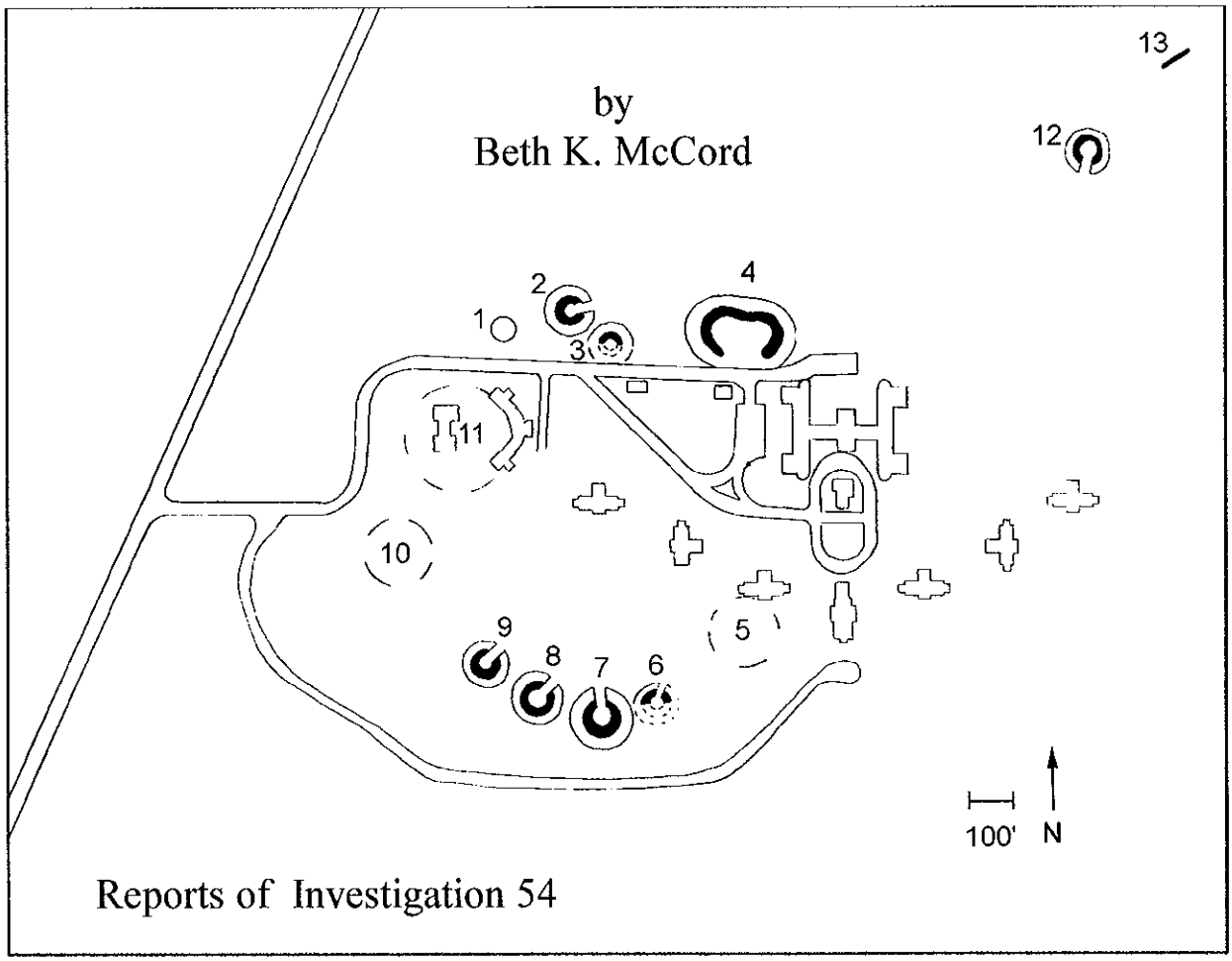
THE NEW CASTLE SITE REVISITED



by

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I apologize for any omissions.

My final thanks go the architects, builders and patrons of the New Castle site. Thank you for leaving us such a wonderful site.

ABSTRACT

The Archaeological Resources Management Service (ARMS) at Ball State University conducted a FY98 Historic Preservation Fund Grant to further assess the condition of the New Castle site (12Hn1). The project conducted a shovel probe survey of the site area documenting prehistoric use and historic disturbance of the area. No prehistoric activity areas associated with the earthworks were recorded. Historic disturbance to the site area was extensive. Limited test excavations at each of the extant earthworks were also performed. The excavations documented a consistent pattern of construction. In addition, portions of 4 previously excavated units (Swartz 1976) were reopened. These units documented a more complex construction of Mound 1 and Mound 4 than reported. They also provided the impetus for critically reviewing previous interpretations of the site.

The project documented that the site structures were far more complex than previously documented. While the project obtained new information, it was found that the site was still inadequately understood. Interpretations of the site were limited by the lack of data, ie., no radiocarbon dates associated with the earthworks were obtained. Further excavation of the site and a comprehensive review of previous excavations were recommended.

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INTRODUCTION

The Archaeological Resources Management Service (ARMS) at Ball State University conducted a FY98 Historic Preservation Fund Grant (#13117-16) to further investigate the New Castle site (12Hn1) (Figure 1). The project focused on surveying previously undocumented portions of the site area, assessing the current condition of the earthworks and refining the cultural chronology of the site. This project was carried out under Permit No. 980045 issued by the Division of Historic Preservation and Archaeology, Indiana Department of Natural Resources.

Five Adena-Hopewell earthwork complexes are in east central Indiana including the New Castle site, Anderson Mounds, Bertsch Complex, Fudge Earthwork and Graves Enclosure (Cochran 1992). Only Anderson Mounds has had comprehensive archaeological investigation (Cox 1879; White 1969; Vickery 1970, 1979; Kellar 1969; Buehrig and Hicks 1982; Cochran 1988, 1992; Kolbe 1992a). These investigations have resulted in the testing of 6 of the 8 earthwork structures at the site. Anderson Mounds provides most of the data for Adena and Hopewell chronology (Cochran 1992, 1996; McCord and Cochran 1996).

The New Castle site is the only other earthwork complex that retains major portions of its structures intact. While the New Castle site is listed on the National Register, it is still inadequately and at times inaccurately documented (McCord 1998). Portions of the New Castle site have been excavated, but the excavation utilized methods now 30 years old and a new research focus has been implemented (Cochran and McCord 1997). This project was designed to expand the current information from the New Castle site.

This project had three research objectives:

1. Survey portions of the site area not previously investigated. The only areas of the site that were investigated were the earthworks themselves. Shovel testing of the site area in order to document associated activity areas such as mortuary camps or non-mortuary ritual activity areas was implemented. Additionally, historic disturbance to the site was extensive from the construction and demolition State Hospital buildings and was not fully documented.

2. Assess the current subsurface condition of the individual earthworks. Limited testing of each of the extant earthworks was conducted. Of the 13 structures recorded at the site, only 3 had been previously investigated.

3. Refine the cultural chronology of the site. The only radiocarbon dating for the site was from Mound 4. Obtaining radiocarbon samples was a priority of this research. Radiocarbon dates were necessary to develop a sequence of construction and use of the site and define its relation to the other earthworks in the region.

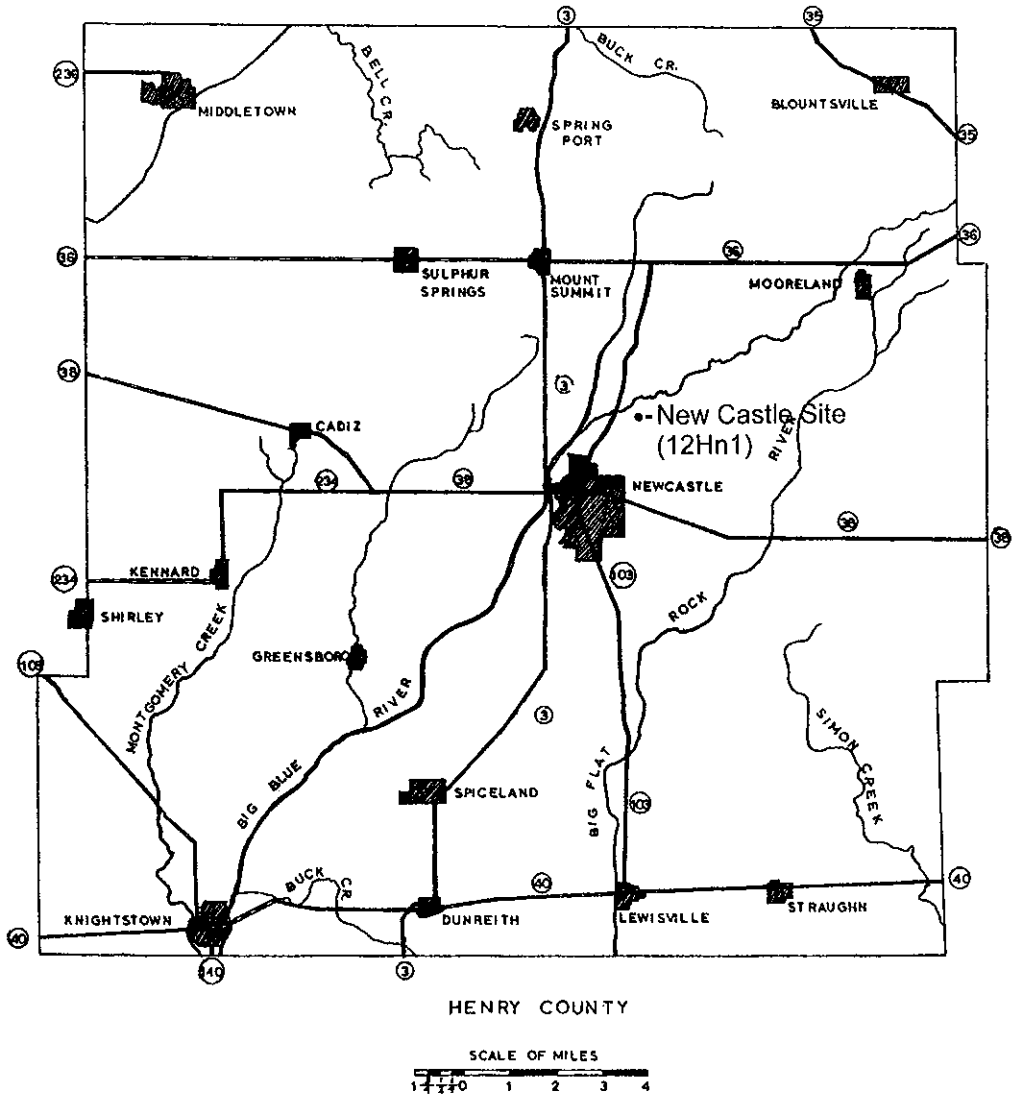

Figure 1. Location of the New Castle site within Henry Co.

NATURAL SETTING

The New Castle Site (12Hn1) is located in Henry County in east central Indiana (Figure 1). A general setting for Henry county is provided below. Specific notations for the site are also included. Because of previous work at the site and the region, much of the following documentation is a reiteration of McCord (1998). A discussion of the environmental and ceremonial landscape is contained in Appendix A.

Geology

Henry County lies within the structural framework known as the Cincinnati Arch, a large, broad and platform-like anticline which is the area of greatest uplift in Indiana. Henry County is underlain by Silurian, Ordovician and Devonian rocks. The Silurian rocks consist of dolomite, limestone, chert, siltstone and shale. The Ordovician rocks consist of shale, limestone, dolomite and sandstone. The Devonian rocks consist of limestone and dolomite. Surface bedrock outcrops are not known in the county but bedrock is shallow in deep stream channels (Gutschick 1966: 5, Schmidt 1990) (Figure 2). Henry County is located within portions of the Bluffton Plain, Dearborn Upland and Muscatatuck Regional Slope bedrock physiographic units. The New Castle site lies within the Dearborn Upland (Schneider 1966:54)(Figure 3).

There are no known chert outcrops within Henry County. Chert resources are found in the secondary source of glacial till and outwash (Cantin 1994). Cantin (1994) states that gravel cherts were significantly utilized in archaeological assemblages.

Pleistocene and recent sediment deposits account for all of the unconsolidated surface material in the county. The Wisconsin Age sediments consist of the kame and esker facies, the end moraine facies and the ground moraine facies of the Cartersburg and Center Grove Till Members of the Trafalgar Formation. The New Castle site lies within the Cartersburg Member of the Trafalgar Formation. Other sediments in the county are primarily Wisconsin in age, but also contain Kansan and Illinoian sediments consisting of the outwash and lacustrine facies of the Atherton Formation. Nonglacial sediments from the recent age consist of the alluvial and paludal facies of the Martinsville Formation (Schmidt 1990, Wayne 1966:26) (Figure 4).

Physiography and Topography

Henry County is located in the general physiographic unit known as the Tipton Till Plain. The Tipton Till Plain is characteristically a nearly flat ground moraine plain (Malott 1922:105, Schneider 1966:49)(Figure 5). The Tipton Till Plain is a constructional feature of the glaciers that was a plain without valleys until the ice began melting and cut broad sluiceways leading southward and southwestward across the plain (Malott 1922:109). The topography is virtually featureless except for the knolls, basins and ridges of terminal moraines, eskers, kames and fluvio-glacial features (Malott 1922:106). The rolling topography of the county results from granular moraines (Schmidt 1990:20).

Bedrock Geology

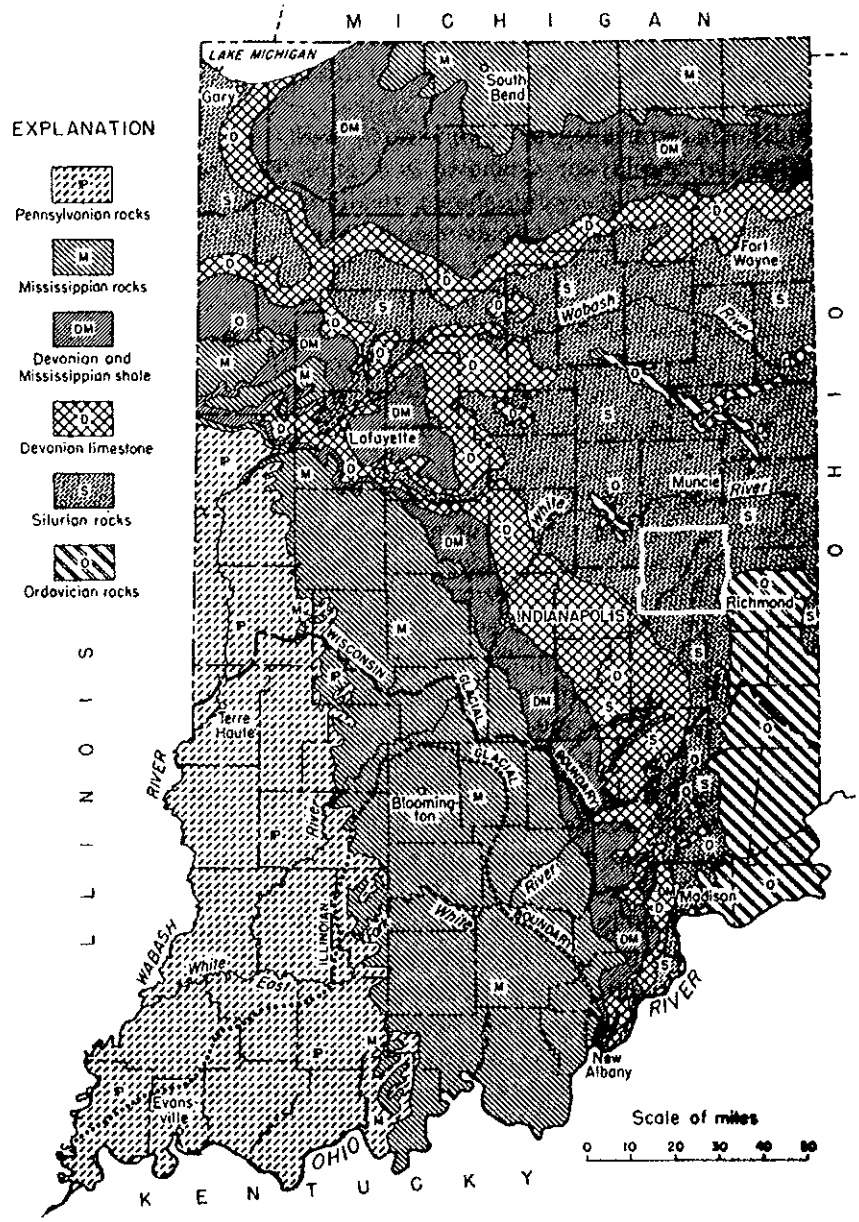

Figure 2. Bedrock geology of Henry County (Gutschick 1966:5).

