another aspect of surface texture that can contribute to an estimate of Cluster A's age of occupation is the percentage of smoothed over cord-marking. By the time that cordmarking becomes dominant, the cordmarks are normally left intact. Smoothing the cordmarks appears to mark the transition from one to the other and may help position the occupation in the middle of the Middle Woodland period.

In Cluster C, Features 103A and 103B contain a homogeneous sample of potsherds the properties of which contrast sharply with Cluster A ceramics, as discussed above. The striking property of this assemblage is the high percentage of cordmarking in the total assemblage, vertical and horizontal cordmarking up to and parallel with the squared rim, and one case of an angular shoulder.

Radiocarbon Dating

Radiocarbon dates obtained on charred plant remains from six cultural features are shown in Table 6-5. The oldest date is from Feature 17 and falls in the fourth millennium B.P., the Late Archaic period. This was a surprise since the deep pit from which the sample was obtained expands at the base similar to the Fort Ancient tradition bell-shaped storage pits in the Late Prehistoric period (ca. 500-100 B.P.), as noted above. On the other hand, the teeth of the individual at the bottom of the pit lack evidence of dental caries, a condition common among maize-eating populations of the Late Prehistoric in the Middle Ohio Valley.

Table 6-5. Overly Tract radiocarbon dates arranged in chronological order.

Lab No.	Feature No.	C14 Age	BC/AD	2 sigma Calibration	Material
Beta-181502	Fea. 103A	1450+/-50 BP	AD 500	1415-1280 BP	Charred Black Walnut
Beta-181501	Fea. 31	1720+/-60 BP	AD 230	1795-1515 BP	Charred Honeylocust
Beta-181500	Fea. 23	1810+/-60 BP	AD 140	1875-1565 BP	Charred Honeylocust
Beta-181497	Fea. 8	1820+/-80 BP	AD 120	1920-1545 BP	Charred Honeylocust
Beta-181499	Fea. 21	1890+/-80 BP	AD 60	2000-1620 BP	Charred Hickory
Beta-181498	Fea. 17	3510+/-60 BP	BC 1750	3925-3635 BP	Charred Hickory

The calibrated radiocarbon dates from Cluster A Features 8, 21, 23, and 31 (Table 6-5) fall largely within the early Middle Woodland period between 1700 and 1900 B.P. The Cluster C Feature 103A calibrated radiocarbon date falls between 1300 and 1400 B.P., within the early Late Woodland period. The radiocarbon dates dovetail with the ceramic properties in the temporal assignment of the cultural features.

Archeobotany

All fill from all of the features was removed for flotation in order to exhaustively examine the pit contents for rare plant remains, such as maize. About 15 percent of the fill was processed during the field school and archeobotanical samples from the fill of 15 cultural features analyzed by Crystal Reustle (1995) with the results shown in Table 6-6. The suite of hickory (*Carya* sp), walnut (*Juglans nigra*), acorn (*Quercus* sp), and hazelnut (*Corylus Americana*) along with a trace of squash (*Cucurbita* sp) mirrors that commonly recovered from Middle Woodland sites in southern Ohio (Wymer 1987). Table 6-7 shows the seed species represented. Here also the plants commonly found as domesticates, namely goosefoot (*Chenopodium berlandieri*), maygrass (*Phalaris caroliniana*), and knotweed (*Polygonum* sp), are the best represented. Reustle concludes that food production was being practiced by the occupants of Cluster A in the Overly Tract. Significantly, no trace of maize was found in these samples.

Discussion

The salvage nature of the Overly Tract project precludes definitive reconstruction of the tract's occupational history. Nevertheless, some valuable information was obtained. In particular, some aspects of the record bear on the nature of Hopewellian settlement pattern. These are expressed below in discussing the probable periods of occupation, the timing of Middle Woodland period occupation of the Overly Tract in relation to the building of the Hopeton Earthworks, and the nature of the Cluster A (33RO110) settlement.

Table 6-6. Plant food remains from Overly Tract cultural features* (Number of Fragments).

Feature No.	Hickory	Walnut	Acorn	Hazlenut	Seeds	Squash	Total Fragments
8	17	0	0	0	33	2	52
10	9	0	0	0	1	0	10
15	393	86	0	3	6	0	488
17	20	1	0	0	0	0	21
18	77	3	0	0	2	0	82
20	0	0	0	0	0	0	0
21	2	0	0	0	27	0	29
23	161	0	5	0	476	0	642
24	14	0	0	0	1	0	15
25	1	0	1	0	105	0	107
26	10	1	0	0	0	0	11
30	0	0	0	0	0	0	0
31	0	0	0	0	72	0	72
32	2	0	0	0	471	0	473
33	1	0	0	0	1	0	2
Total	**707**	**91**	**6**	**3**	**1195**	**2**	**2004**

*Reproduction of Table 2 from "Partial Analysis of the Archaeobotany of the Hopeton Vicinity, The Ohio State University Fieldschool, 1995," by Crystal Reustle Patil.

Table 6-7. Seed counts from Overly Tract cultural features.*

Feature No.	Goose-foot	May-grass	Knot-weed	Poke	Legume Family	Sumac	Galium	Unknown	Unidentified
8	10	13	2	0	0	1	0	2	5
10	1	0	0	0	0	0	1	2	3
15	0	0	0	0	0	0	0	0	0
17	0	0	0	0	0	0	0	0	0
18	2	0	0	0	0	0	0	0	0
20	0	0	0	0	0	0	0	0	0
21	17	1	2	0	1	0	0	1	5
23	377	27	30	2	1	0	0	32	7
24	1	0	0	0	0	0	0	0	0
25	85	10	3	0	0	0	0	7	0
26	0	0	0	0	0	0	0	0	0
30	0	0	0	0	0	0	0	0	0
31	51	2	5	0	0	0	0	1	13
32	453	3	15	0	0	0	0	0	0
33	1	0	0	0	0	0	0	0	0
Total	**998**	**56**	**57**	**2**	**2**	**1**	**1**	**45**	**33**

*Reproduction of Table 2 from "Partial Analysis of the Archaeobotany of the Hopeton Vicinity, The Ohio State University Fieldschool, 1995," by Crystal Reustle Patil.

With respect to the occupational history of the tract, projectile point stylistic types, bladelets, ceramic decorative traits, and radiocarbon dates from cultural features data point to human utilization of the landform during the Late Archaic, Middle Woodland, and Early Late Woodland periods. Artifacts of the latter two periods dominate the record, and the four clusters probably reflect occupational episodes during those times. Given that the projectile point and ceramic type distributions vary from cluster to cluster it appears that they were not occupied at the same time. In particular, Cluster A appears to have accumulated in the middle of the Middle Woodland period and Cluster C in the Early Late Woodland period.

Lynott (2007; Lynott and Mandel, this volume) estimates that the square enclosure of the Hopeton Earthworks was constructed largely during the Early Middle Woodland period between 1700 and 1850 B.P. [A.D. 100 and A.D. 250]. If this is true, Cluster A may well have been occupied at the same time, for three out of six radiocarbon dates from the Cluster A cultural features fall in this time span. The outer limits of the Middle Woodland period Cluster A dates (2 sigma s.d.) are 1515-2000 B.P. Furthermore, the Snyders point and the Hopewell vessels in Cluster A pit features would not be out of place at that time, nor would the high percentage of cordmarking and presence of a modest amount (17 percent) of Wyandotte chert.

Thus, it appears that two of the questions driving this work, the contemporaneity of the clusters, and any one of the clusters with the Hopeton Earthworks, have been answered. The answer to the first question is negative. There is a high likelihood that the clusters were not produced by contemporaneous occupations. The answer to the second is affirmative. It is quite possible that Cluster A was contemporaneous with the construction of the Hopeton Earthworks.

But what about the kind of settlement represented by these clusters? Cluster A was the most extensively investigated of the clusters and presents an opportunity to address this question. Before looking at the data, however, it is important to evaluate the condition of the property in 1995. For one thing, historic period disturbance eliminated about 35 percent of it on the west end. Also, bank erosion on the north edge has undoubtedly eaten away a significant amount of the site. Burial excavation during the Late Prehistoric period may have disturbed earlier occupation debris along the northern edge of the terrace. Fort Ancient pottery was found during gravelling on the western border, adjacent to the former location of historic structures (Bret Ruby, personal communication 1996). Plowing has deflated the deposit, effectively lowering the feature population and smearing the imprint of settlement organization. The chances for preserved remains of structures and facilities, not to mention a midden component, to remain in a setting like this are low.

In spite of its moderate integrity, low clarity, and modest quantity and variety of artifacts, my view is that Cluster A constitutes the patterned remains of a settled domestic household engaged in food production for a significant portion of its diet. The cluster as a whole, as defined by lithic densities, is estimated to cover 0.7 ha (similar to the others; B=0.8 ha; C=1.4 ha; D=1 ha). This figure puts the cluster well within the range of other Middle Woodland hamlets (0.2-1.2 ha, mean of .6 ha [Pacheco 1988b]) in southern Ohio. The biface industry debris reflects start-to-finish chipped stone tool

production. As seen at other Middle Woodland settlements in southern Ohio, Overly Cluster A contains a functionally and decoratively varied ceramic assemblage, including a few sherds of small, decorated, thin-walled vessels that appear to be special purpose containers for ritual, identity, or prestige purposes, among others.

The single-noded density of the artifacts and features in Cluster A suggests a single household unit, as appears to be true of most other sites of the time. The plant remains present in Cluster A cultural features include most of the Eastern Agricultural Complex species, which suggests that the Cluster A Middle Woodland occupants were food-producers, as is true for most other similar sites of the period.

Cluster A matches the physical properties of most other Middle Woodland period settlements and helps expand knowledge of this type of settlement. Most other Middle Woodland sites (Dancey and Pacheco 1997) that have been investigated comprehensively consist of a concentration of pit features, most of which are earth ovens, post mold remains of structures, household level biface tool manufacture, Hopewellian artifacts and materials (e.g., fine ware vessels, mica), and domesticated plants. When there was a secondary agent of burial, as at the McGraw site (Prufer 1965) and Jennison Guard (Kozarek 1997), middens were preserved, along with bone and antler when shell was part of the midden. However, at settlements high above flooding, as at Overly, preserved midden accumulation is rare. Despite differences in condition and preservation, on a regional scale it has been found that Middle Woodland sites of similar size, content, and composition are found in lowland, intermediate, and hinterland locations.

Acknowledgments

Of the many people involved in the Overly Tract project, I would like to to single out Mark Lynott, Chief Archeologist of the Midwest Archeological Center (MWAC), to start my list. Mark put his trust in The Ohio State University program and has been a supportive and patient colleague. At Hopewell Culture National Historical Park, my thanks go to John Neal, former superintendent, for opening his facilities and office staff to us and for arranging dormitory space at the Veteran's Administration Hospital nearby for the field school students and staff. Forest Frost and Karen Archie from MWAC were my support staff in the field, along with OSU graduate students Jarrod Burks, Jennifer Pederson Weinberger, and Tori Saneda. Bret Ruby was our liaison with the Park and Jim Brown spent a week at Overly accompanied by his field school students. Thanks are due also to Chillicothe Sand and Gravel for unobstructed access to the tract and for the panning that exposed the pit features. Dick Sisson gave support for Graduate Research Associates, including Deborah Wood, in the analysis stage through The Ohio State University Provost's Research Fund. Thanks also to Jennifer Pederson Weinberger, Park Archeologist, for arranging for the radiocarbon dates. Last, but not least, thanks to the many students who participated in the fieldwork and in the laboratory processing and analysis. Thanks to Mark and the reviewers for helping to make the paper better. I am grateful to all who contributed, but acknowledge that responsibility for accuracy of the data presented in this paper and the conclusions drawn from it rests upon my shoulders.

CHAPTER 7

HOPEWELL OCCUPATION AT THE HOPETON EARTHWORKS: LARGE SCALE SURFACE SURVEY USING GPS TECHNOLOGY

By
Jarrod Burks and Dawn Walter Gagliano

Some models of Ohio Hopewell settlement (e.g., Dancey and Pacheco 1997) spatially situate earthwork complexes in one area of a community, often near the center, and suggest that Hopewell groups lived a fairly sedentary life in small settlements dispersed across the landscape within easy travel of the community earthwork. Such models imply that Hopewell earthworks were essentially vacant much of the year until the arrival of visiting groups. With periodic influxes of perhaps hundreds of individuals, an obvious question is where did everyone eat, sleep, and prepare for these important activities while visiting the ceremonial center and can these occupations be identified through archeological means?

If use of the earthwork area was limited to short term occupations focused on activities common to such ceremonial centers (e.g., feasting, dancing, seasonal, and mortuary ceremonies), then the following expectations should hold:

1. unless relatively permanent buildings were in place to house the temporary influx of visitors, debris should be scattered and minimally clustered,

2. tool diversity should be low since only a narrow range of production activities were required,

3. lithic debris should be focused on tool maintenance and use, and

4. subsurface facilities like storage and cooking pits should be small and scattered, except in the case of large communal facilities.

In 2001, National Park Service archeologists from Hopewell Culture National Historical Park, with the assistance of a small number of volunteers, conducted systematic surface collections across a large area within and near the Hopeton Earthworks (Burks et al. 2002; Burks and Walter 2003). In this chapter we present the results of the 2001 surface collection at the Hopeton Earthworks and use these data to explore the above expectations. While a significant amount of Hopewell debris was found, much of it was scattered across the survey area outside of the earthworks. Few high density Hopewell clusters were encountered, suggesting the presence of intermittent occupations rather than longer-term settlements.

THE SURVEY AREA

The Hopeton Earthworks are located on a broad second terrace overlooking the Scioto River, about 1.6 km north of Chillicothe, Ohio (Figure 7-1). In 1848, Ephraim Squier and Edwin Davis published the most detailed historic map of the earthworks to date. However, based on Global Positioning System (GPS) data collected in 20011, it is clear that the 1888 map prepared by Middleton (Thomas 1894) is much closer to what the earthworks look like today. Our depiction of the earthworks in Figure 7-1 is a composite of both historic maps. The two main enclosures, the large circle and so-called square, are based on Middleton's work and the smaller earthen enclosures, mounds, borrow pits, and parallel walls come from the Squier and Davis map. We used the GPS data to scale our composite drawing and establish true north (in this case, UTM north). The lines marking the edge of the bluff to the east of the earthworks and the second terrace margin to the west are estimated and based on topographic data from the USGS Kingston, Ohio 7.5' quadrangle map. While our depiction of the earthworks and their surroundings is somewhat closer to reality than either of the historic maps, a National Park Service map based on detailed topographic and geophysical data should be used for future research.

The survey area consists of seven agricultural fields covering 69.6 ha of the terrace on which the earthworks are located (Figure 7-1). Surface conditions were ideal for much of the survey. During the approximate four months over which the survey took place, each of the fields was disked. Survey work was begun in each of the newly disked fields only after significant rainfall.

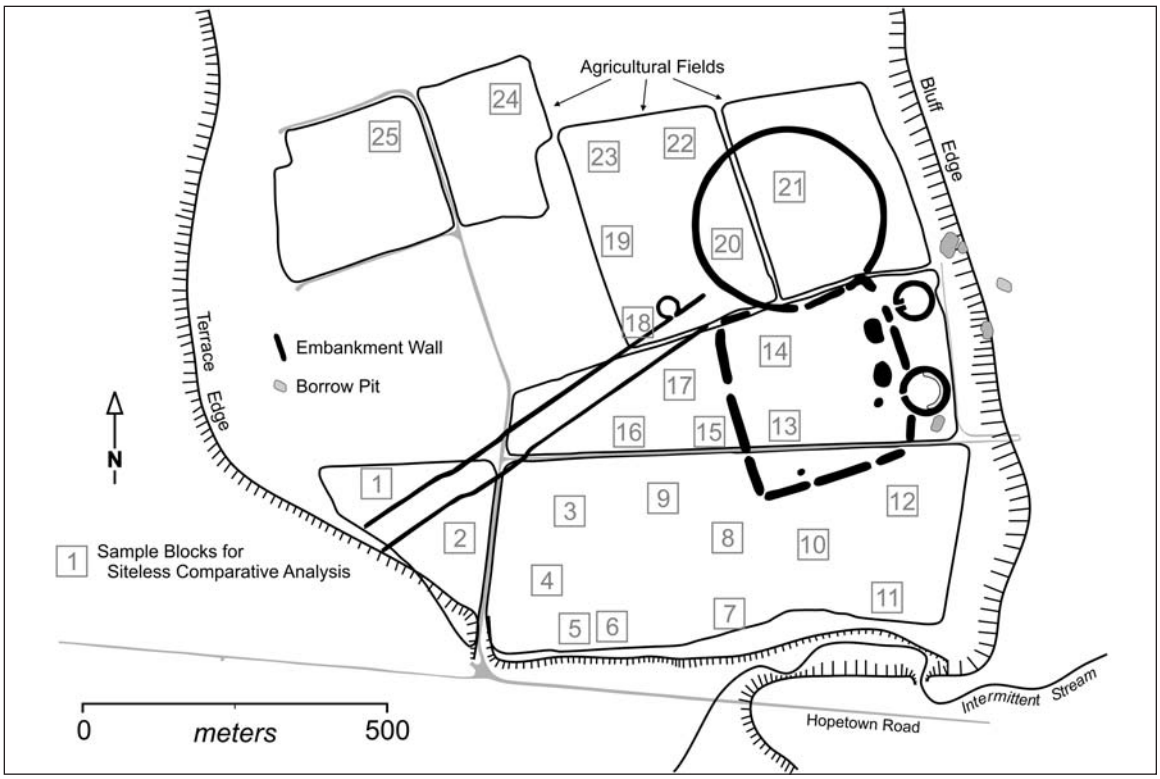

Figure 7-1. Surface collected areas at Hopeton Earthworks.

SURVEY METHODOLOGY

The 2001 surface survey at the Hopeton Earthworks was conducted in each field using parallel transects spaced 10 m apart. The survey began with the use of a laser transit to set out pin flags at 100 m intervals. These flags served as survey grid nodes. Once in place, we used a 100 m tape measure to set in pin flags every 10 m in long parallel lines in between the grid nodes. This system allowed us to walk long parallel survey transects perpendicular to the rows of pin flags, with each pin flag marking the centerline of a survey transect. As surveyors walked each transect, additional pin flags (of a different color) were used to mark all artifacts at the surveyor's feet in a 1 m wide corridor. In effect, this allowed us to conduct a 100 percent systematic collection over a 10 percent sample of each field. Only a very few temporally diagnostic objects were encountered by chance in between the survey transects and these were also collected.

The location of every flagged object was measured in using a Trimble ProXR GPS with a backpack-mounted hurricane antenna. Each object location is an average of at least three real-time corrected (beacon) GPS positions, providing an accuracy of no worse than about ±50 cm for each object. Fire-cracked rock (FCR) was plotted and left in the field while all other prehistoric objects were collected into sequentially numbered bags and returned to the lab for further analysis. The surface survey covered a total of 69.6 ha and piece-plotted 12,541 objects, a roughly 10 percent sample of what was present on the surface.

SURVEY RESULTS

Based on past investigations at Hopeton (Brose 1976; Ruby 1997a, Ruby 1997b, Ruby 1997c), we were aware that our survey universe contained a number of artifact concentrations dating to the Late Archaic, Middle Woodland, Late Woodland, and Late Prehistoric periods. Thus, one of our primary goals was to ascertain whether or not we could tease apart temporally distinctive landuse patterns across the terrace. Specifically, we wondered if GPS piece-plotting would allow us to pinpoint discrete Hopewell occupations and provide enough information to compare one occupation area to another.

In the sections that follow, we examine the overall spatial patterning of time-sensitive objects, including projectile points and bladelets, and compare them to the distribution of chert raw material types in an attempt to identify temporally distinctive debris clusters. We then use a siteless approach to more closely examine debitage characteristics in 25 50 x 50 m sample blocks strategically overlaid on the data so as to sample high and low density areas near to, as well as away from, the earthworks. The results of these analyses show that Middle Woodland period debris varies in composition and density based on distance from the earthworks and the terrace margin. Other time periods seem to have been more focused on the terrace margin, with minimal evidence of occupation in the area of the earthworks.

The speed of GPS mapping allowed us to piece plot the vast amounts of FCR in our survey universe. To our knowledge, FCR has never been piece-plotted at such a scale in the vicinity of a Hopewell earthwork. In total we identified 9,301 pieces of FCR,

making this our largest artifact class. In Figure 2 the FCR piece plot data are displayed as density data per 10 x 10 m unit². At least half a dozen higher density (20+ pieces per 10 m transect segment) clusters are present southeast of the earthworks near the terrace margin. Very little FCR was found inside the earthworks. In fact, FCR density declines right at the southwestern edge of the earthworks and is noticeably lower in between the two parallel walls—or at least until the walls approach the terrace edge. While FCR is present in the vicinity of the earthworks, no high-density concentrations were found.

Figure 7-2 also shows the location of all chert flakes and shatter (over 2,400 objects), which appear as small, black crosses on top of the FCR density data. In nearly every area where FCR density increases, a coincident increase in the number of flakes and shatter is also found. However, not all areas with relatively higher numbers of chert debitage are associated with an increase in FCR. In particular, the area just south of the parallel walls and west of the square has a relatively high debitage count but only lower density FCR clusters. While this difference in the distribution of knapping debris versus the byproducts of thermal facilities (e.g., FCR) could be a reflection of occupation length, it most likely represents a functional difference in the use of space, i.e., thermal facilities that produced FCR were less frequent immediately adjacent to the earthworks at Hopeton. Additional evidence presented below shows that this simple difference in the distribution of FCR and debitage is related to time period as well, a fact that can be better resolved by looking at the distribution of select chert raw material types.

Vanport (a.k.a. Flint Ridge), Upper Mercer, and Harrison County are three major chert types found during the survey. All are exotic to the Ross County area and each

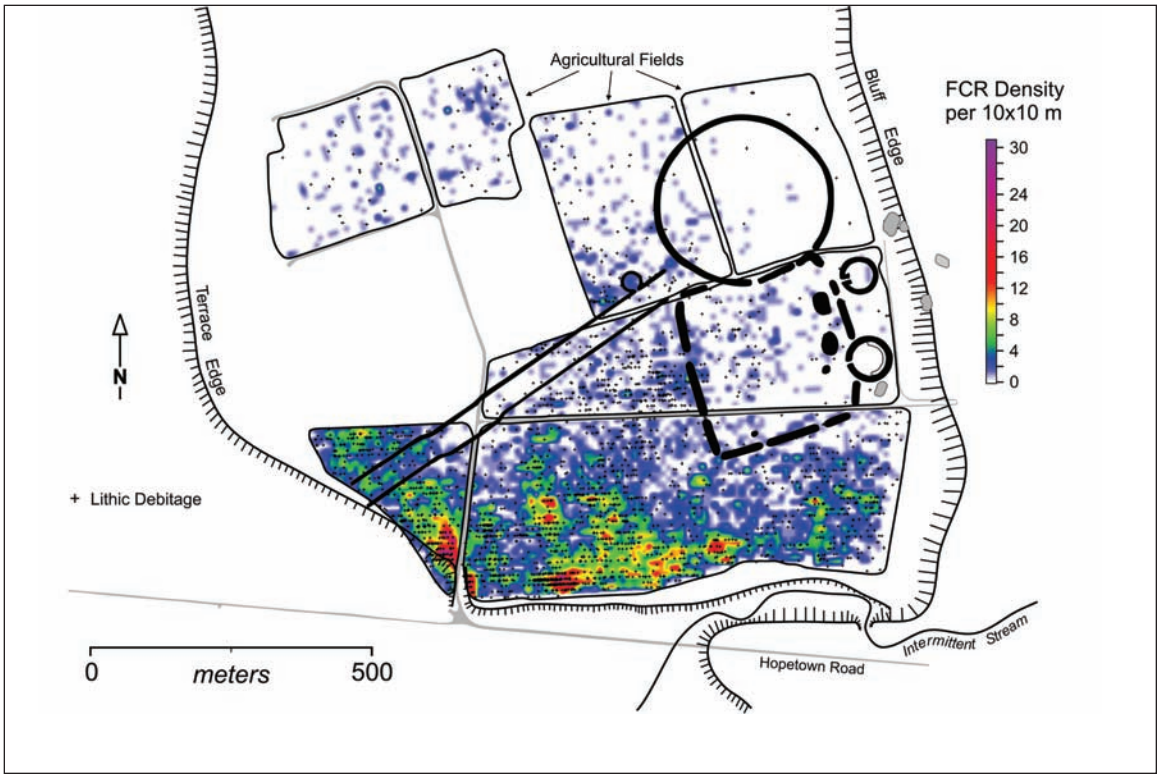

Figure 7-2. Fire-cracked rock density and all lithic debitage, Hopeton Earthworks.

was used in varying amounts by Hopewell groups (Vickery 1996). A fourth type, lithic materials exhibiting hard cortex, represents a locally available raw material that was most commonly, though not exclusively, used in the Late Woodland and Late Prehistoric periods, when smaller pieces of raw material sufficed for projectile point manufacture.

Vanport, Harrison County, objects with hard cortex, and quartz crystal appear in low densities across most of the survey area, but in Figure 7-3 only the higher density clusters are highlighted for ease of display. Whether these clusters represent statistically significant increases in density has yet to be determined.

Most of the lithic materials exhibiting hard cortex are found south of the earthworks along the terrace margin. At least eight small clusters are apparent in the data. Upper Mercer chert has a similar distribution to objects with hard cortex, with high density debris clusters near the terrace edge (Upper Mercer clusters are not shown in Figure 7-3). Vanport is more widely distributed across our survey area but has at least 10 higher density clusters, both along the terrace edge and near the earthworks. Objects made from Harrison County chert are even more widely spread but have fewer high density clusters, mostly near the earthworks and overlapping the Vanport clusters. Thus, an examination of only the higher density raw material clusters shows that Vanport and Harrison County cherts are found mostly near the earthworks while Upper Mercer and objects with hard cortex are found away from the earthworks. Minimally, the raw material distributions suggest that non-Hopewell occupations were focused on the terrace margin while Hopewell occupations occurred across much of the terrace, but not inside the earthwork. The clusters with co-occurring Vanport and Harrison County chert objects near the earthworks also lack dense clusters of FCR.

The distribution of projectile points and Hopewell bladelets reinforces the temporal pattern of landuse emerging from the raw material distribution data. We collected 56 projectile points during our survey, of which we assigned 42 to a particular time period (Figure 7-3 and 7-4).

The earliest, well-represented time period is the Late Archaic. These points have a fairly wide distribution and are not specifically associated with the lithic debris clusters, though they tend to be found closer to clusters of lithic debris exhibiting hard cortex. Middle Woodland period projectile points are also widely scattered. While they do not regularly co-occur with any of the lithic debris clusters, their wide distribution is significant and matches the wide distribution of bladelets, as shown in Figure 7-4.

Finally, 15 Late Woodland and Late Prehistoric period arrow points were found. These types do associate well with the clusters of FCR, Upper Mercer chert, and objects exhibiting hard cortex along the terrace margin.

In summary, if we assume that Vanport and Harrison County cherts were predominantly deposited during the Middle Woodland period and that Hopewell visitors used little locally available raw material while at the earthworks, then Figure 7-4 (minus the hard cortex clusters) shows an overall view of Hopewell occupation and use of the area. Notably, while bladelets and Middle Woodland period projectile points are

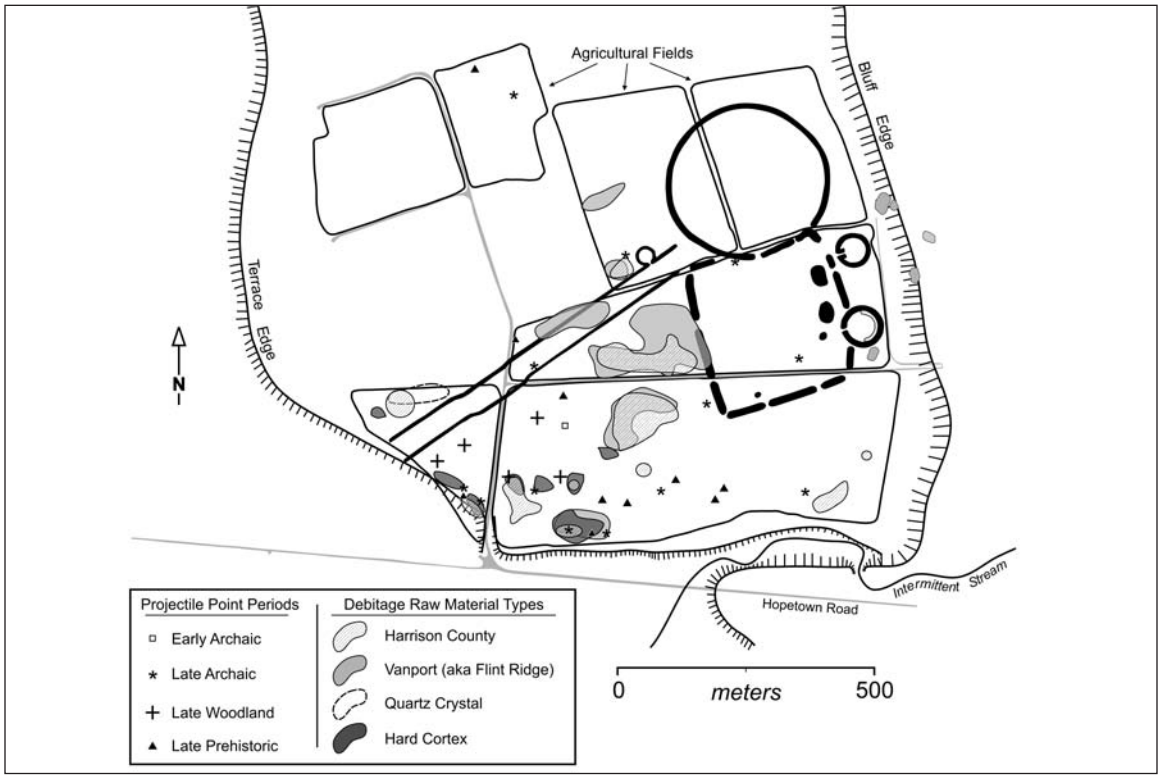

Figure 7-3. Surface distribution, lithic raw material type clusters and non-Hopewell projectile points, Hopeton Earthworks.

associated with many of the chert clusters, they also occur out in the lower density areas across much of the survey universe. Very few other kinds of tools were found during the survey.

Based on these data, our first two expectations presented at the beginning of the chapter are met and the following working hypotheses can be put forth:

1. Hopewell occupation near the earthworks was short term and scattered. The dispersed distribution of Hopewell objects such as bladelets, projectile points, and low density lithic raw materials suggests that most areas of the terrace surrounding the earthworks were occupied. Low densities of FCR in these areas support the idea of short term occupation;

2. There were strict rules against depositing debris inside the earthworks and/or these areas were periodically cleaned of all occupation and use debris;

3. Select areas near the earthwork edges, and perhaps recognized entrances, were special-use zones. As such, these areas may contain the remains of ceremonial and gearing-up facilities, including preparation areas, buildings, caches, and large cooking pits.

In the next section, we more closely examine the lithic debris in order to address expectation number three and further support the three working hypotheses.

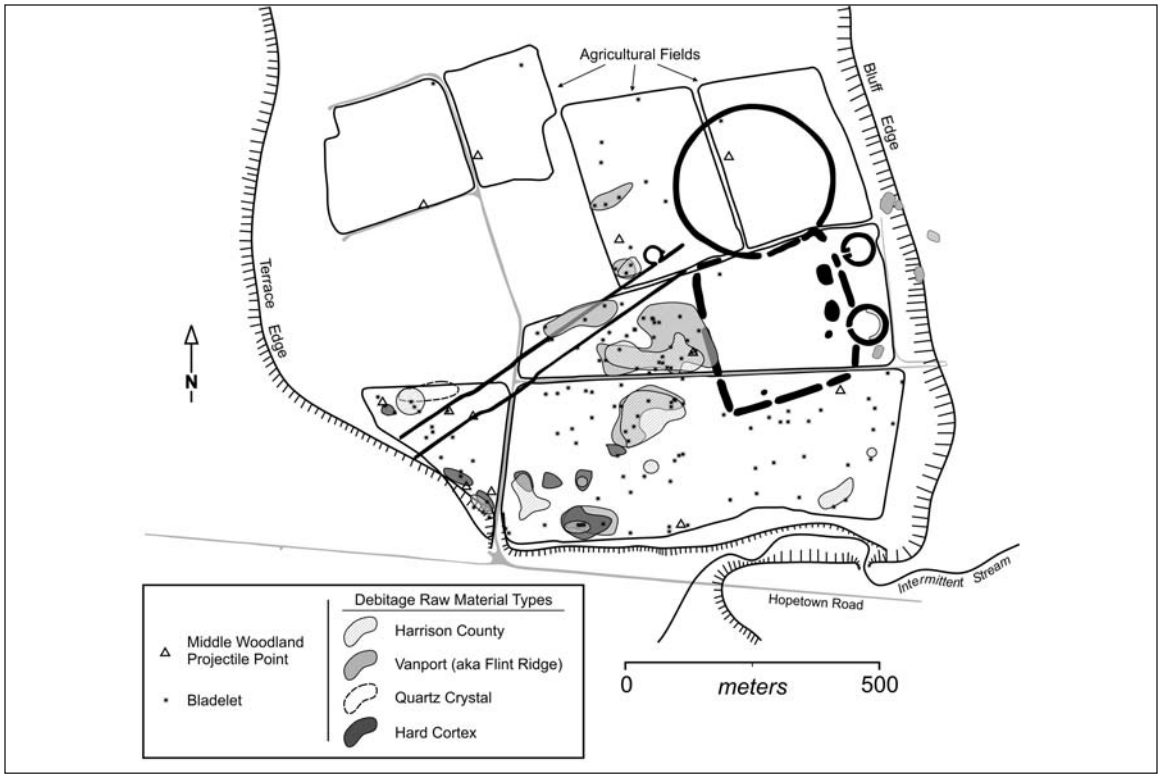

Figure 7-4. Surface distribution, lithic raw material type clusters and Hopewell diagnostic objects, Hopeton Earthworks.