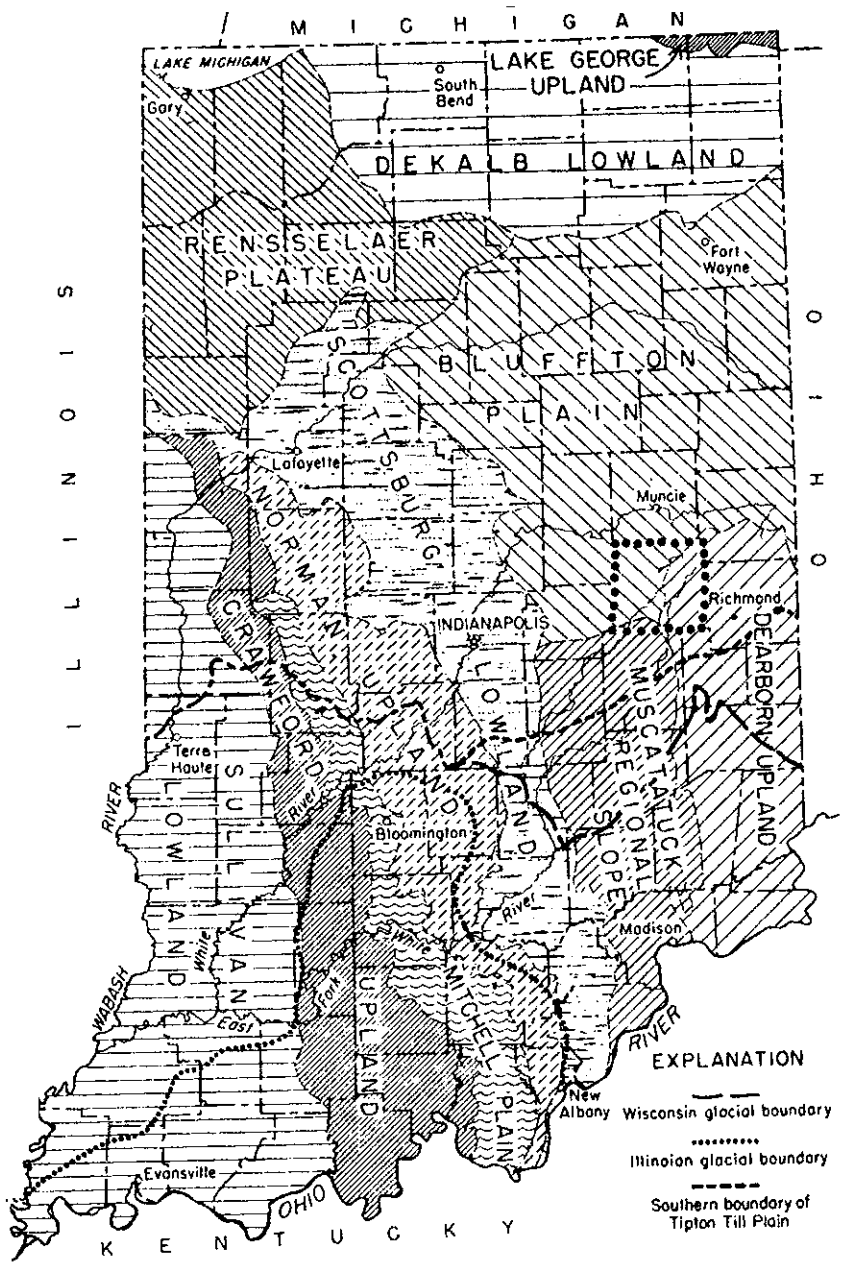

Figure 3. Bedrock physiography of Henry County (Schneider 1966:54).

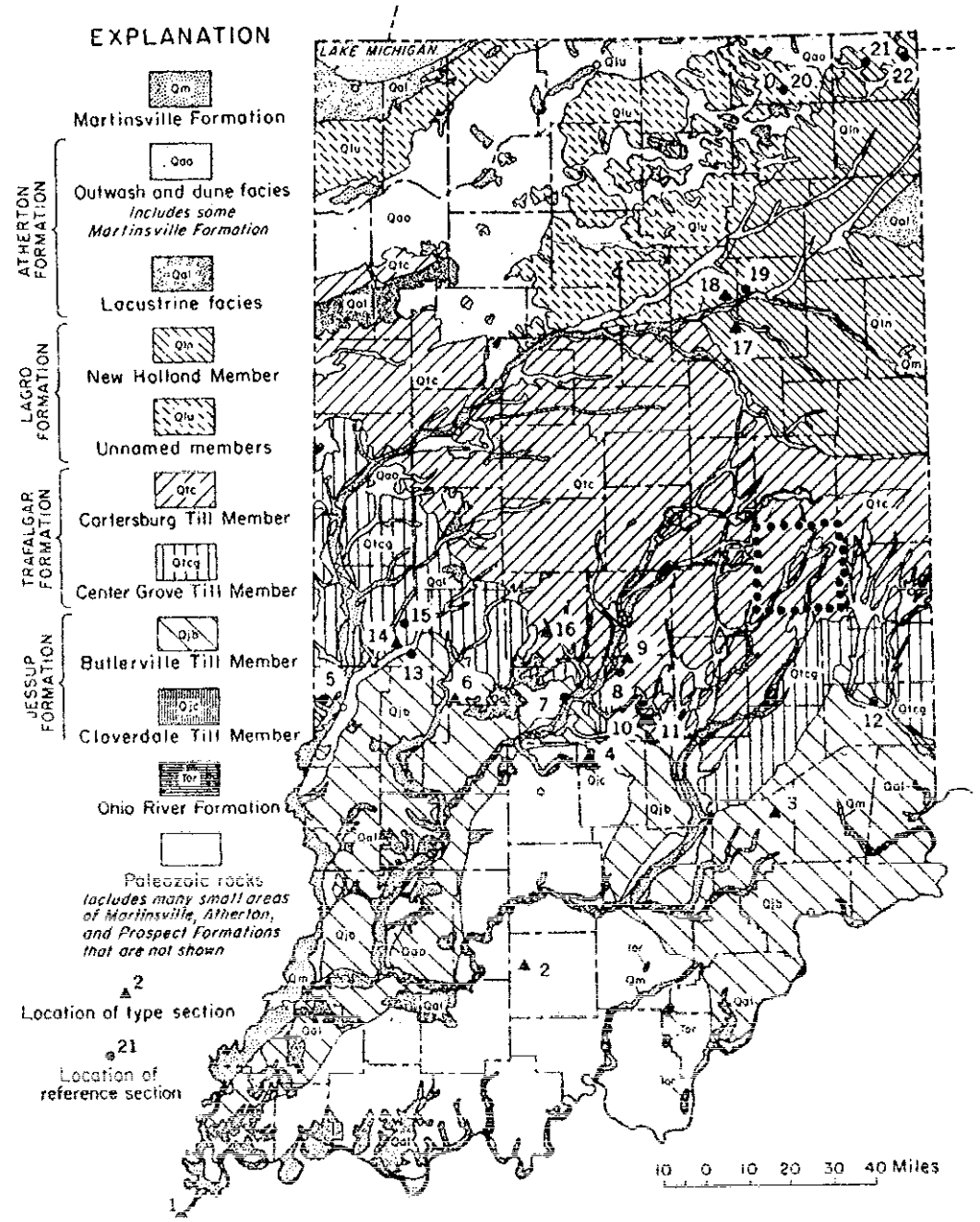

Figure 4. Glacial sediments in Henry County (Wayne 1966:26).

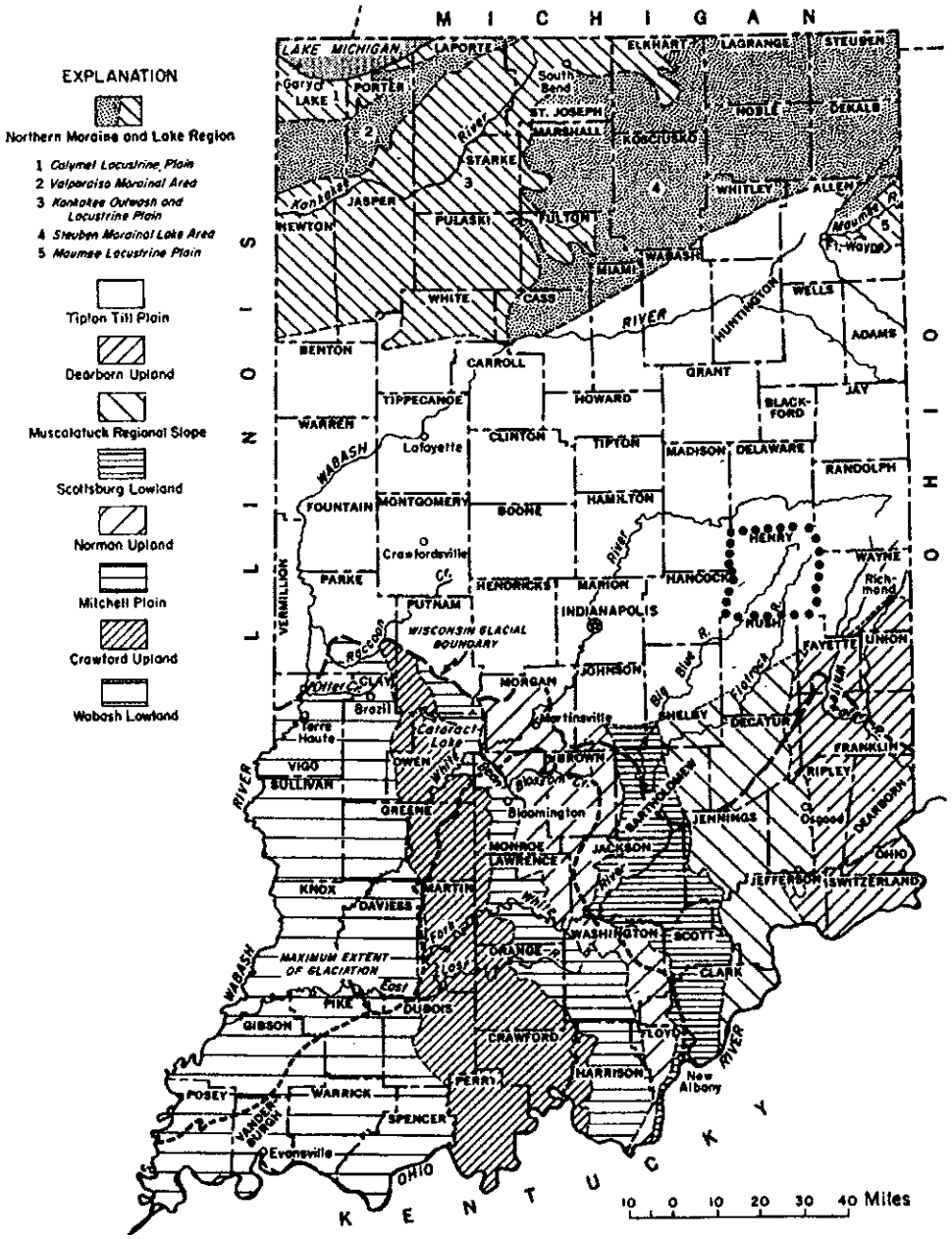

Figure 5. Surface physiography of Henry County (Schneider 1966:41).

The lowest elevation in the county, approximately 880' above sea level, is in the Big Blue River valley near Knightstown in the southern part of the county. The highest elevation, approximately 1190', occurs in Stony Creek and Blue River Townships in the northeastern part of the county. The greatest local relief of over 100' occurs along the sluiceway of the Big Blue River (Hillis and Neely 1987:1, Schmidt 1990:20).

Drainage

The majority of Henry County is within the Upper White, East Fork drainage basin. The northern portions of the county lie in the Upper White, West Fork and eastern portions lie in the Whitewater drainage basin (Kingsbury 1970:18)(Figure 6). The main drainages in the county, the Big Blue and Flatrock Rivers, follow the course of the glacial sluiceways. In places, these valley trains are one-half mile wide and 60' deep into the surrounding glacial till (Schmidt 1990:20). Secondary drainages in the county include the Little Blue River, Buck Creek, Montgomery Creek, Fall Creek, Bell Creek and numerous other drainageways. The county contains no natural lakes (Schmidt 1990:7). The New Castle site is located on a terrace in the Big Blue River valley.

Climate

Henry County, like most of Indiana, is cold in the winter and hot in the summer. The average summer temperature is 71 degrees Fahrenheit and the average daily maximum temperature is 84 degrees. The average winter temperature is 28 degrees and the average daily minimum temperature is 19 degrees. The total annual precipitation for the county is 40 inches (Hillis and Neeley 1987:2).

Flora

The presettlement vegetation of the county is predominantly beech-maple forest with some oak-hickory forest in northern portions of the county (Figure 7). The beech-maple forest developed from the mesophytic forest as northward postglacial migration occurred. In a beech-maple association beech is usually the dominant canopy tree with sugar maple co-dominate in the canopy and dominating the understory. Other species occurring in beech-maple forests include: black walnut, white oak, burr oak, red oak, tulip poplar, white ash, american elm, slippery elm, cork elm, basswood, black gum, hickory, sassafras, and black cherry. Small tree understory is generally redbud-dogwood-blue beech or dogwood-hop hornbeam. Shrub layers can include pawpaw, spicebush, greenbriar, elderberry, leatherwood, wahoo and maple-leaf viburnum. The most prominent herbaceous plants occur in the spring consisting of rue anemone, jack-in-the-pulpit, spring beauty, cutleaf toothwort, pretty bedstraw, mayapple, false Solomon's seal and wild ginger (Petty and Jackson 1966). The New Castle site is located within the beech-maple association (Petty and Jackson 1966:280).

The oak-hickory association is found in balance with both beech-maple and western mesophytic types. The oak-hickory forests are usually found on south-facing and west-facing

DRAINAGE

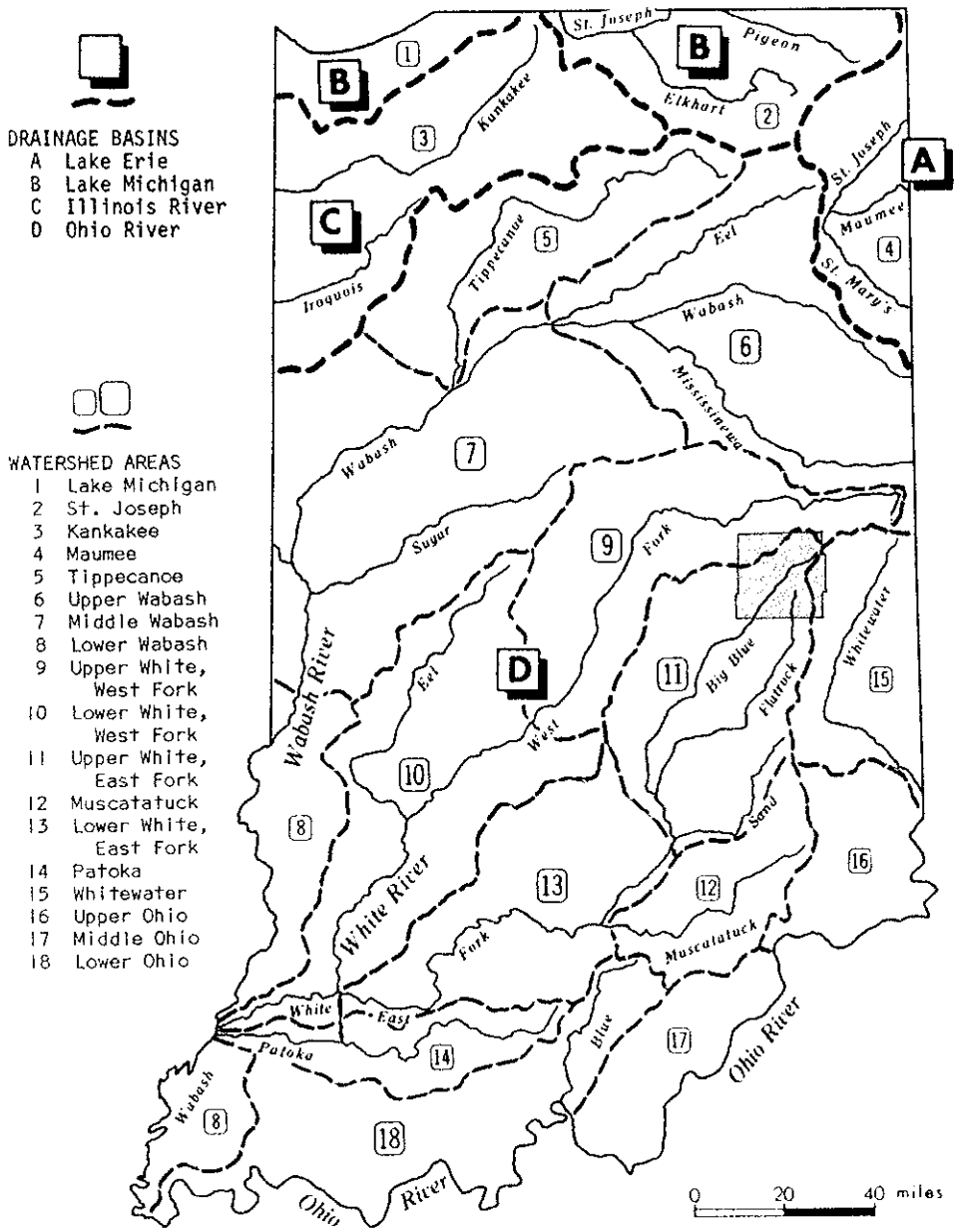

Figure 6. Watershed of Henry County (Kingsbury 1970:18).

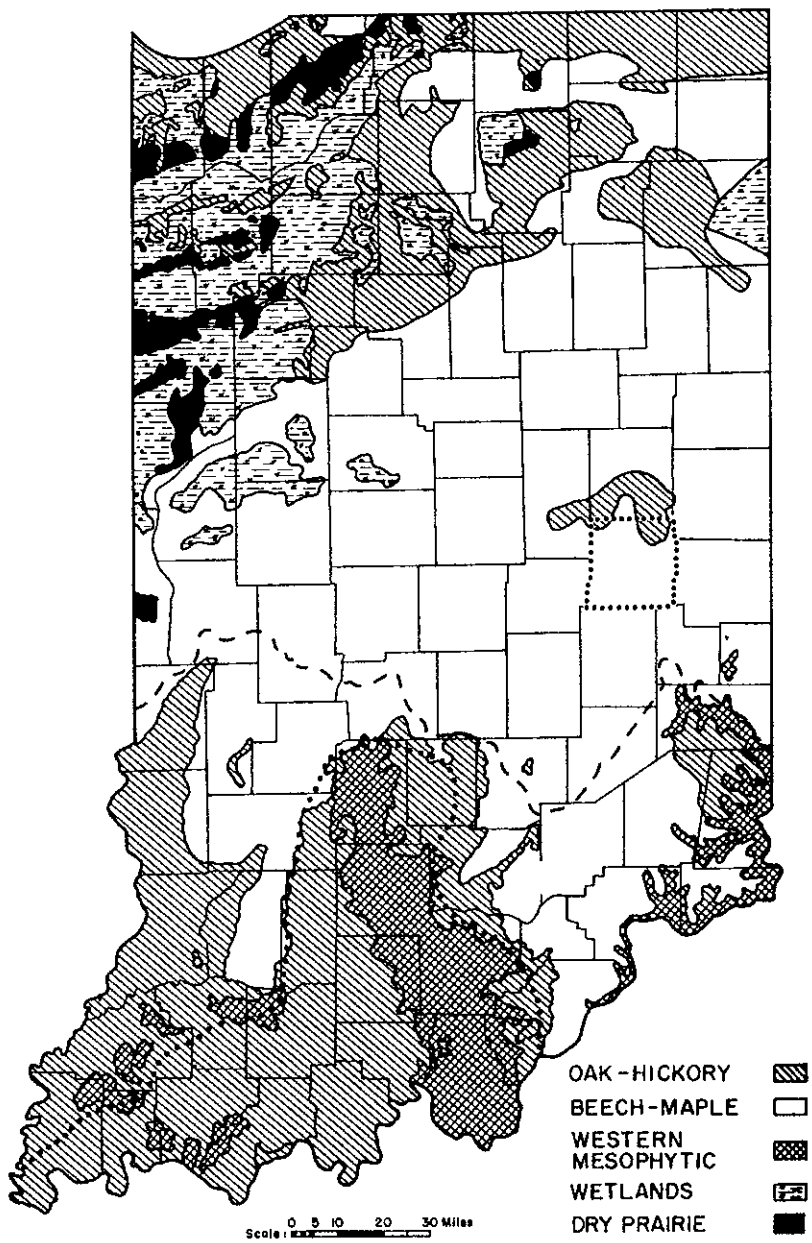

Figure 7. Flora of Henry County (Petty and Jackson 1966:280).

slopes while beech-maple forests usually occupy north-facing and east-facing slopes. Oak-hickory forests are consistently drier than beech-maple forests. It appears that the oak-hickory forests at the time of European settlement were undergoing a gradual replacement by more mesic species. The principal species of the oak-hickory association are white oak, black oak, red oak, pignut hickory, shagbark hickory, sugar maple, american beech, white ash, swamp white oak, chinquapin oak, burr oak, mockernut hickory, american elm, slippery elm and black gum. The understory frequently is less well developed than the beech-maple and western mesophytic associations with one or two species such as hop hornbeam, blue beech, service berry or dogwood dominating the layer. The most common herbs present in the oak-hickory associations are pussy-toes, common cinquefoil, wild licorice, tickclover, blue phlox, waterleaf, bloodroot, Joe-pye-weed, woodland asters, goldenrods, wild geranium and bellwort (Petty and Jackson 1966).

Indiana flora has undergone many changes since the retreat of the glaciers. Table 1 shows a model for the vegetation sequence of east central Indiana. The deciduous forests discussed above are representative of the vegetation during the Woodland period at the time the New Castle site was utilized prehistorically.

Table 1
Vegetation Sequence of East Central Indiana
(Cochran and Buehrig 1985:9, after Shane 1976)

<table>
<tr><td>AD 2000</td><td rowspan="2">Historic</td><td rowspan="10">Deciduous Forest</td></tr>
<tr><td>AD 1000</td></tr>
<tr><td rowspan="2">0</td><td>Late Woodland</td></tr>
<tr><td>Middle Woodland</td></tr>
<tr><td>1000 BC</td><td>Early Woodland</td></tr>
<tr><td>2000 BC</td><td rowspan="2">Late Archaic</td></tr>
<tr><td>3000 BC</td></tr>
<tr><td>4000 BC</td><td rowspan="3">Middle Archaic</td></tr>
<tr><td>5000 BC</td><td rowspan="2">Prairies and Open Vegetation</td></tr>
<tr><td>6000 BC</td></tr>
<tr><td>7000 BC</td><td rowspan="2">Early Archaic/ Late Paleo Indian</td><td rowspan="2">Deciduous Forest</td></tr>
<tr><td>8000 BC</td></tr>
<tr><td>9000 BC</td><td rowspan="8">Early Paleo Indian</td><td>Pine Maximum</td></tr>
<tr><td>1000 BC</td><td rowspan="2">Conifer-Deciduous Woodland</td></tr>
<tr><td>11000 BC</td></tr>
<tr><td>12000 BC</td><td>Boreal Forest</td></tr>
<tr><td>13000 BC</td><td>Park Tundra</td></tr>
<tr><td></td><td>Tundra or Open Areas</td></tr>
<tr><td>14000 BC</td><td>Periglacial Zone</td></tr>
<tr><td>15000 BC</td><td>Wisconsin Ice</td></tr>
</table>

Fauna

Several species of Pleistocene megafauna have been recorded in Indiana. The Pleistocene mammals reported include giant sloth, giant beaver, musk-ox, mastodon, mammoth, horse, dire wolf, bison, tapir, Virginia deer, peccary, elk and probably moose, caribou and some form of bear (Moodie 1929:77-96). Richards (1984) has additionally documented moose, caribou, two forms of bear, white-tailed deer, Canadian goose, armadillo, jaguar, sabertooth tiger and camel.

Man has altered the Indiana environment toward a single type habitat. In the process, many species have moved into new territories or have become restricted or extinct. It was estimated that approximately 66 species of mammals were present in Indiana in 1816. The following species have since been exterminated: porcupine, gray (timber) wolf, red wolf, black bear, fisher, wolverine, eastern spotted skunk, river otter, mountain lion, lynx, elk, bison and possibly bobcat. Some of the mammals found in all or most Indiana counties include: opossum, short-tailed shrew, least shrew, eastern mole, little brown bat, red bat, hoary bat, evening bat, eastern cottontail, eastern chipmunk, woodchuck, gray squirrel, fox squirrel, southern flying squirrel, beaver, deer mouse, white-footed mouse, meadow vile, pine vole, muskrat, southern bog lemming, Norway rat, house mouse, meadow jumping mouse, coyote, red fox, gray fox, raccoon, long-tailed weasel, mink, striped skunk and white-tailed deer. Beaver and white-tailed deer were once extirpated and reintroduced (Mumford 1966:475-476).

The fish fauna has also changed over the last several thousand years. During the Wisconsin glaciation, coldwater species such as trout, grayling, whitefish and cisco probably inhabited the southern part of the state. As the glaciers retreated, the coldwater fish migrated north and warm water fish migrated into the state from the south. A total of 177 species of fish have been described in Indiana waters. Ten of the species have not been seen since 1900 and may be extinct and 20 species are rare. Several species have been introduced by man or man's intervention including carp, goldfish, brook trout, rainbow trout, brown trout, smelt, sea lamprey, alewife, and threadfin shad (Gammon and Gerking 1966:402-404).

Approximately 200 species of mollusks and 400 species of crustaceans occurred in Indiana waters (Young 1966:321-335). Call (1900:342) identified 131 species of mollusks in 1900 and reported the mollusks from southern Indiana were larger than those found in northern Indiana.

Between 1947 and 1957, 83 species of amphibians and reptiles were recorded for the state. The composition and distribution of the herpetofauna was influenced by environmental changes since the retreat of the Wisconsin glaciers. With the shifting environmental patterns, new immigrating species became dominant. But, the prior residents were not completely replaced. Man has introduced no new species, but has altered the distribution of most species and a species of semiaquatic snake is no longer found in the state (Minton 1966:426).

Approximately 366 species of birds have been reported in Indiana since 1816. This number includes transients and migratory species. The Passenger Pigeon and Carolina Parakeet,

two common species of the nineteenth century are now extinct. Nine species found in Indiana in the nineteenth century no longer occur in the state: the Wood Ibis, Trumpeter Swan, Prairie Chicken, Whooping Crane, Eskimo Curlew, Mississippi Kite, Swallow-tailed Kite, Ivory-billed Woodpecker and Raven (Webster 1966:455).

Soils

The formation of soils is influenced by several factors: parent material, climate, flora and fauna, topography and time. Most of these factors have been discussed in preceding sections. The parent materials for the soils in Henry County were deposited as glacial till and outwash, loess, lacustrine sediments, alluvium and organic material (Hillis and Neely 1987). The soil associations for the county are discussed below.

The Crosby-Cyclone-Miamian association consists of deep, nearly level and gently sloping, somewhat poorly drained, and well drained, medium texture and moderately fine textured soils formed in loess or silty material and in the underlying loamy glacial till. These soils are found on till plains and moraines and are characterized by swells and swales. This map unit comprises approximately 46 % of the soils in Henry County (Hillis and Neely 1987:5).

The Miamian-Losantville association consists of deep, gently sloping to steep, well drained, medium textured and moderately fine textured soils formed in glacial till or in a thin mantle of loess and the underlying loamy glacial till. These soils are found on till plains and moraines on knobs and breaks along major and many minor streams. This map unit comprises approximately 29 % of the soils in the county (Hillis and Neely 1987:5 and 6).

The Eldean association consists of nearly level to strongly sloping, well drained, medium textured and moderately fine textured soils that are moderately deep over sand and gravel formed in outwash material. These soils are found on outwash plains, moraines and terraces bordering major streams. This map unit comprises approximately 9% of the soils in the county (Hillis and Neely 1987:7). The New Castle site is located in the Eldean association. The soils mapped at the New Castle site consist of the nearly level, well drained Eldean silt loam, 0 to 2% slopes (EdA); the gently sloping, well drained Eldean silt loam, 2 to 6% slopes, eroded (EdB2); and the strongly sloping, deep, well drained Losantville silt loam, 12 to 18% slopes, eroded (LeD2) (Hillis and Neely 1987: 17 & 24, map sheet 28).

The Losantville-Crosby-Miamian association consists of deep, nearly level to steep, well drained and somewhat poorly drained, medium textured and moderately fine textured soils formed in glacial till or in a thin mantle of loess and the underlying loamy glacial till. These soils are found on till plains and moraines on knobs and breaks along the upper reaches of the Big Blue River and Buck Creek and some minor streams. The unit has an abundance of stones. This map unit comprises approximately 7% of the soils in the county (Hillis and Neely 1987:10).

The Westland-Milgrove-Martisco association consists of deep, nearly level, very poorly

drained, medium textured or mucky soils formed in glacial outwash sediments and organic deposits. These soils are found on outwash plains, terraces and valley trains bordering the major stream channels. This map unit comprises approximately 6 % of the soils in the county (Hillis and Neely 1987:7 and 8).

The Genesse-Shoals-Landes association consists of deep, nearly level, well drained and somewhat poorly drained, medium textured soils formed in loamy alluvial deposits. These soils are found on bottom lands bordering major and some minor stream channels. This map unit comprises approximately 3 % of the soils in the county (Hillis and Neely 1987:9).

THE NEW CASTLE SITE

Setting

The New Castle site (12Hn1) is in Henry Township in portions of the [redacted] Quadrangle (Figure 8). The site is located between 1050' and 1070' AMSL on a terrace overlooking the Big Blue River sluiceway to the west. The complex is between two drainages with the Little Blue River approximately 500' north of the northern earthworks and an intermittent drainage approximately 300' south of the southern enclosures. The site is primarily on the nearly level, well drained Eldean silt loam, 0 to 2% slopes (EdA), but the site boundaries also include the the gently sloping, well drained Eldean silt loam, 2 to 6% slopes, eroded (EdB2) and the strongly sloping, deep, well drained Losantville silt loam, 12 to 18% slopes, eroded (LeD2)(Hillis and Neeley 1987:17 & 24, map sheet 28).

Historically, the landuse at the New Castle site has involved agricultural activities and was the location of Colony No. 3 of the Indiana Village for the Epileptics. The land was originally purchased in 1821 by Allen Shephard (Anonymous 1980:n.p.). In 1875 John C. Huddleson owned the property (Anonymous 1972:10). In 1906 the property was purchased by the state of Indiana for the Indiana Village of Epileptics (Flynn 1974). In 1913, Colony No. 3, consisting of 2 cottages for boys, was built at the location of the earthwork complex (Flynn 1974). The Epileptic facility grew and became a self-sufficient community. In 1956, the facility was renamed the New Castle State Hospital to incorporate mentally retarded patients. With new treatments for epileptics, the patient enrollment declined. In 1972 the land involving the New Castle site was transferred to the Department of Natural Resources for the development of the Wilbur Wright State Recreation Area (Radford 1992). In the mid 1980s the buildings associated with the hospital were torn down. Redding (1892) noted that early cultivation had damaged Earthworks 3, 4, 5, 10 and 11. These same earthworks were further damaged by the construction of the colony buildings and roads (Lilly 1937, Vickery 1976).

History of Investigations

The New Castle site is reported in various historical accounts as the most impressive prehistoric earthwork site in the county (Pleas 1871:135- 136, Gorby 1886:115-116, Redding 1892:99-103, Thomas 1891:75, Shetrone 1930:249, Lilly 1937:68-71). Pleas (1871:135-136) provides the earliest account of the site. He notes that some of the enclosures "appear to have been circular, others quadrangular, one octagonal and some of irregular outline, though from the partial obliteration of the walls [from plowing] the exact state is not easily determined" (Pleas 1871:136). Pleas (1871:136) also notes that one or more mounds exist without a surrounding ditch or embankment. Pleas also documents the New Castle site in a letter written in 1889:

> "Near the centre [sic] of this county is one of the most remarkable collection of mounds and earthworks, some 14 within a space of 10 or 15 acres. These are

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Figure 8. A portion of the USGS 7.5' New Castle East Quadrangle showing the location of the New Castle Site.

being rapidly demolished by cultivation. . . . The remarkable fact connected with these works were that when the white man arrived about 1819 or 1820 the Indians were using them and had timbers (palisades) on some of the ditch banks to keep their horses within. At some time I aim to have these works surveyed and have [an] accurate map of them preserved" (National Museum of Natural History Acc. 21440).

Of the early sources, Redding (1892) provided the most detailed descriptions for individual earthworks and their spatial relationships. Since Redding's descriptions have proven to be quite accurate and an important resource they were reproduced in Appendix B. Other sources provided only a brief mention of the site or repeated previously documented information.

While Redding's (1892) descriptions were important, no map of the site was made and his descriptions were not ordinal. The first and only map of the site was pictured in Lilly (1937) (Figure 9) and later reproduced in Swartz (1976)(Figure 10). Unfortunately, this map was made after the construction of Colony No. 3 at the Indiana Village for Epileptics. The construction of Colony No. 3 severely damaged or destroyed some of the earthworks (Swartz 1976). Lilly (1937) and Vickery (1976) both discussed the size and condition of the earthworks, but several of their descriptions were found to be inaccurate in a 1998 survey of the complex (McCord 1998).

The most extensive investigations of the New Castle site were conducted by Ball State University field schools from 1965 to 1971. The field schools excavated portions of three of the earthworks; Mound 1, Mound 4 and Earthwork 7 [actually Earthwork 6 - (McCord 1998:58 - 60)] (Swartz 1976). Further descriptions of the excavations are provided below.

A recent survey of the New Castle site relocated and mapped the extant earthworks in the complex and refined the previous documentation of the site. The buildings from the Epileptic Colony had been removed and the site area was grown over with grasses, small trees and multiflora roses. Previous errors concerning the location and preservation of the earthworks were amended by the project. It was also found that previous work misrepresented the integrity of the site. Of the 13 earthworks reported at the site, portions of 10 structures were still visible. It is likely that portions of the bottom of ditches of the 3 remaining structures were also intact and could be relocated. Damage to the northern portion of embankment of Mound 4 from borrowing operations was documented. The National Register Nomination for this site was found to be deficient in a factual description of the entire complex and the site boundaries were inaccurate. The survey provided the realization that the New Castle site was the best preserved earthwork complex still existing in east central Indiana and further research of the site was necessary (McCord 1998). The instrument survey conducted by this project found some errors in the 1998 site map (see Methods). The map was revised to produce Figure 11.

Site Description

A description of the earthworks recorded at the New Castle site is provided below. The

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Figure 9. Lilly's (1937) map of the New Caslte site.

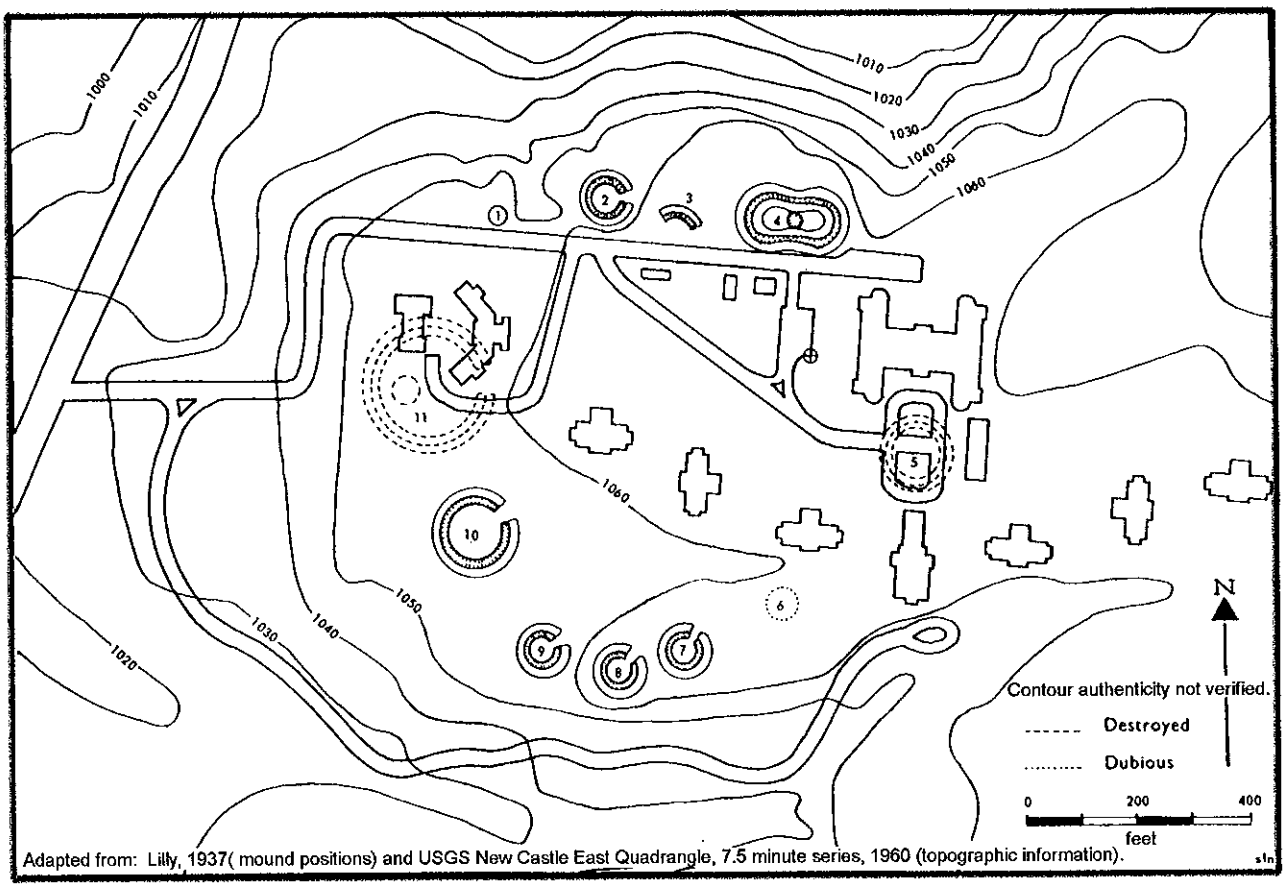


Figure 10. Swartz's (1976:63) map of the New Castle site.