THE SURFACE DATA: A SITELESS APPROACH

For this chapter, we wanted to speak more specifically about some of the lithic reduction activities represented by the surface collection debris. To this end, we reanalyzed the 2001 assemblage and coded for lithic reduction characteristics such as platform type, debris size, and the presence of biface production debris. To avoid creating site assemblages by drawing arbitrary lines around seemingly clustered groups of artifacts, we have instead overlaid a series of 25 50 x 50 meter sample blocks on the survey universe (Figure 7-1). While these sample blocks were not randomly positioned, their wide distribution allows us to more specifically compare debris between comparable units within, near, and away from the earthworks. For example, the bladelets in Figure 7-4 look to be fairly evenly distributed outside the earthworks, with possible clusters near the parallel walls. However, using the sample block approach, it is clear that none of the 25 sample blocks include an unusual abundance of bladelets and over half of the blocks lack bladelets altogether (Table 7-1). Thus, while bladelets are widely scattered, the block samples show that they do occur more frequently near the earthworks, but in low density.

The sample blocks also work for studying the distribution of the kinds and stages of lithic reduction present around the earthworks. In an attempt to differentiate between core reduction and biface reduction debris, we looked at platform type, debitage size, and flake type. Platforms were differentiated based on Andrefsky's (1998) four basic

Table 7-1. Siteless sample block frequency data.

					Flake Platform			Debitage size		
Sample Blck #	FCR	Bladelets	Biface/ Frags	Biface Thinning Flakes	Ptype 1	Ptype 2	Ptype 3&4	Size Grade 1-2	Size Grade 3-5	Size Grade 6-10
1	127	3	2	10	3	3	9	25	17	1
2	121	1	1	5	0	3	6	10	11	1
3	94	1	1	3	1	6	6	12	12	0
4	60	0	2	4	2	7	4	9	20	1
5	134	4	1	32	20	28	50	108	65	1
6	280	0	4	10	3	11	14	27	20	0
7	167	0	1	4	2	4	5	11	15	0
8	47	0	0	0	0	1	1	4	3	0
9	43	2	0	5	0	1	10	9	8	0
10	34	1	0	1	0	0	1	2	0	0
11	86	2	1	3	2	2	7	1	12	1
12	41	0	1	4	2	3	4	3	8	0
13	9	0	3	4	0	3	3	4	5	0
14	9	0	2	1	0	2	3	3	6	0
15	29	3	1	14	2	4	16	19	24	0
16	22	1	0	6	0	0	12	16	10	0
17	11	2	2	4	0	2	6	12	12	0
18	34	3	2	1	1	2	3	19	5	0
19	5	3	0	0	0	0	0	1	1	0
20	5	0	0	0	0	0	0	0	0	0
21	0	0	0	0	0	0	0	0	0	0
22	3	0	0	0	0	0	0	0	0	0
23	7	0	0	0	0	0	0	0	0	0
24	14	0	0	2	0	0	3	1	6	0
25	6	0	0	0	0	0	0	0	0	0
Totals	**1388**	**26**	**24**	**113**	**38**	**82**	**163**	**296**	**260**	**5**

platform types: Type 1 is completely covered in cortex, Type 2 has a single facet, Type 3 is multifaceted, and Type 4 has a ground or abraded platform surface. According to Andrefsky, Types 1 and 2 are more typical of core reduction and Types 3 and 4 are commonly associated with later stage biface production. Only one of the sample blocks contained a predominance of flakes with platforms consistent with core reduction debris (platform Types 1 and 2), and it is located away from the earthworks (Figure 7-5). Nine of the blocks have platforms suggesting a mixture of core and biface reduction. Another nine of the blocks closer to the earthworks have assemblages more consistent with later stage biface reduction.

The distribution of cores and bifaces supports this pattern of biface production near the earthworks and mixed biface and core reduction near the terrace margin. Cores are most prevalent in the sample blocks near the terrace margin. The location of early stage bifaces and later stage and complete bifaces supports the pattern presented

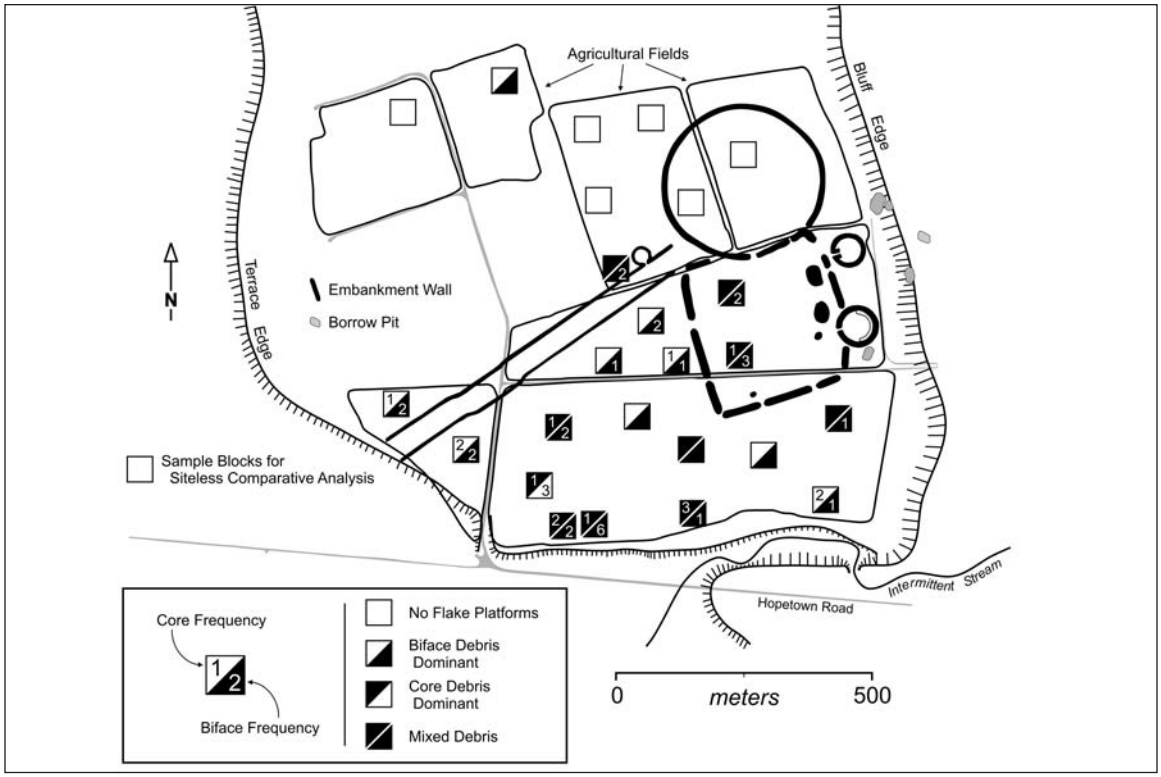

Figure 7-5. Stages of lithic reduction present in sample blocks, Hopeton Earthworks.

by the distribution of platform type. Later stage bifaces tend to be more prevalent near the earthwork.

Debitage size presents a somewhat less clear pattern, with a mixture of large and small objects across much of the survey area. Nevertheless, most of those blocks dominated by small debris, that is, objects less than 2 cm in length, are more closely associated with the earthworks.

Flake type also does little to differentiate biface from core reduction areas. Biface thinning flakes make up about 20-30 percent of nearly every sample block in the southern part of the survey universe.

In sum, based on the lithic debris in our block samples, late stage biface production was occurring across much of the southern portion of the survey universe. Near the terrace margin, this biface production co-occurred with core reduction and is associated with the Late Archaic, Middle Woodland, Late Woodland, and Late Prehistoric periods. However, closer to the earthworks, where Middle Woodland diagnostics predominate, it seems Hopewell visitors to the earthworks were also finishing, maintaining, and discarding their bifaces. That said, and as with the bladelets, biface reduction activities were fairly widespread and not concentrated in any one area. Core reduction, especially with locally available pebble cores, on the other hand, is mostly confined to the terrace margins with the largely non-Middle Woodland period debris.

DISCUSSION AND CONCLUSION

The 2001 surface survey at the Hopeton Earthworks encountered a wide range of debris from numerous time periods. By looking at the distribution of chert raw material types and temporally diagnostic stone tools, it seems clear that the debris closer to the earthworks is predominantly Middle Woodland period in origin and that the clusters closer to the terrace margin are a mixture of Woodland and Late Prehistoric period occupations. While the non-Hopewell occupations produced fairly concentrated debris deposits, Hopewell remains are scattered across much of the terrace outside of the earthworks.

The lack of high densities of Hopewell debris suggests that visitors occupied much of the area on the terrace surrounding the earthworks at Hopeton. Such widespread use of the area may indicate that the earthworks were only in use for a short time and/or that there were few limitations in place to control landuse outside the earthworks—be they formal rules of landuse or the presence of fixed buildings.

This compares differently to DeBoer's modern case from the Cayapas Basin in northern Ecuador (DeBoer 1997). As proposed for Scioto Valley Hopewell groups in Ohio, the Chachi of Ecuador are organized into dispersed communities of small settlements. Periodically, members of these communities aggregate at ceremonial centers that contain permanent structures but are largely vacant for most of the year. Because of the permanency of the ceremonial center accommodations and facilities and the fact that the ceremonial centers are used longer than any one domestic site is occupied, deep middens accumulate at the Chachi centers. As DeBoer notes, the long-term, periodic reuse of the Chachi ceremonial centers "can create the archeological appearance of large, sedentary settlements" (1997:227). Thus, while relatively dense clusters of Hopewell debris are present adjacent to the earthworks at Hopeton, the higher artifact density is likely more a reflection of repeated reuse than occupation permanency. The lack of FCR at these clusters also sets them apart from the known longer-term domestic occupations, which are blanketed in FCR.

Recent geophysical survey in 2003 at a selection of clusters near the earthworks and clusters along the terrace margin further supports these conclusions (Burks and Walter 2003). Few geophysical anomalies, i.e., subsurface facilities, were found at small clusters away from the earthworks, numerous large and small anomalies are present beneath one of the dense clusters near the terrace margin, and unusually large anomalies were present beneath one of the lithic debris clusters near the earthworks. While it is not yet possible to say how many people used the earthwork facilities at any one time, the distribution of surface debris suggests that groups visiting the earthworks stayed in small, short term camps spread out around the earthworks.

Acknowledgments

Drafts of this chapter were first presented at the 2002 and 2003 Society for American Archeology meetings in Denver and Milwaukee, respectively. A number of people participated in the various stages of this project. We would like to acknowledge the assistance of the following individuals: Dean Alexander, Lance Love, Michelle

Lundy, Susan Lundy, Mandy Murray, Jennifer Pederson Weinberger, Larry Wickliff, and Kathy Brady. While their assistance helped make the project a success, we the authors are ultimately responsible for any errors in detail or logic.

Notes

1. The earthworks were mapped with the GPS by walking the inside and outside edges of the currently visible earthworks. GPS data points were collected at a timed interval as the instrument operator walked along the visible break in slope of the earthworks. This mapping technique is limited by two obvious sources of error. First, while surface visibility was excellent and the earthworks were clearly apparent during the survey, the location of the "edges" of the earthworks is somewhat subjective and based on the observations of the instrument operator. Second, each GPS position is only accurate to within about ±1 meter at a 99 percent confidence interval.

2. To convert the continuously distributed FCR piece plot data into density data, a 10 x 10 m, arbitrary grid was laid over a map showing the location of every piece of FCR. The 10-meter grid was positioned independently in each agricultural field such that the survey transects in each field crossed the middle of the 10 x 10 m grid squares. Each grid square was assigned northing and easting coordinates and an FCR frequency, the latter of which comes from the 10-meter-long segment of the one meter wide survey transect that falls within the 10 x 10 m grid square. These data were entered into an Excel database as XYZ data. Once an entire agricultural field was completed, the data were pulled into the Surfer software and gridded using the Nearest Neighbor method with 10 x 10 m grid line spacing. An image map was then produced with the gridded data and each field's map was independently fit to the final map shown in Figure 7-2.

CHAPTER 8

HOPEWELLIAN CENTERS IN CONTEXT: INVESTIGATIONS IN AND AROUND THE HOPETON EARTHWORKS

BY
BRET J. RUBY AND MARK J. LYNOTT

Squier and Davis left their footprints on the Hopeton Earthworks in 1846, in pursuit of their conviction that only systematic fieldwork could lead to the "solution of the problems of the origin and purposes of the remains under notice" (Squier and Davis 1848:xxxiii-xxxiv). Now, more than a century and a half later, the National Park Service is pursuing that same conviction and sponsoring new field investigations, driven in part by the same urgency expressed by Squier and Davis (1848:xxxix): *"[t]he operations of the elements, the shifting channels of the streams, the leveling hand of public improvement, and most efficient of all, the slow but constant encroachments of agriculture, are fast destroying these monuments of ancient labor."*

This chapter presents the results of recent National Park Service surveys and excavations in and around the Hopeton Earthworks. These investigations are built on the premise that we can understand the construction and use of these monumental structures, and provide for their future preservation, only by broadening our focus to encompass the surrounding archeological landscape and the full range of civic and ceremonial activities recorded there.

The great Hopewellian geometric earthwork and mound complexes surrounding the Scioto River-Paint Creek confluence in south-central Ohio have attracted attention since the earliest beginnings of systematic archeological inquiry in eastern North America (e.g., Atwater 1820; Squier and Davis 1848; Thomas 1894). But for much of the long history of Hopewellian archeology in the Ohio country, attention has been narrowly focused on individual mounds and mound contents. Few studies have sought to systematically catalog and investigate the full range of human activities conducted in and around these major centers (for examples of more inclusive treatments in the Scioto Valley area, see Brose 1976; Coughlin and Seeman 1997; Greber 1997; Lepper and Yerkes 1997; Lynott and Monk 1985; Seeman 1981). As a result, a series of fundamental questions about the nature of Hopewellian activities near the major mound and earthwork centers continue to challenge students of Ohio archeology yet today. Some of the earliest observers speculated that the great earthen enclosures served as military fortifications. Others considered the mounds and enclosures more suited to peaceful pursuits—great religious centers serving sedentary agricultural populations residing in large villages nearby. Still others viewed the mounds and earthworks as non-residential civic and ceremonial centers used for periodic gatherings by otherwise dispersed populations who resided in scattered households and hamlets. In most cases, and the Hopeton case is certainly one, few field studies have been directed toward gathering the field data necessary to discriminate among these various possibilities.

This chapter describes the results of two field projects undertaken by the National Park Service in 1996 and 1997 intended to address this gap. These projects began with the premise that the great mound and earthwork centers represent complex cultural landscapes that may include a wide range of civic, ceremonial, and domestic contexts and may display considerable time-depth. The primary goal then, was to place the mounds and earthworks at Hopeton within a wider context to identify and evaluate the full range of archeological resources in the vicinity of the earthworks, especially potential habitations and other activity areas outside the earthwork walls. The following pages will briefly describe the results of these projects and will conclude with a comparative discussion.

SURFACE SURVEY

The first project, conducted during June 1996, involved systematic and intensive surface collections focused on three cultivated fields (Fields A, B, and C) totaling 55 acres located immediately west of the earthworks proper (Figure 8-1, Ruby 1997a, 1997b; Ruby and Troy 1996). Field conditions at the time of the survey were excellent. The study area had been fall-plowed, allowed to weather over the winter, and disked and planted in corn in the spring. By the time of the early June survey, spring rains had washed the fields sufficiently to expose surface artifacts and the crops had just begun to sprout. Surface visibility exceeded 80 percent throughout the survey area. Survey crews systematically traversed each tract at a maximum transect interval of 10 m. Pin flags were used to mark all cultural materials observed within approximately one meter on either side of each transect. Surveyors subsequently returned to artifact concentrations to search for and flag additional diagnostics to be piece-plotted. This strategy resulted in a sample of approximately 20 percent of all non-diagnostic artifacts and 100 percent of all diagnostic artifacts. The location of each artifact was subsequently recorded by transit and stadia. A total of 1,221 artifacts was recorded at 1,098 point locations that included 960 prehistoric artifacts and 261 historic period (Euroamerican) artifacts. One hundred nineteen prehistoric artifacts were diagnostic of a particular culture-historical unit.

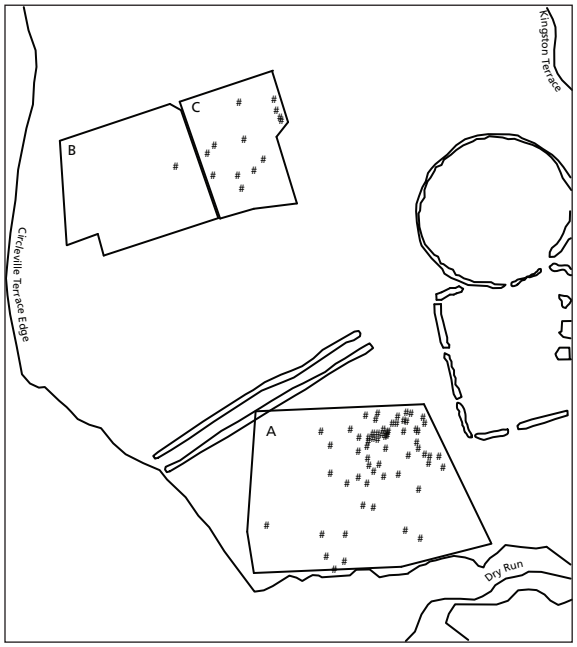

Figure 8-1. Survey tracts and diagnostic artifact distributions from 1996 surface survey.

The distribution of these 119 diagnostic prehistoric artifacts[1], along with the historic period artifacts, is shown in (Figure 8-1). Archaic and Early Woodland diagnostics are widely and sparsely scattered over all three survey tracts. There are too few specimens to confidently identify any distributional patterns, but these probably represent very temporary activities or occupations. Late Woodland period (Intrusive

Mound Culture) diagnostics are also widely dispersed and display no clear distributional patterning[2]. In contrast, most of the Late Woodland/Mississippian period (Fort Ancient) diagnostics are tightly clustered in a ceramic-bearing occupation along the Circleville Terrace edge, overlooking Dry Run and the Scioto River floodplain below. Similarly, historic period structural remains and artifacts are concentrated in two clusters along the Circleville Terrace edge in Field A and a third cluster occurs on a small knoll in Field B.

The distribution of Middle Woodland period diagnostics stands in sharp contrast to all other periods. The density of Middle Woodland period diagnostics clearly points to a much more intensive utilization of the landscape in comparison to any of the other prehistoric periods[3]. In addition, the distribution is clustered in an interior terrace setting in the vicinity of the earthworks themselves rather than along the Circleville Terrace edge or any other clearly identifiable feature of the natural environment. The greatest density of Middle Woodland period diagnostics occurs in Field A, just beyond the southwest corner of the rectangular enclosure.

REDWING SITE

The concentration of Middle Woodland period diagnostics in Field A was designated the Redwing Site (33RO817) and became the focus of additional investigations during June and July, 1997 (Ruby 1997a, 1997c). These investigations were intended to shed light on the nature and function of the Middle Woodland period activities evident here.

A 60 x 100 m area encompassing the greatest density of Middle Woodland period diagnostics was targeted for subsurface investigations (Figure 8-2). A set of 32 1 x 1 m units ("Systematic Plowzone Sample Units") spaced at 10-20 m intervals was excavated and screened through ¼" hardware mesh to provide a systematic sample of plowzone artifacts and to probe for intact sub-plowzone features. In addition, a resistivity survey[4] was conducted within four 20 x 20 m blocks as an additional means of identifying intact sub-plowzone deposits. Additional excavation units ("Phase 2 Units") totaling 45 sq. m were opened to investigate any anomalies encountered during the initial excavations and remote sensing.

Only one cultural feature (Feature 3) was identified beneath the plowzone (Figure 8-3). Feature 3 was a midden feature extending not more than 20 cm below the base of the plowzone. Artifact density was generally low and the feature was usually detectable only in profile as a faint organic stain. Only the western edge of the midden was clearly identified, but based on its distribution in surrounding units, it is possible to state that the midden covered an area of at least 12 x 12 m but less than 20 x 20 m. A total of 28 sq. m of the deposit was exposed. Four possible postholes ranging from 7-15 cm in diameter were identified in a 2 x 2 m area on the western edge of the midden. However, it is difficult to assign much significance to these because they extended no more than four cm below the plowzone and formed no clear pattern.

Two conventional radiometric age determinations were run on wood charcoal recovered from the midden (Beta-109963 and Beta-109964; see Table 8-2). The first date,

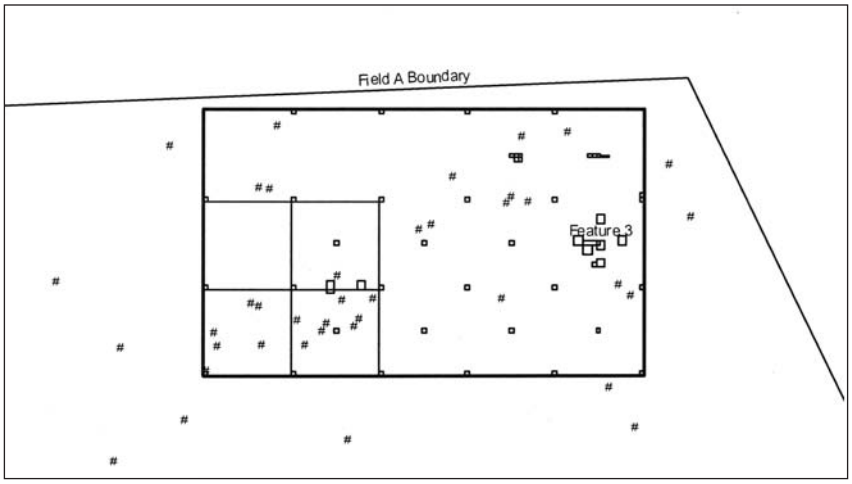

Figure 8-2. Redwing site, Hopeton Earthworks, excavation units and geophysical survey blocks.

Figure 8-3. Redwing site, Feature 3.

with calibrated[5] intercepts close to A.D. 100, fits comfortably within the range expected for the construction and use of Hopewellian earthworks in the Scioto region. The second date, with a calibrated intercept at A.D. 892, more clearly pertains to the local Late Woodland period. No evidence of such an occupation was evident in the excavated deposits, but Jack's Reef Cluster projectile points were recovered from the area during the 1996 surface collections. The second date does suggest that some portion of the artifact assemblage discussed below might be attributable to a post-Hopewellian occupation.

The Redwing artifact assemblage is most remarkable for its restricted range of materials and functional tool types. The assemblage was overwhelmingly dominated by chert artifacts. These were subjected to an extended analysis, discussed below. Otherwise, the lithic assemblage was limited to one pitted stone in association with the midden, and two celts from surface contexts. The faunal assemblage consisted of a single deer tooth and four fragments of mussel shell from plowzone contexts. A total of 41 small grit-tempered plain and cordmarked body sherds completes the prehistoric assemblage.

Artifact Distributions

The distributions of select artifact classes as reflected in the 32 systematic plowzone sample units—total chert (diagnostic lithic debris and non-diagnostic shatter), bladelets, and fire-cracked rock—are mapped in (Figure 8-4). The distributions of different artifact classes are disjointed and multi-nodal. This suggests that the debris from different activities was discarded in primary context and there is little evidence that refuse was systematically removed and discarded at secondary locations. This pattern is characteristic of short-term occupations and contrasts with the clearly segregated refuse disposal areas defined at several other Middle Woodland sites interpreted as year-round habitations (see Connolly 1997; Dancey 1991a; Kozarek 1997; Pacheco 1997; Stafford and Sant 1985).

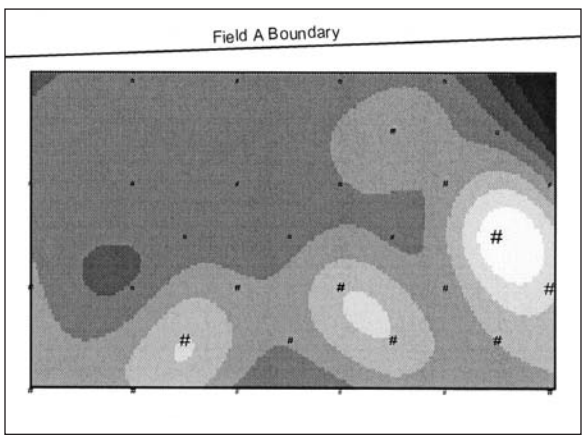

Figure 8-4. Redwing site, artifact distribution, chert, bladelets and fire-cracked rock

Lithic Analysis

The lithic artifacts from the Redwing site were examined with the goal of observing whether these materials might be useful in interpreting the nature and temporal placement of prehistoric activities conducted at this site. Lithic artifacts were sorted into the following classes: unmodified pebbles, diagnostic lithic debris (flakes and proximal flakes), non-diagnostic shatter, fire-cracked rocks, cores, tools, and bladelets. All but the unmodified pebbles classes are products of past human activity at the site.

All lithic artifacts were examined to determine whether they exhibit evidence of a bulb of percussion and striking platform. Objects that have these characteristics are classified as diagnostic lithic debris and were further classified into flakes and proximal flakes. All diagnostic lithic artifacts were examined to record the type of striking platform and the type of raw material. Complete flakes were also examined to record the amount of dorsal cortex, the number of dorsal scars, the length of the flake, and the weight of the flake. Non-diagnostic shatter and fire-cracked rock were counted and weighed. Cores were identified to record the number and orientation of striking platforms, the number of flake scars, raw material and weight. Chipped stone tools were classified using a morphological typology that reflects the amount and position of retouch, rather than the perceived function of the object. Blades were examined to record attributes used by other scholars in the study of Hopewell bladelets (Greber et al. 1981). All of these morphological and technological attributes and variables were selected because they are believed to be useful in interpreting the nature of past human activity at the Redwing site.

Diagnostic Lithic Debris

Examination of the lithic assemblage revealed that 711 objects have a striking platform or bulb of percussion. There are also 1,397 pieces classified as non-diagnostic shatter and these objects weigh collectively 1400.4 g. The diagnostic lithic debris assemblage includes 241 complete flakes and 470 proximal flakes. Observation of platform type indicated that 46.4 percent are facetted, 29.3 percent are crushed, 17.0 percent are plain, and 7.3 percent have cortex remaining. The high frequency of facetted platforms is anticipated in association with the final stages of tool manufacture or tool maintenance/resharpening. This is also reflected in the amount of dorsal cortex present on complete flakes, where 64.7 percent have no dorsal cortex at all, and only 8.7 percent exhibit dorsal cortex that covers more than half of the dorsal surface. The overall size of the complete flakes is quite small, with a mean length of 14.5 mm (s.d.=6.3 mm) and a mean weight of 1.1 g (s.d.=3.3 mm). This is also consistent with an assemblage associated with the final stages of tool making or tool maintenance. Harrison County (a.k.a. Wyandotte) chert is the most common raw material identified among the complete flakes and proximal flakes, with smaller quantities of local or unidentified flint also occurring in significant numbers. Vanport (a.k.a. Flint Ridge Flint), Upper Mercer, and several other well recognized Ohio flint types are present, but in much smaller relative frequencies. Single instances of obsidian, Knife River, quartz crystal, and Dover were also found among the diagnostic lithic debris and constitute the only occurrences of these rare materials in the total assemblage.

Cores

Eighteen cores and core fragments were collected from the Redwing site. These include: three single platform cores; two two-platform, bi-directional cores; one multiple platform core; five discoidal cores; two blade cores, four fragmentary cores, and one tested cobble. As a group, the cores can be characterized as small (mean weight=23.8 g, s.d.=13.0 g) and simple cores that were used to produce a few bladelets or flakes and then were likely discarded prior to being exhausted. The majority of the cores have only one or two striking platforms (mean=1.4, s.d.=0.64), with an average of only 7.8 flake scars

per core (s.d.=3.3). The majority of the cores were made from local glacial gravels, but Harrison County, Vanport, and Coshocton Black flint were also used (Table 8-1).

Table 8-1. Redwing lithic classes and raw materials.

Raw Material	Retouched Pieces	Other Chipped Stone Tools	Cores	Bladelets	Diagnostic Lithic Debris	Total	Total %
Coshocton			1			1	0.1%
Harrison County	12	4	4	47	395	462	53.7%
Vanport	4	2	1	5	14	26	3.0%
Zalesky		1		1		2	0.2%
Upper Mercer					15	15	1.7%
Knife River					1	1	0.1%
Dover					1	1	0.1%
Quartz Crystal					1	1	0.1%
Obsidian					1	1	0.1%
Unidentified/ local	26	13	12	17	283	351	40.8%
Total	**42**	**20**	**18**	**70**	**711**	**861**	**100.0%**

Chipped Stone Tools

Sixty-two objects from the Redwing site have been classified as chipped stone tools. Unifacially chipped pieces are the most common (n=48), and include 42 retouched pieces, one scraper, one burin, two gravers, and two notches. Bifacial tools (n=14) include three projectile point fragments and 11 bifaces–most of which are fragments. None of these materials are temporally diagnostic.

Retouched pieces are the most common form of chipped stone tool at the Redwing site (n=42). Two-thirds of the retouched pieces were made from either flakes or proximal flakes. The remaining retouched pieces were made on distal flakes or non-diagnostic shatter. The amount and location of retouch on these pieces is quite variable. The majority of retouch occurs only on the dorsal (n=24, 57 percent) or ventral surface (n=10, 24 percent) of the flake. Bifacial retouch (n=2, 5 percent) and pieces with both ventral and dorsal retouch (n=6, 14 percent) are also present. The amount of retouch on these pieces is generally very small with 40 percent of all pieces having retouch on less than 10 percent of the perimeter of the specimens. Specimens with retouch around 10-25 percent of the perimeter comprise 40 percent of the sample. Marginal retouch on 26-50 percent of the perimeter of individual specimens was observed on 13 percent of the sample and retouch that exceeded 50 percent of the perimeter was observed on only 7 percent of the sample.

Unidentified/local cherts account for the majority of the chipped stone tools and retouched pieces. Harrison County, Vanport, and Zalesky cherts occur in descending order of frequency (Table 8-2).

Table 8-2. Hopeton radiocarbon dates.

Sample No.	Site	Context	C-14 Date B.P. Corrected	Calibrated Date, 1 sigma1	Reference
Beta-109961	Hopeton Floodplain, 33 Ro 811	Occupation Level, 115-145 cm bs	1850 +/- 70	AD 78 (133) 243	This report
Beta-109963	Hopeton Redwing	Feature 3, Midden	1900 +/- 50	AD 34 (86, 102, 122) 133	This report
Beta-109964	Hopeton Redwing	Feature 3, Midden	1150 +/- 40	AD 783 (892) 963	This report
Beta-176574	Hopeton Square	Feature 1, Clay Basin	220 +/- 100	AD 1526 (1662) 1949	Lynott 2003
Beta-176575	Hopeton Square	Feature 1, Clay Basin	190 +/- 40	AD 1659 (1670, 1780, 1798, 1945, 1945) 1947	Lynott 2003
Beta-176576	Hopeton Square	Trench 1, Feature 6	1990 +/- 130	BC 167 (cal AD 4, 8, 21) cal AD 131	Lynott 2003
Beta-176579	Hopeton Square	Trench 3, Feature 14	1900 +/- 40	AD 68 (86, 102, 122) 131	Lynott 2003
Beta-176577	Hopeton Square	Trench 2, Feature 11	1710 +/- 80	AD 240 (265, 267, 341, 375, 375) 422	Lynott 2003
Beta-176578	Hopeton Square	Feature 9	1900 +/- 50	AD 34 (86, 102, 122) 133	Lynott 2003
Beta-109962	Hopeton Square	Feature 1, Upper Wall	1840 +/- 50	AD 90 (134, 159, 170, 196, 209) 241	This report
Beta-96598	Hopeton Square	Feature 3, Sub-Wall	1930 +/- 60	AD 4 (75) 130	Ruby 1997b
Beta-177506	Hopeton Square	Trench 1, Feature 6	2040 +/- 80	BC 167 (43, 6, 4) cal AD 53	Lynott 2003
Beta-177507	Hopeton Square	Trench 1, Feature 6	1990 +/- 70	BC 50 (cal AD 4, 8, 21) cal AD 79	Lynott 2003
Beta-159033	Hopeton Square	Trench 1, Feature 6	1740 +/- 50	AD 240 (260, 281, 291, 297, 322) 383	Lynott and Weymouth 2001a
Beta-176580	Hopeton Square	Trench 3, Feature 17	1890 +/- 40	AD 74 (91, 98, 126) 133	Lynott 2003
Beta-176581	Hopeton Square	Feature 23, Posthole	1920 +/- 40	AD 31 (78) 128	Lynott 2003

Table 8-2. Concluded.