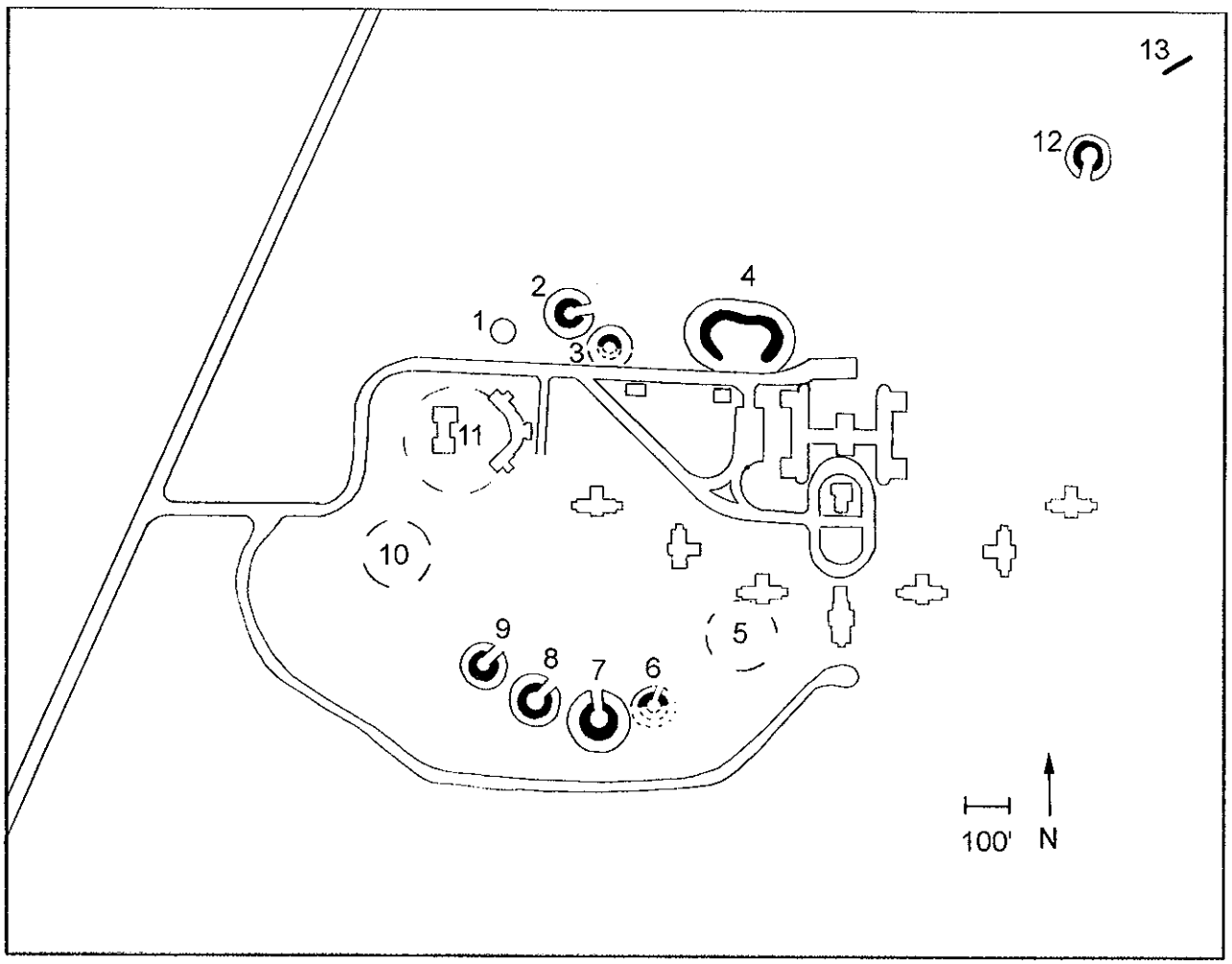


Figure 11. Map of the New Castle site (after McCord 1998).

summary is based on information provided by Redding (1892), Lilly (1937), Vickery (1976) and McCord (1998). The numbering system follows that established by Lilly (1937) and varies slightly from Vickery (1976). Mounds 1 and 4, Earthworks 2 and 3 and the suspected areas of Earthworks 5, 10 and 11 were located in overgrown areas of grass, small trees and multiflora roses. All other earthworks were located in second growth woods (McCord 1998:57).

Mound 1 was described as 40' in diameter and about 6' high (Figure 12). The southern edge was in a cultivated field in the 1890s. Pleas (1871:136), Redding (1892:101) and Lilly (1937:70) all mention excavations that occurred in the mound. McCrumb (1966a:3) noted that the mound was partly obliterated by road fill, landscaping, small trees and bushes. Three 5 x 5 foot units were excavated in 1965 by a Ball State University field school (McCrumb 1966a, Swartz 1976). The 1998 survey found Mound 1 was well preserved. The locations of the BSU excavations were apparent (McCord 1998:58).

Earthwork 2 was a circular enclosure approximately 100' in diameter with a gateway opening to the east. It was in woods in the 1890s. A small mound was reported on the south side of the central platform by Redding (1892:101) but he questioned its origin as artificial. In 1998 Earthwork 2 was well preserved. The ditch on either side of the gateway was noted as uncharacteristically deep giving the appearance of 2 pits within the ditch. No evidence of a mound was visible (McCord 1998:58).

Earthwork 3 was a circular enclosure approximately 150' in diameter. It was partly in woods, but the southern part was almost obliterated by cultivation in the 1890s. The southern side was further damaged by road grading for the Epileptic Colony (Vickery 1976:7). Lilly (1937:71) displays the gateway oriented to the east, but Redding (1892) did not mentioned a gateway. Redding (1892: 101) also mentioned the possibility of a mound within the enclosure, but if it existed it was nearly leveled in the 1890's. Only the northern one-half of Earthwork 3 was apparent from the surface in 1998 (McCord 1998:58).

Mound 4 was a large elliptical/panduriform shaped mound and enclosure (Figure 13). The enclosure was 215' long (east-west) and between 122' and 150' wide (north-south). The ditch was 3' to 6' deep and the embankment was about 6' high. The mound was reported to be 2 mounds conjoined with the west being higher. The length of the mound was 160' (east-west) and 80' to 100' wide (north-south). The mound averaged about 10' in height (Redding 1892:100, Vickery 1976:7). The majority of the earthwork was in woods, but the southern portion of the embankment was in a cultivated field in the 1890s. The southern edge was further damaged by road grading for the Epileptic Colony. No gateway was reported for this earthwork. Redding (1892:100) noted that the mound had been dug into in four or five places. Redding (1892:100-101) also excavated two trenches into the mound. Ball State University field schools excavated a large portion of the mound, part of the enclosure and areas immediately east and west of the mound between 1965 and 1971 (McCrumb 1966b, McCrumb 1966c, Neirinck 1966, Middleton 1966, Strickler and Wilson 1967, Townsend and Morris 1968, Shrader 1968, Curren 1969, Habart 1969a, Habart 1969b, Whitten and Brieschke 1970, Pullen 1971, Stacy 1972, and Swartz

Figure 12. Mound 1, looking north, photograph taken 6-17-65.

Figure 13. Mound 4, looking north. Photograph taken 6-15-65.

1976). In 1998, the mound looked very little like pre-excavation photographs. The mound was not well recontoured after excavation (McCord 1998:58)(Figure 14). In 1971, Stacy (1972:8) noted that due to backfilling and dirt being added it had the appearance of a single mound. Areas of previous excavation were apparent in 1998. The enclosure was fairly well preserved except for the southern side. The northern edge of the bank in the northwest portion of the enclosure was damaged by a large borrow pit not previously mentioned in the literature. Fill in the northeast corner of the bank was apparent since the bank was very wide and irregular in this area (McCord 1998:58).

Earthwork 5 was a circular enclosure reported as 160' in diameter. It was in a cultivated field and badly eroded in the 1890s. Redding (1892) was unsure if it was an artificial enclosure. Lilly (1937:71) reported the enclosure as destroyed by hospital construction. A 1938 aerial photograph of the site area at the Indiana State Archives shows an apparent enclosure in the location of Earthwork 5 as described by Redding. Lilly (1937:71) mapped an enclosure in this area, but identified it as Earthwork 6. Earthwork 6 was found in a different location so, Earthwork 5 may have actually been missed by the Epileptic Colony construction (McCord 1998:60-61).

Earthwork 6 was a circular enclosure 100' in diameter with a shallow ditch (Figure 15). The embankment adjoins the embankment of Earthwork 7 to the west. Redding (1892) stated that the opening was not clear but seemed to be to the east. Lilly (1937) and Vickery (1976:7) reported a small mound on the central platform and an entranceway east of north. In 1998, Earthwork 6 was noted as severely damaged with only approximately one-quarter of the enclosure intact. Based on photographic evidence, field notes and excavation descriptions it was ascertained that Earthwork 6, not Earthwork 7, was actually excavated by BSU field schools in 1970 and 1971 (Heathcoate 1972, Olson 1971, Swartz 1976). This misidentification would explain why no apparent mound was found in 1970 in this enclosure as described by Vickery (1976:7). Unfortunately, the heavy machinery utilized for backfilling severely damaged the enclosure (1971 field notes, on file at ARMS). The bank and ditch for the southern half of the enclosure were not identifiable (McCord 1998:58-60).

Earthwork 7 was reported as a circular enclosure 120' in diameter. A mound 3' to 5' high was reported on the central platform (Redding 1892:102). Lilly (1937) reported the enclosure was destroyed. The 1998 survey observed that Earthwork 7 was the largest of the extant southern enclosures. It was built on a natural elevation, described by Redding (1892:101) as a mound. Several potholes on the central platform were noted (McCord 1998:60).

Earthwork 8 was a circular enclosure 90' in diameter with a gateway to the northeast. A mound was reported in the center of the enclosure. Lilly (1937:71) reported the enclosure was destroyed. The earthwork was found as described, but no mound was apparent (McCord 1998:60).

Earthwork 9 was a circular enclosure 150' in diameter with an entranceway to the

Figure 14. Mound 4 after excavation, looking north. Photograph taken 8-15-75.

Figure 15. Southern half of Earthwork 6, looking east. Photograph taken 6-12-70.

northeast. Lilly (1937:71) reported the enclosure was destroyed. A recent pothole was noted on the central platform in 1998. The enclosure was covered in fallen timber which may account for the misidentification of some of the southern enclosures (McCord 1998:60).

Earthwork 10 was a circular enclosure 150' in diameter with a gateway to the east. The earthwork was in cultivation in the 1890s. Lilly (1937:71) reported the enclosure was destroyed. The location of Earthwork 10 was in an area where at least 1' of earth has been removed. The enclosure was not visible (McCord 1998:61).

Earthwork 11 was the largest circular enclosure in the complex. It was 250' in diameter with a ditch 3' to 5' deep. A mound 40' in diameter and 2' high was located on the western portion of the central platform. The gateway faced east. The earthwork was in cultivation in the 1890s. Lilly (1937:71) and Vickery (1937:8) reported the earthwork destroyed by the Epileptic Colony construction. According to Redding (1892:102), Earthwork 11 was farther north then Lilly's location (1937:71). During the 1998 survey, the southern portion of the ditch of Earthwork 11 was tentatively identified in the area of Redding's location (McCord 1998:61).

Earthwork 12 was located to the northeast of the other enclosures. Vickery (1976:6) designated it as Earthwork 1, but it has been renamed to avoid confusion with Mound 1. This earthwork was reported as a mound 100' in diameter and 6' high surrounded by a ditch and bank. The earthwork had been recently cleared of timber in the 1890's. The earthwork was not pictured on Lilly's (1937) map or Swartz's (1976) revised map even though it was relocated by BSU field schools and included on sketch maps (1966 and 1967 field notes, on file at ARMS). Earthwork 12 appeared to be the mound Harlos (1967:37) reported as 12Hn3. Since this mound was clearly associated with the New Castle site, it was considered part of 12Hn1. The mound described at Earthwork 12 by Redding (1892) appears to be a natural knoll surrounded by the bank and ditch of the enclosure (McCord 1998:60).

An earthen wall, Earthwork 13, was located across a ravine to the east of Earthwork 12 across a ravine. It was reported as a linear embankment 200' long and 6' high along the side of a hill. This earthwork was not included on Lilly's (1937) map or Swartz's (1976) revised map even though they were relocated by BSU field schools and included on sketch maps (1966 and 1967 field notes, on file at ARMS). The linear embankment was found by the 1998 survey (McCord 1998:60)

Another possible mound was reported only by Redding (1892). He reported that there was a slight indication of a mound not within an enclosure near Earthwork 10. The area was in cultivation and he could not confidently call it a mound. This mound was not relocated in 1998 (McCord 1998:60).

Excavations

Several writers document excavations occurring at the site (Pleas 1871:136, Redding

1892:100-102, Lilly 1937:70, and Swartz 1966:1). These reports focussed on excavations at either Mound 1 or Mound 4, but excavations at the enclosures were also documented by McCord (1998). Little information about most of these excavations was known. Hellar (1974:10) reports seeing artifacts taken from the site by a construction crew when the colony was being built and that they were in the possession of Dr. Walter Van Nuys, the superintendent of the Epileptic Village. Mr. Frank Setzler was invited to see what Dr. Van Nuys "has obtained from the excavation made on the ground [New Castle site]" (Smith 1929). Swartz (1966:1) reports that hospital employees had dug a trench into the north side of Mound 4 in 1937.

Redding (1892:100-101) excavated 2 trenches in Mound 4 and briefly described his findings (see Appendix B). He reports areas of burned clay and ashes from the north-south oriented trench across the western end. He reports similar findings of ashes, charcoal, bone and burned clay from an east-west oriented trench across the eastern end (Redding 1892:100-101). Figure 16 provides a sketch of Redding's findings created by McCrumb (1965 field notes).

The most extensive excavations at the site were those conducted by Ball State University field schools between 1965 and 1971 (Swartz 1976). Each field school was five weeks long during June and July. A summary of the excavations was provided below.

The 1965 BSU field school excavated 3 - 5' square units in the western portion of Mound 1. The interpretation of the excavation reported the mound had been built on a natural knoll with a primary mound of banded soil and a second capping of soil containing burned bone, charcoal, red ocher, ash and lithic debris. A sheet of untrimmed mica was found surrounded by fragmented human cranial and long bones (Swartz 1976:22-23).

Between 1965 and 1971, portions of Mound 4 were excavated each year. The interpretation of Mound 4 was that each lobe of the mound had a primary mound core and a complex stratigraphy of features (Swartz 1976). The excavations reportedly recovered 27 individuals (3 were intrusive), 617 chipped stone artifacts, 9 ground stone artifacts, 2 untrimmed sheets of mica, several thousand ceramic sherds including 1 complete plain vessel and 1 portion of a Hopewell Zoned Rocker Dentate Stamped vessel, 1 clay platform pipe, 27 split turkey bone pins, 1 bone awl, 2 drilled lynx mandibles, 2 cut long bones, 1 antler rod, 2 bird claws, 5 conch containers, 31 circular shell beads, 462 drilled pearl beads, 4 copper covered bear canine effigies, 1 dog burial and unmodified animal bone (Swartz 1976). Fragments of a copper panpipe were also recovered (Cree 1992). Uncorrected radiocarbon dates from Mound 4 include AD 10 +/- 160, AD 40 +/- 140 and AD 230 +/- 300 (Swartz 1976:58).

During the 1970 and 1971 BSU field schools, the southern half of the enclosure identified as Earthwork 7, actually Earthwork 6, was excavated. A Kanawha, Matanzas, a bifurcate point, and a point fragment were recovered from the surface. Two point fragments, a bipolar artifact, 2 anvils and 127 pottery sherds were recovered from the central platform and ditch (Swartz 1976, ARMS files).