Sample No.	Site	Context	C-14 Date B.P. Corrected	Calibrated Date, 1 sigma1	Reference
Beta-147190	Hopeton Triangle	Feature 1	3260 +/- 40	BC 1600 (1520) 1464	Lynott 2001
Beta-147186	Hopeton Triangle	Feature 143-144	3660 +/- 60	BC 2137 (2030, 1987, 1984) 1942	Lynott 2001
Beta-147189	Hopeton Triangle	Feature 149	3520 +/- 60	BC 1921 (1879, 1839, 1829, 1785, 1785) 1744	Lynott 2001
Beta-147183	Hopeton Triangle	Feature 17	3180 +/- 40	BC 1504 (1435) 1411	Lynott 2001
Beta-147185	Hopeton Triangle	Feature 44	210 +/- 40	AD 1652 (1665, 1784, 1789) 1946	Lynott 2001
Beta-147187	Hopeton Triangle	Feature 50	4850 +/- 80	BC 3703 (3644) 3537	Lynott 2001
Beta-147184	Hopeton Triangle	Feature 64, Mica	1960 +/- 50	BC 36 (cal AD 31, 38, 53) cal AD 116	Lynott 2001
Beta-147188	Hopeton Triangle	Feature 88	1080 +/- 90	AD 887 (981) 1023	Lynott 2001
OWU-172	Mound City	Feature 35, Redeposited Midden	1889 +/- 96	AD 5 (91, 98, 126) 240	Brown 1994
Beta-5448	Mound City	Mound 10	1680 +/- 60	AD 259 (388) 426	Brown 1994
OWU-51	Mound City	Mound 10	1778 +/- 58	AD 135 (243) 339	Brown 1994
Beta-5452	Mound City	Mound 13	1770 +/- 80	AD 133 (245, 310, 315) 383	Brown 1994

Bladelets

This class of chipped stone tools has been demonstrated to be diagnostic of the Hopewell culture in Ohio. As is the case at most Ohio Hopewell sites, bladelets far outnumber other formal tool types (e.g., bifaces, scrapers, gravers, etc.) at the Redwing site (see Genheimer 1996), where 70 bladelets and bladelet fragments were collected. This constitutes 78 percent of the total formal tool inventory (excluding the 42 retouched pieces). The vast majority of these are fragments, with only five complete bladelets being observed (7.1 percent). There are also 24 proximal fragments (34.3 percent), 34 medial fragments (48.6 percent), and 7 distal fragments (10 percent). Examination of the complete and proximal bladelets revealed that 44 percent of the striking platforms are facetted, 32 percent are plain, 16 percent are crushed, and eight percent have dorsal cortex. Examination of dorsal cortex on all the bladelet specimens revealed that 84 percent have no dorsal cortex, 13 percent have less than 50 percent dorsal cortex, and only three percent have dorsal cortex exceeding 50 percent of their dorsal surface. Observation of the cross-section of these bladelets indicated that they are nearly evenly divided between triangular (n=36) and trapezoidal (n=43) specimens.

There are only a limited number of complete bladelets and they range in length from 21.20 mm to 55.06 mm (n=5, mean=33.72 mm, s.d.=14.19). Measurements of width (n=68, mean=11.31 mm, s.d.=3.29) and thickness (n=69, mean=2.90 mm, s.d.=1.75) were possible for nearly all specimens and provide more meaningful comparisons with other sites (see below).

The raw material used to make the Redwing blades is dominated by Harrison County chert with 67 percent of the total (n=47). Vanport (n=5) and Zalesky (n=1) are also represented, but unidentified and local gravel cherts (n=17) comprise the remainder of the raw materials used to make bladelets. Evidence of heat treatment was observed on only five bladelets. Ten of the bladelet pieces exhibited evidence of marginal retouch and in all cases the retouch was minimal and did little to change the shape of the piece.

COMPARISONS

Though still small, a comparative database of non-mound Hopewellian contexts is beginning to emerge in the central Scioto Valley against which the Redwing assemblage might be compared. In addition, many researchers have contributed to a theoretical framework that can be used to differentiate among various Hopewellian site types (Table 8-3).

The Murphy (Dancey 1991a) and McGraw sites (Prufer 1965) constitute the two best documented Middle Woodland habitation sites in the central Scioto region. Both are interpreted as the remains of one or a few sedentary households occupied on a year-round basis for a generation or more (Dancey 1991a; Pacheco 1997; Prufer 1965). Direct comparisons are complicated by differences in field methods, but there are clear contrasts nonetheless. The McGraw and Murphy sites differ markedly from Redwing in assemblage size and diversity. Murphy produced more than 21,000 chert flakes, more than 300 lamellar blades, 84 blade cores, and one Middle Woodland biface. Screens were not used in the McGraw excavations but even so, the site produced 1,691 pieces of chert

Table 8-3. Hopewellian site type attributes.

Attribute	Sacred	Secular		Key References
		long-term	short-term, specialized	
Site structure		non-overlapping features; specialized use-areas; formalized refuse disposal areas marked by distinct high-density concentrations; concordant distributions of disparate artifact classes	overlapping features (multiple short occupations:); unstructured use-areas marked by diffuse, low-density scatters; discordant distributions of disparate artifact classes	Lepper and Yerkes (1997); Dancey (1991); Stafford and Sant (1985); Pacheco (1997); Kozarek (1997)
Wooden Architecture	larger, formal rectangular or circular (Mound City, Harness, Seip, Stubbs, Fort Ancient?, Tunacuhnee, Napoleon Hollow)	smaller, circular/oval	absent/ephemeral	Smith (1992), Wiant and McGimsey (1986), Connolly (1997), Greber, Baby et al. (1979), Brown,
Lithic Assemblage composition	Predominance of exotic raw materials; little manufacturing debris	full reduction sequences; diverse tool types	full reduction sequences on manufacturing sites, otherwise restricted to late stage/maintenance/use	Pacheco (1997)
Bladelet Attributes	longer, narrower	shorter, especially on manufacturing sites	shorter, especially on manufacturing sites	Lepper and Yerkes (1997); Greber et al. (1991)
Faunal remains	high quality/high yield venison cuts; "power animals"; modified human remains	generalized	may display restricted range, seasonal indicators	Wiant and McGimsey (1986); Styles and Purdue (1991); Baby et al. (1979)
Microwear		use-wear well-developed, extensive; heavily used, curated tool use	generalized, brief, expedient tool use	Lepper and Yerkes (1997)

debitage, 233 lamellar blades, four blade cores, and 23 Middle Woodland bifaces. These figures can be compared to the 2,108 pieces of lithic debris, 70 lamellar blades, two blade cores, and complete absence of diagnostic bifaces in the 1997 Redwing collection. Even more telling is the difference in ceramic assemblages: Redwing produced a total of 41 sherds, while McGraw and Murphy yielded 9946 sherds and 858 sherds, respectively.

Redwing differs from McGraw and Murphy in site structure as well. There is little evidence at Redwing for the maintenance of secondary refuse disposal areas, as seen at Murphy, McGraw, and other sites interpreted as sedentary occupations. Instead, Redwing debris distributions are multi-nodal and more characteristic of short, episodic occupations (see above and Table 8-4). It must also be noted that the Redwing midden cannot be described in the same terms applied to the McGraw midden which was described as "intensely black" and consisting of "densely packed cultural refuse" (Prufer 1965:12). Organic staining was generally light and debris densities were comparatively quite low in the Redwing midden.

Table 8-4. Selected site assemblages.

	Site Area (m2) [10]	Ceramics	Debitage	Lamellar Blades	Blade Cores	Exotics [17]	MW Bifaces
McGraw[4]	1,236	9,946	1,691	233	4		23
Murphy[11]	10,000	858	>18000	>300			
Liberty Site A (aggregated) [15]		NR	NR	184	19		139
Liberty Site 14 (cache) [13]		NR	NR	37	6	2,427	0
Liberty Site 25 (blade prod) [14]		NR	NR	678	58		0
Redwing [16]		41	2,108	70	2		0

The dominance of simple chipped stone tools at Redwing, particularly retouched pieces, differs from both McGraw and Murphy where bifaces, projectile points, and other chipped stone tools reflecting a greater investment of time to manufacture are more common. The majority of the chipped stone tools at Redwing represent objects that were minimally modified for use. The relatively small number of tools, the simple nature of the retouch used to shape the tools that are present, and the limited diversity of tool forms that are present, suggest an expedient chipped stone assemblage. This sort of assemblage is expected in the context of short-term, rather than long-term occupations (see Lepper and Yerkes 1997). The opportunistic usage of local glacial gravels for these expedient tools would be expected in this context as well. Redwing also lacks evidence for the well-developed biface industry evidenced at Murphy by more than 400 bifaces and copious debitage including more than 300 large, cortex-bearing flakes and blocky fragments. The lithic artifacts at Redwing more closely correspond to a short-term occupation where expedient, generalized tools were made and other tools were resharpened.

Although fire-cracked rock is present at Redwing, it does not occur in the quantity or configuration we would expect from a long-term habitation site.

The material assemblage from Redwing is smaller and less diverse even in comparison to sites interpreted as seasonal upland camps. The Marsh Run site (33FR895, a.k.a. "Wal-Mart site") is located on a gentle upland rise in the central Ohio Till Plains, in Franklin County, just southwest of Columbus, Ohio. This is one of the few well-documented upland Hopewellian habitation sites. In comparison to Murphy and McGraw, the site is smaller, with fewer and less functionally-diverse features, midden development is absent, there is evidence for periodic abandonment and rebuilding of structures and the botanical assemblages are dominated by wild plant foods rather than agricultural products. For these reasons, the site is interpreted as a seasonal, fall-winter occupation, perhaps complementary to valley-bottom warm-season farming occupations (Aument et al. 1991; Aument and Gibbs 1992). Even so, the material assemblage documents a wider range of domestic activities than seen at Redwing. The assemblage includes: at least one diagnostic Middle Woodland projectile point, two drills, five endscrapers, 102 whole and fragmentary bladelets, seven bladelet cores, four celts, two pitted stones, one grinding stone, one fragmentary gorget, one fragmentary pendant, and 149 grit-tempered sherds and many sherdlets.

The remarkable Robert L. Harness, Jr. surface collection from the Liberty Earthworks provides another body of excellent comparative data from the central Scioto region (Coughlin and Seeman 1997). Coughlin and Seeman recognize two main site types among the 33 Ohio Hopewell components identified in the vicinity of the Liberty Works that include special-purpose sites associated with ceremonialism and blade production and sites associated with domestic occupations. The ceremonial and blade-making sites are distinguished from domestic occupations by distinctive assemblages that may include high frequencies of exotic raw materials, caches of burned and broken artifacts, or more commonly, unusually high numbers of lamellar blades and cores. Similar localities marked by concentrations of lamellar blades and blade cores have been documented in association with the Seip, Baum, and Turner earthworks (also see Greber 1997; Greber et al. 1981). At Liberty, all of the special-purpose blade production or ceremonial sites were located in association with mound and earthwork constructions, hence these sites were found in terrace interior settings near the earthworks or in terrace edge settings where mound and earthwork locations coincide with the terrace edge. Sites interpreted as domestic occupations were exclusively located on terrace edge or floodplain landforms.

In comparison to the Liberty components, the Redwing component most closely fits the profile of a special-purpose ceremonial occupation, where the projectile points and knives characteristic of domestic occupations are lacking; the tool assemblage is dominated by lamellar blades, blade cores characteristic of manufacturing locales are poorly represented, and there are exotics such as obsidian, Knife River, and quartz crystal (compare to Coughlin and Seeman 1997:Table 9-1). In addition, the terrace interior setting of the Redwing component is clearly oriented toward the earthworks rather than the natural resources of the terrace edge or floodplain.

The Redwing blade assemblage offers further opportunity for comparison with blade assemblages from other Ohio Hopewell sites. In terms of length, width, and thickness, the Redwing blades fit comfortably within the ranges reported for other Ohio Hopewell assemblages (Greber et al. 1981; Pi-Sunyer 1965). Some Ohio Hopewell

assemblages are biased toward the extremes of these ranges due to cultural selection to meet particular social or technical needs: examples include the unusually long blades from some sub-mound contexts or the unusually narrow blades from some habitation contexts (see Greber et al. 1981). The Redwing assemblage is not particularly distinctive in this regard.

The composition of the Redwing blade sample in terms of raw material does offer some interesting comparisons. Analyzed blade assemblages from several of the major mound and earthwork centers in the Scioto-Paint Creek region display significant differences in the percentages of Harrison County (derived from sources more than > 250 km distant) and Vanport cherts (derived from sources more than > 100 km distant). Vickery (1996) notes that the Mound City blade industry is dominated by Harrison County chert (46.7 percent) with only minor representation of Vanport chert (5.2 percent). This is in contrast to the Liberty (Harness) blade industry (located less than 18 km from Mound City), which is overwhelmingly dominated by Vanport chert (94.2 percent) and displays only trace quantities of Harrison County (0.1 percent). Vanport is also dominant (ca. 95 percent) in the Liberty sample analyzed by Greber et al. (1981). A recent study of 113 bladelets from the Seip Earthworks (located about 24 km from Mound City) revealed a similar distribution of chert types with 91.2 percent Vanport chert and 5.3 percent blue-gray cherts[6] (Ruby and Troy 1998).

Measured in this way, the Redwing blade industry (67 percent Harrison County, 7.1 percent Vanport) is quite similar to the Mound City industry and differs markedly from both Liberty and Seip[7]. This observation lends independent support to Ruby's (1996, 1997a, 1997b) argument that Hopeton and Mound City (spaced less than 3 km apart) may have functioned together as a closely related unit integrating a single local community, in contrast to models that portray each of the major mound and earthwork complexes as independent of one another, with each center acting to integrate a distinct community (e.g., Dancey and Pacheco 1997; Pacheco 1996b).

CONCLUSIONS

The Redwing site is located just outside the southwest corner of the Hopeton square. Test excavations were initiated because surface survey indicated that Middle Woodland artifacts are concentrated in this area and might provide some evidence for Hopewell occupation in association with the earthworks. Testing has certainly demonstrated that artifacts are concentrated in this area, but the character of the artifacts does not indicate a habitation area.

The absence of food remains, the paucity of ceramics, the limited number of features, and general low density of artifacts is certainly not indicative of long-term habitation. The large number of lamellar blades is strong evidence for Hopewell activities at the site, but the presence of Late Woodland artifacts and a radiocarbon date of A.D. 783 ± 40 (Beta-109964) indicate that the area continued to be used by Intrusive Mound Culture peoples. Unlike the nearby Triangle site (Lynott, this volume), there is little evidence that the Redwing site was used by earlier Late Archaic people.

While it is relatively easy to determine that the Redwing site is not a long-term habitation, it is less easy to determine how the site was used. Larger-scale excavations or more intensive geophysical survey is needed to determine if features or remains of structures are present. In 2002 through 2005, excavations to the northeast along the west wall of the Hopeton rectangular enclosure uncovered a pattern of post holes associated with a large structure. The absence of domestic refuse in association with this structure suggests it was used for specialized activities. At this time, it seems likely that the Redwing site may also have been used for specialized activities associated with the earthwork. Hopefully, future research will help refine our understanding of the nature and function of those activities.

Acknowledgments

Midwest Archeological Center: Forrest Frost, Karen Archey , Renata Coleman. Milton Hershey School: Randy Farmer, Mary Bryner and students. Hopewell Culture National Historical Park: Deborah Wood, Jennifer Pederson, Tori Saneda, Scott Troy, Heman Sweet, Joe Wakeman. Volunteers: J.G. Shepard, Tom Hays, Shawn Casson, Gerald Parker, Larry Wickliffe, Lauren Butler, Dean Good, Susan Nicholson, Steve Patrick. Extra special credit: To Scott J. Troy for all his work in compiling and interpreting the surface survey and bladelet data discussed herein.

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[1] The classification of diagnostic bifaces used here follows Justice (1987). Early Archaic diagnostics include four Dalton Cluster and LeCroy Cluster bifaces. Late Archaic diagnostics include four Late Archaic Stemmed Cluster and Matanzas Cluster bifaces. Early Woodland period diagnostics are limited to a single hafted scraper assignable to the Early Woodland Stemmed Cluster. A single large biface fragment manufactured from Vanport (Flint Ridge) flint likely relates to the Early or Middle Woodland periods, but could not be more precisely classified. Late Woodland period (Intrusive Mound Culture) diagnostics are represented by four Jack's Reef Cluster bifaces. Late Woodland/Mississippian period (Fort Ancient) diagnostics are represented by one Fort Ancient Knife, seven Late Woodland/Mississippian Cluster triangular points, and twelve ceramic sherds. Historic period artifacts include forty-five artifacts likely related to historic period buildings and structures such as bricks, nails, and window glass; and 216 artifacts likely related to historic period domestic activities such as bottle glass, dishware, earthenware, and other miscellanea. Middle Woodland period diagnostics include three lamellar blade cores, one Copena Cluster biface, five Snyders Cluster bifaces, four Lowe Cluster bifaces, three Snyders/Lowe Cluster bifaces, 48 lamellar blades, 18 single-arris lamellar flakes, two obsidian flakes, and one quartz crystal fragment.

[2] Interestingly, the Late Woodland period diagnostics do show some tendency to cluster in the same area most intensively used during the Middle Woodland period, i.e., just outside the earthwork walls in the vicinity of the Redwing Site. This may reflect re-utilization of Hopewellian mounded landscapes by Intrusive Mound Culture peoples, as well documented at Mound City (see Brown 1994; Mills 1922) and elsewhere.

[3] The density of Middle Woodland period diagnostics is higher in part because lamellar blades, blade cores, and exotic raw materials are included in addition to bifaces. Nevertheless, the comparison holds true even when limited to bifaces only. The total of 13 Middle Woodland period bifaces is rivaled only by the total of eight Late Woodland/Mississippian period (Fort Ancient) bifaces; the other prehistoric periods pale in this comparison.

[4] The survey was conducted using a Geoscan Research RM-15 resistivity meter with 0.5 m remote probe separation. Sample and traverse intervals were both 1 m.

[5] The calibrations reported here were calculated using the University of Washington Quaternary Isotope Lab Radiocarbon Calibration Program Rev. 4.3, based on Stuiver and Reimer (1993) and Stuiver et al. (1998).

[6] The "blue-grey chert" category used in this study includes Harrison County along with other macroscopically-similar cherts such as Cobden/Dongola, St.Louis, and Ste. Genevieve. All are a fine-grained Mississippian cherts derived from bedrock and residual sources located >250 km from the Scioto-Paint Creek confluence in southern Illinois, southern Indiana, Kentucky, and Tennessee.

[7] Ruby and Troy's (1998) blade study also found that some contexts at Mound City are dominated by Vanport, rather than blue-grey cherts. In particular, assemblages from the "Drill Field" and "Maintenance Building" localities have unusually high frequencies of Vanport: 99.4% (n=124) and 88.9% (n=27), respectively. This stands as cautionary evidence that it is often inappropriate to treat large mound and earthwork complexes as single units of analysis: that approach often masks significant intra-site variability. It also suggests that access to Vanport and blue-grey cherts varied, perhaps over time, or along social or political lines. Hence, variation in assemblage composition may prove to be a useful temporal marker, or a marker of social organization or political alliance.

CHAPTER 9

SEARCHING FOR HOPEWELL SETTLEMENTS: THE TRIANGLE SITE AT THE HOPETON EARTHWORKS

BY
MARK LYNOTT

Recent trends in the study of Ohio Hopewell archeology have focused attention on the nature of the settlement systems that built and maintained the great geometric earthworks of the Scioto River valley in southern Ohio. Archeologists have generated considerable discussion about the nature of the habitation sites, settlement systems, and subsistence practices of the prehistoric peoples who built these giant earthen monuments (Dancey and Pacheco 1997; Pacheco 1996b). Unfortunately, only a handful of habitation sites that can be confidently attributed to Scioto Valley Hopewell have been excavated and reported.

The recent debate about the nature of Hopewell settlement patterns was initiated by Prufer (1965), who proposed that the large earthworks were vacant ceremonial centers and the Hopewell people lived in small dispersed hamlets in the countryside around the earthworks. Other archeologists have subsequently argued for alternative models to explain the organization of Hopewell society (e.g., Dancey and Pacheco 1997; Griffin 1996, 1997; Pacheco 1996b), but very little new field data has been reported on Hopewell habitation sites in the Scioto Valley. Most recent studies of habitation sites are from other drainages (Carskadden and Morton 1997; Church and Ericksen 1997; Connolly 1997; Dancey 1991a). Coughlin and Seeman's (1997) study of the Robert Harness surface collection have provided an excellent view of habitation data associated with the Liberty Earthworks, but current interpretations about the prehistory of the Scioto River Valley are generally based upon limited data and general anthropological theory.

When the National Park Service began to purchase land at the Hopeton Earthworks in Ross County, Ohio in the early 1990s, one of the questions that was asked was whether there were any Hopewell habitation sites associated with the earthworks. An assessment of the condition and significance of the site by David S. Brose (1976) included discussions with local collectors about the nature of surface remains at the site. Brose reported that collectors had found fire-cracked rock (FCR) and other artifacts characteristic of habitation debris along the edge of the terrace at the southwest edge of the site.

The Midwest Archeological Center (MWAC) initiated archeological testing at Hopeton in 1994. The testing was intended to be the start of a long-term program to evaluate the nature of archeological materials and deposits associated with the earthworks. These investigations were designed to contribute to the discussions about the nature of Hopewellian settlement systems and the role that earthworks played in Hopewell society. The 1994 testing program was conducted on a triangular tract of land at the edge of the terrace southwest of the earthworks. This area is the location where the parallel walls of the Hopeton Earthworks as described by Squier and Davis terminated

and is an area where surface collectors had noted evidence of habitation when the site was in cultivation (Brose 1976).

A team from MWAC spent two weeks in 1994 excavating test units at an area of the Hopeton Earthworks called the Triangle site, 33RO812 (Figure 9-1). The 1994 testing consisted of eight test units, covering a total of 17 square meters. The purpose of the testing was to conduct a preliminary assessment of the nature and extent of the archeological remains along the western edge of the terrace landform. Very few temporally or functionally diagnostic artifacts were recovered. Although artifacts

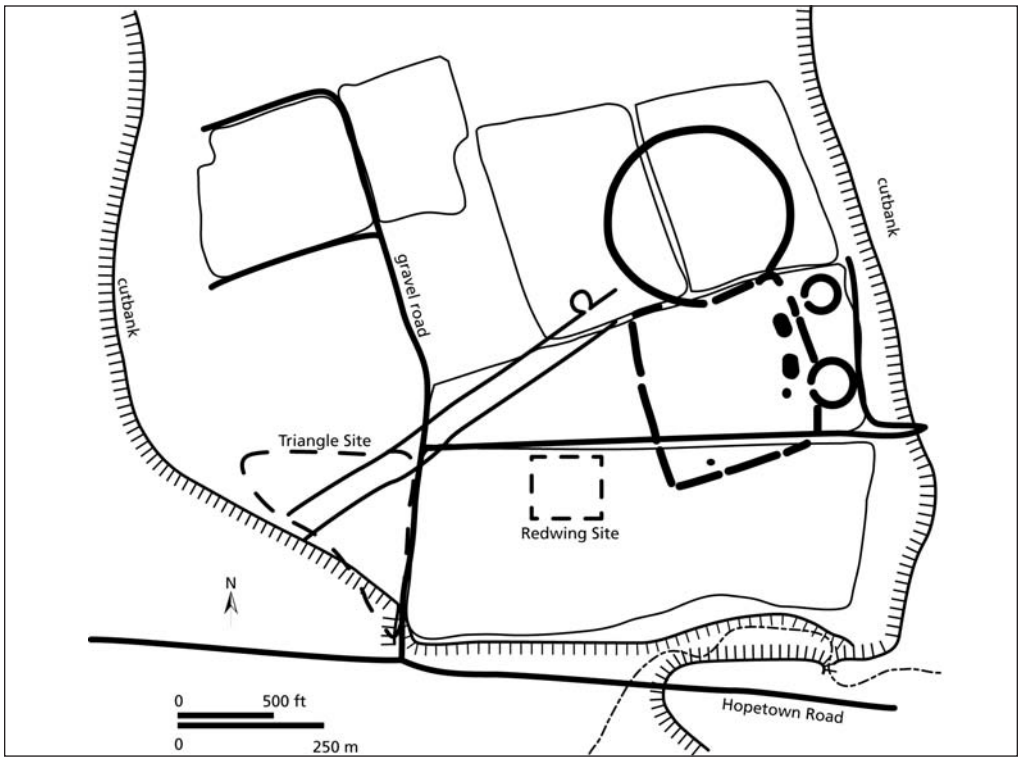

Figure 9-1. Map of the Triangle site and the Hopeton Earthworks.

were found across the entire Triangle site study area, densities were generally low. The most likely evidence for significant occupation of this area of the site came in the form of a subsurface pit. The pit was approximately a meter in diameter and extended more than 0.5 m. below the plowzone. The pit was filled with FCR, charred macrobotanical remains, and some fauna. At the conclusion of this brief field investigation, it was apparent that evidence for occupation was present at the Triangle site, and further research was needed to determine the age, extent, and nature of that occupation.

Further work at the Triangle site was postponed in 1995 and 1996 to support work by The Ohio State University at the Overly site, which was threatened by gravel quarry operations in the immediate future (Dancey, this volume); field investigations at the Triangle site resumed in the fall of 1997. In an effort to make testing more productive, a research plan emphasizing geophysical survey in advance of testing was developed. The plan was to conduct a fairly large geophysical survey in the area where the parallel

walls should have crossed the Triangle site. Although no longer visible on the surface, it was hoped that the parallel walls might be detected by geophysical survey techniques. The geophysical survey was also intended to identify potential subsurface features that might be associated with Hopewell habitation or use of the site.

After examining the geophysical survey data from 1997, field research was resumed at the Triangle site in the summer of 1998. The 1998 investigations were designed to evaluate the effectiveness of the geophysical survey methods and attempt to determine whether physical evidence of the parallel walls and any associated features might remain

FIELD INVESTIGATIONS

Although the Triangle site had been cultivated regularly over the last 150 years, it was covered with grass in 1994. Surface visibility was poor, so we were forced to rely on observations that Brose (1976) had reported from surface collectors who had viewed the site in cultivation over a number of years. This information indicated that FCR and other habitation debris had been abundant along the edge of the terrace. We decided to start our testing on the south end of the Triangle site and move northward. Test units were placed at broad, irregular intervals to search for a concentration of artifacts or midden from a hamlet or village.

Testing in 1994 consisted of seven 1 x 2 m units and a single 1 x 1 m unit that was excavated to expose a feature. Approximately 8.5 cu. m of soil was excavated and screened. Overall, we noted that the areas of the site closest to the terrace edge were heavily deflated by erosion resulting from agriculture. Pleistocene gravel was incorporated in the plowzone in test units located near the terrace edge. Test units farther from the terrace edge lacked gravel in the plowzone, but cultivation had clearly disturbed all of the archeological deposits that had not been excavated into the subsoil. While recognition that the site had been heavily impacted by cultivation was discouraging, we were encouraged by the presence of an intact subsurface feature within the widely spaced test units. Due to our very limited sampling, this implied that other occupation features were likely present and they might be located with geophysical survey methods and tested using a more strategic campaign.

Feature 1 was exposed at the base of the plowzone in one of the 1 x 2 m test units. The northern side of the feature appeared in plan form as a large pit filled with organic soil and FCR. To examine the feature in cross-section, another 1 x 1 m unit was excavated adjacent to the original test unit, exposing a 1 x 3 m area. At the base of the plowzone, the feature was 135 cm east-west and 80 cm north-south, and extended into the south wall of the test units an undetermined distance. The dark brown loam fill of the pit was visually distinct from the yellow-brown subsoil, which made the edge of the feature fairly easy to trace during excavation. We also noted that FCR was abundant along the edges of the pit walls and bottom. Excavation of what is estimated to represent the northern two-thirds of this pit yielded considerable FCR, charred macrobotanical remains, fauna, and lithics. The pit had rounded sides and a relatively flat bottom, and extended to 74 cm below surface and 46 cm below the base of the plowzone. Unfortunately, no temporally diagnostic artifacts were collected.

GEOPHYSICAL SURVEY

The earthworks at Hopeton are comprised of several small circles, a large circle, a large rectangle or square, and two very long parallel walls. Squier and Davis (1848) reported that the parallel walls were two feet high and fifty feet apart in 1846 and they could be traced for about 0.64 km. All of the major earthwork features were still prominent on a 1938 aerial photograph of the site, but later aerial photographs show the slow but steady degradation caused by cultivation. After nearly 150 years of agricultural activities, Brose (1976:47) reported that the "low parallel walls are only visible in short sections, especially at the southwestern edge along the bluff. They are less than one foot high and average about five feet in width." When the National Park Service acquired the property in the early 1990s, the parallel walls were no longer visible.

In an effort to locate subsurface components of the parallel walls, we decided to use a variety of different geophysical survey instruments to explore a portion of the Triangle site. The survey zone was selected to transect the area where we believed the parallel walls would have terminated at the edge of the terrace. In October 1997, we were able to survey 9600 sq. m of the Triangle site using an RM-15 resistance meter, Geometrics G858 cesium magnetometer, and Geoscan FM36 fluxgate gradiometer. Survey was conducted in 20 x 20 m blocks with readings along 1 m transects within the blocks. Prior to the magnetic survey, we used a metal detector to locate and remove pieces of metal from the plowzone. Our survey covered an area roughly 80 x 140 m. Field survey and interpretation of the geophysical data was conducted under the direction of Dr. John Weymouth of the University of Nebraska.

Although our projections indicated that the 1997 geophysical survey area should have intersected the parallel walls, no evidence of the earthen embankments was noted in the geophysical survey data. However, the RM-15 data did indicate that a relatively large anomalous feature might be present in this area. Unfortunately, the geophysical data collected from this area of the site produced nothing to suggest that physical evidence from the parallel walls remain.

Our geophysical survey coverage of the Triangle site included an area roughly 140 m north-south and 80 m east-west and was designed to evaluate whether the geophysical survey data we collect might prove useful in identifying possible subsurface features that might be related to Hopewell occupation of the site (Figure 9-2). The magnetic survey of this area yielded numerous small anomalies that might be related to Hopewellian use of this area of the earthworks. Our intention was to use the magnetic and electrical resistance survey data to guide the selection of test units. Due to the large size of the Triangle site, and other archeological resources associated with the Hopeton Earthworks, we hoped that an approach that combined large-scale geophysical survey and strategic testing would lead us to features associated with the Hopewell occupation of this landform.

1998 SEASON

The next phase of research at the Triangle site was designed to evaluate the utility of geophysical survey methods and equipment in association with our long-range

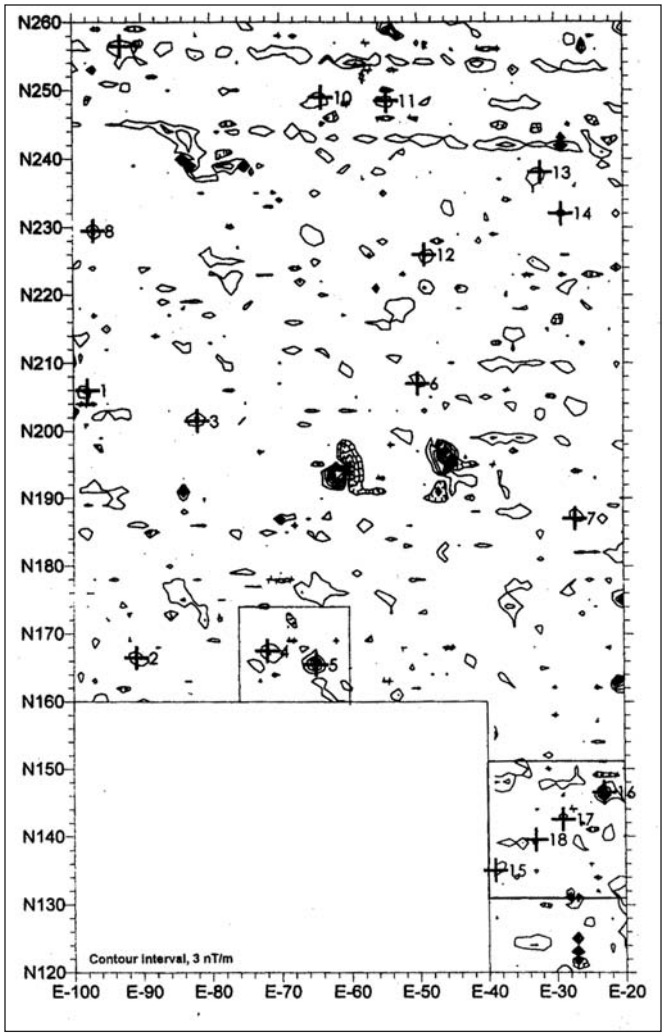

Figure 9-2. Magnetic survey map, Triangle site.

plans for study of the Hopeton Earthworks and to examine the nature of prehistoric occupation of this area of the landform. The geophysical survey conducted in the fall of 1997 produced evidence of numerous small anomalies, but little evidence of the larger earthworks that were known to have been in this area. To better understand the nature of the small anomalies, we selected five individual anomalies to examine through excavation of 2 x 2 m test units. We also selected two groups of anomalies to examine through excavation of a 20 x 20 m block and a 16 x 14 m block. The block units were planned to evaluate whether subsurface features not identified through geophysical survey might also be present.