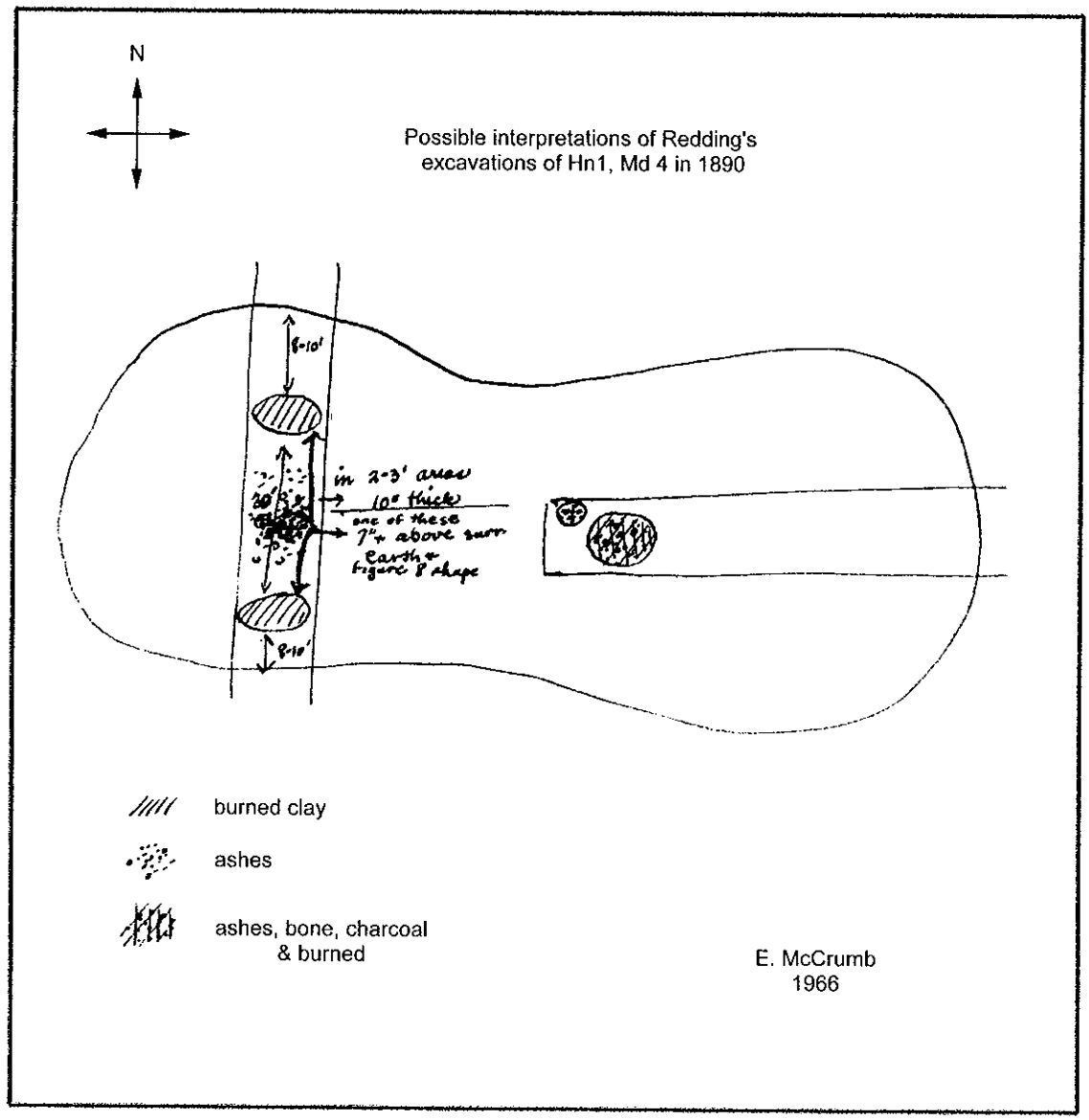


Figure 16. Sketch by Eleanor McCrumb of Redding's (1892) excavations of Mound 4.

The site was interpreted as a "Hopewell Ceremonial Complex" (Swartz 1976). Vickery (1979:59 & 62) reported that the entranceway of eight of the circular enclosures were oriented toward the panduriform which suggested it was the focal point of religious and/or civil ceremonial activity. Because of the BSU excavations, the site was nominated and listed on the National Register of Historic Places on April 16, 1976 (Swartz 1976).

The 1998 mapping project helped to clarify and refine previous documentation of the site. The enclosure gateways did not intersect to a focal point. Actually none of the gateways aligned to Mound 4. While the site was listed on the National Register, the nomination was found to have a fallacious site description and the site boundaries were inaccurate reported (McCord 1998).

METHODS

Research Methods

To provide an accurate and current report on the New Castle site, documentary research was utilized to complement the field work. The documents reviewed included county histories, archaeological reports and correspondence on file at ARMS. The excavations at the site between 1965 and 1971 by Ball State University field schools was the main focus of the research.

Extensive research was conducted to help correlate the current project with the data recovered by the field schools. This research included a meticulous search of the published information from the field schools including the site report by B.K. Swartz, Jr. and the foreman's reports of each season published in the Archaeological Reports series (Swartz 1966, McCrumb 1966a, McCrumb 1966b, McCrumb 1966c, Neirinck 1966, Middleton 1966, Strickler and Wilson 1967, Townsend and Morris 1968, Shrader 1968, Buchman 1968, Swartz 1969, Curren 1969, Habart 1969a, Habart 1969b, Whitten and Brieschke 1970, Swartz 1971, Pullen 1971, Olson 1971, Heathcoate 1972, Stacy 1972, Glenn 1973, Stacy 1973 and Swartz 1976). Generally, these reports did not provide the details necessary for our investigations. Fortunately, the original field notes, drawings and photographs of the field school excavations were on file at BSU. All of the sources were examined to help clarify the location of the previous excavations, excavation methodology, stratigraphy, association of the materials and artifacts recovered.

In addition to the archival evaluation, a review of the artifacts and human remains was conducted. A reanalysis of the artifacts from the site except for the ceramics was previously conducted by the author (Kolbe 1990). A reanalysis of the ceramics was conducted by Amy Johnson (1995). Appendix C contains a listing of the materials with the reanalysis identification. The human remains were also reviewed to examine the material present and document aspects not previously examined. The analysis of the human remains was conducted by Michele Greenan (Appendix D).

Shovel Probing Methods

The focus of most of the archaeological work at the New Castle site involved the earthworks. The remainder of the site area had received little attention. Therefore, shovel probing of the entire site area at 20 meter intervals was proposed to document associated activity areas, other prehistoric use of the area and determine the extent of the historic disturbance. The site area was defined as the upland ridge spur where the earthworks were constructed. This area incorporated approximately 27.3 hectares (67.4 acres).

Areas containing obivious historic disturbance, including extant foundations, locations of former buildings, borrow areas and dump areas were not shovel probed. Areas with slopes of 25% or greater were not investigated. Additionally, areas of very dense vegetation were not investigated. Transects were cleared using a brush mower around the northern group of

enclosures. It should also be noted that the earthworks were not shovel probed. Collectively, these areas included a large portion of the site area.

Since the site area that could be investigated was reduced, the shovel probe interval was reduced to a 10 meter interval. Shovel probes were excavated to subsoil and all excavated soil was screened through 6.35 mm wire mesh. The depth to subsoil, the munsell color and the texture of the soil was recorded. A small soil sample for phosphate testing was collected from the A-horizon. Disturbances (other than bioturbation) were also noted.

Excavation Methods

To meet the project objectives of assessing the current condition of the earthworks and refining the chronology of the site, limited test excavations in each extant structure were necessary. The research objectives concerning each structure were discussed below. The methods utilized were tailored to meet the objectives set for each structure.

The research objectives concerning the small circular enclosures, Earthworks 2, 3, 6, 7, 8, 9 and 12, were to determine if the central platform contained an artificial mound or subsurface features, find the depth of the original ditch and generally assess the integrity of the individual earthworks. To satisfy these objectives, one 1 x 1m unit was excavated on the central platform and one 1 x 1m unit was excavated in the ditch. This placement of units was consistent except at Earthwork 3 which was extensively disturbed. At Earthwork 3 a 1 x 2m unit was placed to incorporate extant portions of the ditch and embankment. The units on the central platform were placed in the approximate center of the platform. This was not a precise measurement since trees and previous pothunting activities were avoided. The units in the ditch were placed directly across from the gateway at Earthworks 7, 8, 9 and 12. This was done to provide some consistency in the placement of the units and to test if any structural features might be associated along a gateway alignment. At Earthwork 6, the area opposite the identified gateway had previously been excavated. The unit in the ditch was positioned to confirm the location of the gateway. At Earthwork 2, two deeper portions of the ditch had been noted on either side of the gateway. The unit in the ditch was placed south of the gateway to test for any anomalies.

Earthwork 13 was the linear earthen wall. A 1 x 1m unit was excavated in the wall to determine if it was natural or aboriginal.

Mounds 1 and 4 had been subjected to varying levels of excavation during the BSU field schools (Swartz 1976). However, this project had different research objectives and new data from these structures was required. The goal was not to cause any further destruction of the mounds with more excavation. The objectives were to obtain more accurate profiles and samples for radiocarbon dating. Portions of two of the three previously excavated 5' x 5' units were reopened in Mound 1. Portions of two previously excavated 5' x 5' units at Mound 4 were also reopened. One of the units was in the western portion of the mound and one was in the western embankment wall.

Excavation of the units was conducted as follows. In the four units that reopened previous excavations, the disturbed area was removed as one level. The fill was not consistently screened. Screening was only conducted to note that previous excavations did not recover all the cultural material. Artifacts were recovered both from screening and during excavation. The excavation of the units in undisturbed areas were hand excavated in 10 cm levels to sterile soil. A constant volume sample of 10 cm^3 of soil was taken from each level. All excavated soil was screened through 6.4 mm wire mesh.

For all units at least one wall was profiled. Level records for each unit were completed. Features were numbered as encountered and a feature form was completed. Features were mapped in plan view, bisected and excavated. All feature fill was retained for flotation. Samples appropriate for radiocarbon dating and floral and faunal analyses were collected as available. Fire-cracked rock and all other artifacts were taken to the ARMS laboratory for processing, analysis and curation. Black and white print film and color slide film were used to document the excavation.

Laboratory Methods

Materials recovered during the project were taken to the ARMS laboratory for processing, analysis and identification using standardized ARMS procedures. Artifacts were cleaned, identified and catalogued. Definitions for the categories used in prehistoric lithic classification were included in Appendix E. Historic artifacts were identified and dated using several references (Feldhues 1995, Fike 1984, IMACS 1984, Loftstrom et al. 1982, Majewski and O'Brien 1987, Miller 1995, Nelson 1964, Newman 1970, ODOT 1991). Metrical attributes and raw material identification were recorded as appropriate. Diagnostic artifacts were illustrated for inclusion in this report. Constant volume and flotation samples were water processed using a five gallon bucket, a 1 mm mesh screen and hand sieve. The samples were dried and then sorted macroscopically and microscopically for cultural remains. Radiocarbon samples were dried, weighed and repackaged prior to submission to Beta Analytic, Inc. Feature forms and level records were verified and selected maps were redrawn for publication. Material from this project was catalogued under accession number 99.1 and were curated at ARMS. An updated site form was completed for the New Castle site.

Instrument Survey Methods

Mapping of the New Castle site was a challenge given the size of the site, the density of vegatation and the complexity of the earthworks. The survey was conducted this year with a total station and electronic field book. The survey was able to update and correct errors, specifically the location of Earthwork 13, found in the 1998 map. The survey was conducted in March when the vegetation was less of a hindrance. Locations of the shovel probes, excavation units and earthworks were made in reference to the site datum. The site datum was a manhole cover utilized by the previous BSU field schools in the southeast corner of a parking lot.

RESULTS

The project completed 136 shovel test probes across the site area. Historic and prehistoric artifacts were recovered. Historic disturbances of the site area were recorded. Limited test excavations consisting of 15 m^2 were conducted. A consistant pattern of earthwork construction was documented. Portions of 4 units previously excavated (Swartz 1976) were reopened. These units found that Mound 1 and Mound 4 were more complex than had been reported.

Shovel Probes

The survey portion of this project delimited historic disturbance of the site and excavated 136 shovel probes (Figure 17)(Appendix F). The historic disturbance of the site area was extensive. It consisted of building foundations, roads, borrow areas and fill areas. Most of this disturbance was not previously documented. While the disturbance to the site area was extensive, the majority of the earthworks and the immediately adjacent areas were relatively undisturbed. The direct disturbance to the earthworks had been documented by previous investigators (Redding 1892, Lilly 1937, Vickery 1976 and McCord 1998). Because of the historic disturbance to the site, fire-cracked rock was not used in determining loci of prehistoric activity. The distribution of fire-cracked rock was documented but its origin at the site was ambiguous (Figure 18).

Twenty of the shovel probes recovered historic artifacts (Figure 19, Appendix F). Ten of the shovel probes documented disturbed soil. The majority of the historic artifacts and disturbances were in the areas around the northern group of earthworks, specifically, in the areas between Earthworks 2 and 3 and Mound 4, and to the east of Mound 4. This area was easily accessible from the hospital road and previous excavations occurred in the area (Swartz 1976). The historic artifacts were recent in origin or could be related to the Epileptic Colony era. A few square nails were recovered but were too corroded to determine manufacture and relate them to an earlier occupation. No diagnostic historic artifacts were recovered.

Fourteen of the shovel probes recovered prehistoric artifacts (Figure 20, Table 2). The spatial grouping of the positive probes resulted in the identification of 2 lithic scatters and 5 isolated finds.

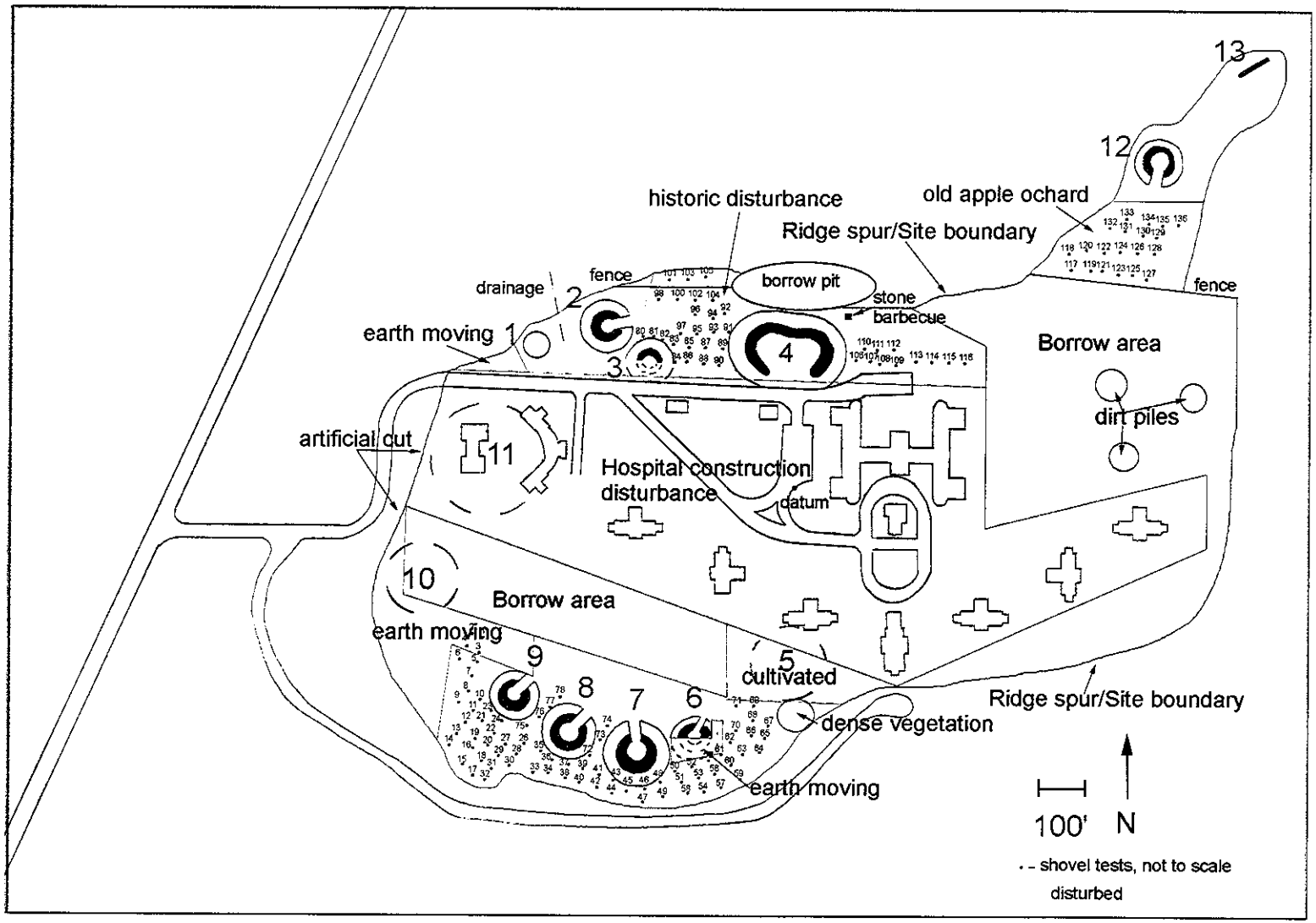


Figure 17. Site map showing the location of the shovel probes and disturbances.