Five anomalies were investigated by hand excavation of 2 x 2 m test units. In each case the plowzone was removed in arbitrary 10 cm levels and the floor of the unit was carefully scraped with a trowel. The plowzone ranged from 25-28 cm in thickness. No evidence of subsurface features was observed in any of the five units at the base of the plowzone, so excavations were continued in arbitrary 10 cm levels. Culturally sterile soil was encountered in three of the test units without exposing a feature, but considerable FCR in the plowzone of one of the units was likely part of a disturbed feature and would explain the presence of a magnetic anomaly. Two test units did eventually expose subsurface features.

Two larger block excavations were also opened during the 1998 field season in an effort to evaluate two groups of anomalies. These block excavations were 20 x 20 m (Block B) and 16 x 14 m (Block A) in size (Figure 9-3). The plowzone for each of these units was removed with assistance from a backhoe. Excavators then skim-shoveled the area to flatten the floor and remove any plowzone left by the backhoe. The floors of the units were then scraped with trowels and any soil stain or possible feature was noted and marked with a pin flag.

Of the 144 possible features that were identified during the 1998 excavations, only 40 were determined to be features attributed to cultural activities. The vast majority of

Figure 9-3. 1998 excavations, Block B, Triangle site.

these are small and subtle, mainly pits or post holes. These generally exhibit a low density of artifacts and very few temporally diagnostic artifacts. Overall they are indicative of short-term activities.

The geophysical surveys conducted in 1997 failed to reveal any magnetic or electrical resistance evidence that remnants of the parallel walls are still extant. Electrical resistance survey did suggest the presence of a large anomaly in an area where our projections indicated that the parallel walls might have stood. To investigate this anomaly in 1998 we excavated a 20 met long trench across the anomaly.

The trench was excavated by backhoe and shovels and revealed the presence of a pit or ditch. The fill of this feature was very similar to the surrounding subsoil, but incorporated small pieces of burned wood. The pit was 4 m across and reached a depth of 65 cm below surface as exposed in the west wall of our trench. The feature appears to have been excavated down into an ancient alluvial stratum that is comprised of silt loam with considerable small gravel. Although the color of the pit fill and the subsoil are similar, there was no gravel in the pit fill, so it could be easily traced. No artifacts were observed in association with this feature, but it does appear to be cultural in origin. More research is clearly needed on the parallel walls, but based on our study at the Triangle site, it would appear that they have been nearly, if not totally, destroyed by agricultural activities.

FEATURES, ARTIFACTS AND RADIOCARBON DATING

The vast majority of features recorded at the Triangle site are pits and post holes (Table 9-1). The 34 pits can be grouped into three categories based on volume. There are 24 small pits and post holes, which are 20,000 cu. cm or less in volume. Medium pits are greater than 20,000 cu. cm. but less than 100,000 cu. cm in volume and large pits are greater than 100,000 cu. cm in volume. Only six large pits and one medium pit have been recorded and excavated.

Smaller pits and post holes are often difficult to differentiate. They range from less than 1,000 cu. cm to nearly 20,000 cu. cm in volume and occur in a wide range of shapes. The smaller features, those less than 5,000 cu. cm, are almost certainly post holes. These are round in plan view, less than 20 cm in diameter, and in profile have straight, parallel sides. The features that are greater than 5,000 cu. cm but less than 20,000 cu. cm may be either large post holes or small pits. Due to their small size, unless features in this category contained FCR or some other highly magnetic material, our magnetic survey equipment and survey methods likely did not detect them.

Larger pits are generally circular to oval in plan, with sloping sides and flat bottoms. They generally range in size from 0.5 to 1 m in diameter, and extend 0.5 to 1 m

Table 9-1. Pit features, Triangle site.

Feature	Horizontal Shape	Vertical Shape	Horizontal Diameter (cm)	Vertical Depth (cm)	Volume (cm^3)	Contents
6	Circular	Cylinder	14	56	11232.34	Charcoal
8	Circular	Basin	23	12	2698.65	Charcoal
10	Circular	Cylinder	18	55	6774.04	1 ceramic 1debitage
11	Circular	Cylindrical cone	8	27	540.88	None
12	Amorphous	Amorphous Basin	46	8	3573.3	Debitage, sherd, FCR
13	Circular	Basin	50	8	10033.47	FCR, sherd, NDS
17	Circular	Basin	107	42	307417.4	Few artifacts
22	Oval	Basin	220 x 110	40	648,560	Gravel
24	Circular	Basin	12	16	1053.48	1 debitage
25	Circular	Basin	10	16	1182.73	None
40	Circular	Basin	14.5	10	1417.07	Bone specimen
43	Amorphous	Basin	18	21	4593.79	Debitage, FCR
44	Circular	Cylindrical Basin	22	40	12074.97	Charcoal (charred post)
47	Ellipse	Amorphous cylinder	24 x 12	44	2616.47	2 debitage
50	Circular	Amorphous Basin	38	14	10895.04	Charcoal
62	Circular	Cylinder	14	21	1922.65	none
63	Circular	Cylinder	24	12	4574.16	Charcoal
64	Circular	Basin	140	50	570722.67	Mica, Charcoal, bladelet, debitage, pottery
67	Circular	Amorphous cylinder	20	54	6972.27	1 debitage
71	Ellipse	Basin	110 x 85	28	179277.7	FCR, debitage
88	Circular	Basin	85	30	69179.73	FCR, debitage, bone, projectile point base
91	Circular	Cone	20	13	1361.36	Charcoal, debitage, FCR
104	Circular	Basin	33	2	1608.5	None
116	Ellipse	Basin	46 x 28	15	14172.6	Charcoal, debitage, FCR
136	Amorphous	Shallow Basin	Area 748cm^2	6	3564.22	Charcoal
138	Roughly circular	Unavailable	8	Unavailable	Unavailable	Unavailable
139	Circular	Amorphous basin	30	36	13192.60	Charcoal, debitage
140	Circular	Unavailable	8	Unavailable	Unavailable	Unavailable
143	Circular	Basin	102	22	115905.92	FCR, debitage, biface fragment
145	Ellipse	Truncated cone	40 x 39	30	17612.19	FCR …..debitage, charcoal
146	Amorphous circle	Basin	36 x 32	22	10517.1	2 debitage, charcoal
147	Oval	Shallow basin	54 x 50	5	6220	FCR
149	Amorphous	Bell shaped Basin	Area 32504cm^2	70	1035981.1	FCR, debitage, charcoal, mica
153	Ellipse	Basin	180 x 80	30	214707.36	Charcoal, debitage

below plowzone, but may be somewhat larger with volumes greater than 100,000 cu. cm. Pit fill typically contains FCR, macrobotantical remains, lithic debris, and temporally non-diagnostic tools. Seven features in this size range have been recorded. Examination of the magnetic survey data suggests that these larger features are likely to be detected using the magnetic survey methods employed in our study.

In addition to pit features, four hearth features were also recorded and excavated at the Triangle site in 1998. All these appear to be associated with intense heat. Features 20 and 157 were circular to oval areas of red-yellow soil about 60 cm in diameter. Both of these features are thin (4-5 cm) lenses of heat-altered soil and charcoal that appear to have formed without intentional preparation. Feature 72 was a circular lens of FCR. The FCR lens was 25 cm in diameter and only 4 cm thick, suggesting a relatively short period of use. Feature 104 is a prepared clay basin that was subjected to intense heat. The basin is circular in plan form and about 60 cm in diameter. In cross-section the feature looked like a shallow basin with the center of the basin about 3 cm lower than the outer edges. The mottled red and yellow clay lens that forms the basin is about 6 cm thick. No artifacts, with the exception of charred wood, were found in direct association with any of the hearth features, but the prepared nature of Feature 107 (Figure 9-4) is reminiscent of Hopewell fire basins at other sites in Ohio.

Figure 9-4. Feature 1, Late Archaic pit, Triangle site.

Prior to the 1998 excavations, we assumed that due to the proximity to the parallel walls, it was likely that most of the Triangle site features were associated with the Hopewell occupation of the area. Since most of the features did not contain temporally diagnostic artifacts, the field investigations produced little obvious evidence to change that assumption. However, when we began to conduct more detailed analysis of the artifacts and received radiocarbon and AMS dates from samples collected from those features, it became obvious that the Triangle site was utilized over thousands of years.

Eight radiocarbon samples were submitted to Beta Analytic for either Radiometric or AMS dating. Table 9-2 presents the results of these analyses. The eight results fall into four groups. Five samples date to the Late Archaic stage, one sample is Middle Woodland, one sample is Late Woodland and one sample is Historic.

Five of the eight dates from the Triangle site document Late Archaic use of this landform. Charred hickory wood from Feature 17 was processed using AMS and has yielded a date calibrated to two sigma of 1520-1390 B.C.E. (Beta-147183). A sample of charred walnut hulls from Feature 1, another large pit filled with FCR, was processed using standard radiometric techniques and yielded a date calibrated to two sigma of 1620-1440 B.C.E. (Beta-147190). A sample of charred True Hickory wood from Feature 149 was dated by the standard radiometric method and yielded a date calibrated at two

Table 9-2 Radiocarbon dates.

Sample #	Feature #	2 sigma calibrated age	Material dated	Method
Beta-147183	17	1520-1390 BC	True Hickory	AMS
Beta-147-184	64	50 BC – AD 130	True Hickory	AMS
Beta- 147185	44	AD1650-1700; AD1720-1820; AD1840-1880; AD1920-1950	Bark	AMS
Beta-147186	143	2200-1890 BC	True Hickory	AMS
Beta-147187	50	3780-3510 BC; 3430-3390 BC	Unidentified wood	radiometric
Beta-147188	88	AD 770-1160	Basswood	radiometric
Beta-147189	149	2010-1690 BC	True Hickory	radiometric
Beta-147190	1	1620-1440 BC	Walnut hulls	radiometric

sigma of 2010-1690 B.C.E. (Beta-147189). Another sample of charred True Hickory wood from Feature 143 was dated by AMS and yielded a result calibrated at two sigma of 2200-1890 B.C.E. (Beta-147186). The final Late Archaic date was obtained from unidentifiable wood charcoal collected from a post hole (Feature 50) and it yielded an age calibrated at two sigma of 3780-3510 B.C.E. (Beta-147187). With the exception of Feature 50, which was a post hole, the other features that produced Late Archaic radiocarbon dates are all relatively large pits.

Features that may be definitely associated with the Hopewellian occupation of the site are more limited. Unfortunately, no dateable material was collected from Feature 104, a circular basin that was lined with clay and hardened by heat. Feature 64 is clearly associated with Hopewell activities at the site. The feature is a large and generally amorphous pit that was identified through magnetic survey and exposed in a 2 x 2 m test unit. Although the feature could not be clearly detected at the base of the plowzone, cordmarked, grit-tempered pottery and bladelet fragments were collected from undisturbed sediments below the plowzone. Feature 64 was a large pit in which the pit fill was very similar in color and texture to the surrounding subsoil. Consequently, it was very difficult to determine accurately the horizontal and vertical extent of this feature. Excavators depended upon their ability to feel a difference in soil texture as they scraped to define the limits of the pit. This is fairly common for Hopewell pit features at Hopeton and elsewhere in the Scioto River valley.

The presence of Feature 64 was first noted at 37 cm below surface and the bottom of the pit was measured at 86 cm below surface. The sides and bottom of the pit were slightly rounded and the pit had been excavated from the loamy subsoil down into subsoil with increased amounts of fine gravel. The fill of the pit was mottled and dark brown near the surface but became more yellow-brown with depth until it was distinguishable from the subsoil only by the reduced quantity of fine gravel. The fill of this pit included charcoal, FCR, lithic debris, a chert bladelet, the tip of a projectile point blade, pottery, a large piece of cut mica, and a small quantity of calcined bone. A sample of charred True Hickory from this feature was submitted for AMS dating and yielded a date calibrated at two sigma of 50 B.C.E.-A.D. 130 (Beta-147184).

Late Woodland occupation of the Triangle site is best documented at Feature 88. This pit was dark and circular in plan view, with sloping sides and a round bottom. Unlike most features at the site, this one was loaded with FCR, charred macrobotanical remains, faunal remains, lithic debris, chipped stone tools, and grit-tempered pottery. The pottery is cord-marked with diagonal cord-wrapped stick impressions on the lip. The presence of substantial amounts of faunal remains makes this pit unique among features examined thus far at the Triangle site. Turtle, raccoon, and elk are present in association with large quantities of deer. Examination of seven deer antler burrs from the pit show that four are still attached to the skull and three have been shed. Assuming that the fill of this pit was from a single year, the pattern of antler shedding and growth would indicate a late winter occupation (Bozell 2000). A sample of charred basswood from the feature yielded a radiometric date calibrated to two sigma of A.D. 770-1160 (Beta-147188). The large quantity of artifacts found in this pit is in marked contrast to the relatively impoverished contents of other features at this site and seems to reflect a differing use of the site in Late Woodland times.

The lone Historic period radiocarbon date from the Triangle site was obtained from unidentified charred bark collected from the fill of a post hole. This sample produced an uncalibrated date of 190 ± 40 B.P. (Beta- 147185). The feature was clearly identified as a burned post, but must date to the early historic farming period in the Scioto River valley.

Archeological excavations at the Triangle site yielded a wide range of artifacts, including chipped stone tools and debris, FCR, pottery, animal bones, and macrobotanical remains. The animal and plant remains are discussed in subsequent sections of this chapter, but the remainder of this section will consider the temporal and functional implications of the ceramic and lithic artifacts (Table 9-3).

FCR is the most common artifact class. A total of 5,067 specimens were collected. These consist mainly of glacial cobbles that have been fractured by heat. Scattered FCR was found in the plowzone of all excavation units and 40.8 percent of all FCR by count and 31.3 percent by weight were collected from the plowzone. The majority of FCR occurred in features (59.2 percent by count and 68.7 percent by weight). Three features (1, 88, and 149) produced 50.5 percent of all FCR from the site and 85.3 percent of all FCR from features. Charcoal from Features 1 and 149 have produced radiocarbon dates that suggest these features were used in the Late Archaic period. Charcoal from Feature 88 has been dated to the Late Woodland period.

Chipped stone tools and debris represent the second most common artifact class. These materials include 23 cores, 88 tools, 29 bladelets, 579 flakes, 550 proximal flakes, and 2,253 non-diagnostic shatter. Recognizing the inherent difficulties associated with macroscopic identification of raw material sources, the material from the Triangle site has been tentatively identified as 46.6 percent derived from local glacial gravels, 35.7 percent Wyandotte (Harrison County) chert, 15.5 percent Flint Ridge (Vanport) chert, and 2.2 percent Upper Mercer chert.

The cores from the Triangle site are all simple forms, primarily single platform or amorphous multi-platform types. These seem to reflect opportunistic efforts to

generate flakes without much effort at formal core preparation. Notably absent from the assemblage are any examples of Hopewell blade cores.

Twenty-nine bladelets have been identified. These are usually triangular or prismatic in cross-section and consistent with the diagnostic bladelets consistently found at Ohio Hopewell sites. Most of the specimens are mid-section fragments that permit only limited technological inference. It is likely that some of these bladelets may even be accidental byproducts of flintknapping rather than specialized bladelet production associated with Ohio Hopewell.

A limited number of stone tools were also collected from the 1994 and 1998 excavations. These include 28 bifaces, 14 projectile points, four drills, three spokeshaves, a scraper, 37 retouched flakes, a hammerstone, and a groundstone gorget. Most of these specimens are fragments that were discarded after being damaged in use or manufacture. Only a few are temporally diagnostic. Projectile points reflect the long temporal span of the site and include Late Archaic (Lamoka, Brewerton, Merom), Late Woodland (Jack's Reef), and Fort Ancient (Madison) forms. Some of these are illustrated in Figure 9-5.

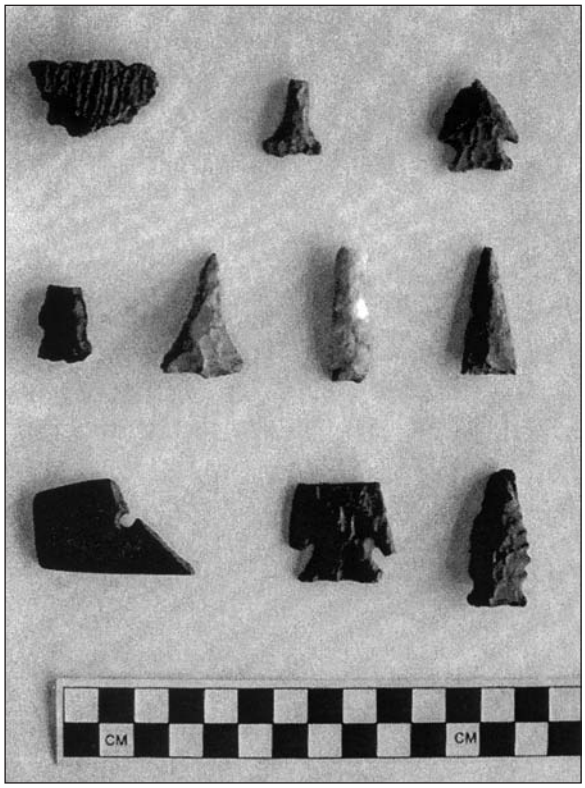

Figure 9-5. Selected artifacts, Triangle site.

Ceramics from the Triangle site are all small sherds, mainly the size of a quarter or smaller. A limited number were collected from the plowzone, but the soft and fragile nature of the pottery suggests that sherds in the plowzone may deteriorate more quickly than sherds that remain buried in subsurface features. All of the pottery is grit- tempered, with temper varying from quartzite to limestone. A total of 84 sherds were examined and 43.9 percent of these are either sloughed or so heavily eroded as to not permit meaningful observations about surface treatment. Of the remaining sherds, all but one are cordmarked on the exterior surface. The single exception is a small sherd that exhibits simple stamp impressions. All but two of the sherds are body sherds. The two rimsherds are from the same vessel and were recovered from Feature 88. They have a flat lip with diagonal cord-wrapped stick impressions on the lip. The exterior of the rim is cordmarked and the sherds have large round fissures in the paste that likely result from the erosion of limestone temper. The majority (64 percent) of the sherds were collected from five features, with most of these coming from Feature 64 (16 percent) and Feature 88 (44 percent). Although we know that there are both Middle Woodland and

Table 9-3. Artifact provenience.

	Flakes	Prox. Flk	NDS	FCR	Pottery	Cores	Tools	Bladelets
1994								
TU 1	13	22	66	41	6	2	2	
TU 2	46	38	194	93	4		4	1
TU 3	50	50	197	325	1	3	12	1
TU 4	45	53	329	204	2	3	8	
TU 5	31	38	108	445			7	2
TU 6	37	34	97	201			6	1
TU 7	14	14	83	182			1	
TU 8	28	31	124	69	2		9	2
TU 9	5	12	37	37			3	
Misc	2	5						
Subtotal	**271**	**297**	**1235**	**1597**	**15**	**8**	**52**	**7**
1998								
TU 1	31	19	71	49		1	1	
TU 3	36	51	110	78		1	10	5
TU 6	76	45	126	23	20	2	5	9
TU 7	33	28	131	105			2	
TU 8	48	60	143	217			7	4
Subtotal	**224**	**203**	**581**	**472**	**20**	**4**	**25**	**18**
Features								
1	56	21	304	1393	2	3	3	
10			2		1			
12	1			3				
17	16	8	26	98			2	
43		1	2	1				
47		2						
49								
64	5	6	14	45	16		1	
71	4	5	2	35			1	
88	14	8	14	524	44	3	2	1
116			3	60				
122							1	
139	1		3					
143	6	2	52	90			1	
145	2		2					
146	1	1						
147				16				
149	31	16	10	643		1	2	
152					1			
153	3	2	3	90			1	
157								
Subtotal	**84**	**50**	**437**	**2998**	**64**	**7**	**14**	**1**
Total	**579**	**550**	**2253**	**5067**	**99**	**19**	**91**	**26**

Late Woodland ceramics in this assemblage, they are similar enough that they are very difficult to distinguish in their eroded and fragmentary condition.

ANIMAL REMAINS

The faunal remains from the Triangle site were identified and analyzed by John R. Bozell (2000). The assemblage consists of 3257.5 g of bone, the vast majority (93.1 percent) of which was recovered from a single Late Woodland feature (Feature 88). Bone was collected from 10 features and two plowzone levels of test excavation units. With the exception of the bone from Feature 88, most of the assemblage is small, unidentifiable, and was recovered from flotation samples. Evidence of burning or charring was observed on 8.5 percent of the assemblage.

Only one piece of modified bone has been identified from the Triangle site. A fragmentary tip of a bone awl was collected from Feature 1. The awl is in very bad condition and has broken into several pieces. When combined the pieces are 30 mm long and 7.8 mm wide. The awl is a splinter of bone that has been ground and tapers to a sharp point. Feature 1 is a large flat-bottomed pit that contained considerable FCR and dates to the Late Archaic stage.

The faunal assemblage consists of 187 identifiable elements that may be assigned to eight taxa. These include an unknown bird, box/water turtle, eastern chipmunk, mice, raccoon, wapiti, white-tailed deer, and cattle/wapiti. The bird element is from the plowzone and is believed to be from an immature duck. The wapiti/cattle element is an incisor that was collected from the plowzone and is most likely a product of historic farming activity. The mice and chipmunk remains were likely residents of the site and it is likely that they entered the site deposit through natural rather cultural processes. The remaining faunal elements are believed to be food refuse.

The identifiable raccoon, turtle, elk, and white-tailed deer remains from the Triangle site were all collected from Feature 88. The turtle remains consist of two plastron and two carapace fragments. The raccoon remains consist of fragments of teeth and cranium from a single individual. A tibial tarsal and a distal first phalange have been identified as elk. White-tailed deer are represented by 170 different elements.

White-tailed deer represent 90.9 percent of the identifiable faunal remains from the site. The elements that have been identified from Feature 88 are from a minimum of eight individuals. Examination of individual elements indicates that 11 were burned, 20 exhibit butchering marks, 61 exhibit spiral fractures, and 25 percent exhibit gnawing from carnivores. Bozell (2000:12) observes that the high incidence of gnawing by carnivores indicates that deer bones were not deposited immediately in this refuse pit, but were exposed on the surface and available to dogs and other scavengers for some time.

Bozell (2000:16-17) notes that among the deer remains, the antler and skull elements are elements are reflective of late winter/early spring kills. This is consistent with the absence of waterfowl and the presence of parts of only a single turtle shell in

this feature. He further notes that the high incidence of spiral fractures is indicative of marrow extraction and this is also consistent with a late winter or early spring occupation.

The overall paucity of faunal remains at the Triangle site left the initial impression that preservation conditions were not conducive to the survival of bone in this soil. However, when Feature 88 was uncovered and a substantial number of identifiable faunal elements in relatively good condition were collected, it became obvious that preservation conditions alone did not explain the absence of bone in other features. The number and nature of faunal elements in Feature 88 is quite different from any of the Late Archaic or Middle Woodland features that have been excavated. Based on the current evidence, it appears that Late Archaic and Middle Woodland people participated in only limited processing and consumption of animal remains on this part of the Triangle site. The faunal remains from Feature 88 indicate that Late Woodland people used the Triangle site as a short-term, late winter camp. Whether Late Woodland occupation occurred at other seasons of the year can only be determined by further excavation.

PLANT REMAINS

Charred macrobotanical remains were preserved at the Triangle site in 32 features. Flotation samples of feature fill were collected from each feature. The macrobotanical remains from 73 flotation and 33 radiocarbon samples were identified by Gina S. Powell (2000). Powell (2000:1) noted that the remains were in very good condition, with the edges and features of nutshells and wood being well preserved. This suggests that the samples were promptly deposited in the features and not redeposited multiple times or left on the surface to weather. The identified macrobotanical remains are all burned and consist of wood, nuthulls, and seeds.

Charred wood is by far the most common type of plant remains in the assemblage. A total of 332 pieces were examined and identified. A wide range of taxa are present, mainly representing trees that grow in bottomland environments. Hickory is the most common tree, with three different taxa present (thin-shelled hickory/bittern=24.1 percent, True Hickory=16.9 percent, indeterminate hickory=9.3 percent). Other identified woods include cherry (12.7 percent), walnut (8.4 percent), white oak (7.2 percent), maple/box elder (5.4 percent), honey locust/Kentucky coffeetree (3.6 percent), and elm (3.3 percent). Powell also notes that high diversity of taxa represented, combined with the large number of fungal bodies in the samples, suggests that the inhabitants of the Triangle site were collecting dead wood from the floor of the bottomland forest. This implies that the site was occupied intermittently, because a more permanent occupation would likely have resulted in the inhabitants exhausting the supply of downed trees in the vicinity of the site and cutting standing trees.

Nut hulls are the most common form of plant food remains at the Triangle site. Of the 930 identifiable nut hull fragments, 99.8 percent are walnut or hickory. Walnut is the most common nutshell that can be identified to genus (36.3 percent), followed by thick-shelled hickory (18.4 percent) and thin-shelled hickory (1.6 percent). The remaining hickory-walnut shells are too eroded or broken to be identified to genus. This

is consistent with other sites in the Eastern Woodlands, where nuts form an important part of the subsistence strategy adopted by prehistoric Woodland populations.

Only 21 charred seeds have been collected from the Triangle site. These include three *Chenopodium* sp./*Amaranthus* sp., one wild bean (Strophostyles sp.), eight bedstraw (Galium sp.), one grass (*Poaceae*), three black nightshade (*Solanum ptycanthum*), one grape (*Vitis*), and four indeterminate seeds. Over half of the charred seeds were collected from Feature 64, which is one of the few Middle Woodland features at the Triangle site. Although some of these are considered part of the Eastern Agricultural Complex (Smith 1992; Wymer 1996), none of these clearly represent domestic plants. In fact, all of these reflect open, disturbed, moist habitats consistent with the bottomland edge environment immediately adjacent to the Triangle site.

Radiocarbon dating and analysis of temporally diagnostic artifacts has demonstrated that the Triangle site was occupied from the Late Archaic through the Late Woodland stages. Although the majority of excavated features cannot be attributed to a specific stage of prehistory, it is interesting to note that among those that can be assigned a temporal context, there are some differences between the Late Archaic, Middle Woodland, and Late Woodland features. Table 9-4 shows the distribution of nut, seed, and wood charcoal by feature and grouped by temporal stage. The Late Archaic pits contain the majority of nut hulls collected from the site. The lone Middle Woodland pit (Feature 64) contains only one nut hull, but 52 percent of the charred seeds collected from the site. The only Late Woodland feature (88) contains a mixture of nut hulls and charred seeds. Although this is clearly a small sample, this data seems to support the observation that the nature of occupation at the Triangle site changed through time.

INTERPRETATIONS

At large geometric earthworks like Hopeton, the size and scope of the earthen monument leads us to focus on the Hopewell people who built the earthworks. When we began work at the Triangle site in 1994, we assumed that most of the surface artifacts and geophysical anomalies were associated with the people who built the earthworks. The 1994 and 1998 test excavations at the Triangle site have demonstrated that this is an invalid assumption and documented that the landform was occupied over thousands of years. Of the eight radiocarbon dates from the Triangle site, five are indicative of Late Archaic or Early Woodland activities, one is clearly Hopewell, another one is Late Woodland, and the final one is Historic.

Evidence of prehistoric occupation at this site is extensive across the entire Triangle site, but none of the areas examined are indicative of anything other than short-term use and occupation. The density of artifacts and the number and type of features that have been encountered are suggestive of short-term use. Although we cannot rule out the possibility that Hopewell people lived somewhere on the Triangle site, research conducted thus far is indicative of only short-term and specialized use. The strategic location of the Triangle site, on the edge of a major terrace overlooking the Scioto River floodplain, made it an ideal place for short-term and seasonal camps throughout prehistory.

Table 9-4. Macrobotanical remains.

Feature#	Period	Fungal Tissue	Carya thick	Carya thin	Hickory family	Walnut	Acorn	Charred Seeds
1	Late Archaic		143	10	367	279	2	
17	Late Archaic				1	1		
143	Late Archaic							
149	Late Archaic		12		9	6		
64	Middle Woodland		1					11
88	Late Woodland		6	1	22	49		4
153	Prehistoric		9	4	3	1		
62	Prehistoric	14						
29	Prehistoric	92			2	2		
21	Prehistoric							1
40	Prehistoric							3
47	Prehistoric							2
44	Historic	252						
Total		**358**	**28**	**15**	**404**	**338**	**2**	**21**

The earliest evidence for occupation of the Triangle site dates to the Late Archaic period. During this time, site occupation is characterized by the presence of circular or oval pits with flat bottoms. The pits contain FCR and lithic debris, but relatively little food remains or temporally diagnostic artifacts. The relatively low density of artifacts and features relating to the Late Archaic is in marked contrast to the more intensely utilized shell midden sites seen in the Late Archaic of central and western Kentucky (Prufer et al. 2001).

During the Middle Woodland period, Ohio Hopewell people built two long parallel walls from the large square and circle earthworks southwest across the Triangle site. Although these long, low walls were mapped in the nineteenth century (Squier and Davis 1848; Thomas 1889), years of cultivation have eradicated any visible evidence of their presence. Magnetic and soil resistance survey has failed to produce any evidence that remnants of the walls still exist. The 1998 excavations did produce limited evidence for Hopewell activities in the area where the parallel walls were built.

Evidence for Hopewell occupation at the Triangle site is in the form of prismatic bladelets. Prismatic bladelets are made from carefully prepared blade cores and both of these artifact types are characteristic of Ohio Hopewell occupations. Bladelets occur in low densities in many of the 1994 and 1998 test units, but they are rare in the subsurface features. No blade cores were found at the Triangle site. This suggests that most of the features encountered at the Triangle site are not related to the period of Hopewell occupation and use. Hopewell activities are inferred from two different features, a prepared circular clay basin and a refuse pit with a sheet of cut mica. Although some of the other, more subtle features at the site may eventually be attributed to the Middle Woodland period, there is minimal evidence in this area for Hopewell occupation.

Current data suggests the Triangle site was only occupied for short periods of time by the Hopewell, possibly for ritual activities in the proximity of the parallel walls.

Late Woodland use of the site also appears limited. However, the contents of Feature 88 are so different from the contents of earlier pits that the nature of activities at the site must have changed. Food remains, stone tools, lithic debris, and pottery are plentiful in this Late Woodland feature but they are very minimal in the earlier features at the site. Until Feature 88 was exposed, we believed that the soil conditions at the Triangle site were not conducive to bone preservation. However, the presence of a large and well-preserved faunal assemblage in a relatively small pit demonstrated that the absence of faunal remains is not likely due to soil conditions. The nature of the faunal elements in Feature 88 suggests a late winter or early spring occupation, probably from a short-term camp rather than a sedentary village or hamlet. This may simply be a product of the limited sample of excavated features at Hopeton, but it more likely reflects a change in the nature and use of the site.

In addition to interpreting the archeological record at the Triangle site, this project was designed to study the utility of geophysical survey for possibly locating subsurface features associated with large earthwork sites like Hopeton. Weymouth et al. (this volume) present a more comprehensive assessment of this research question from the standpoint of geophysics, but a brief discussion of the Triangle site data is appropriate.

Magnetic and soil resistance surveys were conducted to determine if they could detect remnants of the parallel walls and identify possible subsurface features associated with Hopewell occupation of the site. Neither geophysical survey technique was successful in finding evidence that remnants of the parallel walls are still present. However, a number of anomalies that represent potential subsurface features were identified. Magnetic survey appears to be more effective than resistance for locating small potential occupation features (Weymouth 1998).

Test excavations were placed over 11 different magnetic anomalies that varied from 5.3 to 20 nT/m. Archeological features were identified in association with seven of these anomalies. Although no feature was identified in Test Unit 8, a substantial amount of FCR was collected from the plowzone, suggesting that a feature was present in this area but had been disturbed by cultivation. Of the total number of features recognized in excavation units, seven were easily identified in the magnetic survey data. Analysis of the size of these features, both in terms of magnetic strength and physical volume, is presented in Table 9-5. Features were classified into small, medium, and large based on total volume.

These data suggest that the magnetic survey data was very successful in identifying large features, particularly those over 100,000 cu cm. Of the seven large features that were identified, five of these were clearly visible in the magnetic data. Only one medium size feature was excavated, and it was not noticed in the magnetic survey data. Magnetic survey was only successful in identifying two of the 23 small features that were exposed by testing.

Table 9-5. Magnetic anomalies examined.

Anomaly #	nT/m	Excavation Unit	Feature #	Feature size (cm3)
4	7.2	Block A	22	Large
5	2.0	Black A	17	Large
7	5.3	Test Unit 8	?	-
11	5.5	Test Unit 7	63	Small
12	7.1	Test Unit 6	64	Large
13	5.6	Test Unit 3	?	-
14	5.3	Test Unit 1	?	-
15	6.9	Block B	71	Large
16	19.2	Block B	149	Large
17	7.3	Block B	104	Small
18	9.8	Block B	?	-

We are now clearly able to identify more anomalies in the geophysical survey data than we did prior to the 1998 testing program. The Triangle site research has been successful because it has demonstrated that we are able to identify magnetic anomalies that represent prehistoric features. The anomalies we focused on in 1998 turned out to be large and small pits. The geophysical survey was successful in identifying Feature 64, a large Hopewell pit, and four other large pits from the Late Archaic occupation. The magnetic survey was less successful in distinguishing smaller features. Reducing the interval between geophysical survey transects might produce more data and make smaller features easier to identify, but this will increase the cost and time required for survey. Ongoing investigations will continue to address this question with the goal of developing a geophysical survey methodology that will be efficient and productive for sites like Hopeton.

Our work at the Triangle site was initiated in 1994 with the goal of identifying evidence of Hopewell occupation in association with the parallel walls. Thus far, we have found only limited evidence that the Hopewell used the Triangle site. While it is possible that the Hopewell used this area for activities that left no physical evidence, it seems more likely that use of the area was reserved for short-term occupations associated with ritual activities. The Triangle site data also suggest we must be cautious in attributing all of the archeological remains that are in proximity to large earthworks to the Hopewell. Clearly, much more work is needed before we can make sense of what appears to be a fairly complex pattern of prehistoric activities in association with the Hopeton Earthworks.

Acknowledgements

Many people made significant contributions to the success of this study. Dr. John Weymouth, Steven De Vore, Dr. N'omi Greber, Forest Frost, Deborah Wood, and Phil Wanyerka worked with the author on the geophysical surveys of the Triangle site. Bret Ruby, Jarrod Burks, Jeff Weinberger, Bill Pickard, Joe Wakeman, Deborah Wood and Scott Troy took time away from their duties at Hopewell Cultural National Historical Park to assist with the 1998 excavations. Midwest Archeological Center staff, Bruce

Jones, Phil Wanyerka, Forest Frost, Bill Volf, Olivia Little, Harold Roeker and Linda Plock participated in the 1998 excavations and subsequent laboratory and curatorial processing. Particular thanks go to Pam Machuga, Larry Wickliffe, Susan Hollyday, Sean Casson and Dan Crace who volunteered their time during the 1998 excavations. We greatly appreciated the efforts of the students from the Milton Hershey School and their instructor Randy Farmer. Their work contributed immensely to the project, and their enthusiasm contributed greatly to the wonderful morale of the project. I wish to thank Drs. Bret Ruby, James Brown and N'omi Greber for their interest in the project and their willingness to offer advice and ideas during the excavation and analsyis of this data. Finally I want to thank Lynn Frankowski for supporting my many absences to pursue field studies at Hopeton and elsewhere.

CHAPTER 10

GEOPHYSICAL INVESTIGATIONS AT THE HOPETON EARTHWORKS

BY
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The large earthen enclosure sites of southern Ohio remain poorly understood more than a century and a half after they were mapped and described by Squier and Davis (1848). The great size of these sites, in combination with their relatively low density of artifacts, has served to discourage long-term archeological investigations. With the development of more efficient and effective geophysical sensing instruments, it is now possible to record and map the subsurface character of these and other large sites.

As part of the continuing study of the Hopewell culture in Ohio, a geophysical examination of the rectangular enclosure at the Hopeton Earthworks near Chillicothe, Ohio was conducted in 2001 and 2002. The Squier and Davis (1848) map of the Hopeton Earthworks shows a large circle, a large square, at least four small circles, and a pair of parallel lines extending southwest from the junction of the circle and square for about 730 m.

The research we report here was focused on the rectangular enclosure, which is the best preserved geometric enclosure at Hopeton. After more than two centuries of agricultural activities, walls that were once 4 m high and 15 m wide (Squier and Davis 1848) are now only 0.6-0.9 m high and have been flattened so much that their width is difficult to measure.

The geophysical investigations at the rectangular enclosure are of two kinds: surface mapping and subsurface measure of soils exposed in excavation units. Previous research at Hopeton produced evidence that the G858 cesium gradiometer offered the best combination of efficiency and resolution for large-scale mapping of this site and this instrument was used for the majority of surface magnetic survey at Hopeton.

In the 2001 season, the section of the square south of the road was surveyed with a Geometric G858 Cesium gradiometer. Part of the area was also explored with a Geoscan FM36 fluxgate gradiometer and with a Geoscan RM15 resistance meter (Lynott and Weymouth 2001, 2002). In 2002, the remainder of the west wall, the east wall, and the interior of the rectangle were surveyed with the cesium gradiometer. This also included a small part of the south edge of the large circle. In addition, parts of the west and east walls were covered with the FM36 and with the RM15. The choice of using magnetometry to obtain most of the geophysical data was indeed fortuitous as testified by the immediate success in seeing the magnetic anomalies along the wall line. The total area surveyed in 2001 and 2002 with the G858 was 321 20 x 20 m blocks or a total area of about 12.8 ha.

The geophysical survey of the rectangular enclosure at the Hopeton Earthworks revealed unusual patterns. The soil in the wall line is very magnetic along two bands that are centered on the slight topographic ridge of the earthwork. These bands are spaced about 10 m apart. In addition, there is a pair of bands where the shallow soil strata have high electrical resistivity. These resistive bands are spaced about 5 m apart and are centered between the magnetic bands. These geophysical findings indicate that the earthen ridge has a moderately complex construction.

THE CESIUM GRADIOMETER SURVEY

The advantage of using a gradiometer is that the diurnal variations in the earth's magnetic field are eliminated. In addition to its speed, the G858 has the additional advantage of high sensitivity and negligible drift. The gradiometer was configured in the vertical mode with the lower sensor 30 cm above the surface and the upper sensor 100 cm above the lower. With the moderately wide spacing between the two sensors, the readings of magnetic gradient are very similar to those that would be measured with a single sensor. The gradiometer was operated with a two-person crew, one holding the pole with the sensors the other carrying the batteries and electronic pack. The data were gathered in the continuous or walking mode using a 0.2 sec cycle time resulting in measurements spaced along each traverse at about 20 cm. The traverses were spaced 1 m apart. All traverses were only done south to north. With a cycle time of 0.2 seconds, the G858 specifications indicate that the sensitivity of each sensor is 0.03 nT.

After initially processing the raw data with MagMap of Geometrics, the subsequent processing was done with the Golden Software program Surfer. The data were not de-spiked – the occasional metal anomaly was left where it occurred. Since the traverses were unidirectional it was not necessary to de-stripe the data. The data were gridded with Surfer's Kriging algorithm at an interval of 0.25 x 0.25 m. The individual gridded blocks were then combined into mosaics for final mapping.

CESIUM GRADIOMETER RESULTS

Figure 10-1 is a map of all the 2001 and 2002 data. Also marked on the map are the positions of the trenches excavated across the wall. The most notable accomplishment of the geophysical survey was the discovery that the walls of the square are very distinctly visible in the magnetic survey data. The sharp magnetic boundaries on the interior and exterior of the wall is in marked contrast to existing topography, which is very subtle due to years of agricultural activities.

A topographic survey was done of the 2001 research area. Figure 10-2 illustrates the relationship between the surface magnetic data and a topographic profile at the same location. It can be seen that the magnetic maxima lie within the topographic high region of the earthwork line, but the magnetic maxima are closer together while the topographic high is broad. It is interesting to note that the spreading of the soils by plowing has not destroyed the material causing the magnetic highs within the intact wall. Later magnetic tests in trench excavations showed that the magnetic features were more than 0.3 m underground.

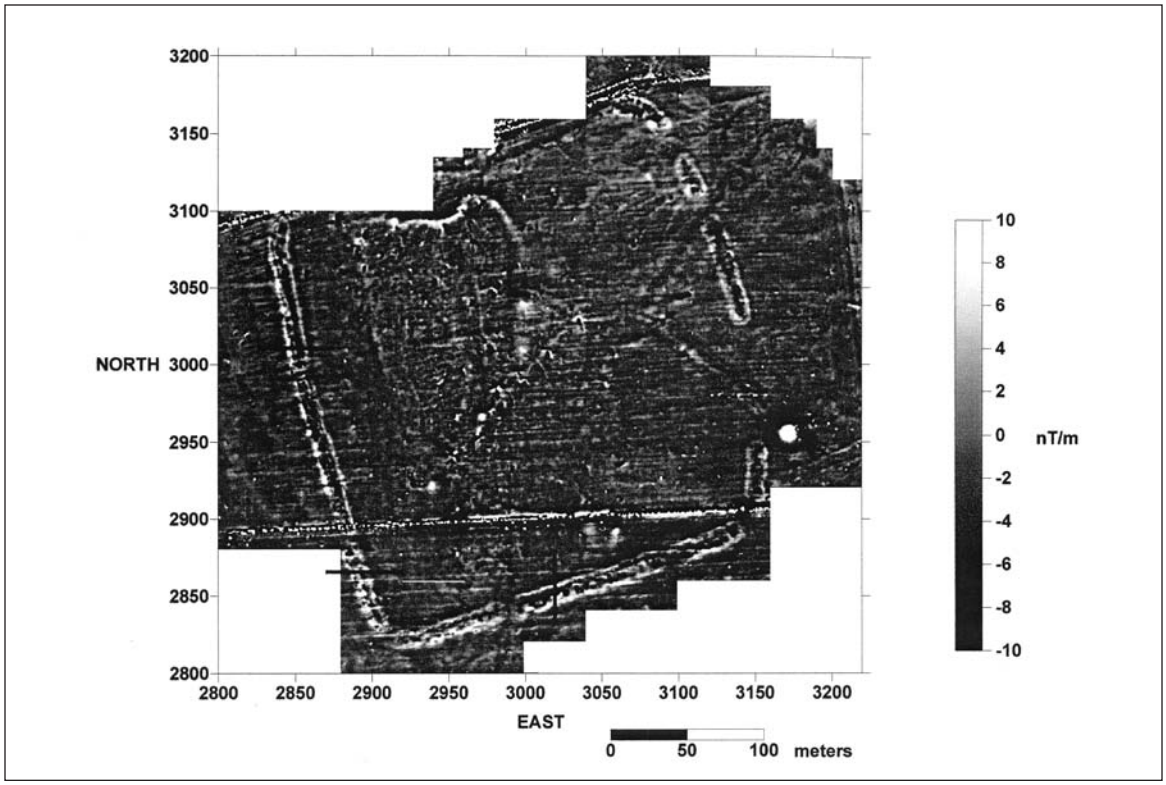

Figure 10-1. Cesium gradiometer map of the rectangular enclosure, Hopeton Earthworks.

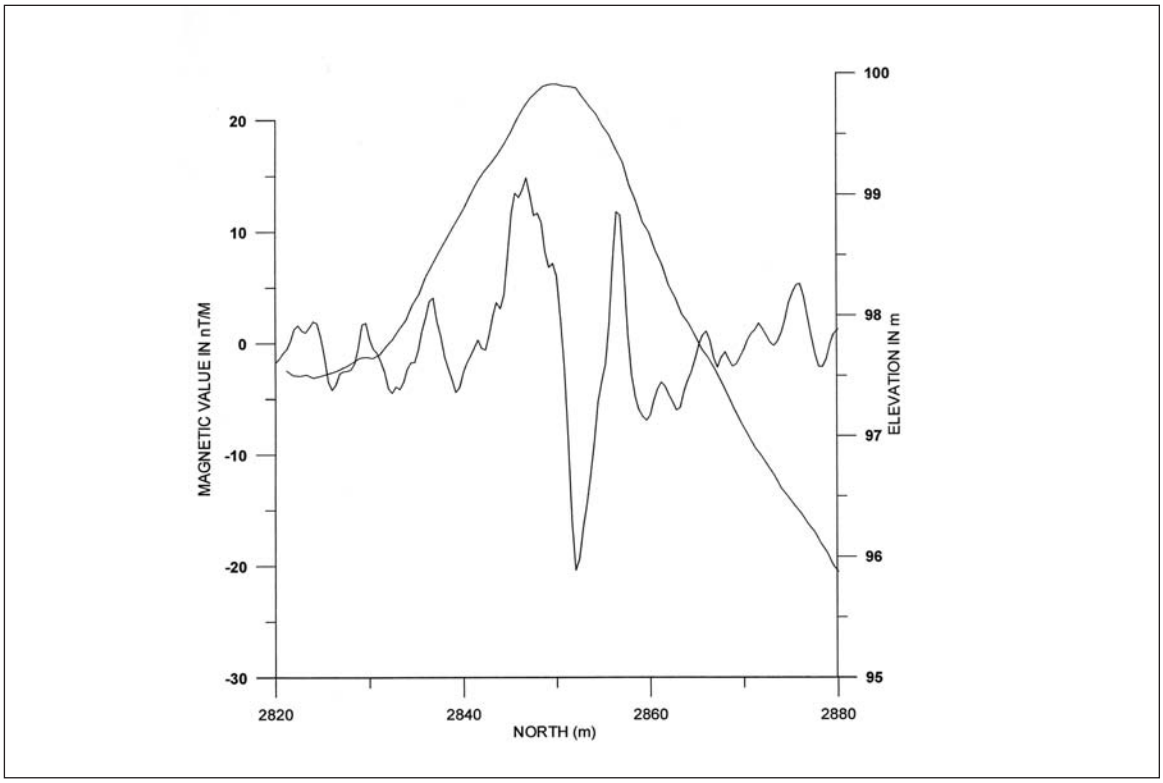

Figure 10-2. Topographic profile superimposed on magnetic profile along line east 3020.

The sharp magnetic contrast between the core of the wall and the surrounding soils suggests that the interior of the wall must have been constructed from a material that differed markedly from the soils that occur naturally on the terrace. The strong magnetic lines marking the earthwork wall lines are separated by 8-12 m. The magnetic maxima are 15-20 nT/m, which are clearly visible in the various profiles. Also, the breaks in the anomalies along the line of the wall are in the same positions as breaks in the wall as noted in the Squier and Davis maps. The strong line of magnetic anomalies along N2885 to N2900 arises from the remnants of a fence line that was beside the east-west road. The similar line of strong anomalies along the north edge of the map (N3150 E2980 to N3180 E3080) results from the remains of another fence along a former road. Just south of this can be seen a southern part of the large circular wall as it connects to the northeast corner of the square. The smaller circles next to the east wall will be discussed in a separate section below.

There are a number of anomalies inside and outside the square, some of which are of recent agricultural origin, but some are of archeological significance. The latter will be discussed below. The ubiquitous east-west streaks arise from disturbances to the soil caused by deep plowing. Some of these plow scars can have magnetic signals up to 2-4 nT/m, even 8 nT/m.

GEOSCAN INSTRUMENT SURVEYS

Several blocks were surveyed with two Geoscan instruments. The FM36 fluxgate gradiometer covered 38 blocks and the RM15 resistance meter covered 21 blocks.

The FM36 has a 50 cm vertical separation between the sensors. It was operated on traverses separated by 1 m in a continuous mode with eight readings per meter. The FM36 results are very similar to the G858 results.

The RM15 was operated in the twin electrode probe configuration with two moving probes separated by 1 m and two stationary probes set several meters away from the block being surveyed. The RM15 was moved along traverses separated by 1 m with readings spaced by 1 m. The resistance meter also shows the wall line, but in a way different from that of the G858. This will be discussed below in comparing the magnetic and resistance responses.

COMPARISON OF CESIUM MAGNETIC AND RESISTANCE DATA

A group of four blocks on the west wall line were surveyed with both the cesium gradiometer and the resistance meter so these blocks were mapped as a group for both instruments in Figure 10-3. Several conclusions can be drawn by comparing these maps.

Both the high magnetic values and the high resistance values form two parallel lines along the wall. This is true of all the magnetic data on the wall line and it can be assumed that it would be true of the resistance values all along the wall also. There are two sets of soils in the wall structure, soils with high magnetic susceptibility and soils with high resistance. The two magnetic zones are approximately centered on either side

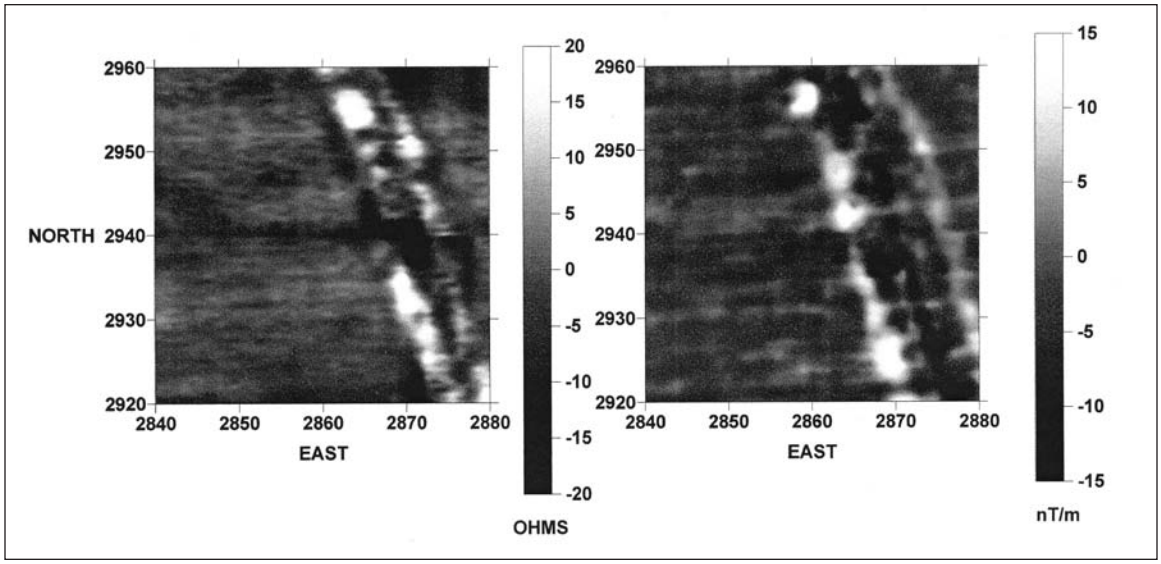

Figure 10-3. Four blocks surveyed with the cesium gradiometer and the RM-15 resistance meter.

of the topographic ridge that is visible at the surface; these magnetic zones have a spacing of about 10 m. The high resistance zones are about 5 m apart and they are symmetrical inside the magnetic zones. Since there are two lines of the resistive soil we can infer that the high resistance is not due to selective drying of the soil on the high part of the wall. In examining the maps as well as the profiles it can be seen that the highly magnetic soils are, for the most part, low in resistance or higher in conductivity. This would be true if the magnetic soils are porous, clayey, or both.

SMALL CIRCLES

The map of the Hopeton Earthworks by Squier and Davis (1848) show two small circles next to the east wall of the rectangular enclosure. Less than fifty years later, the resurvey by Thomas (1889:472) was unable to trace these small circles. In the magnetic data they show up but are very weak. Figure 10-4 combines the maps of both the northern and southern circles. A smaller circle is visible centered at N3120 E3140. This small enclosure was not shown on the Squier and Davis (1848) map of the site. It might not be prehistoric and could have a modern or natural origin. There is a west to east line of anomalies at about N2980, which is a trace of an excavated trench that was placed in the west part of the southern circle by Bret Ruby in 1997. Interestingly, the signals of the circles are negative, very faint, and below the background by 2-4 nT/m; the earth of the circular ridge is less magnetic than the surrounding soil. This is the opposite of the magnetic signals of the wall and likely reflects the interior ditch associated with these features (Squier and Davis 1848; Ruby 1997a). Figure 10-5 is a profile of the smoothed magnetic signal at N3006 across the southern circle. The lows at E3164.3 and E3202.5 are from the circle.

TRENCH EXCAVATIONS

In 2001 and 2002, three trenches were excavated across walls of the rectangular enclosure. As part of our research, we compared the stratigraphic data with the surface

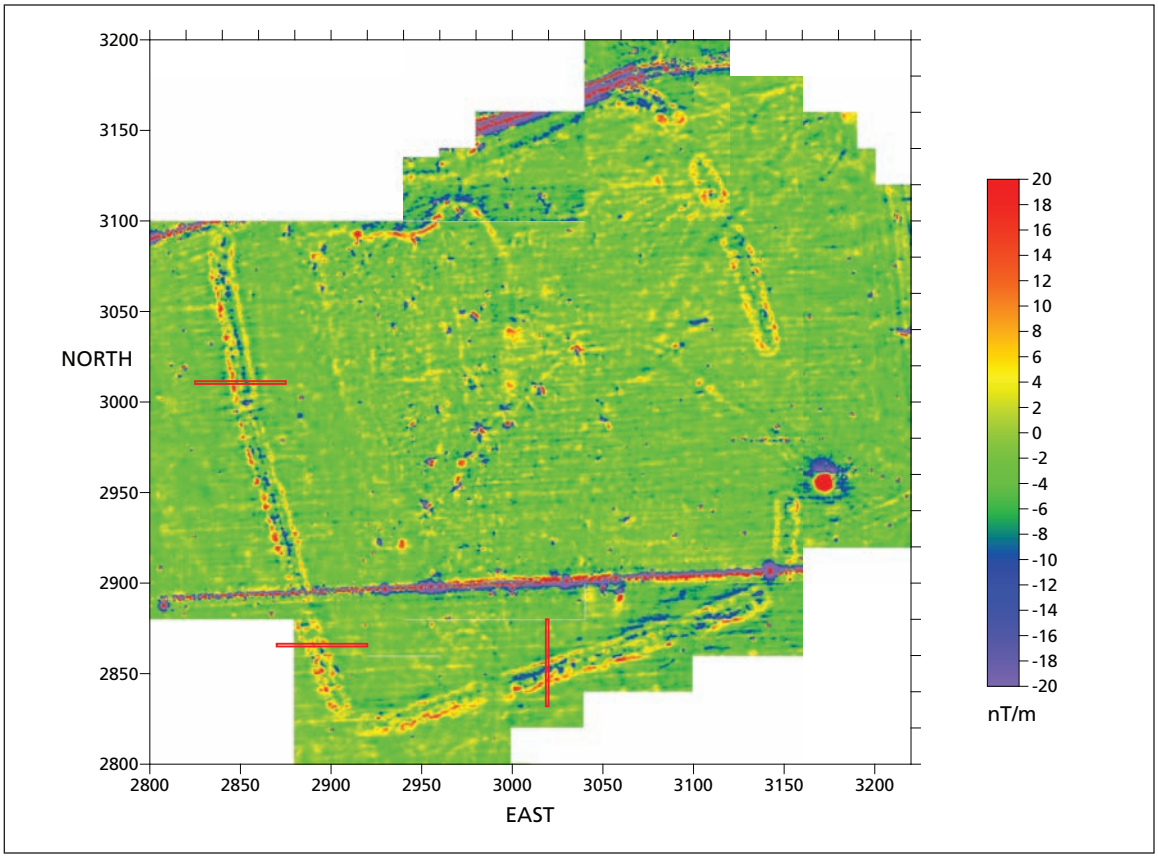

Figure 10-4. Small circles east of the east wall line of the rectangular enclosure.

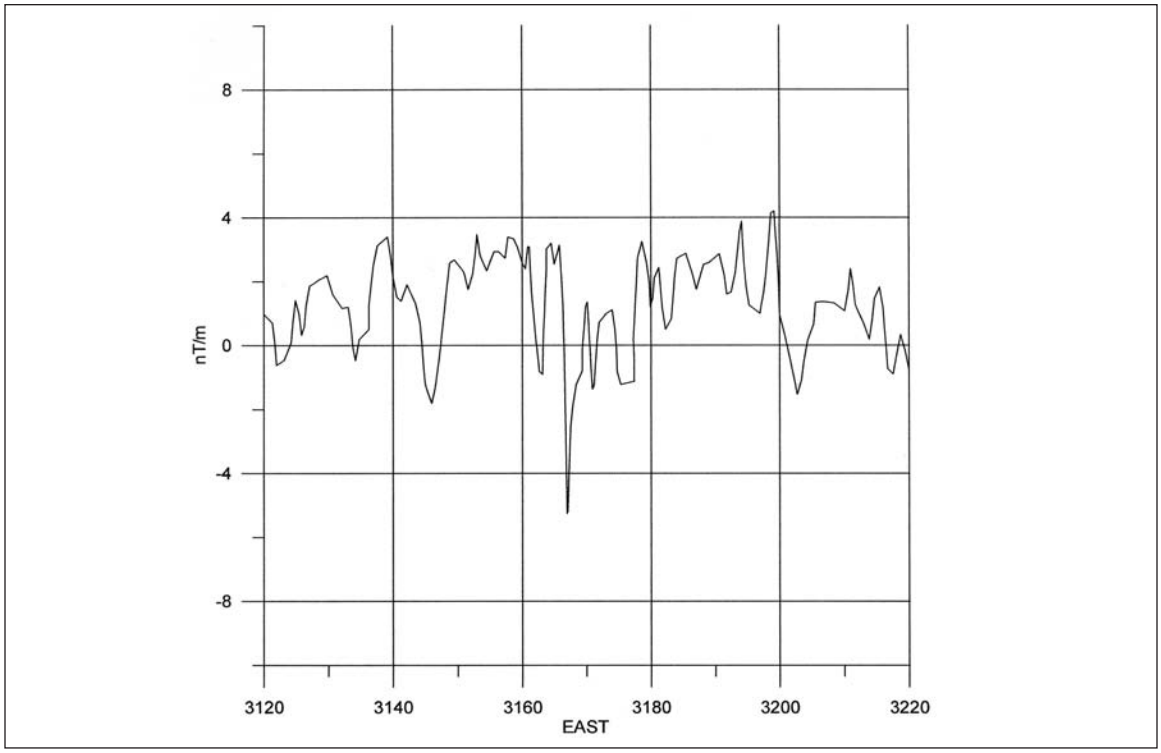

Figure 10-5. Magnetic profile through south Sacred Circle at N3006.

and subsurface geophysical data associated with these trenches. Understanding the relationship between these data is important to interpreting the geophysical data from mounds and earthworks.

In the 2001 season, Trench 1 was dug north-south through the south wall at about E3020. In the 2002 season, Trenches 2 and 3 were excavated east-west through the west wall. Trench 2 was at about N2865 and Trench 3 was at about N3010. The positions of the all three trenches are marked on the map of Figure 10-1. The construction sequence of Trench 1 is discussed in Lynott and Weymouth (2001, 2002) and Chapter 11 of this volume. We will first take a brief look at the construction sequence of Trench 1 and then consider some magnetic studies of Trench 3.

Trench 1

Trench 1 was 1.5 m wide and 48 m long. The general construction sequence for this segment of the south wall of the large square can be determined from the stratigraphy in the trench. First, all topsoil was removed from the area upon which the wall was built. This exposed subsoil that was a compact yellow clay-loam. Additional yellow clay-loam, similar to the subsoil, was then brought in from another location and piled up to form a wall. A red, sandy clay was then piled on the top and outside (south) of the yellow clay-loam wall. The contact between the yellow and red soils is very sharp and it would appear that little time elapsed between these two construction phases. According to Mandel, Arpin, and Goldberg (2003), "[t]he reddish fill strongly resembles a well-developed alluvial soil in the immediate vicinity of the site. Iron-bearing minerals in the parent material (sandy alluvium) were weathered during pedogenesis, thereby producing Fe^2O^3." The magnetic profile from the cesium gradiometer survey along the trench line (before excavation) had two strong, narrow maxima that must be related to the iron-oxide soils. The trench profile revealed two A horizons that sloped upward toward the middle of the wall segment and appear to represent the original surfaces of the wall. These have been covered by slopewash from the top of the wall as a result of historic agricultural activities.

Trench 3

Figure 10-6 is a map of the cesium magnetic data over the three blocks covering Trench 3, which was opened in 2002. Figure 10-7 is a profile of the magnetic data that were measured before excavation along the line of the north face of Trench 3.

After excavation, a Geonics EM38 was operated in the magnetic susceptibility mode on the south face of Trench 3 from E2835 to E2870. The EM38 was held with the bar oriented east-west and the dipoles vertical. It was moved along lines at a constant elevation and measurements were made at intervals of 0.1 m while profiles were made at nine different elevations. The data at elevation 99 m are plotted in Figure 10-8.

Also, excavation unit magnetic susceptibility measurements were made using a Bartington susceptibility meter with an at-surface probe. Measurements were made at 20 cm intervals on six elevations spaced 20 cm on the north face of Trench 3. Soil samples

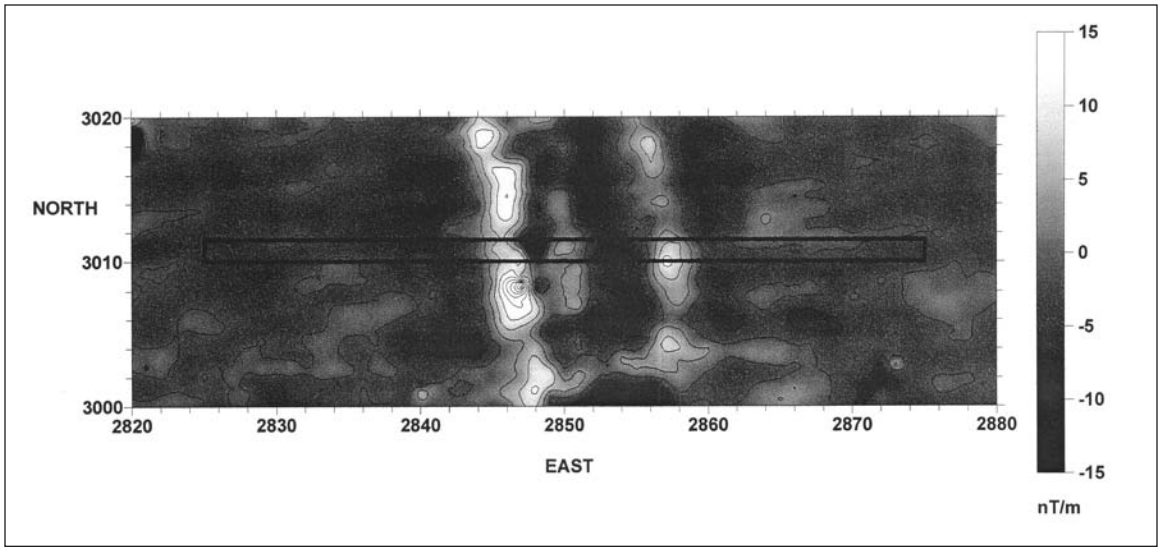

Figure 10-6. Cesium gradiometer map at location of Trench 3.

were taken and measured with the Bartington meter. Figure 10-9 is a map rendition of the susceptibility values on the north face of Trench 3. Figure 10-10 is a plot of the data from an elevation of 99 m smoothed with a running averaging window.

The three profile plots agree very closely. The deep low value at about E2848 in the G858 magnetic data and in the Bartington data but not in the EM38 data arises from a small concentration of nonmagnetic soil in the north face not extending to the south face. This can be seen in the map of Figure 10-6 and in the map of susceptibility values on the north face, Figure 10-9.

DISCUSSION

Geophysical measurements in the trenches agree with the findings of the above ground geophysical maps. The soil strata show interesting patterns in their magnetic and resistivity properties. Conductivity measurements were also made with the EM38 in Trench 3. These revealed a single high resistivity feature about 3 m wide, below the topographic ridge of the western wall. This matches a similar feature that was detected in 2001 by a resistivity pseudosection near the location of Trench 2.

The geophysical pattern of the earthen ridge can be summarized as "oYo." The letter Y approximates the cross-section of a high resistivity feature at the topographic ridge. Resistivity maps reveal a pair of high resistivity features at a shallow depth. A resistivity pseudosection and EM38 measurements in Trench 3 show that these high resistivity features merge into a single feature at a greater depth. The two letters "o" indicate the magnetic strata that are deeper and outside the high resistivity feature.

Magnetic measurements were also made on a cube of soil that was extracted from one of the magnetic measures in Trench 3. These tests indicated that the remnant magnetization of the soil approximately equals its induced magnetization. Therefore, archeomagnetic dating of the soil may be possible.