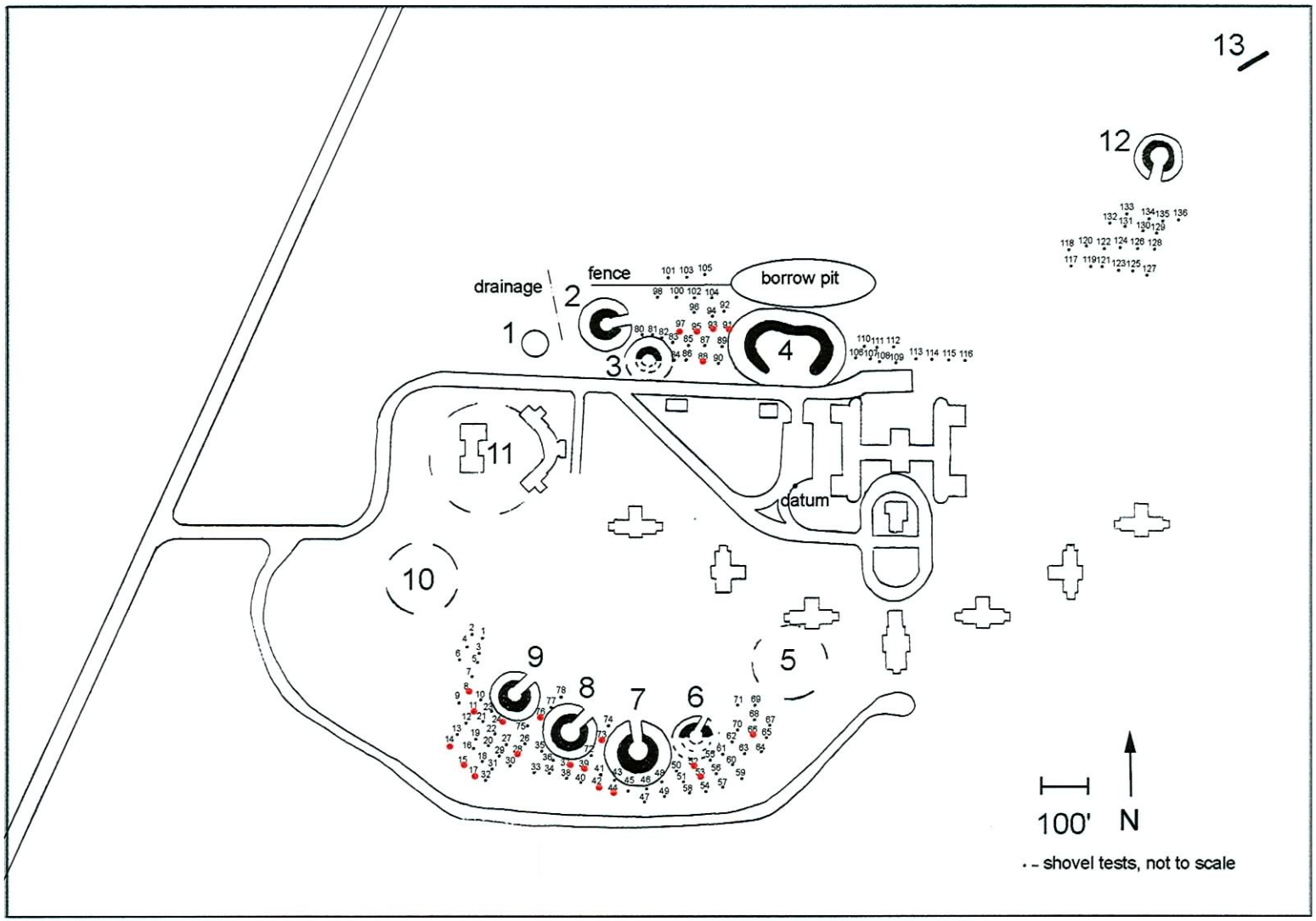


Figure 18. Distribution of fire-cracked rock in the shovel probes.

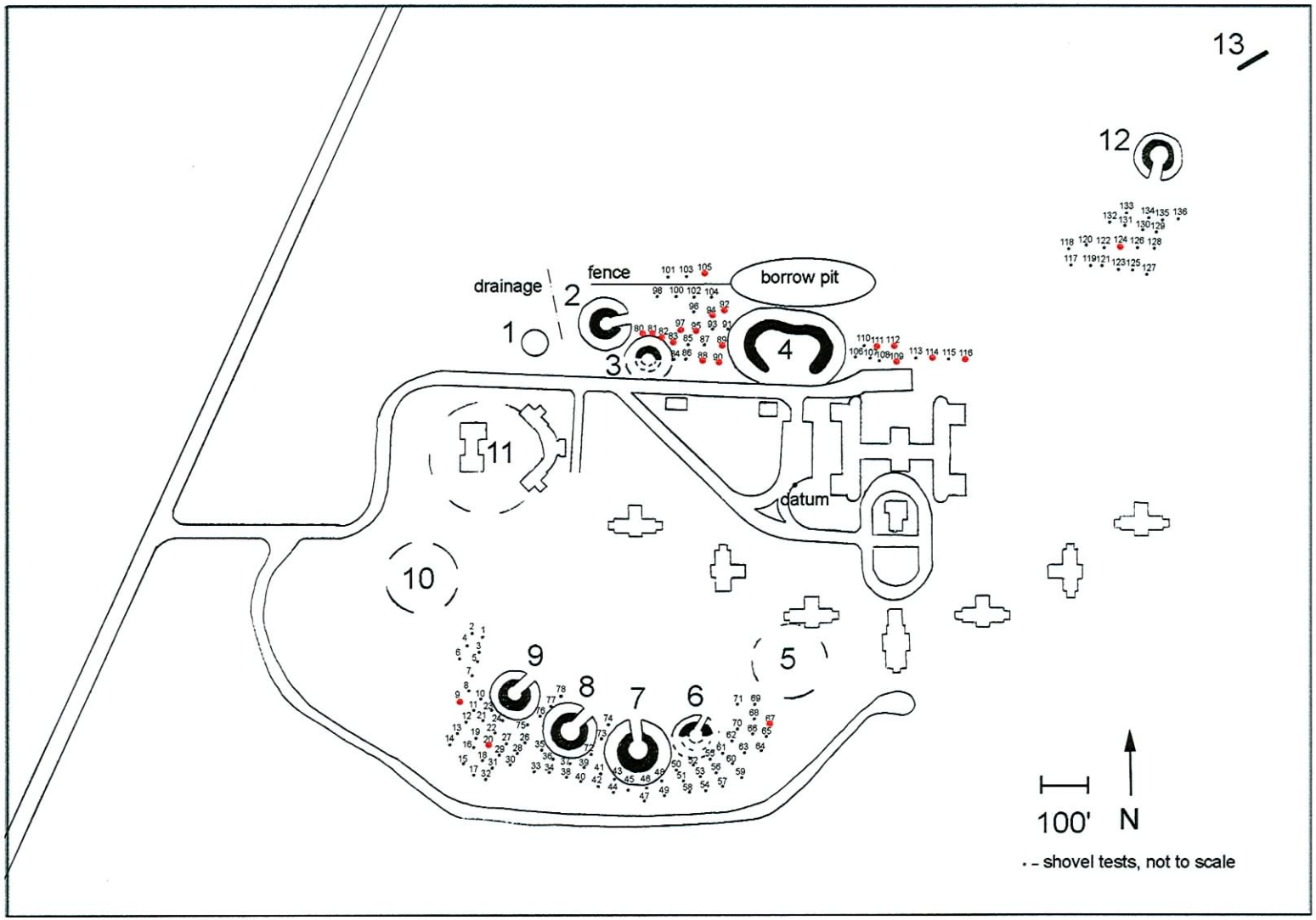


Figure 19. Distribution of historic materials in the shovel probes.

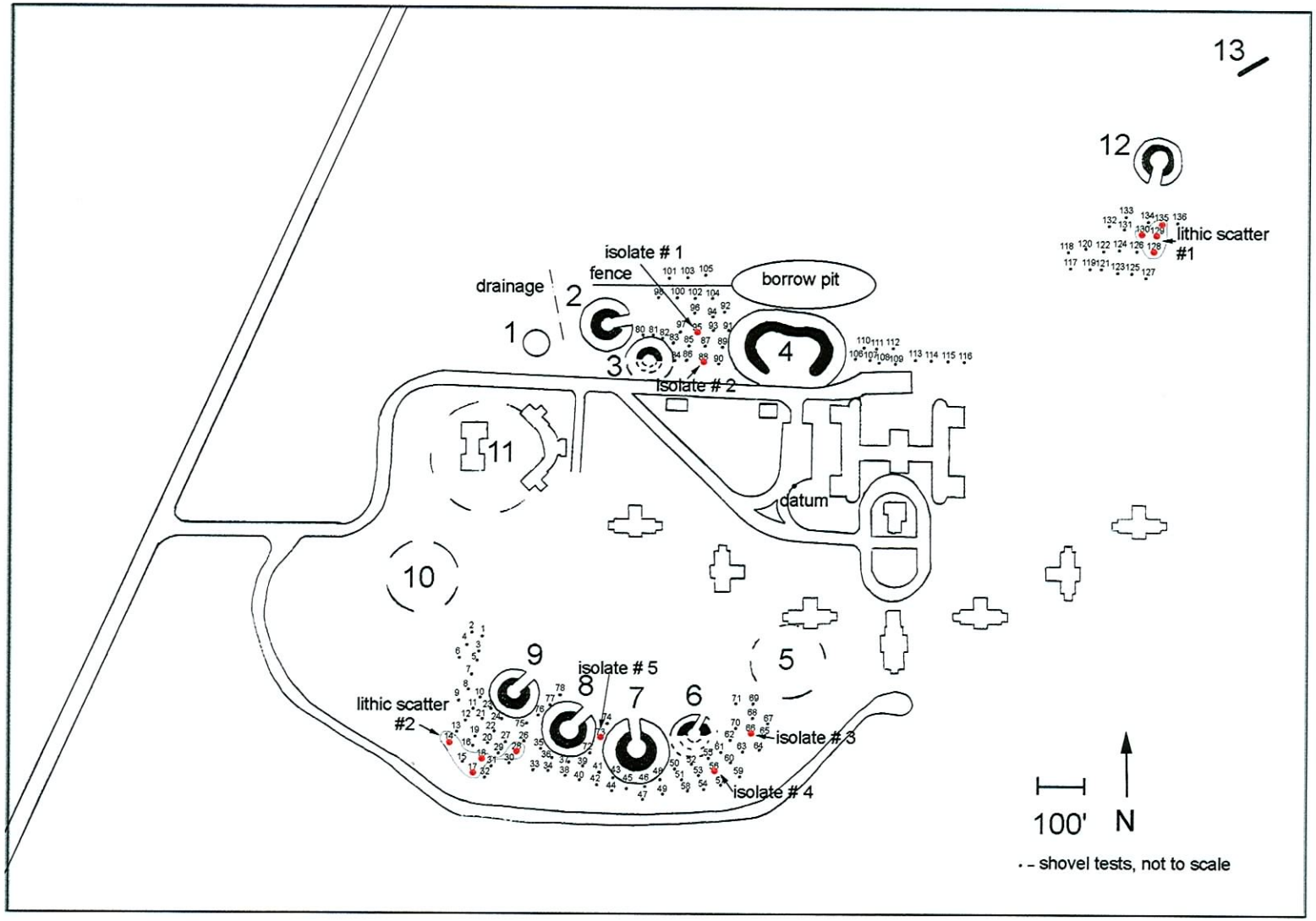


Figure 20. Distribution of prehistoric artifacts in the shovel probes.

Table 2
Prehistoric Artifacts Recovered by Shovel Probe

Location	Identification	Raw Material	Number
Isolated Find # 1	unmodified flake	HT Laurel	1
Isolated Find # 2	unmodified flake	Fall Creek	1
Isolated Find # 3	unmodified flake	Unknown	1
Isolated Find # 4	unmodified flake	HD Laurel	1
Isolated Find # 5	body sherd, plain - grit temper		1
Lithic Scatter # 1	unmodified flake	2 Laurel , 1 HT Laurel, 1 HT Fall Creek, 1 Burlington, 1 Jeffersonville, 1 Wyandotte	7
Lithic Scatter # 2	unmodified flake	1 Attica, 1 Wyandotte, 1 HD Wyandotte	3

HT - heat treated
HD - heat damaged

The shovel probes recovered very little prehistoric material. The isolates were not useful in determining activity areas. Only Isolated Find #4, the potsherd, could possibly be temporally related to the earthwork complex. The two lithic scatters were small and contained non-diagnostic artifacts that could have resulted from any time during the prehistoric record. However, the flake of Burlington in Lithic Scatter # 1 may relate to the Middle Woodland use of the site (Hicks 1992:25). The scatters were located along the upland ridge spurs in prime locations for habitation. Since the prehistoric artifacts did not indicate activities associated with the earthworks, no further excavations were conducted as originally proposed.

Because of the extensive disturbance to the site area outside of the earthworks, very little of the area could be investigated. This greatly hampered the identification of any associated activity areas. This is unfortunate since an apparent post mold was observed in the early 1980's in the open area to the east of Mound 4. Hospital crews were removing topsoil from this area when the feature was observed and reported to DHPA (Don Cochran 1999, personal communication).

To help define areas of prehistoric use, phosphate testing of soil from the shovel probes was conducted. Phosphate anomalies in the soil have been tied to human activity (Spoerry 1992:68,71) For a full discussion see Appendix G by Nikki Waters.

Figure 21 displays the shovel tests that had a phosphate level of 5 ppm or higher. The high phosphate values around the southern group of enclosures was believed to be related to prehistoric use. That use did not necessarily occur during the Early/Middle Woodland period, however. Lithic scatter # 2 occurred on the ridge spur south of Earthwork 9, but there was no

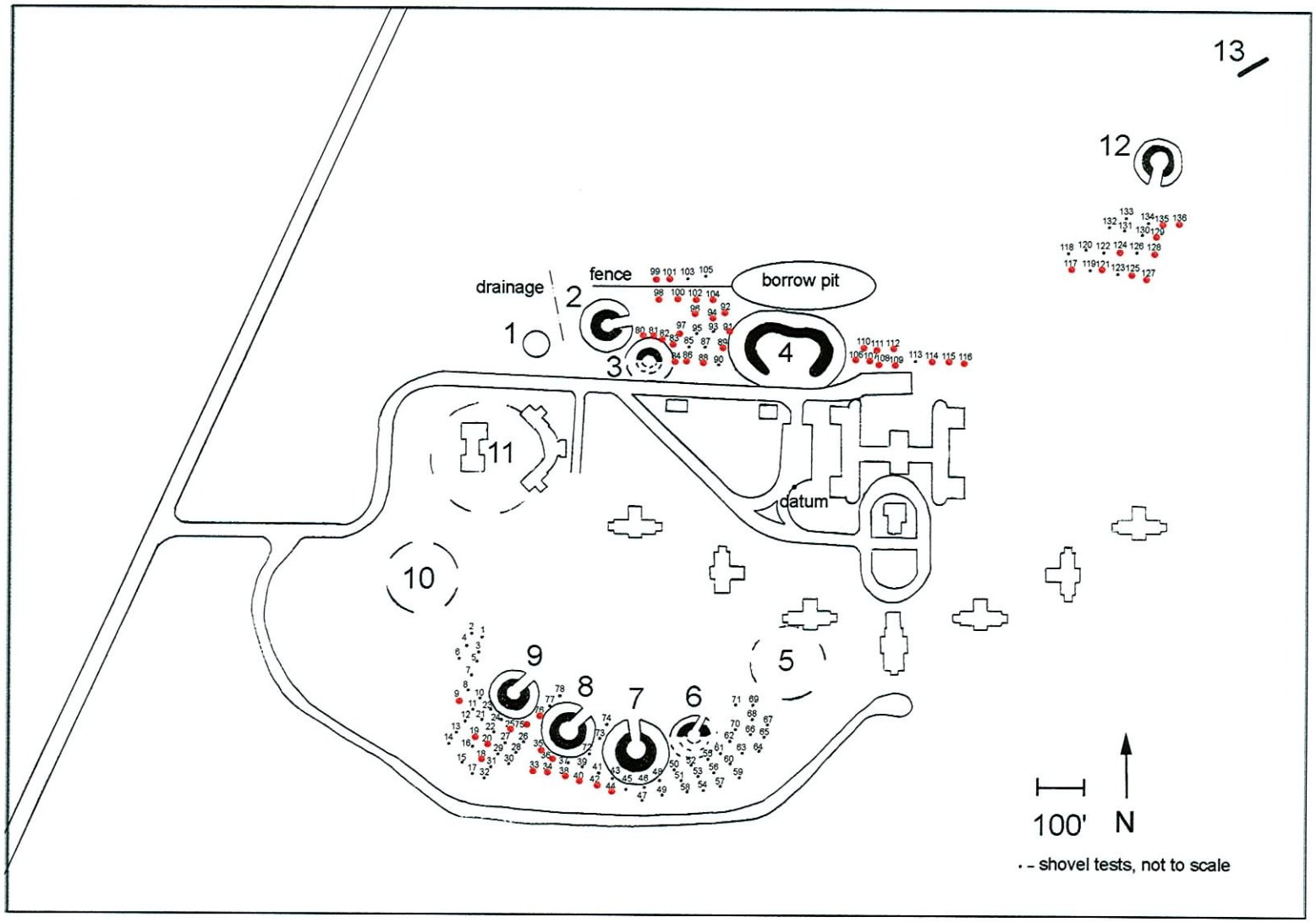


Figure 21. Distribution of phosphate levels 5 ppm and higher.

indication the site was related to the earthworks. The high phosphate values encountered around the northern group of earthworks was more questionable in its indication of prehistoric use. Historic disturbance in this area was documented by the shovel tests. The high values south of Earthwork #12 could be a result of either prehistoric or historic use. Lithic scatter #1 occurred in this area, but the area was also utilized as an apple orchard. Because of the extensive historic disturbance to the site area, phosphate anamolies were somewhat inconclusive in documenting prehistoric activity areas.

Excavation units

Excavations were conducted at each of the extant earthwork structures (Figure 22). This comprised 15 m^2 of new excavation and approximately 6 m^2 of reexcavation. The results of these excavations were discussed below.

Before discussing the results of the 1998 excavation units, a few remarks regarding the previous BSU field school excavations were required. Numerous inconsistencies or omissions in methods both in the field and lab were encountered. For example, screening was employed only when "profitable". In numerous instances the material that was recovered and catalogued was discarded in 1975 with no explanation. In several cases this was reportedly human bone. It was not explained if the identification of the material was incorrect or if the material was simply missing. A reanalysis of the material in 1989 and 1990 found that numerous items other than those noted as discarded were missing from the collection (Kolbe 1990, Johnson 1995) (Appendix C). The lack of context, accurate descriptions, maps and photographs severely hindered our attempt to provide a current and comprehensive site report.

Mound 1

Previous excavations

Mound 1 was subjected to several excavations (Pleas 1871:136, Redding 1892:101 Lilly 1937:70, and Swartz 1976). In 1965, three 5 x 5 foot units were excavated by a Ball State University field school (McCrumb 1966a, Swartz 1976) (Figure 23). Unit N2W1 "was a completely sterile pit" (McCrumb 1966a:3). A depression apparent on the surface of the mound before the excavation led to the belief that this was an excavation by Redding (McCrumb 1966:a 3). Actually, Redding (1892:101) never excavated in Mound 1, he just reported some previous excavations. The profiles shown in Figure 24 did not clearly indicate any disturbance. The report that Unit N2W1 was sterile should not be surprisingly since screening during all of the Ball State field schools was erratic.