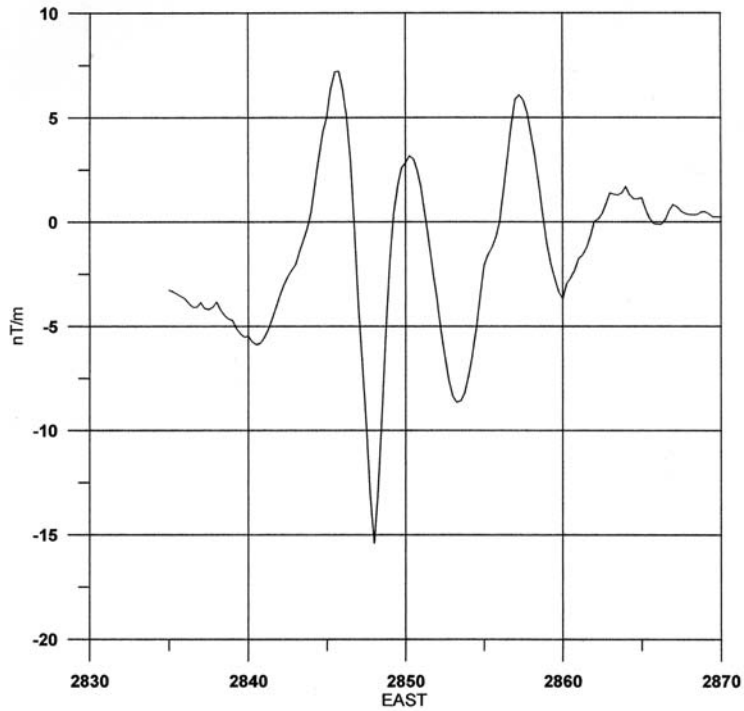

Figure 10-7. Magnetic profile along north wall line of Trench 3 before excavation.

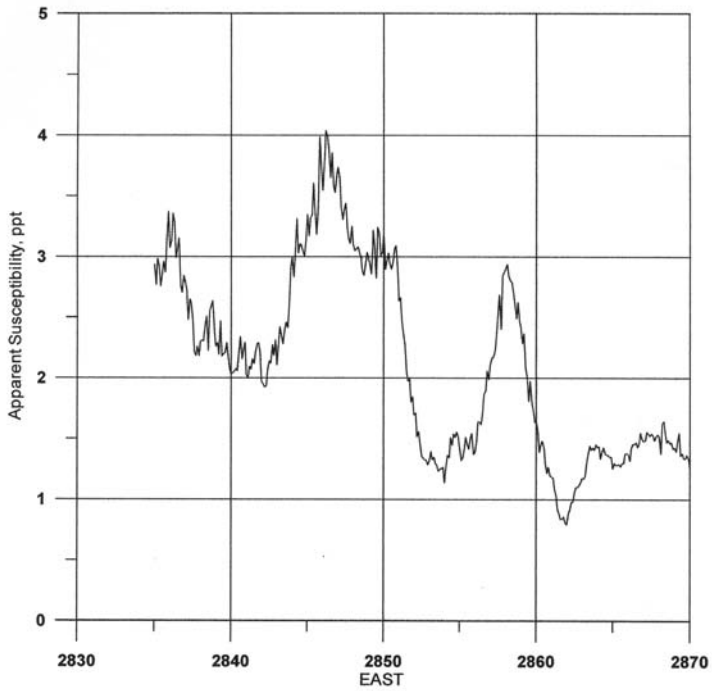

Figure 10-8. EM-38 magnetic susceptibility on south wall of Trench 3.

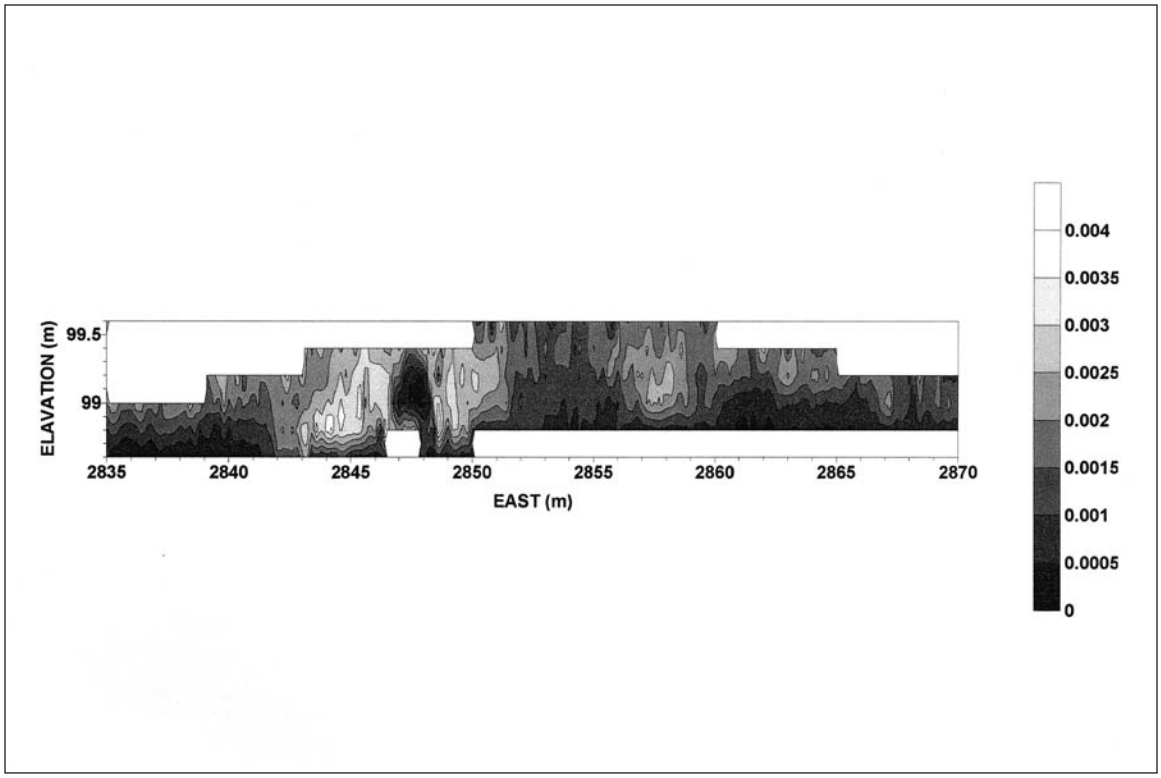

Figure 10-9. Contour map of volume susceptibility measured on north face of Trench 3.

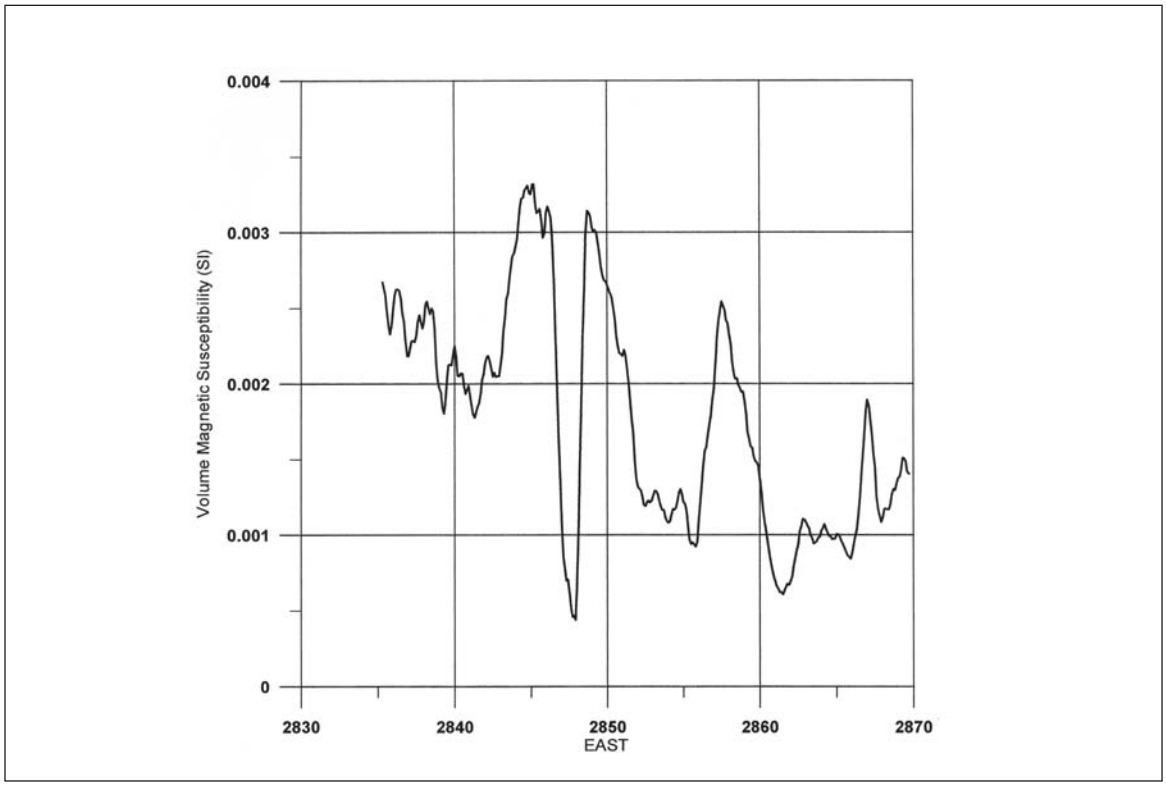

Figure 10-10. Magnetic susceptibility profile, north wall of Trench 3.

Feature Excavations

The walls of the earthen enclosures were not the only anomalies identified during the magnetic survey of the rectangular enclosure. In addition to the examination of the layout and structure of the earthwork wall, it was of interest to examine individual anomalies to see if they signaled significant archeological features. To that end, the magnetic survey data from the areas surrounding the wall lines were examined.

In looking for anomalies outside the walls, it is more advantageous to examine line contour maps than color image maps. The following criteria were used as a guide: a) the anomaly should not be strong, usually less than 10 nT/m, b) the anomaly should not obviously have a metal source; that is, the negative part should not have an orientation other than north of the maximum, c) it should not obviously be part of a plow scar. Clearly not all significant anomalies will be identified and some anomalies that appear interesting will turn out to have unimportant causes. Table 10-1 was drawn up for the 2001 data on the basis of these criteria. It contains location, strength, width, and rank. The last is somewhat objective and based on previous experience. The attribute "FWHM" is the full width at half maximum of the anomaly profile peak. This is an approximate estimate of the source-to-sensor distance.

Table 10-1. Hopeton feature anomalies of 2001.

SINGLE ANOMALIES AT THE HOPETON SITE OF MAY 2001							
ANOMALY	EAST	NORTH	nT/m	FWHM	RANK	REMARKS	
2	3108.00	2870.00	25	Narrow	F	Plow scar, Horseshoe, post hole	
3	3105.00	2870.50	12	1	B	Plow scar, Horseshoe	
4	3086.00	2866.50	32	1.5	A	Part of wall?, fired clay basin	
6	3008.00	2825.50	8	1	A	Large pit	

Four 2 x 2 m test units were placed to expose the four different magnetic anomalies in Table 10-1. All four units were located adjacent to or near the exterior of the south wall of the square earthwork. Test units were assigned numbers to correspond to the arbitrary numbers assigned to the anomalies, so Test Units 2, 3, 4, and 6 were excavated.

Deeply buried metal horseshoe fragments were found in Test Units 2 and 3 and may have produced signals that were misinterpreted as prehistoric features. Test Units 4 and 6 exposed two important prehistoric features that appear to be related to the Hopewell activities at the earthworks. These will be discussed below.

Feature 1 is located in Test Unit 4 and represents a large clay basin that had been hardened by fire. The basin has a raised rim on the north and west sides and slopes slightly downward to the southeast. Although the feature extends into the east wall of the test unit, enough of the basin was exposed to note that it appears to represent a prepared clay surface that was hardened by repeated exposure to fire. The basin contained burned soil, charcoal, and ash. Several ceramic sherds were found on the northwest edge of the basin. Although this basin is not as symmetrical and well prepared as the features that are routinely called crematory basins at other Hopewell sites, it is clear that it is similar

in form and construction. No bone was present in association with this feature, but the evidence for repeated fires is likely indicative of ritual activities. The feature is located at the eastern end of a segment of the south wall and appears to have been built at the edge of one of the many gateways to the square (Lynott and Weymouth 2002).

Feature 9 is located in Test Unit 6, which is on the south side of the southern wall of the square. The feature is located about 10 m outside one of the gateways in this part of the wall. The feature appears to be a large pit. The fill of the pit is similar in color to the surrounding subsoil, but the presence of abundant artifacts, combined with a looser textured soil in the pit, made it possible to distinguish the pit during careful excavation. Only a sample of the pit fill was excavated in 2001, with most of the remainder of the pit being excavated in 2002 (Spielmann 2002a, this volume). Fire-cracked rock (FCR), bladelets, pottery, and mica were abundant in the pit. Excavators recovered what appears to be part of a tetrapod ceramic vessel, along with fragments of other ceramic vessels and mica cut-outs. In numerous cases, small pieces of mica were found adhering to the interior surface of ceramic sherds, and potsherds and other artifacts were carefully placed in the pit and covered by sterile soil. Further analysis is necessary but the pit may contain refuse from ritual activities or it may have been used for the preparation of objects for ritual activities.

In 2002, a number of anomalies were identified as possible features (Table 10-2 is a list of these anomalies). Test units were then opened over some of the anomalies. The locations of four of these are shown in Figure 10-11, which is a map of some of the western blocks surveyed in 2002. Several of the test units yielded significant archeological features. The test units are listed in the last column of Table 10-2 with a brief description

Table 10-2. Hopeton feature anomalies of 2002.

ANOMALY	EAST	NORTH	nT/m	FWHM	RANK	TEST UNIT	CONTENT
J	2850.00	2909.50	5.0	1.0	B		
P&Q	2900.00	2928.50	12.5	1.4	A	11	Pit, some FCR
T1	2839.00	2921.00	4.0	1.5	B		
T2	2827.00	2936.50	5.0	1.0	B	8,18,19	Post holes
X	2845.00	2947.50	3.0	1.5	B	9	Fire hearth
AD	2908.00	2974.00	7.0	1.5	A		
Z&AE	2888.00	2960.00	12.0	1.5	A	14	F20, pit, red earth, charcoal
AI1	2812.00	2964.50	8.0	1.0	B		
AI2	2817.00	2970.50	3.0	1.0	B	10	Nothing
AP	2930.00	2997.75	6.0	1.5	A	16	Lots of FCR
AR	2906.00	3010.00	7.0	2.0	A on line 1	12	
AX	2810.00	3032.50	4.0	1.3	C		
BH	2869.00	3052.75	3.0	1.5	B		
BN	2852.25	3076.25	4.0	1.5	B		
BO	2873.00	3075.50	4.0	2.0	A	13	Large post hole

of the contents. Some of the features are of particular interest and will be mapped separately and described further.

Figure 10-12 maps four of the anomalies that were tested with the associated test units outlined. Test Unit 8 revealed a post mold with burned earth in it; this was the cause of the anomaly. The excavation was then extended to Test Unit 18 and Test Unit 19 with the rather surprising finding of a group or row of post molds, none of which had produced observable magnetic anomalies. Test Unit 11 arose from a pit containing several FCR. The anomaly in Test Unit 9 was caused by a fire hearth that was about 40 cm below surface. Test Unit 14 contained Feature 20, which was very interesting. The initial excavation down to about 60 cm revealed nothing in spite of the 12 nT/m anomaly that prompted the test. A fluxgate magnetometer was scanned over the exposed surface of the excavation; analysis of the numerical readings indicated a feature 20 cm lower. Further excavation lead to a pit at 80 cm below surface that contained some red earth.

CONCLUSIONS

The productive interplay of archeological and geophysical research is clearly demonstrated in the work at Hopeton. Large earthen enclosure sites like this are too vast for traditional archeological sampling strategies. Various forms of geophysical survey offer a systematic mechanism to map the subsurface character of even very large sites. The results obtained at the Hopeton Earthworks suggest that similar methods could prove useful at other large Ohio Hopewell mound and earthwork sites.

Acknowledgments

The continuing work at the Hopeton Earthworks has been a team effort involving many people, among whom were Mark Lynott and Steve DeVore of the Midwest Archeological Center, John Weymouth of the University of Nebraska, Bruce Bevan of Geosight, Rinita Dalan of Minnesota State University Moorhead, Jennifer Pederson Weinberger, and Jarrod Burks of Hopewell Culture National Historical Park. The exhausting work of obtaining the cesium gradiometer data day after day with low noise and high quality were obtained by two crews (at different times) of Bill Volf, Ann Bauermeister, Melissa Kruse, and William Hill.

The work of the three authors was divided as follows: Weymouth coordinated the magnetic and resistivity surveys and did their analysis; Bevan did EM38, resistivity, and magnetic tests in Trenches 2 and 3; and Dalan made magnetic susceptibility measurements in Trenches 2 and 3.

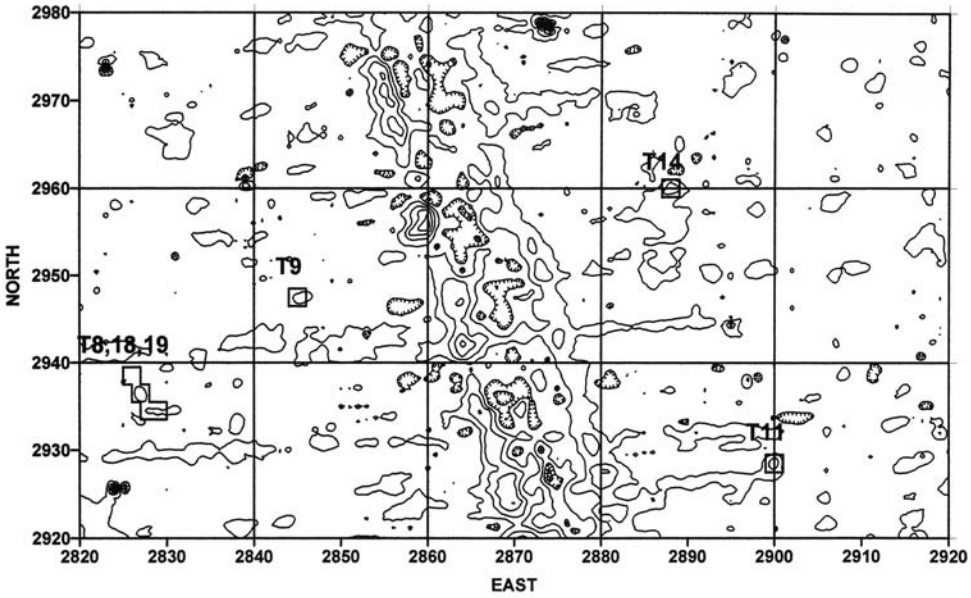

Figure 10-11. Gradiometer contour map showing location of four anomalies.

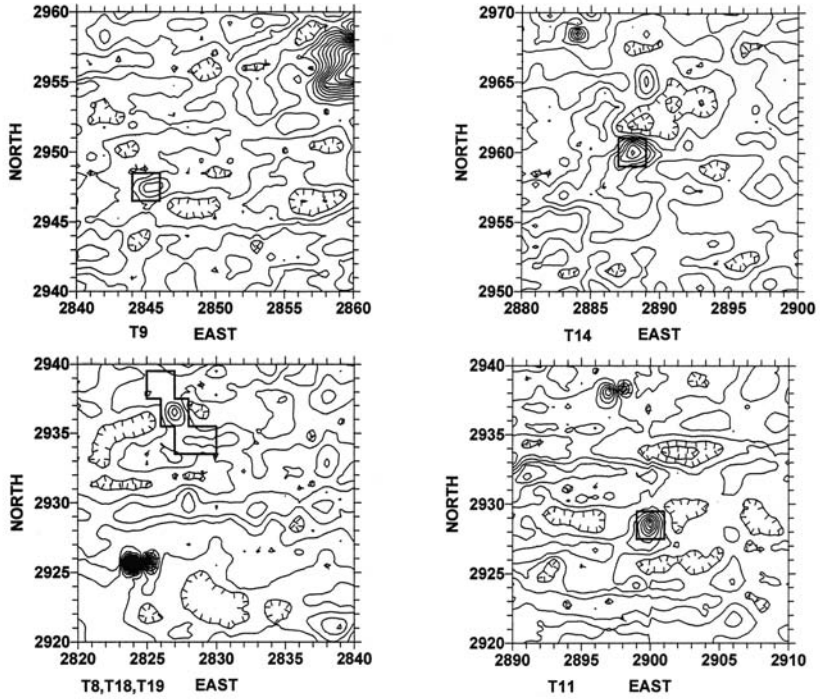

Figure 10-12. Detailed contour map of four anomalies.

CHAPTER 11

ARCHEOLOGICAL AND GEOARCHEOLOGICAL STUDY OF THE RECTANGULAR ENCLOSURE AT THE HOPETON WORKS

BY
MARK J. LYNOTT AND ROLFE D. MANDEL

The large Hopewell geometric earthworks of southern Ohio have attracted the interest of archeologists and the general public for more than 150 years, but many basic and fundamental questions about the earthworks and the people who built them remain unanswered. Archeological study of mounds has produced a good view of Hopewell mortuary rituals, but very little effort has been dedicated toward understanding the large geometric earthworks that characterize Hopewell in the Scioto River Valley. As part of an ongoing, multi-year study of the Hopeton Earthworks north of Chillicothe, we are conducting a multi-disciplinary study of the earthen walls that comprise the earthworks. The earthworks at Hopeton, as reported by Squier and Davis (1848) and later by Cyrus Thomas (1889), consist of a large circle, a large square, two smaller circles to the east, and two long parallel walls (Figure 11-1).

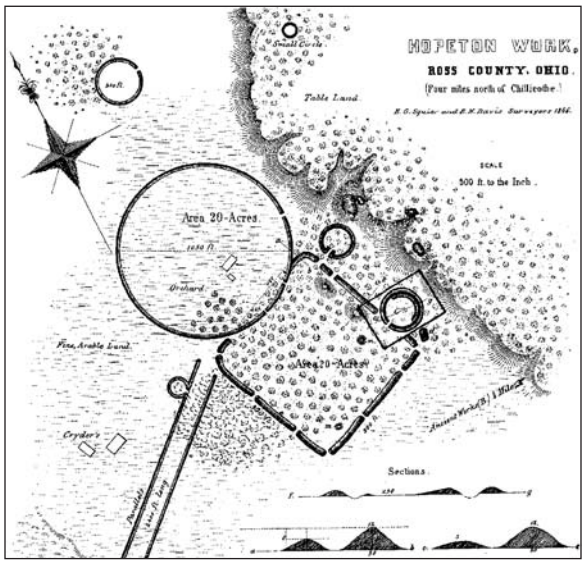

Figure 11-1. Hopeton Earthwork as depicted by Squier and Davis, 1848.

Although Squier and Davis were certainly not the first writers to mention these great earthworks north of Chillicothe, their 1848 description and map was the first to reach a large audience. The earthworks that they recorded consisted of "a rectangle, with an attached circle, the latter extending into the former, instead of being connected with it in the usual manner" (Squier and Davis 1848:51). They also noted that two smaller circles were integrated into the east side of the rectangle and a pair of parallel walls extend from the northwest corner of the rectangle 731.5 m to the southwest. The large circle was reported to be 1050 ft (320 m) in diameter, and the rectangle was 950 ft by 900 ft (289.5 x 274.3 m). The walls of these two large geometric enclosures were not continuous, but built in segments. Squier and Davis illustrated three breaks or gateways in the large circle and the twelve gateways in the rectangle.

The monumental nature of the earthwork was documented in the size and construction of the earthen walls. Squier and Davis noted that the:

> [w]alls of the rectangular work are composed of a clayey loam, twelve feet high by fifty feet base, and are destitute of a ditch on either side. They resemble the heavy grading of a railway, and are broad enough, on the top, to admit the passage of a coach. The wall of the great circle was never as high as that of the rectangle; yet, although it has been much reduced of late years by the plough, it is still about five feet in average height. It is also destitute of a ditch. It is built of clay, which differs strikingly in respect of color from the surrounding soil [1848:51].

Squier and Davis recognized that with the absence of a ditch in association with these massive walls, vast amount of soil had to be carried here from another location. They noted the presence of several "dug holes" in the hillside to the east, but also noted that these were insufficient to account for all the soil used to build the earthworks (Squier and Davis 1848:52). Although they did not elaborate on this point, this very clearly raised the question – how were the walls constructed?

Squier and Davis also initiated discussion about the function of the earthworks when they suggested they were built for defense. In making this interpretation, they did note that the location of the earthworks in a setting that could be overlooked from higher ground to the east argued against a fortification unless the walls had included palisades. It is unlikely that any serious scholar today would propose that Hopeton was built for defensive purposes, but the question – how was it used? – is still a valid research question.

The origin of the mounds and earthworks in the eastern United States was a hotly debated topic among scholars of the late nineteenth century (Silverburg 1968). The newly established Bureau of Ethnology under John Wesley Powell was provided with $5,000 by the U.S. Congress in the appropriation bill for 1881 for archeological investigation of the mound builders and the prehistoric mounds. Under the direction of Cyrus Thomas, the Division of Mound Exploration began investigating and recording mounds and earthworks throughout the eastern United States. Thomas was impressed with the geometric nature of the earthworks in the Ohio River valley and sent Colonel Middleton to resurvey many of the sites recorded by Squier and Davis.

Middleton's detailed survey of the rectangle and large circle was presented by Thomas (1889) in a paper that was highly critical of the accuracy of the survey work of Squier and Davis. Although the new survey confirmed the general shape and configuration of the earthworks, Thomas noted that it is "apparent from Pl. VIII, which represent the square according to the resurvey, that the form given in *Ancient Monuments*, L. XVII, is erroneous in that it is much more regular than the facts warrant. Neither side is straight, nor is there a right angle at any point. It is not regular in any sense, but was doubtless intended for a square" (Thomas 1889:25). Thomas also reported that the actual length of the four walls of the rectangle is 291.6, 241, 293 and 251.5 m respectively. Thomas noted that the walls of the rectangular enclosure were relatively well preserved, with the lowest point still being 1.5 m high.

Although Hopewell earthwork sites in the Scioto River valley attracted considerable archeological attention in the first half of the twentieth century, professional archeologists paid the Hopeton Earthworks very little attention. However, while managing Mound City Group National Monument, located across the river from Hopeton, National Park Service managers often expressed a desire to see Hopeton protected (Cockrell 1999). Through the efforts of John L. Cotter, Hopeton was nominated and designated a National Historical Landmark in 1964. In 1976, David S. Brose prepared a report for the National Park Service on the condition, suitability, and feasibility of adding Hopeton to the National Park system. Through the dedication of Congressman John Seiberling and Senator Howard Metzenbaum, legislation authorizing the purchase of the Hopeton Earthworks passed in 1980. Unfortunately, a moratorium on adding new lands to the National Park system under the administration of President Ronald Reagan delayed purchase of the site until 1988 (Cockrell 1999:326). Annual cultivation during this period continued to degrade the earthworks, and the delay also resulted in a substantial increase in land values and subsequent increase in the cost of the purchase.

The National Park Service began research at Hopeton in 1994 as an effort to discover if settlement or habitation sites were associated with the large earthwork. This effort focused on a triangle-shaped tract of land along the terrace edge where the parallel walls ended. That study also included geophysical survey and excavations aimed at determining whether evidence of the parallel walls remained. A report on research at the Triangle site is presented in Chapter 9 of this volume.

Although numerous models have been proposed to explain the nature and distribution of the large geometric earthworks of the Scioto River Valley, archeological research has been unable to answer three basic questions about these earthen monuments:

> When were the walls built? How were they built? What was their purpose or function?

In the summer of 2001, we enlisted support from a group of colleagues and initiated a multi-year study aimed at answering these questions about the Hopeton Earthworks through the use contemporary technology and research techniques. We believe that the best way to build an understanding about the relationship between the giant earthworks and settlement patterns associated with them is to study them one site at a time. We believe that these large earthen monuments can best be studied through a sustained multi-year effort using a wide range of archeological, geophysical, and geoarcheological techniques. This paper describes our first three seasons of research, focusing on the large rectangular enclosure.

THE STUDY OF THE RECTANGULAR EARTHWORK

The rectangular enclosure is comprised of eleven wall segments separated by a series of gateways. The north side of the rectangular enclosure is formed by the southern arc of the large circle. The east wall of the rectangle is formed by four wall segments and two smaller "sacred circles." Nearly two centuries of agriculture have severely impacted all of these earthen architectural features. Some of these features are no longer visible as

topographic elements of the site (Figure 11-2). Much of our research has been focused on determining the condition and research potential of these earthen features.

In 1996, Bret J. Ruby directed hand-excavation of a 1 x 14 m trench across a segment of earthen wall that forms the northwest corner of the enclosure. This is the best preserved segment of earthen wall at Hopeton, having been preserved in a fence-row since at least 1938. This wall segment currently stands 1.5 m high and is 20 m long. Ruby (1997a) noted that agricultural activities have greatly reduced this part of the wall, but

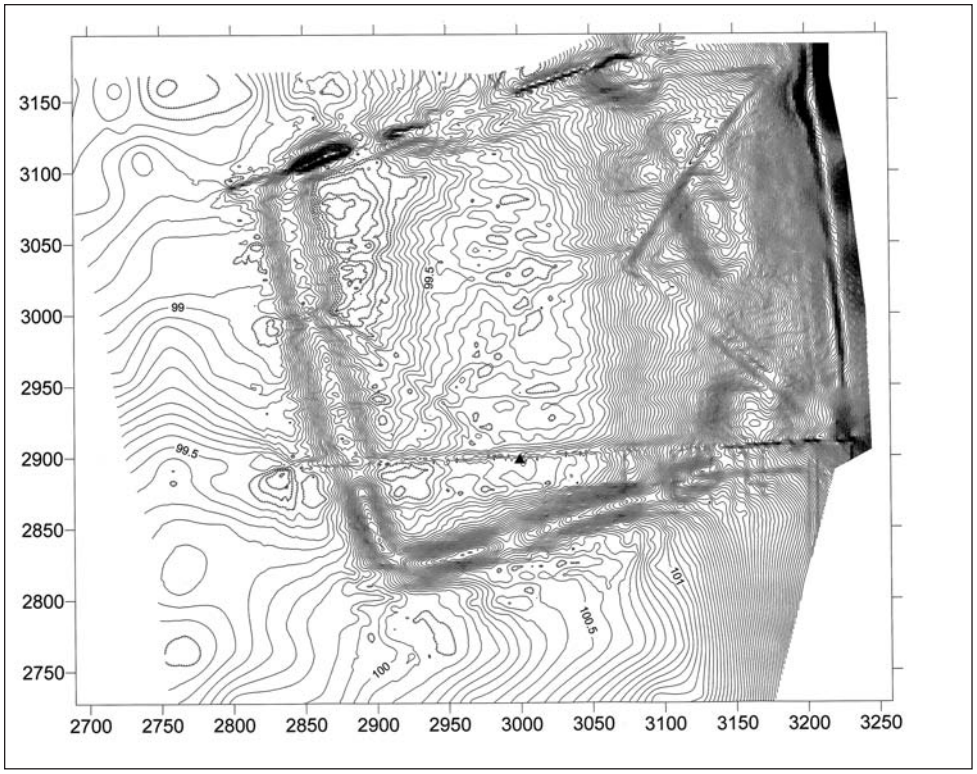

Figure 11-2. Current topography of the rectangular enclosure, Hopeton Earthworks.

that the core of the wall appeared to be largely intact. On the basis of deposits exposed in the 1996 excavation, Ruby reported that three soil deposits representing different stages in the construction of the wall are present.

This segment of wall is reported to have been built upon "a deep, highly organic, undisturbed A horizon consistent with a prairie soil" (Ruby 1997a:4). The builders of the wall placed a 1 cm thick layer of sand and clay on top of an irregular layer of silt loam, which was deposited immediately on top of the surface of the A horizon. Ruby (199a7:4) notes that this "surface was overlain by a deposit of wood charcoal that had burned *in situ*." Small flecks of mica were observed in the residue from flotation samples collected from this stratum. The *in situ* burning and mica flecks appear to be associated with a specific activity conducted prior to the construction of the first major part of the wall segment. This type of feature has also been observed in our other three trenches, and appears to be the product of rituals conducted in association with construction of wall segments.