In excavation unit S1W1, ash, ocher, charcoal, 1 pottery sherd and bone fragments including some identified as skull fragments were reported. It was with some of the bone that a mica sheet was recovered. Since bone was discovered with the mica, it was suggested that the mica may have been used as a head rest (McCrumb 1966a:4-5). While mica has been documented

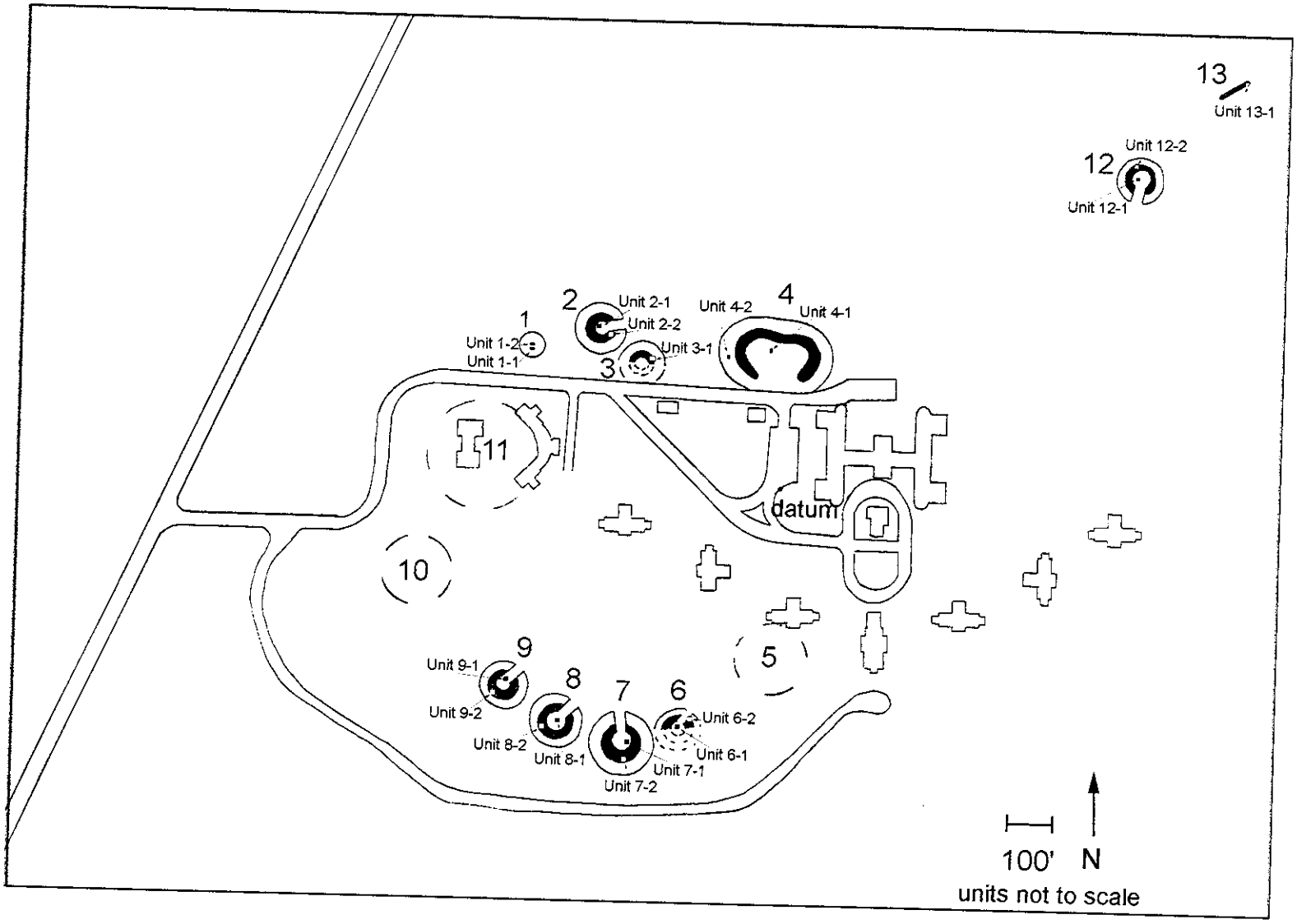


Figure 22. Site map showing the location of the excavation units.

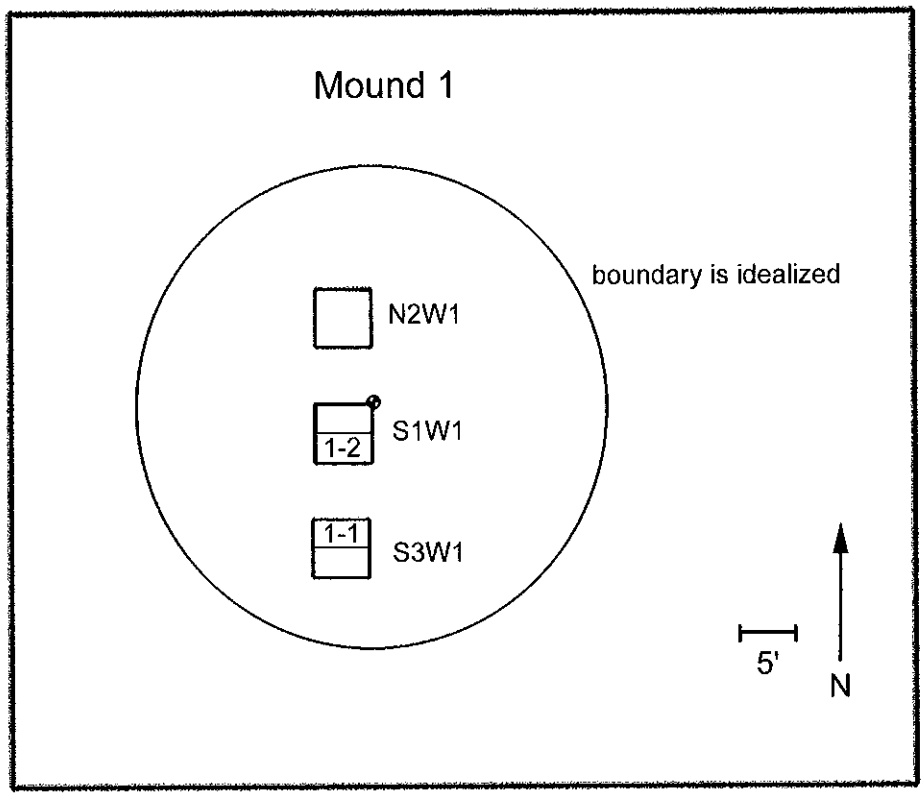


Figure 23. Sketch map of Mound 1 showing the location of the 1965 and 1998 units.

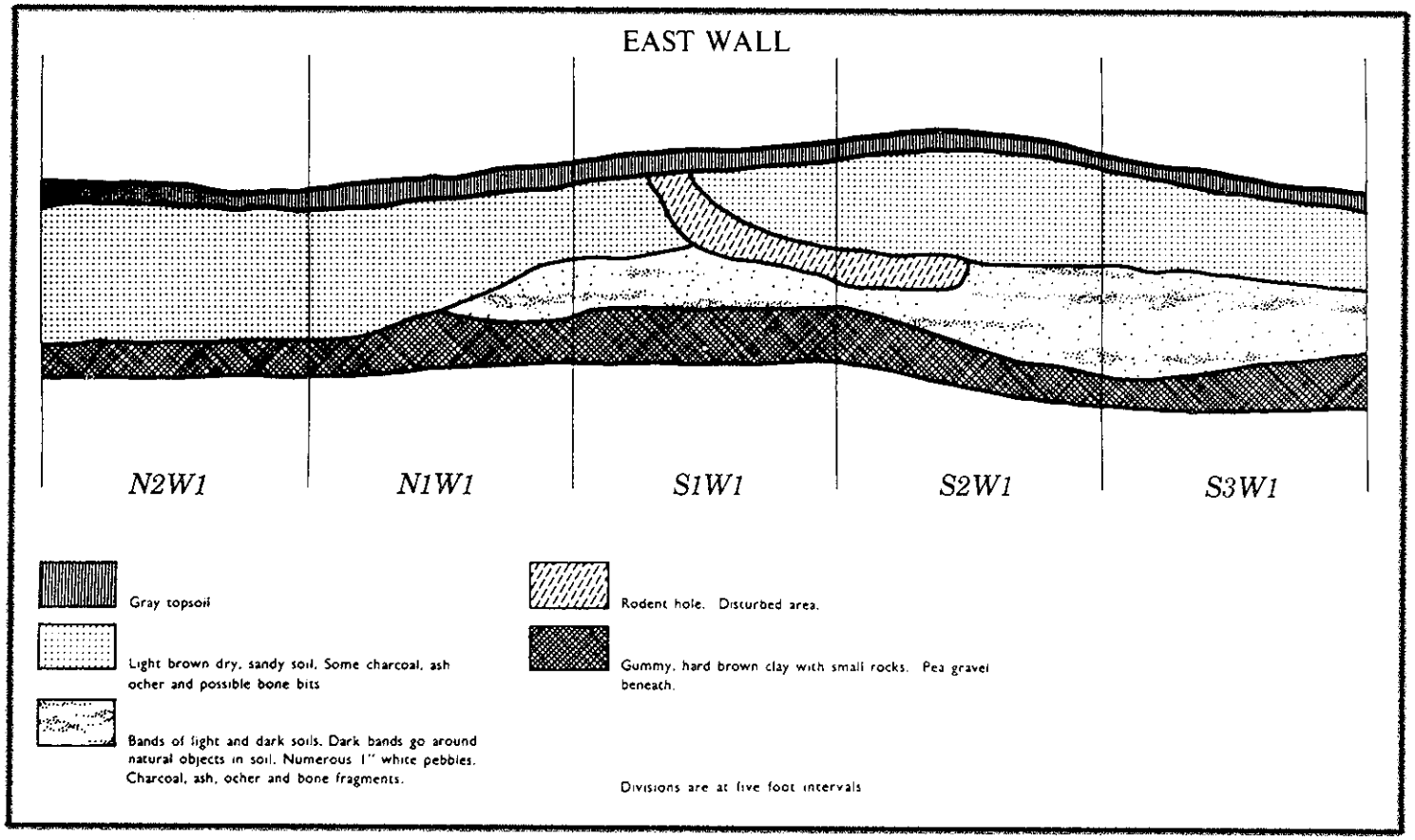


Figure 24. 1965 profiles of Mound 1 (Swartz 1976:78).

for this purpose (Webb and Baby 1937:30), in this case it was unlikely since some of the bone recovered was actually below the mica. The bone fragments were apparently human, but were discarded from the collection in 1975 so the identification could not be confirmed (records on file at ARMS). The mica sheet, 1 plain grit tempered body sherd, and 2 unmodified flakes were found in the collection from this unit (Appendix C).

In excavation unit S3W1 charcoal, red ocher, ash, a mano, burned bone, a scraper and a small piece of mica were reported (McCrumb 1966a:4-5). The burned bone was once again discarded and unavailable for identification. The mano was determined to be a natural rock, the scraper was either a piece of other chipped stone or a natural rock (2 items were given the same catalogue number) (Appendix B).

The excavation reported that the mound had been built on a natural knoll with a primary mound of banded soil and a second capping of soil containing burned bone, charcoal, red ocher, ash and lithic debris. Sterile clay was reportedly encountered between 3 and 5' below the surface followed by naturally deposited gravel (Swartz 1976:23) (Figure 24). Test pits were reportedly sunk to a depth of seven feet with no change in the gravel (McCrumb 1966a:5). It is interesting that the published profiles of the units showed profiles of 5 units when the field school only excavated three units (Figure 24).

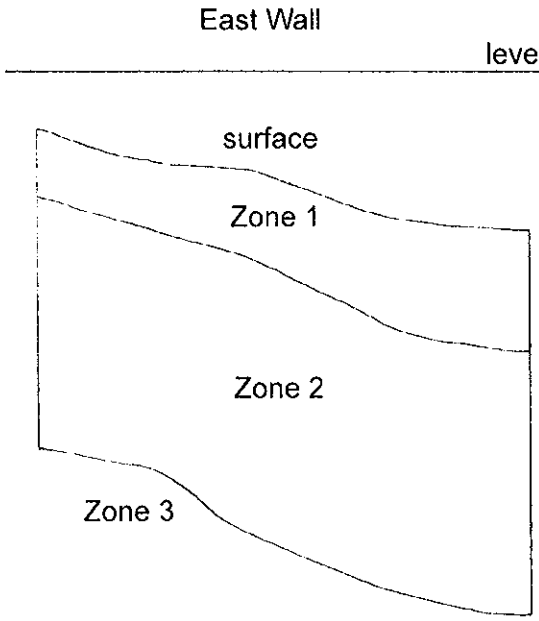
1998 Excavations

Portions of two of the units, S1W1 and S3W1, excavated in 1965 were reexcavated during this project (Figures 22 & 23). An area approximately 1 m x 1.5 m was excavated in each unit. The northern portion of Unit S3W1 (Unit 1-1) and the southern portion of Unit S1W1 (Unit 1-2) were reexcavated. The excavated backfill was not screened, but some materials were noted and recovered. A small soil sample for water screening was also collected from the north wall of Unit S3W1.

In Unit S3W1 (Unit 1-1) a few historic artifacts were recovered from the backfill (Table 3). The unit was somewhat of a surprise given the descriptions by McCrumb (1966a). First of all, the unit was between 64 and 80 cm deep from the present ground surface (Figure 25). We had anticipated a unit 3 to 5' deep (91 to 150 cm). Second, the previous excavations had not reached a sterile clay or gravel zone. The excavation simply stopped in the artificial mound fill and the floor was very irregular.

The Unit in S1W1 (Unit 1-2) was similar. The previous excavations had not reached sterile deposits (Figure 26). The excavation had reached a depth of 125 cm and the floor was relatively level. A few prehistoric artifacts were noted and recovered from the backfill (Table 3). It is likely that these artifacts did originate from Mound 1. An intrusive pit near the bottom of the unit was interesting. Based on the locational information provided by McCrumb (1966a:4), the mica sheet may have been found in this pit. Our unit was not placed far enough to the north to confirm this.

Unit 1-1



Zone 1 -10YR 3/2, silt loam.
A-horizon development.

Zone 2 - 10YR 4/4, silt clay loam.
Granular, weak structure.
Capping episode.

Zone 3 - 10YR 4/4 with 10YR 3/4 and 7/1 mottles, silty clay loam to clay.
Subangular blocky, compact but friable.
Mixed deposit with ash and charcoal flecking.

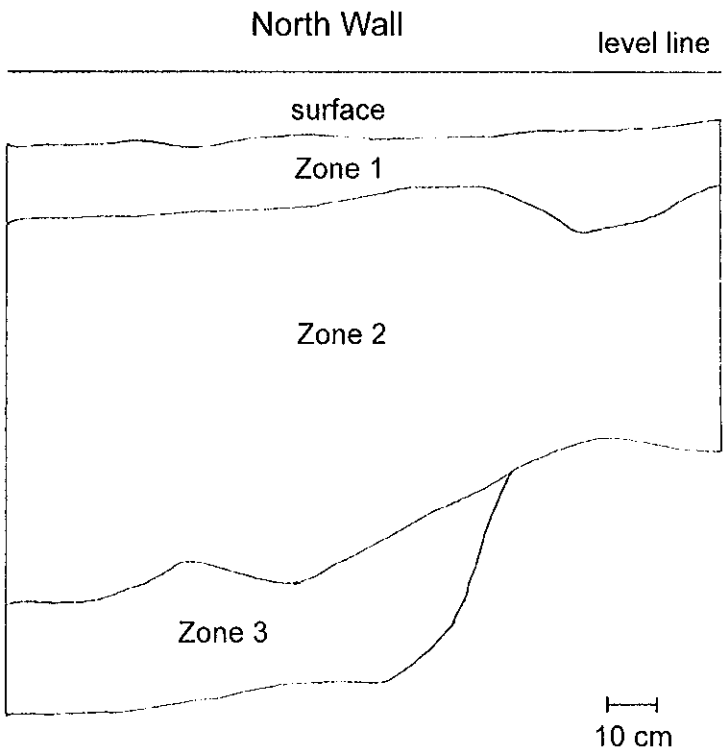
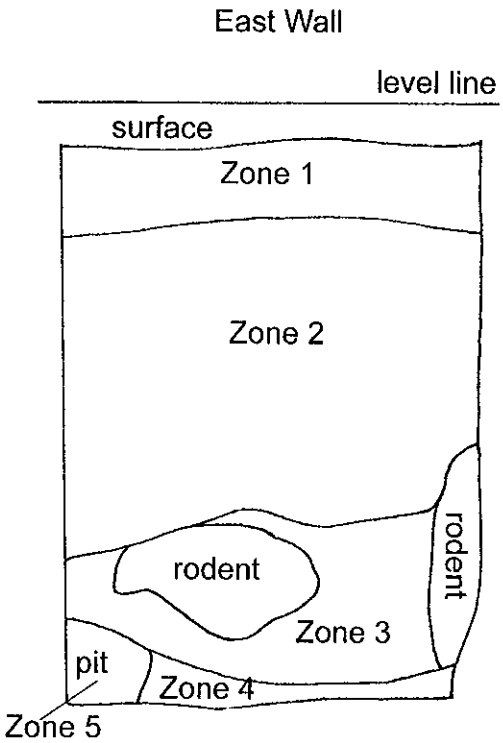


Figure 25. 1998 profiles of Unit 1-1.

Unit 1-2



Zone 1 - 10YR 3/3, silt loam.
A-horizon development.

Zone 2 - 10YR 4/6, silt loam.
Granular, weak structure.
Capping episode.

Zone 3 - 10YR 4/4 with 10YR 3/4 and 7/1 mottles, silt loam.
Subangular blocky, friable.
Ash and charcoal flecking.

Zone 4 - Mixed deposit, 10YR 5/4, 6/1 and 6/6, silty clay loam.
Subangular blocky, friable.

Zone 5 - 10YR 4/4, silt loam.
Ash mixed in.
Subangular blocky, friable.