The first major phase of construction associated with this wall segment consisted of a low linear berm of yellow-brown silt loam. This deposit was only about 20 cm tall and slightly more than 6 m wide. The next phase of wall construction consisted of the deposition of a large amount of yellowish-brown silt loam on the southern half of the basal wall deposit and extending southward onto the A horizon for about another 4.5 m. In 1996, this second layer of silt loam still rose more than 1.5 m above the original A horizon and must have been much thicker when the site was recorded by Squier and Davis. The next stage of wall construction is a layer of reddish-brown silty clay-loam that was piled on the northern half of the initial berm and piled against the side and possibly on top of the yellow-brown silty loam that formed the second phase of the wall. Ruby's (1997a:Figure 4) description of this profile concludes that this reddish-brown sediment was the final phase of wall construction, but his drawing of the profile illustrated redeposited soils on either side of the deep mantle of soil associated with the first three phases of wall construction. Based upon our observation of three other profiles through wall segments at Hopeton, we believe these redeposited soils are sediments that were placed on the top and sides of the wall segments by the builders. If this is correct, what Ruby assumed were redeposited soils are the original edges of this segment of the wall. Squier and Davis reported that the walls of the square were approximately 15.2 m wide. According to Ruby's profile (1997a Figure 4) this segment of wall would have been originally about 13.4 m wide.

GEOPHYSICAL SURVEY

Our study of the earthworks at Hopeton was initiated in the spring of 2001 with a geophysical survey of the southern wall of the rectangular enclosure (Figure 11-3). The purpose of this survey was to begin an assessment of the potential of geophysical survey to understand the subsurface composition of earthworks and mounds. Consequently, a wide variety of different methods and instruments have been used to test their utility in producing data about subsurface features and deposits. Based upon our experience with different geophysical instruments at Hopeton, we have conducted the majority of our survey work with a G858 cesium gradiometer. We also use an RM-15 soil resistance meter and a Geoscan FM-36 fluxgate gradiometer.

In May 2001, the Midwest Archeological Center initiated geophysical survey of the southern wall of the rectangle at Hopeton. Geophysical survey data was collected in blocks measuring 20 x 20 m. A total of 47 blocks were surveyed, covering an area of 18,200 sq. m. The most notable result of this effort was the discovery that the western and southern wall segments that comprise the rectangle are very distinctly visible in the magnetic survey data. The interior and exterior of the walls appear as sharp lines that are in marked contrast to the gradual slope of the existing topography. This suggested to us that the sharp magnetic contrast between the core of the wall and the surrounding soils likely meant that the soils used to form the core of the wall must be different from the soils that occur naturally on the terrace. A detailed description of the methods and results of our ongoing geophysical surveys are presented by Weymouth et al. (this volume).

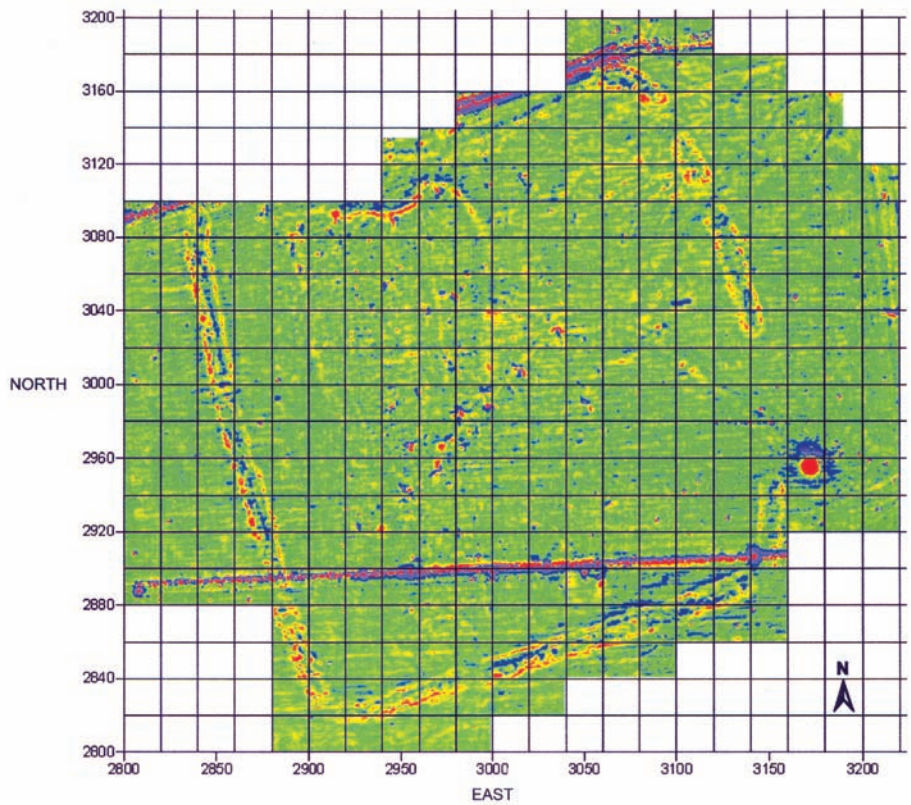

Figure 11-3. Magnetic survey map of the rectangular enclosure, Hopeton Earthworks.

TRENCH EXCAVATIONS

We have used geophysical surveys as a basis to plan the location of test trenches to further investigate the nature of the composition of the earthen walls. Trench locations were planned for places where the geophysical survey data was sharp and the edges of the wall were well delineated. It was presumed that the core of the wall segments might be better preserved at these locations. Thus far, four trenches have been excavated through walls of the square. Trench 1 was excavated in 2001, Trenches 2 and 3 were excavated in 2002, and Trench 4 was excavated in 2004 (Figure 11-3). Each of these trenches provides us with a cross-section of a wall segment, and an opportunity to examine the relationship between the sediments used to construct the wall segment and the geophysical survey data.

Trench 1

The southern wall of the rectangular enclosure is formed from three wall segments. Trench 1 was excavated north-south across the central portion of the middle segment in the southern wall. The north-south orientation of the trench was selected to correspond with the site grid, but consequently the trench is not precisely perpendicular to the wall segment. Trench 1 was 1.5 m wide and 48 m long. It was located between N2880

Figure 11-4. Trench 1 showing red soil overlying yellow soil in wall construction.

and N2832 and between E3018.5 and E3020 on the site grid (Figure 11- 4).

Trench 1 was excavated by backhoe. The operator very carefully removed small amounts of soil along the trench alignment as archeologists watched and stopped the excavation to more closely examine features or changes in the soil. In the core of the wall, and in several places where the backhoe exposed features, mechanical removal of soil was halted. In these areas, the remaining soil to the base of the wall segment was removed with shovels and trowels. Although very few artifacts were observed during the excavation of Trench 1, three prehistoric features were recorded and excavated. The walls of the trench were cleaned and examined in an effort to understand how the wall was constructed.

The general construction sequence for this segment of the south wall began with the removal of topsoil from the area upon which the wall was built. This exposed the compact yellow silt-loam subsoil and the builders of this segment piled additional yellow silt-loam sediments in a row to form the base of the wall. Red sandy-loam sediments were then piled on the top and south side of the yellow silt loam. A gray-brown loam was then piled on the top and both sides of the growing wall. The contact between the original yellow silt-loam and the red sandy-loam is sharp and distinct, suggesting that little time elapsed between the deposition of these two materials. The original interior and exterior surfaces of the wall segment are preserved under slope wash from the top of the wall. They appear as gray organic layers that slope upward from the margins of the wall and are truncated by the plowzone (Figure 11-5).

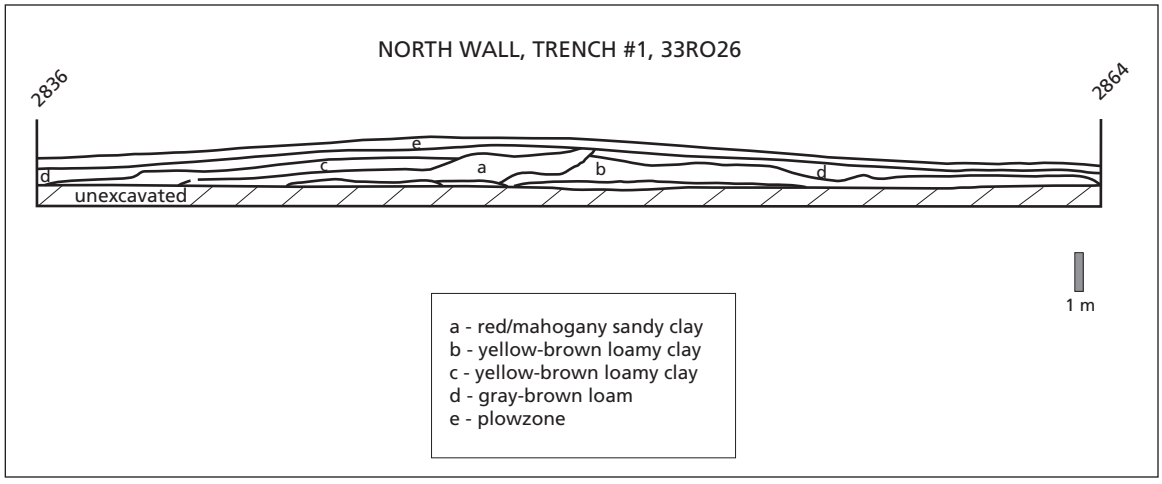

Figure 11-5. Profile drawing, Trench 1.

Figure 11-6. Trench 2 showing the dark organic soil that formed the original wall surface.

Very few artifacts were observed in the wall fill, but four features were recorded in Trench 1. At the base of the wall, lying directly on the undisturbed yellow silt-loam subsoil, Trench 1 exposed two charred oak logs. Both logs were lying horizontally and in a perpendicular orientation to the trench. There was no burned or reddened soil associated with the logs to indicate that they were burned in place. Based upon their stratigraphic position, it appears that they were laid on the top of the undisturbed subsoil and then were covered by additional yellow-brown clay loam. The logs were designated Feature 6. In addition to the burned logs, three post holes were exposed during the excavation of Trench 1. Feature 2 was at the northern end of Trench 1, located inside the square and was not associated with the wall segment. Features 4 and 5 were post holes exposed within the wall fill. Feature 4 contained red sandy-loam sediments and had been excavated into the yellow silt-loam wall fill. Feature 5 contained yellow-brown silt-loam and was excavated into the red sandy-loam wall fill. The purpose of the post holes is unknown, but the burned log at the base of the wall segment appears to be in some way related to activities associated with the start of the construction of this wall segment.

Trench 2

The western wall of the rectangular enclosure is formed by three wall segments. Trench 2 was excavated in an east-west direction across the southern-most wall segment, and Trench 2 was 43 m long and 1.5 m wide (Figure 11-6). Trench 2 was excavated by backhoe in the same manner as described for Trench 1. Much like we noted in Trench 1, very few artifacts were observed during the excavation of Trench 2. However, near the base of the wall, we exposed a small feature that appeared to be directly related to construction of the wall.

The construction sequence in Trench 2 may be reconstructed from the stratigraphic profile recorded in the trench (Figure 11-7). Just as we observed in Trench 1, the builders of this segment stripped all the topsoil from the area under the wall segment and exposed yellow-brown silt-loam subsoil. The surface of the subsoil was unevenly exposed and rises and divots are visible in the trench profile. After the subsoil was exposed, the builders brought in quantities of dark gray-brown silt-loam and piled it up to form the base of the wall segment. This dark-colored deposit is 20-25 cm thick. Large amounts of yellow-brown silt-loam were then piled on the eastern half of the dark soil and extending eastward about 6 m onto the subsoil. This deposit is similar in color and texture to the subsoil and reaches a maximum thickness of 110 cm. After the yellow-

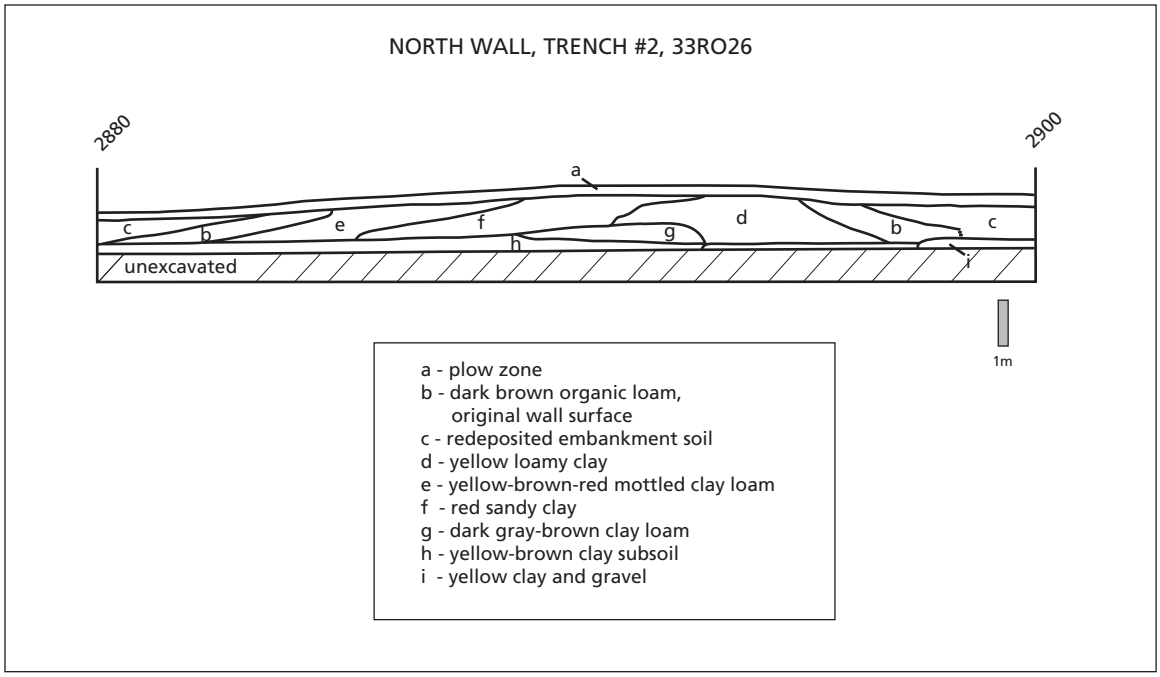

Figure 11-7. Profile drawing, Trench 2.

brown sediments were deposited, the builders then piled yellowish-red sandy-loam on top and to the west of the developing wall segment. The color of the soil was most consistent over the center of the wall segment and became somewhat mottled as the soils were piled on the outside of the wall. We assume this is likely due to changes in the source material being used in the wall, but it is possible that post-depositional processes may have contributed to the mottling also. This reddish soil material is not as vivid in color as we observed in Trench 1, but the red character of the soil is still notable. Dark loam soil from the original wall surfaces are still visible on the sides of the wall, where they have been covered by redeposited wall fill that has been pulled down and outward by agricultural activities.

During the excavation of Trench 2, we exposed a small area of burned soil and charred material lying on top of the dark organic soil that formed the basal wall segment. Due to the reddened color of the soil associated with Feature 11, we believe the charred materials were burned in place. The only artifacts found in association with this feature were three small fire-cracked rocks, a broken quartz cobble, and very small piece of mica. The location of this feature at the intersection of two different soil materials, resting on top of the dark basal wall segment, is significant. We believe the feature is a product of a ritual conducted in association with the completion of the first phase of construction for this wall segment.

Trench 3

Trench 3 was excavated in an east-west direction across the northern-most wall segment forming the west wall of the enclosure. The trench was 50 m long and 1.5 m wide. Trench 3 was excavated by backhoe in the same manner as described for Trenches 1 and 2. Much like we noted in the other trenches, very few artifacts were observed during the

excavation of Trench 3. However, we did expose two small features that appear to be directly related to construction of the wall. Trench 3 was located at the southern end of this wall segment and we noted that the various soil deposits exposed in this trench are more compressed than the other two trenches. We believe this is because the end of the wall segment tapered toward the gateway just as the sides of the wall segment taper on both sides. Further excavation is needed to confirm this interpretation, but this is the most plausible explanation for what we observed.

Just as we observed in Trenches 1 and 2, this wall segment was initiated by removing all the topsoil under the wall segment and exposing yellow-brown silt-loam subsoil. Two small features that exhibit *in situ* burning were observed at different places on the surface of the subsoil. Construction of the wall segment was then started with a layer of dark gray-brown silt-loam soil. This was 10 to 20 cm thick and spread across an area about 8 m wide. Yellow-brown silt-loam was then piled up on the east or inside of the developing wall segment. This deposit is currently only 60 cm thick and covers an area of about 3.5 m in the cross-section. After this, a large amount of red-brown sandy-loam was deposited on top and to the west of the yellow-brown material. The reddish-brown soil is now only about 65 cm thick, but it is 9 m wide and lies directly on the yellow-brown subsoil at the western margin of the wall. As we noted in Trenches 1 and 2, the original wall surfaces are preserved along the base of the wall segment at its margins. This is a dark gray-brown silty-loam and it has been covered by wall fill that has been dragged down and outward by agricultural activities (Figure 11-8).

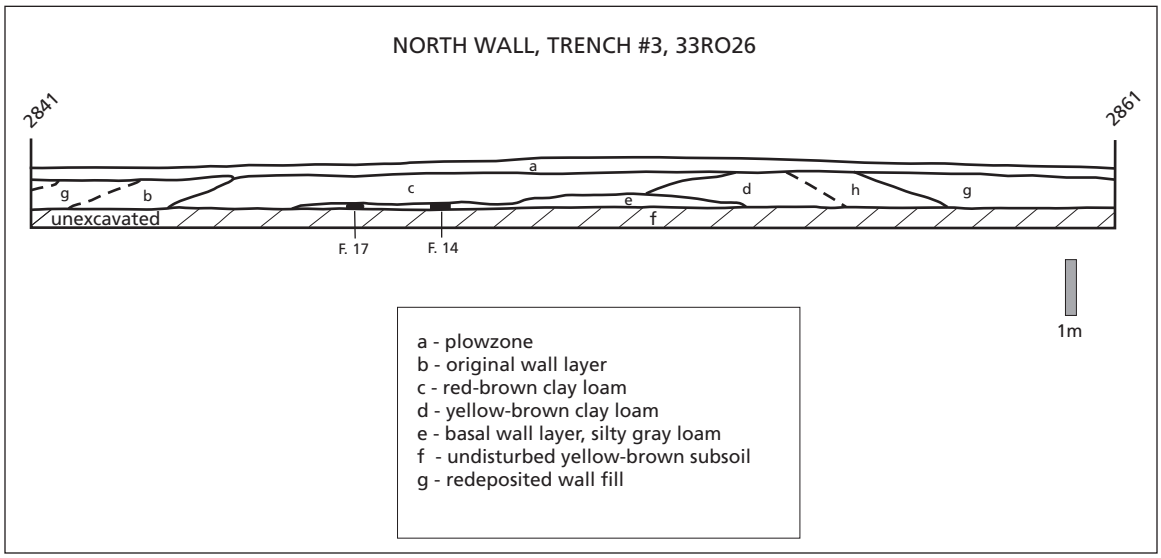

Figure 11-8. Profile drawing, Trench 3.

Two small features associated with *in situ* burning were exposed and recorded in Trench 3. Both features were located on top of the yellow-brown subsoil and appear to be from rituals that were conducted in association with construction of this wall segment. Feature 14 was a circular area of burned soil and charred wood about 75 cm in diameter. This thin layer consisted of orange, oxidized soil and numerous fragments of charred wood. Two small pieces of mica and a flint bladelet were collected from within the feature. Feature 17 was found in the same stratigraphic position as Feature 14, lying on top of the yellow subsoil. This feature appeared to be an oval area of burned soil,

burned wood, and bone that extended north into the wall of Trench 3. The feature, as exposed, looked like half of an oval, 40 cm wide and 35 cm long. In cross-section this feature is only a few centimeters thick. The bone found with the feature is heavily burned and very fragmentary and can only be identified as mammal. In addition to the burned wood and bone, several small pieces of mica, including a fragment of possibly cut mica were collected, along with a several pebbles and a chert flake.

Trench 4

The rectangular enclosure at Hopeton is comprised mainly of straight wall segments, with three of the corners being open. The northeast corner of this enclosure is formed by a segment of curved wall. Since the enclosure seems to be built around the southern end of the Great Circle, most scholars (e.g., Byers 1987, DeBoer 1997) have suggested the circle was built first and the rectangle added later. If this hypothesis is correct, then it is logical that the curved wall segment at the northeast corner of the square was either the first or last segment built for this enclosure. Trench 4 was excavated in 2003 to see how its construction compared to the other walls forming the rectangle. Trench 4 was 1.5 m wide and 41 m long and was oriented northeast to southwest across the curved central part of the wall segment.

Trench 4 provided evidence that construction of this wall segment was initiated just like the others we have examined, with the A horizon and the top of the B horizon being removed. This area of the landform differs from the other areas we examined, with the subsoil being red rather than yellow-brown. The red soil being classified in the Fox series and the yellow being in the Ockley series (Petro et al.1967). With the reddish subsoil exposed, a dark gray loam layer with lenses of fine gravel were spread across the surface. A thick layer of gray loam was then placed on top of this surface to form the core of this wall segment. Red sandy-loam was placed immediately south and partly overlying the gray matrix. The red and gray sediments are fairly homogenous in color and texture and the contact between them is quite sharp, just like we observed in the other wall segments. However, in this instance, the reddish soil placed on the side of the wall faced the interior of the enclosure, while in the other three trenches the red soil faced outward.

On the north side of this wall segment, the situation is quite different. A gray-brown loam was deposited on the north side of the gray loam that forms the core of the wall. The contact between the gray loam and the gray-brown loam includes numerous small lenses of gray loam, gray-brown loam, red sandy-loam, and gravel. Most of these appear to be the result of basket loads of matrix being dumped on this side of the wall segment. Of the four trenches excavated at Hopeton, this is the only instance where basket loads could be observed in the profiles. As we observed in the other three trenches, Trench 4 exposed two sloping, dark gray, organic layers that formed the original interior and exterior surfaces of this wall segment.

Excavation of Trench 4 exposed several features. Two unusual features were found resting on the dark loam that forms the base of the wall. Both of these features consisted of white calcined material and burned wood that appear to have been burned in association with the start of wall construction. Three small features were also found

within the fill of the wall. Each of these small features were comprised of burned soil and burned wood and were similar in size to the features we have found in the other trenches.

CHRONOLOGY

It is ironic to recognize that despite the development of increasingly sophisticated anthropological models to explain the past, we are unable to evaluate those models due to our inability to recognize the chronological order of features and sites within the archeological record. Temporal controls are crucial to evaluating the nature of the relationships between Hopewell habitation sites and the great earthwork sites of southern Ohio. Radiocarbon dates tell us that sites we attribute to the Hopewell culture span 500 years or more and we dare not assume that Hopewell culture went unchanged for five centuries. Within that interval, we cannot be certain when the construction of geometric earthworks started or stopped. We do not even know whether the large earthworks in the Scioto River valley, like Hopeton, Mound City, Seip, Hopewell, High Bank, Cedar Bank, and Liberty were built and used at approximately the same time. The inability to control time in our understanding of the Hopewell archeological record greatly impedes our ability to address most of the important questions that are being raised about the Hopewell culture.

One of the most important objectives of our work at Hopeton has been to develop an internal chronology for interpreting the surface and subsurface features we encounter at the site. As we began work on the large rectangular earthwork, we asked the question "how long did it take to build the enclosure?" Since the rectangular enclosure is comprised of 11 segments at the southern end of the Great Circle, we asked whether these segments were built and spaced specifically for some purpose – such as marking lunar or solar alignments. This would imply that the rectangle was built relatively quickly from a very precise plan. Alternatively, could the linear wall segments represent convenient units of work that a relatively small group of people could accomplish when they were not engaged in other crucial activities? Understanding when the construction of the square began and the length of time required to complete it is essential to interpreting its purpose. Unfortunately, we lack this information for all of the great geometric earthwork features in southern Ohio. Consequently, our study has emphasized the collection of suitable radiocarbon samples from contexts that will help us better understand the chronology of events associated with the construction and use of the Hopeton Earthworks.

Thus far, 11 radiocarbon samples have been processed from contexts directly associated with the construction of segments of earthen wall that form the rectangular enclosure (Table 11-1). Four of these are from a single oak log at the base of Trench 1 and the other seven are individual samples associated with specific construction features in different wall segments.

The four dates obtained from the oak log (Feature 6) at the base of Trench 1 represent a very wide range of time. However, considering the length of time an oak tree may live, this is not surprising, and illustrates the difficulty we face in obtaining dates from large, complex samples of this nature. The 2 sigma calibration range of the four

Table 11-1. Radiocarbon dates associated with the Hopeton Earthworks.

Beta Analytic Sample #	Measured Radiocarbon Age	2 Sigma Calibration	Context
159033	1740+/-50 BP	AD 150 – AD 410	Charred oak log at base of Trench 1, Feature 6
176576	1990 +/- 130 BP	BC 370 – AD 330	Charred oak log at base of Trench 1, Feature 6
176574	220 +/- 100 BP	AD 1450 – AD 1950	Charred wood, level 4, Feature 1
176575	190 +/- 40 BP	AD 1650 – AD 1700 AD 1720 – AD 1820 AD 1840 – AD 1880 AD 1920 – AD 1950	Charred wood, level 5, Feature 1
176577	1710 +/- 80 BP	AD 130 – AD 530	Charred wood, Feature 11, Trench 2
176578	1900 +/- 50 BP	AD 40 – AD 250	Charred wood, Feature 9, NW Level 4, 101-110 cm
176579	1900 +/- 40 BP	AD 20 – AD 220	Charred wood (sweetgum), Feature 14, Trench 3
176580	1890 +/- 40 BP	AD 20 – AD 220	Wood charcoal, Feature 17, Trench 3
176581	1920 +/- 40 BP	AD 30 – AD 220	Wood charcoal from post hole, Feature 23
177506	2040 +/- 80 BP	350 BC - 310 BC 210 BC – AD 120	Oak log, Feature 6, Trench 1
177507	1990 +/- 70 BP	170 BC – AD 140	Oak log, Feature 6, Trench 1
96598	1930 +/- 60 BP	40 BC – AD 235	Feature 3, 1996 Trench, Ruby (1997)
109962	1840 +/- 50 BP	AD 75 – AD 330 AD 120 – AD 245	Feature 1, 1996 Trench, Ruby (1997)

dates is 370 B.C. to A.D. 410. With the assistance of Dr. Dee Anne Wymer, we attempted to use only bark and outer rings from the log in hopes of getting a more refined age estimate. Unfortunately, that sample (Beta-176576) also yielded results with a wide 2 sigma calibration.

Radiocarbon samples from Trenches 1, 2, and 3 have produced dates reflecting a Middle Woodland temporal placement and these are consistent with the dates reported by Ruby from his 1996 excavation (Table 11-1). Comparison of the radiocarbon ages of the samples from features in the wall segments range from 1990 ± 130 B.P. to 1710 ± 80 B.P., suggesting a very long period of construction. However, an examination of 2 sigma calibrations for the same samples reveals that all dating results from the four trenches overlap between A.D. 150 and A.D. 250. Although we hope to obtain more dates relating to wall construction, this seems to be a reasonable estimate for the age of at least the southern and western walls of the rectangle.

Two radiocarbon samples from Trench 4 produced dramatically different results. Both samples were collected from features that were uncovered within the core of the wall. One of the features was found resting on the subsoil under the central part of the wall and clearly is associated with the initial stage of construction for this portion of the wall. The other feature was found in the fill of the wall, near its northern edge and also appeared to be associated with wall construction. Both of these samples yielded uncorrected radiocarbon dates of about A.D. 1000 (Table 11-1).

The Trench 4 dates were from two separate features within the wall and consistency of the dates makes it highly unlikely that they can be erroneous. Since one of the samples was obtained from a feature at the base of the wall, it seems unlikely that these features can be intrusive and no evidence of intrusion was observed.

When we consider that these later radiocarbon dates were obtained from the only curved wall section in this enclosure and the unusual wall construction methods that were exposed in Trench 4, it seems likely that at least part of this wall segment was built or significantly modified about 800 years after the southern and western walls of the enclosure were built.

GEOARCHEOLOGICAL ANALYSIS OF TRENCH 1

In addition to the geophysical investigations, geoarcheological research at Hopeton has included detailed studies of the soils and stratigraphy of the earthworks. The objectives of these ongoing studies are to (1) describe and classify wall fills, including the stratigraphy and lithology; (2) determine whether there were any significant hiatuses during construction of walls; (3) assess post-construction pedogenic alteration of wall fills; and (4) define the boundary between wall fills and sub-wall sediments. Information gleaned from the geoarcheological investigation is important for understanding site-formation processes and the nature and magnitude of post-occupation alteration of the earthworks. It also sheds light on possible Hopewellian symbolism as evidenced by the color and placement of different soil materials used in wall construction.

In this paper, we summarize the results of soil and stratigraphic analyses in Trench 1, a 48 m long backhoe trench that transected a segment of the south wall of the rectangular enclosure. Geomorphological investigations were conducted at Trenches 2 and 3 during the 2002 field season, but laboratory analyses are pending.

Three soil-stratigraphic profiles were studied in Trench 1: Profile 1 in the middle of the south wall, Profile 2 on the south flank of the south wall, and Profile 3 on the north flank of the south wall (Figure 11-1). In addition to describing these three profiles, samples were collected for particle-size and micromorphological analyses. The objectives of the laboratory analyses were to (1) characterize and confirm field descriptions of the wall fill, and (2) assess the magnitude of post-construction pedogenic alteration of the wall fill. Particle-size distribution, combined with field observations, is a good indicator of the source(s) of wall fill. It also may indicate post-depositional modifications within fill units. For example, high clay content may be a product of *in situ* weathering and/or clay illuviation. Micromorphological analyses often yield information about the sequence of pedological events and processes that are not discernible in the field (Holliday et

al. 1993). In this study, the major objectives of the micromorphological analyses were to characterize the wall fill and to differentiate inherent properties of the soil material used to construct the south wall from properties associated with post-construction pedogenesis. Detailed results of the field investigation and laboratory analyses are presented in Mandel et al. (2003).

In Trench 1, five major units of wall fill, numbered I through V, were distinguished on the basis of lithologic properties (matrix color, grain-size distribution, etc.). The primary characteristics of these units are summarized in Table 11-1. The south wall was constructed on silty sediment that may be late-Wisconsinan loess or fine-grained alluvium (slack-water deposits). The former surface soil developed in the sub-wall sediments is represented only by well-expressed Bt horizons; the A horizon was stripped off before the wall was emplaced. Hence, the south wall was constructed on a prepared surface.

The five units of wall fill can be grouped into two general categories based on matrix color and texture:

1. Moderately to strongly oxidized loam and occasionally silt loam with 7.5YR and 5YR hues.

2. Slightly oxidized silt, silt loam, and occasionally loam with 10YR hues.

Unit III, which forms the core of the wall, fits the first category and all of the other units fall into the second category. The second category can be subdivided into fills that have silt contents exceeding 70 percent (Unit I) and those that are predominantly silt, but also have fairly high sand contents (24 and 37 percent).

The categorization of the wall fills described above provides a means of inferring the sources of the fill materials. For example, the first category of wall fill strongly resembles the Ockley soil series mapped across the eastern two-thirds of the site (Lemaster 2001). The Ockley series has brown, strong brown, and reddish brown matrix colors (7.5YR and 5YR hues) and is developed in silty and loamy sediment above sandy and gravelly glacial outwash. The second category of wall fill resembles the Mentor soil series mapped across the western third of the site (Lemaster 2001). The Mentor series has brown and yellowish brown matrix colors (10YR hues) and is developed in silty slack-water deposits above loamy and sandy alluvium.

In order to classify the wall fill at Hopeton, an existing classification system was considered. Van Nest et al. (2001) developed a classification of mound fills that is quite applicable to the Hopeton earthworks. They distinguish three major types of fill: loaded, massive, and stratiform. The material composing the south wall at Hopeton meets the criteria for loaded fills. In loaded fills, which have been referred to as "basket loaded" materials (Fowke 1902), the individual masses of soil or sediment used for earthwork construction are discernible (Van Nest et al. 2001:636). Van Nest et al. (2001) distinguished two subtypes of loaded fills: compositional loading and sod blocks. The south wall at Hopeton is a good example of compositional loading. According to Van

Nest et al. (2001), key features of compositional loading are (1) varying composition and texture of individual loads, and (2) abrupt boundaries between loads. They use the following quote from Squier and Davis (1848:144) as a succinct description of compositional loading:

> [b]eneath this layer of gravel and pebbles, to the depth of two feet, the earth was homogeneous, though slightly mottled, as if taken up and deposited in small loads, from different localities. In one place appeared a deposit of dark-colored surface loam, and by its side, or covering it, there was a mass of clayey soil from greater depth. The outlines of these various deposits could be distinctly traced.

Other major objectives of the geomorphological investigation were to determine whether there were any significant hiatuses during wall construction, and to assess post-construction pedogenic alteration of the wall fill. Any significant lapse of time between phases of wall construction would be represented by a buried soil. However, no buried soils separate *in situ* wall units. The only buried soil occurs where machinery dragged material (Unit IV and V) off the South Wall during land leveling and spread it on top of Unit II. Hence, wall construction appears to have been a fairly rapid process.

After the Hopewellian people completed the South Wall, the earthworks were affected by soil development. Evidence for post-construction pedogenesis is apparent at the macro- and micro-level, but soil development is relatively weak (A-Bw and A-Bw&Bt horizonation). Despite the presence of *in situ* pedo-features, such as clay films, pedogenesis has not obliterated boundaries between the units composing the South Wall. In fact, all of the units and subunits are separated by abrupt boundaries. Weak soil development in the South Wall may be related to insufficient intensity and/or duration of pedogenesis. Cambic (Bw) horizons can form in less than 500 years (Birkeland 1999), and lamellae (Bt horizons) can develop in less than 150 years (Thoms 2000). It is important to note that the portion of the South Wall exposed in this study was formerly at great depth (ca. 3-4 m) below the top of the wall. Hence, it may have been insulated from strong weathering and associated soil formation.

In sum, the geomorphic investigation yielded information about the stratigraphy of the South Wall and lithology of its fills. It also sheds light on how the wall was constructed (e.g.., compositional loading) and points to possible Hopewellian symbolism as evidenced by the color and placement of different soil materials used in wall construction. Although the specific source areas of the wall materials have not been identified, the lithologic properties of the individual wall units, combined with information gleaned from general soil maps, provide clues about where the materials were collected.

INTERPRETATIONS

The geometric earthworks of southern Ohio are well known symbols of the florescence of Hopewell culture in the first few centuries of the Christian calendar. Despite considerable investigation of mounds and mortuary practices associated with the Hopewell, modern archeology has invested only limited energy in studying the great earthworks. This study of the earthen walls at Hopeton, in combination with the High

Bank study (Greber and Shane, this volume), are the first large scale efforts to attempt to understand when and how these great earthen monuments were constructed in the Scioto River valley.

The focus of the research reported in this paper has been on the rectangular earthwork at Hopeton. The circle and rectangle at Hopeton are co-joined, with the circle forming most of the northern wall of the rectangular enclosure. Two smaller circles, named sacred circles by Squier and Davis (1848), are located on the east side of the square and form part of the eastern wall. Excluding the walls that form circles, the walls of the rectangle consist of 11 segments and 12 gateways. Squier and Davis reported that these wall segments were "twelve feet high and fifty feet base, and are destitute of a ditch on either side" (1848:51). The wall segments vary in length and shape and form a rough rectangle with one round corner and three open corners. It has been proposed that the wall segments and gateways were deliberately placed to focus sight lines on solstice events (Romain 2000:114-119).

The research reported here has been designed to collect systematic information about the methods used to construct the rectangular enclosure. This paper describes four trenches that were excavated across four different wall segments. A fifth trench across a fifth wall segment has been reported by Ruby (1997). The data from these trenches documents that all of the wall segments were constructed using soils that are present somewhere on the large terrace upon which the earthwork was built. The data from these five trenches provides us with substantial information about how the walls were built. Some observations are noteworthy.

The absence of ditches in association with the walls means that most of the soil had to be quarried and carried from yet to be determined locations. Some of the soil may have been quarried from areas close to the wall segments, but large amounts of contrasting colored soils were clearly being quarried and moved around the site. Although it would have been easier to simply scrape soil from surrounding areas and pile it into the form or a wall, the builders selected different soil types and used them in different combinations to build each wall segment. The reason for using different soils is not yet clear, but the color of the soils seems to have been important. Based upon the wall size dimensions reported by Squier and Davis in 1848 (12 ft. high and 50 ft. wide at the base), we estimate that the 11 wall segments forming the east, south, and west walls of the rectangular enclosure were comprised of approximately 18,650 cu. m of soil. This clearly represents a massive investment of human labor, particularly for a labor force using digging sticks and baskets.

Although all wall segments examined to date reflect the use of red, yellow, and brown or black soils, the soils were not consistent in color or texture from segment to segment. For example, the red sandy clay we exposed in Trench 1 is significantly more vivid than the red soils we have seen in the other trenches. It would appear that certain generalized soil colors were consistently used to build the wall segments. However, the variability we have observed suggest these were not obtained from the same locations.

The pattern and sequence of stages in wall construction varied in all segments, and examination of the magnetic map indicates that the enclosure outline is much less

uniform than it was depicted by Squier and Davis (1848). While other explanations are certainly possible, we believe this means that the wall segments were built at different times. It is unlikely that the interval between construction of the segments exceeded more than a few years, but the variation between the segments and the fact that the walls were built in segments, suggests that the rectangle represents a series of construction episodes. This does not preclude the possibility that the gateways at Hopeton were placed to observe lunar or solar events, but that is a matter for future discussion.

The combination of geophysical and geoarcheological analysis of the Hopeton Earthworks is producing new data about the timing and methods of earthwork construction. Interpretation of the existing walls is complicated by 150 years of cultivation. The geophysical data we have collected for the square indicate sharp boundaries on the interior and exterior of wall segments that is in marked contrast to existing topography. Geophysical survey is generating maps that reflect the position of wall segments and soil deposits as they were built by the Hopewell. This may eventually permit more precise measurement of potential solar and lunar alignments.

The geophysical survey and archeological excavations conducted thus far suggest that the construction techniques used to build the circle and the wall segments of the square probably differ from the techniques used to build the parallel walls at Hopeton. The walls of the circle and rectangle were apparently built with multiple soil types that differ in their magnetic and electrical resistance properties from the underlying subsoil (Weymouth et al., this volume). Our effort to relocate the parallel walls using these same techniques failed to produce any evidence of the parallel walls (Lynott, this volume). This suggests that the soil used to build the parallel walls was similar in magnetic and electrical resistance properties to the soil on which it was placed. Although we cannot present physical evidence to support this interpretation, it is likely that the topsoil that was stripped from the rectangular enclosure was used to build the parallel walls. If topsoil was piled on top of other topsoil and then subjected to nearly 200 years of cultivation, it would be very difficult to distinguish the redeposited soils from the "A" horizon or topsoil that had formed in place.

We noted earlier in this chapter that materials and methods of construction of the wall segment exposed by Trench 4 were significantly different from the other trenches at the rectangular enclosure. Radiocarbon evidence from Trench 4 suggests that at least this wall segment in the rectangular enclosure was built or significantly modified about A.D. 1000. Although it is likely that most of the current configuration of the rectangular enclosure at Hopeton dates to the Middle Woodland period, additions or modifications by later people cannot be ignored.

The data from Hopeton clearly indicates that this is a complex site. Research at the Pollock Works (Riordan 1995) and Fort Ancient (Connolly 2004) have generated evidence that the enclosure walls at those sites were built or modified over a significant period of time. Although there has been a tendency to treat the large geometric enclosures of southern Ohio as static Middle Woodland constructions, there is mounting evidence that these sites were evolving cultural landscapes used by earlier and later people.

Although much work remains, our research indicates it is likely that the wall segments of the rectangular enclosure were built individually, using different materials and different sequences of construction. Although radiocarbon dating is not precise enough to verify this interpretation, the variability in wall construction combined with the irregularity of the square and the variability in the length of the wall segments, suggests it is likely that the square was built over a period of some time. Estimating the length of time is largely speculation, but two to three generations does not seem unlikely.

Acknowledgements

The 2001, 2002 and 2003 archeological investigations at the Hopeton Earthworks were conducted through the efforts of many people. John Weymouth, Bruce Bevan and Rinita Dalan directed the geophysical components of this research. Jennifer Pederson Weinberger, Jarrod Burks, Kathy Brady, and Dawn Walter Gagliano were helpful in many ways through these three years of the Hopeton Earthworks Project. Kate Spielmann, Wes Bernardini and Chad Thomas from Arizona State University contributed ideas and effort that expanded the project and made it more enjoyable. Mike Butts provided outstanding service as our backhoe operator and his skill helped make the study more successful. Participants in 2001 included John Weymouth, Ann Bauermeister, William Volf, Tamie Sawaged, Jennifer Pederson-Weinberger, Jarrod Burks, Bruce Bevan, Steve De Vore, Rinita Dalan, N'omi Greber, Bruce Jones, Harold Roeker, Alicia Coles, Meghan Young, Ben Costello, John Gapp, Andy Sommer, Iannis Misopolous, Jennifer Lahowitz, Randy Farmer and students from the Milton Hershey School. 2002 participants included John Weymouth, Bruce Bevan, Rinita Dalan, Katherine Spielmann, Wesley Bernardini, Chad Thomas, Harold Roeker, William Volf, Maurice Bolden, John Gapp, Alicia Coles, Melissa Kruse, William Hill, Ann Bauermeister, Jarrod Burks, Lynn Frankowski, Kurt Stansbury, Ashley Stansbury, Ryan Duddleson, Scott Lockhorm, Keenan Wright, Kate Assman, Mike Hammons, Dan Chevalier, Kirsten Mader, Tim Splical, Tony Schommer, Jenna Whipking, Frederick Howard III, Randy Farmer and students from the Milton Hershey School. Participants in the 2003 field season included Katherine Spielmann, Wesley Bernardini, Chad Thomas, Bruce Jones, Harold Roeker, John Gapp, Dan Lynch, Pam Rainey, Anne Moore, J.E. Bowen, Jules Angel, Peter Topping, Lynn Frankowski, Rinita Dalan, John Weymouth, Bruce Bevan, Damita Hiemstra, Ken Lemley, Lindy Potmesil, Ryan Schacht, Kyle Baxter, Paul White, David Lardizabel, Arlo McKee, Andrew Moore, Jim Cudsworth, Randy Farmer and students from the Milton Hershey School. The project also benefited from the ideas and support provided by James Brown, N'omi Greber, William Dancey, David Towel, and John Barnhart, and Robert Harness. Many of the participants in the research reported here were students in the University of Nebraska, Archaeological Field School. Students from the Milton Hershey School also participated in each of the field seasons. Support from the Superintendent and staff of Hopewell Culture National Historical Park was essential to the success of this program. We also thank the staff of the Midwest Archeological Center and Kansas Geological Survey for their support during this research and the preparation of this manuscript.

CHAPTER 12

OHIO HOPEWELL RITUAL CRAFT PRODUCTION

By
Katherine A. Spielmann

Much of the known archeological record for Ohio Hopewell is the product of communal ritual preparation and performance. Ohio Hopewell peoples were not unique in their elaboration of the ritual sphere, but the durability of the spaces and objects that were involved in Hopewell communal ritual performance makes this component of their material record particularly prominent. This chapter discusses one aspect of ritual preparation, the production of items used in rituals at earthwork sites.

In small-scale societies such as that of the Ohio Hopewell, communal ritual looms large in all facets of life. Public ritual not only fulfills religious obligations, but is also:

- a source of political power, in that people with ritual knowledge have political influence. In addition, those who are able to organize elaborate ritual performances and feasts gain a measure of prestige within their societies. These organizers may be individuals or groups.

- a context for much social interaction, such as the arrangement of marriages, renewal of trade partnerships, and development of friendships, and

- according to some anthropologists, the motor of economic life within small-scale societies. Rituals demand work, as they involve a great deal of preparation for feasting, ritual performances, and ritual payments (such as bride price, payments at funerals to dancers, and homicide payments) (Spielmann 2002b).

A significant component of preparation for communal ritual events involves the production of material objects and garments. Communal and personal rituals often require certain kinds of clothing and material goods in order to be both appropriate and effective. The efficacy of a ceremonial act derives in part from the power inherent in the objects used (Appaduri 1986; Bradley 2000; Hamann 2002; Helms 1988, 1993:3), and a number of social anthropologists have developed the argument that in many cultures material things may *be* alive and have the power to act in the world. Crafting of ritual objects is, thus, an ideologically loaded activity.

The power of material things derives from multiple attributes. Those attributes that appear to have cross-cultural relevance include: the source of the raw materials from which objects are made, the skill with which the object is crafted, and certain qualities of the finished object, such as its shininess or luster, color, and size (Spielmann 2002b).

Although small-scale societies are relatively non-hierarchical, not everyone produces the craft items necessary for ritual participation and performance. For religious, political, and economic reasons, a fairly strong link can be made between the demand for particular clothing and paraphernalia for ritual performance and the development of craft specialization. On the one hand, large-scale demand by entire populations for certain items that are critical for ritual participation may lead to economies of scale and specialized production. On the other hand, as just noted, skilled crafting is often important in the production of items for ritual participation. Finally, the production of particularly powerful ritual icons may involve esoteric knowledge that is controlled by certain ritual specialists.

In the literature on craft specialization, it is common to refer to specialists as independent or attached (Brumfiel and Earle 1987; Costin 1991). Attached specialists are generally thought to exist only in complex societies as clients to elite patrons. The concept of attachment may also apply to small-scale societies, however, in that craft specialists may be "attached" to (or embedded in, to use Ken Ames' [1995] terminology) ritual contexts rather than elite individuals. The Ohio Hopewell provide a particularly good example of this attachment between crafting and ritual context, as the vast majority of the materials crafted for ritual performance were made at the ritual precincts, the earthworks, themselves.

Given the different reasons that ritual craft specialization might develop in small-scale societies (efficiency, skill, and control over ritual knowledge), the organization and scale of production of the items used in ritual participation and performance is likely to vary. In this chapter I explore the different facets of what we currently know about the organization of Ohio Hopewell ritual craft production. The chapter sections are organized according to the different components of the production process: raw material procurement and distribution, craft production, and ultimate discard. We will see that Ohio Hopewell peoples invested a great deal of time and energy in each component, signifying that the items that were the object of specialized production were of special import in Ohio Hopewell life.

RAW MATERIAL PROCUREMENT

The materials that archeologists recover from locations of ritual production and performance can tell us a great deal about where power was situated geographically, because the material objects themselves embody the power of the places from which they come (Bradley 2000; Helms 1988; 1993:3). British archeologist Richard Bradley (2000:81-84) has coined the term "pieces of place" to encapsulate this concept that material acquired from sacred places, whether it is rock or plant or water, is powerful because it was a physical part of those places.

Powerful places may be local or geographically distant. Mary Helms (1988, 1993:3), in particular, has developed the argument that distance can impart an important dimension of power. Although geographic distance is not universally valued as an attribute of power, the Ohio Hopewell peoples clearly emphasized the power of distant places, places well beyond their known universe, in acquiring raw materials for creating the material objects they used in their ritual precincts.

It is routine knowledge that the raw materials from which Ohio Hopewell ritual materials were created come from a diversity of very distant places. This marked emphasis on distance is unique in Eastern Woodlands prehistory (Seeman 1979). While long distance trade was quite common across the continent and throughout prehistoric times, the large quantities of exotic materials found at Ohio Hopewell sites, the scarcity of population in many of the source areas, and the lack of evidence for down-the-line exchange between the sources and southern Ohio strongly suggest direct procurement of much of the raw material by Ohio Hopewell peoples themselves. Ohio Hopewell people appear to have gone the furthest and brought back the greatest quantities of exotic raw materials for production of the items used in their earthwork precincts. The most abundant durable materials represented in Ohio Hopewell ritual precincts, mica and copper, derive from hundreds of kilometers away. The large quantities of obsidian recovered at the Hopewell site represent a journey of several thousand kilometers.

Not only are the places from which Ohio Hopewell people procured their raw materials physically distant, but often these places are also difficult to access. In the case of obsidian from western Wyoming and southern Idaho and copper from the Lake Superior region, the vagaries of weather can make access challenging if not hazardous. In the case of obsidian, crossing a very different, possibly hostile cultural landscape could be fatal.

In this regard, people in small-scale societies world-wide often deliberately procure ritually important raw materials from places that are difficult to access, even when similar materials are more readily available. Richard Bradley and British colleagues, for example, have demonstrated that raw materials for European stone axes were obtained from quarries that were often in unusual or remote locations. Comparatively accessible, high quality raw material appears to have been passed by in favor of outcrops that were difficult and more dangerous to reach (see also Bradley and Edmonds 1993; Watson 1995).

Mary Helms' (1988:58-59) discussion of "distance as an obstacle" seems apt in these cases. She notes that the conquest of distance, to make a trip beyond the known world and return successfully, is a testament to the exceptional qualities the traveler possesses. Successful traveling can be used to enhance one's political prestige, the pieces of place being evidence that the journey actually occurred. I suspect, for example, that in the case of obsidian, it was the journey to a unique place (the largest geyser basin in the world) that was the intent. This unique material became the proof that one had entirely left the world of the Eastern Woodlands. Helms calls this form of journeying power questing. Power questing refers to individuals' efforts to enhance their prestige by making journeys outside their known universe and returning successfully. Of all the Eastern Woodland populations, the Ohio Hopewell seem to have elaborated most upon the notion of power questing.

HOPEWELL CRAFTING

Based on our existing knowledge of the Hopewell archeological record, with the exception of mica, both the distant raw materials and the more local ones, such as pipestone, are restricted in their distribution to the earthwork sites themselves. In part,

this pattern may have to do with the relative paucity of habitation sites that have been excavated, and with the ability to rework scraps of copper, one of the most abundant non-local raw materials used by Ohio Hopewell peoples. However, as it stands now, obsidian, pipestone, copper, sharks teeth, and marine shell have been recovered only from in and directly around the earthwork sites. This suggests that access to these materials was restricted in some manner. This restriction may have been entirely pragmatic, as the earthwork sites were the primary loci of aggregation for fairly dispersed populations. The easiest way to distribute the exotic raw materials to craftspeople may have been during ritual preparations at these precincts. The fact that even the obsidian debitage was curated within the Hopewell earthwork, however, suggests that there may be more powerful reasons for confining craft production of many items to the earthworks.

Restricting much of ritual craft production to the earthworks also presents the opportunity for control over the materialization of ideology (DeMarrais et al. 1996). Ritual personnel may have controlled access to the raw materials and certainly could have taken charge of or influenced the nature, timing, personnel, and quantity of production. Demonstrating such control, however, will be difficult archeologically.

Ohio Hopewell peoples used a wide variety of material objects in their communal rituals. Given this diversity in material culture, it is not surprising that the organization of production of these items was quite varied as well. Some items were the products of highly skilled artisans, while others required technical knowledge and a sizeable amount of labor, and still others involved relatively little labor or skill. I discuss each of these categories here.

Skilled Crafting

Some Hopewell crafts required a great deal of skill to produce. These include the Ross barbed spears made from obsidian and the effigy pipes. Copper breastplates are another item that required skill and potentially esoteric knowledge about the kinds of materials to use on or attach to these items (e.g., Carr 2002; Wymer 2002). These kinds of skills are not widely distributed in populations and it is likely that the exquisitely flaked obsidian bifaces from Hopewell and Seip and beautifully crafted, lifelike effigy pipes from Tremper and Mound City were made by particularly skilled artisans. Technological style analyses will be necessary to begin to understand how many of these specialists may have existed (e.g., see Cowan and Greber 2002).

Who the skilled artisans were socially may be very difficult to determine. On the one hand, they may have been ritual practitioners themselves. Skilled crafting is one attribute of power that ritual leaders may exhibit (Ames 1995). It is considered an embodiment of the supernatural powers that they possess. On the other hand, these crafts could have been commissioned from a few relatively skilled artisans, much the way Iroquois False Face masks were commissioned historically (Fenton 1987; Spielmann 1998).

Technical Crafting

The more ubiquitously used copper items, such as axes and earspools, required some degree of technical knowledge to produce, but less artistic skill than the obsidian, pipestone, and copper breastplates. Evidence concerning the production of copper objects is derived from individual burials, from generalized information on individual sites, and from the objects themselves. At the Hopewell site, Burial 264 in Mound 25 contained two copper adzes, a large mass of partly hammered copper, beads, and a drill of black chert. Burials 260 and 261 also contained partly worked copper. Overall, only three copper nuggets were found at the site (Greber and Ruhl 1989).

Twenty-five nuggets of native copper were recovered from the GE Mound, as were many pieces of scrap and a few unfinished copper celts (Seeman 1995). A nugget of partly worked copper was found at Turner (Schroeder and Ruhl 1968). No copper nuggets have been reported from habitation sites.

With the exception of Seeman's (1995) discussion of the GE Mound, none of the Hopewell site reports mentions scraps of cut or worked copper. Either these were overlooked in the excavations or the raw material was so valuable that scraps would have been reworked into rivets for the earspools or coverings for small buttons and the like. Copper "debitage" may be difficult to find, making the identification of the particular loci and size of crafting locations impossible to determine.

Detailed technological analyses of copper earspools have provided valuable information on the organization of production of these ubiquitous copper objects. Participants at each earthwork or perhaps concentration of earthworks appear to have crafted largely for their own use. For example, Ruhl and Seeman (1998) have demonstrated that different technological styles in earspool construction characterize different earthwork sites. These data dovetail nicely with Carr and Mazlowsi's (1995) research on textiles, which indicates that visible stylistic differences distinguish different valleys or portions of valleys.

Ruhl's analyses have documented that earspools exhibit variation in disk construction even within a single earspool (Greber and Ruhl 1989; Ruhl and Seeman 1998). This fact suggests that disk makers and earspool assemblers may have been different people or that disk production and earspool assembly were separated in time and perhaps space. Earspools in the same pair may be constructed differently as well. Thus, earspool crafting may have been organized in workshops, a mode of organization more common in state-level societies, but clearly a possibility here. In these hypothetical workshops, different craftspeople produced different parts of the earspool and perhaps others assembled the final product. Taken together with the fact that masses of earspools were often deposited in ritual contexts, earspool crafters may not have been producing pairs of spools for individual users, but instead their products may have been amassed and then distributed in some fashion to individuals, groups, and ritual deposits.

Ruhl discusses details of copper ornament production that may aid archeological analysis of this process (Greber and Ruhl 1989:144-145). Production stages and their corresponding tools are as follows:

1. Hammering and annealing copper nuggets: hammerstones, hearths

2. Cutting shapes: bone awls and grinding stones

3. Grinding and polishing: gritty grinding stones

4. Perforating ornaments: stone drill

It is possible that the quantities of small sandstone slabs, limestone cobbles, and broken bladelets that were found in pits in structures 4 and 6 at Seip (Baby and Langlois 1979) were tools used in copper workshops.

Textiles reflect a similar pattern of multiple artisans producing a single item. Wimberly's (2002) analysis of Ohio Hopewell textiles indicates that many different kinds of yarn were included in individual pieces. Because of the tremendous amount of labor that went into making individual textiles, she envisions multiple spinners getting together to weave individual textiles for more rapid preparation.

Simple Crafting

Mica cut-out production would have taken the least skill of any of the Hopewell ritually focused crafts. With a proper template, a few bladelets, and the raw material, almost anyone could have created a cut-out. Perhaps it is for this reason that the production of mica cut-outs appears to have occurred across the Ohio Hopewell settlement system, rather than being confined solely to ritual precincts. Hamlet sites that have produced debitage and/or the remains of cut pieces include Jennison Guard, Indiana (mica effigy cut-outs, debitage [Blosser 1996]), Twin Mounds west (sheet mica flakes [Hawkins 1996]), Tysinger (mica and bladelets, blade cores [Carskadden and Morton 1996]), the Hale's House site (outside Newark Earthworks; shallow basin lined with pebbles and covered with a layer of mica sheets, mica in a post mold [Lepper and Yerkes 1997]), and the Meridian Alley site (Newark area; shallow basin and post mold each contain some mica in the fill [Lepper and Yerkes 1997]). The latter two sites are thought to relate to occupations associated with activities at the earthworks. McGraw, Miami Fort, and Murphy have also produced cut mica (Blosser 1996). Village site mica found thus far is primarily debitage, although projectile forms were found at Jennison Guard. Other sites on the outskirts of earthworks that have produced evidence of mica working include Fort Ancient, where over 100 sheets of cut mica were found near the earthworks (Connolly 1997).

The earthwork sites, however, have produced evidence of the most intense working of mica, probably due to the greater numbers of people (greater intensity of production) there than in hamlets or sites external to earthworks. At Mound City, a number of mica fragments have been found in midden contexts (F-35, fill of Mound

7, Mound 13, [Brown n.d.]). At Tremper, a room in the charnel house contained large quantities of debitage and production tools (Mills 1917:118, 232). At Seip, all of the non-mound structures that were excavated contained fragments of mica, but structures 1 and 2 were particularly notable for their quantities of raw material and partly cut geometric forms (Baby and Langlois 1979). Greber and colleagues (2002) have recently argued that the debris on the floor of these structures may have been redeposited midden from the site. Nonetheless, there is clear evidence of mica cut-out production from Seip. The Russell Brown mounds produced sheets of cut mica and mica cut-outs, as well as a number of hearths containing fire-cracked rock, animal bone, and mica debris from manufacturing (Seeman and Soday 1980). The Hopewell site collection in Chicago contains mica cut-out debitage, fragments, cut mica sheets, and books. Greber and Ruhl (1989) suggest that the concentrations of cut mica, cutting tools, needles and awls, and fabric found in deposits in Mounds 9 and 17 at Hopewell are related to decorating fabric.

Summary

In sum, there appear to be at least three kinds of ritual crafting represented in the existing Ohio Hopewell archeological data:

1. Highly skilled crafting. Some highly skilled, possibly ritually important craftspersons may have been responsible for the production of obsidian bifaces, copper breastplates, and carved pipes. Those individuals buried with copper nuggets and other evidence of copper production, for example, may have been responsible for the more elaborate and more rare copper items in the Hopewell ceremonial repertoire. The esoteric knowledge and skill required for production of these items was probably limited to relatively few individuals. In some cases, corporate groups may have controlled a certain craft, involving multiple generations of artisans. This is inferred from the several hundred pounds of obsidian debitage that were found deposited in a <u>single</u> offering that was associated with two burials beneath Mound 11 at the Hopewell site (Greber and Ruhl 1989). This debitage may have accumulated over a period of a century or more (Hatch et al. 1990; cf. Hughes 1992; Stevenson et al. 1992).

2. Technically adept crafting. The ubiquitous copper earspools were probably produced by specialists, probably at the ritual precincts, possibly in workshops. It may be the case that portions of the earspools were produced during the year at hamlets, and that assembly of the earspools occurred at the earthworks on communal ritual occasions.

3. Simple crafting. Mica cut-out production was much less restricted than copper and apparently more available to the "general public." The skill required for cut-out production is not high, and it can be cut with a small, sharp-edged flake. Although some mica production was household-based, much larger-scale production appears to have taken place in the ritual precincts. Cut-outs made at earthworks may be differentiated in form or more complex than those made in hamlet households, although this remains

to be seen. Large-scale production of mica cut-outs at the earthworks may be related to decoration of garments made there.

This hypothesized division of ritual crafting labor accounts for many of the Ohio Hopewell ritual crafts, but not all. Copper celts, for example, may be fairly straightforward to make, but some required a very large quantity of copper, likely putting them outside the realm of household crafting and more in the context of ritual specialists.

DEPOSITION

As far as we understand, most objects used for Ohio Hopewell ritual performance were produced, used, and discarded within the ritual precincts. The technological style studies by Ruhl, Seeman, Carr, and Mazlowsi mentioned previously indicate that objects were not circulated to any great degree. "Discard" of these items involved deliberate placing as offerings rather than depositing in middens. Tens of thousands of ornaments were placed in caches and burials, or as burned offerings within the earthwork precincts.

Ceremonial discard and caching also appear to have taken place just outside earthwork enclosures. Coughlin and Seeman's (1997) analysis of Robert Harness' collection from the Liberty Earthworks area identified a cache of 2000 burned and broken Flint Ridge Flint biface fragments at Site 14. Recent excavations at the Hopeton site exposed a pit (Feature 9) that contained deliberately deposited combinations of large ceramic sherds and mica cut-outs. This deposit is described in some detail here.

Feature 9 is a large (roughly 1 x 2 m) oval pit over half a meter deep that was excavated into the yellow clay substrate that underlies the plowzone at Hopeton. It was identified through geophysical survey and was excavated during the summer seasons of 2001 and 2002 that were directed by Dr. Mark Lynott of the Midwest Archeological Center. The author excavated the majority of the feature in 2002.

The pit is located just outside one of the southern entrances to the earthwork (Figure 12-1). The pit may have been originally excavated to acquire yellow clay for earthwork construction. It was not symmetrical (Figure 12-2), being steep-sided on the southern side and more sloping and less defined on the northern side. Since the earthwork lies just north of the pit, excavation for clay could have proceeded south into a vertical face, with a more sloping exit towards the earthwork on the northern side. The pit stratigraphy suggests that it lay open for some time before cultural deposition began, as the initial sediments within it are clay-rich with only occasional artifacts and bits of charcoal.

At some point, however, Hopewell people began to make a series of purposeful deposits of sizeable portions of cordmarked vessels and mica along the northern side of the pit. At least one of the vessels was a tetrapod. The mica adhered both to the inside and outside surfaces of sherds. Where fragments are large enough to examine carefully, the mica appears to have been cut (Long 2003). Although most of the mica was not preserved well enough to identify the original shapes, four triangles were excavated

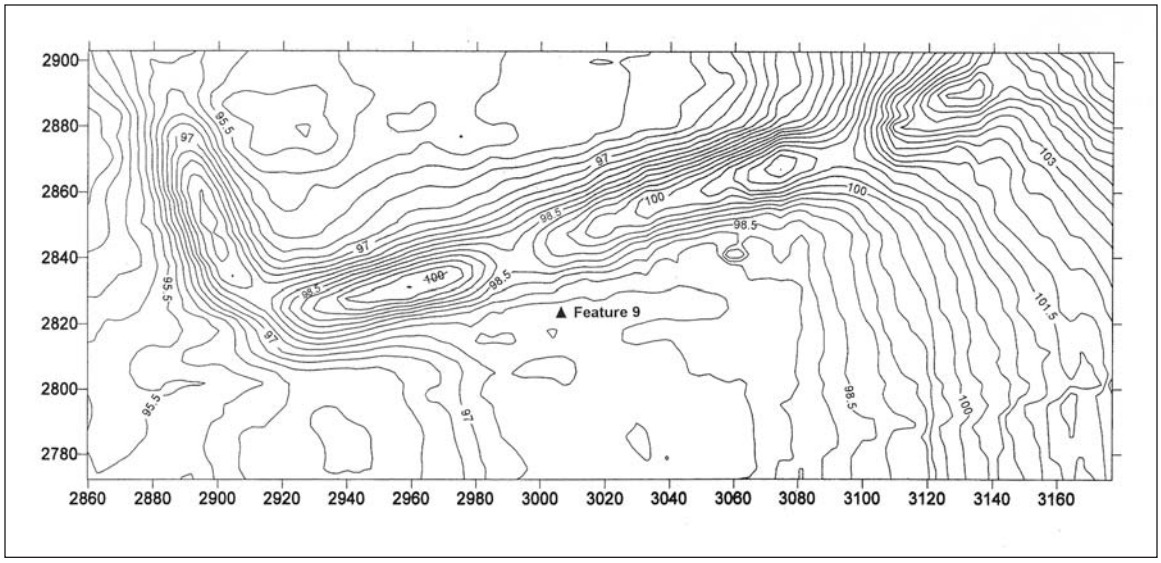

Figure 12-1. Map of the Hopeton site illustrating the location of Feature 9.

Figure 12-2. Western profile of Feature 9.

from these deposits. A fifth triangle was recovered in a ceremonial deposit within the western earthwork during test trenching in 2002. In Feature 9, the mica and sherds were directly associated with fire-cracked rock and burned sandstone. These deposits are vertically stratified within the pit, documenting a series of separate episodes that took place over an unknown period of time. The intensity of mica and sherd deposition increased towards the end of the pit's use.

Archeologist Joshua Pollard's (2001) insights about the purposeful, structured deposition of artifacts within British Neolithic ritual precincts can inform our understanding of the ceramic-mica concentrations at Hopeton, as well as the multiple discard events identified at the other Ohio Hopewell earthworks. He suggests that qualities inherent in certain materials often condition the manner of their deposition, and he likens the act of deposition to a performance. Pollard argues that certain methods of deposition were considered proper, effective, and respectful for certain kinds of materials or objects. There may have been spatial rules for deposition, and proper action may require special knowledge about the symbolic order of things. Pollard goes on to discuss the juxtaposition of different kinds of substances in late Neolithic pit deposits, and separate layers of artifact and sediment, that appear to be somewhat like our sherd-mica deposits in Feature 9 at Hopeton.

We might hypothesize, then, on the basis of the patterning in Feature 9 that ceramics (or perhaps containers in general) and mica cut-outs were symbolically linked in some manner among the Ohio Hopewell and that pit deposition outside of earthworks was an appropriate context in which to dispose of these symbolically charged items. Further work on the deposition of mica should illuminate whether Hopeton is unique, or part of a larger pattern.

CONCLUSIONS

The record of Ohio Hopewell ritual crafting strongly suggests that their objective was to create and manipulate very powerful ritual icons. They took great pains to acquire raw materials from distant, difficult places suggesting that the power of these remote places was of importance to them. The skill then used to craft many of the objects is likely to have added to the spiritual significance of the items, as well as their aesthetic appeal. We do not know exactly how the diverse craft items were then used in Hopewell ceremonies, though many of them appear to be intended for personal adornment. Both mica and copper cut-outs were probably sewn onto textiles, and earspools and breastplates would have been worn as ornaments. Obsidian bifaces and copper celts fall into a different category of things, possibly symbols of power or wealth (see Seeman 1995). When the use life of these items came to an end, they must have been far too potent simply to discard. Many were burned or broken, and all were buried within pits or mounds or both. The Ohio Hopewell peoples' concern with appropriate discard structures much of the record that we recover today.

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