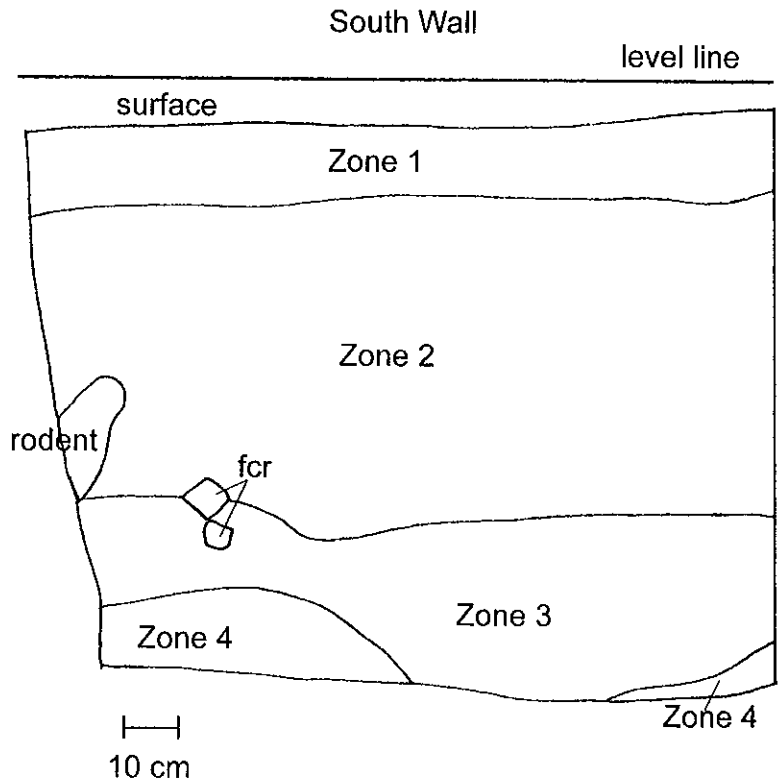


Figure 26. 1998 profiles of Unit 1-2.

Table 3 Artifacts Recovered from Mound 1			
Unit	Level	Identification	No.
S3W1/1-1	1	brick fragments milk glass fragment ceramic insulator fragment soil samples: Zone 3 - microflake - Laurel Flint Ridge	2 1 1 8 1
S1W1/1-2	1	unmodified flake - HD Wyandotte neck sherd - plain, grit tempered fcr - 316.2 g burned bone bone	1 1 5 4 1

The reexcavation of these 2 units partially documented the mound construction. Since, the 1965 excavation did not reach sterile deposits it is uncertain if the mound was constructed on a natural knoll as previously reported (McCrumb 1966a:5). The stratigraphy of the mound was more complex than previously documented (Figures 25 & 26). A primary mound(s) was not documented in the profiles due to insufficient excavation. Zone 4, as documented in Unit S1W1, was a mottled soil deposit that had a gleyed appearance suggesting the source area of this material was poorly drained. This zone was probably a capping episode. The exposed portions of this layer were irregular in thickness. Zone 5 was a pit that was first identified in the floor of the unit. The pit was intrusive into Zone 4 and was capped by Zone 3. In the floor of S1W1, an interesting soil pattern was noted. It appeared that the capping episode represented by Zone 4 had been exposed for some time. The soil showed evidence of water erosion down the slope of the cap into the space between the two areas identified as Zone 4 in the south wall (Figure 26). Zone 3 was documented in both excavation units. It was a very mixed deposit containing flecks of ash and charcoal and represented a capping episode. Fire-cracked rocks were also documented in this zone in the profile of the south wall in Unit S1W1. This zone was irregular in thickness being between 22 and 30 cm. Zone 2 represented a substantial capping episode of approximately 66 cm in thickness. This zone was fairly homogenous with some charcoal flecking. This was the final capping episode of the mound. Zone 1 represented a natural A-horizon that has developed since the mound construction.

The artifacts recovered from S1W1 were consistent with the materials reported previously. However, fire-cracked rock was not reported from the previous excavations. One of the fragments of burned bone was from a large mammal and could be human. The potsherd was fairly thin (4.7 mm), plain and grit-tempered (granitic rock). It was compared with the sherd recovered in 1965. The paste and temper were very similar but the 1965 body sherd was 8.2 mm thick. These ceramics were consistent with the plain sherds recovered from Mound 4 and

Earthwork 6 (Swartz 1976, Johnson 1995) and ceramics from the regional mounds and earthworks (Vickery 1970, Kolbe 1992a, Johnson 1995, McCord and Cochran 1996:131-147).

While no prehistoric material was recovered from the backfill during the reexcavation of Unit S3W1, microflakes were recovered from a soil sample of Zone 3.

Earthwork 2

Test excavations at Earthwork 2 consisted of 2 - 1 x 1m units (Figure 22). Unit 2-1 was excavated in the central platform. Unit 2-2 was in the deepest part of the ditch on the southern side of the gateway. Redding (1892:101) noted a possible mound on the south side of the platform near the gateway. He noted that it had been dug into and was a mass of gravel (Redding 1892:101).

The excavation of Unit 2-1, on the central platform, recovered 10 unmodified flakes, 1 endscraper, 2 fire-cracked rocks, and a few historic artifacts (Table 4). Constant volume samples only recovered a small amount of charcoal. The stratigraphy of this unit was a natural soil profile, an A-horizon followed by a B-horizon (Figure 27). The upper part of the A-horizon had a somewhat darker hue. Excavation ceased when the natural B-horizon was encountered.

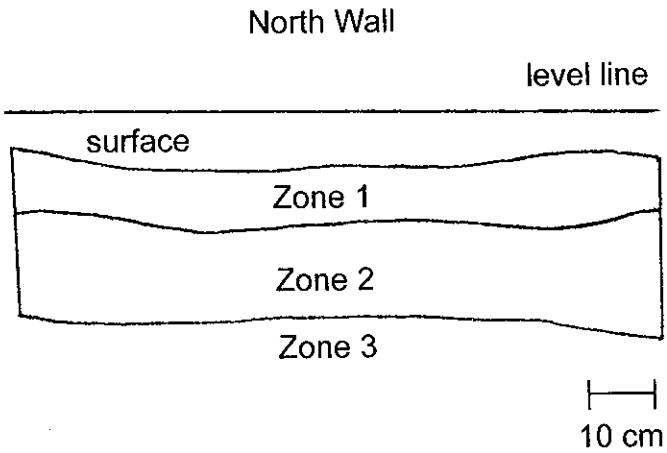
Table 4
Artifacts recovered from Earthwork 2

Unit	Level	Identification	No.
2-1	1	endscraper - Fall Creek	1
		unmodified flake - Wyandotte	1
		Laurel	1
		HT Laurel	1
		fcr - 9.2 g	1
		nail, wire	1
		coal slag	1
		glass, flat - clear	2
		cvs sample - charcoal	7
2-1	2	unmodified flake - Wyandotte	1
		Laurel	4
		HT Laurel	1
		Attica	1
		fcr - 186.3 g	1

Table 4 (cont.)
Artifacts recovered from Earthwork 2

Unit	Level	Identification	No.
2-2	1	unmodified flake - Wyandotte	1
		block flake - HT Fall Creek	1
		hammerstone	1
		bone, unmodified	15
		bone, butchered (historic)	1
		metal container, corroded	13
		nail, corroded	1
		glass, flat - clear	11
		whiteware, plain	1
		glass, container - aqua	1
		glass, milk glass canning lid liner	1
		glass, slag	4
		nail, square - machine cut	1
		wire	9
		brick fragments	2
		glass, container - clear	1
		coal	1
		coal slag	6
		cvs sample - carbon	3
		bone	1
2-2	2	bone, cut marks	1
		bone, unmodified	7
		bone, burned	2
		fcr - 127.5	3
		metal container, corroded	10
		glass, container - aqua	6
		glass, flat -clear	19
		nail, wire	1
		glass, slag	4
		wire	2
		bone, butchered (historic)	4
		coal slag	69
		coal	16
		cvs sample - bone	3
		mussel shell	1
2-2	3	unmodified flake - Wyandotte	1
		Laurel	1
		HT Laurel	2
		HT Fall Creek	2
		fcr - 258.5 g	7
		cvs sample - charcoal	3
		block flake - HD unknown	1
2-2	4	fcr - 309.9 g	6
		cvs sample - charcoal	1

Unit 2-1

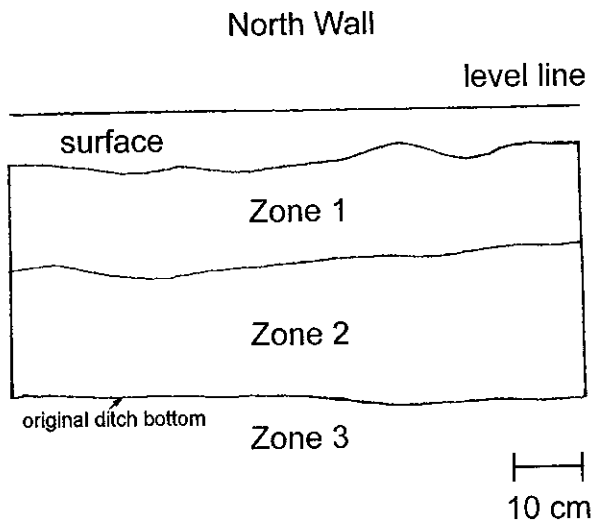


Zone 1 - 10YR 3/3, silt loam.
A-horizon.

Zone 2 - 10YR 3/4, silt loam.
A-horizon.

Zone 3 - 10YR 4/4, silty clay loam.
B-horizon.

Unit 2-2



Zone 1 - 10YR 2/2, silt loam.
A-horizon.

Zone 2 - 10YR 3/4, silty clay loam.
Ditch fill.

Zone 3 - 10YR 5/6, silty clay.
B-horizon.

Figure 27. Profiles of Units 2-1 and 2-2.

Unit 2-2 was located in the ditch. The excavation recovered 7 unmodified flakes, 2 block flakes, fire-cracked rock, bone and historic materials (Table 4). Some of the bone was definitely historic in origin, since it had been sawed, but some of the bone may be related to the prehistoric use of the site. The fire-cracked rock could represent either the prehistoric or historic use of the site. The most prevalent artifacts recovered from the unit were historic. These were all in the top 20 cm of the excavation and documented the erosional filling of the ditch. Small amounts of bone, charcoal and mussel shell were recovered from the constant volume samples. The stratigraphy recorded for this unit consisted of a natural A-horizon, a zone of organic soil filling in the ditch and the bottom of the ditch (Figure 27). The depth to the original bottom of the ditch was shallow. It was encountered at approximately 30 cm below the present ground surface.

Earthwork 3

Only the northern half of the ditch and embankment of Earthwork 3 were visible. The southern half of the enclosure and central platform were severely damaged by cultivation and the hospital road system. Redding (1892:101) believed a mound had existed within the enclosure. The central platform was not distinguishable from the surrounding area. The results of the shovel probes also indicated that historic disturbance had occurred to the north of the embankment. The A-horizon depth was variable around the enclosure and shovel probes # 80, 81, 82 and 83 all contained historic artifacts. A 1 x 2 m unit was placed to encompass portions of both the ditch and the embankment (Figure 22). No excavation on the central platform was undertaken.

The excavation recovered 1 unmodified flake, 2 pottery sherds, bone, fire-cracked rock and a small amount of charcoal (Table 5). Historic materials were also recovered throughout the ditch fill. The bone and fire-cracked rock could be either prehistoric or historic in origin. The 2 pottery sherds were again consistent with the ceramic assemblage previously recovered from the site (Swartz 1976, Johnson 1995). The sherd found in level 2 did have a more sandy paste than usual, however.

Table 5 Artifacts recovered from Earthwork 3			
Unit	Level	Identification	No.
3-1	1	fcr - 8.6 g	1
	2	body sherd - plain, grit temper bone cvs sample - charcoal	1 1 4
	3	body sherd - plain, grit temper bone, burned fcr - 103 g coal glass, container - clear concrete bone, butchered nail, wire cvs sample - bone	1 2 1 1 1 1 2 1 6
	4	unmodified flake - Laurel fcr - 809.9 g bone wire glass, slag coal slag cvs sample - charcoal	1 7 2 1 1 3 2
	5	bone fcr - 163.4 g coal slag glass, container - clear	1 8 2 1

The profile of the unit documented a portion of the embankment wall and ditch (Figure 28). An apparently unmodified B-horizon was encountered 14 to 20 cm below the ground surface in the area defined as the embankment. The A-horizon and embankment wall were not differentiated in the profile. The embankment was not as high as expected, but the unit did not encompass the highest point of the bank and historic disturbance may have modified the original surface. Redding (1892:101) only described the ditch of this structure as being 2 ½' deep. Perhaps the embankment wall was never prominent. The bottom of the ditch was encountered approximately 27 cm below the present ground surface. The bottom was more sandy than the ditch fill. The shallow ditch may seem to contrast with Redding's (1892:101) description, but the ditch was at least 46 cm (1 ½') deeper than the embankment wall. The shallow ditch was consistent with that of Earthwork 2. No reverse stratigraphy of the ditch and embankment was documented.

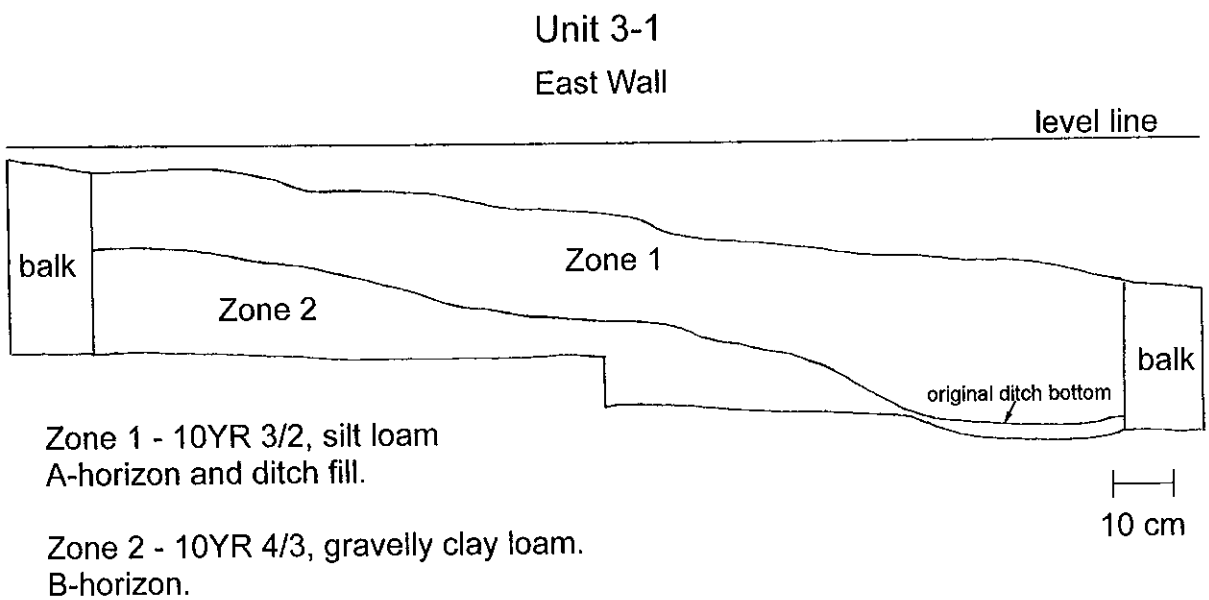


Figure 28. Profile of Unit 3-1.

Mound 4

Previous excavations

Mound 4 was the largest mound in the earthwork complex. The mound was also surrounded by a large ditch and bank structure. The prominence of the mound brought it repeated attention from those interested in treasure and archaeological information (Pleas 1871:136, Redding 1892:100-102, Lilly 1937:70, Hellar 1974:10, Swartz 1966:1).

The structure was originally reported as an elliptical mound surrounded by a ditch and bank measuring 215' east and west and 150' north and south (Redding 1892:100). The mound measured 140' east and west and 100' north and south (Redding 1892:100). The mound had the appearance of two mounds conjoined and was about 10' high with the western portion of the mound the highest (Redding 1892:100). The southern part of the enclosure was in cultivation and no gateway was identified (Redding 1892:100). The structure was later reported as panduriform in shape having a constricted middle (Lilly 1937:70, Vickery 1976:7). From photographs taken in 1965, prior to excavation, the apparent constriction may have been influenced by a natural drainage on the north side of the mound (Figure 29). A contour map of Mound 4 was made, but after some excavation of the mound had already occurred (Swartz 1976:6) (Figure 30).

Mound 4 was the focus of the Ball State University field schools from 1965 to 1971. The three-dimensional extent of the excavations was hard to estimate, but approximately 255 - 5 x 5' units were excavated in the mound and 22 - 5 x 5' units were excavated in the western embankment (Figure 31). Six units were also excavated to the west of the mound between it and Earthwork 3 and 26 units were excavated to the east of the mound (Figures 31 & 32). Prior to 1970, a permanent mound datum was not established and each field season had to reshoot the grid. Inaccuracies in the grid occurred, but were not reported in the site report (Swartz 1976). The 1967 excavations were the only year that recorded the discrepancy in reference to the original grid. To compound the problem backfilling after each field season was accomplished by a bulldozer. The bulldozer did not allow for controlled backfilling and intact portions of the mound were damaged.

The excavations resulted in the recovery of 617 chipped stone artifacts, 9 ground stone artifacts, 2 untrimmed sheets of mica, several thousand ceramic sherds including 1 complete plain vessel and 1 portion of a Hopewell Zoned Rocker Dentate Stamped vessel, 1 clay platform pipe, 27 split turkey bone pins, 1 bone awl, 2 drilled lynx mandibles, 2 cut long bones, 1 antler rod, 2 bird claws, 5 conch containers, 31 circular shell beads, 462 drilled pearl beads, 4 copper covered bear canine effigies, 1 dog burial and unmodified animal bone (Swartz 1976). Fragments of a copper panpipe were also recovered (Cree 1992). The material remains were recently reanalyzed (Kolbe 1990, Johnson 1995)(Appendix C). The human remains were also reanalyzed for this report (Appendix D). As stated previously, missing or discarded materials hindered a complete reanalysis.

Figure 29. The north side of Mound 4 showing the drainage. Photograph taken 6-15-65 looking east.

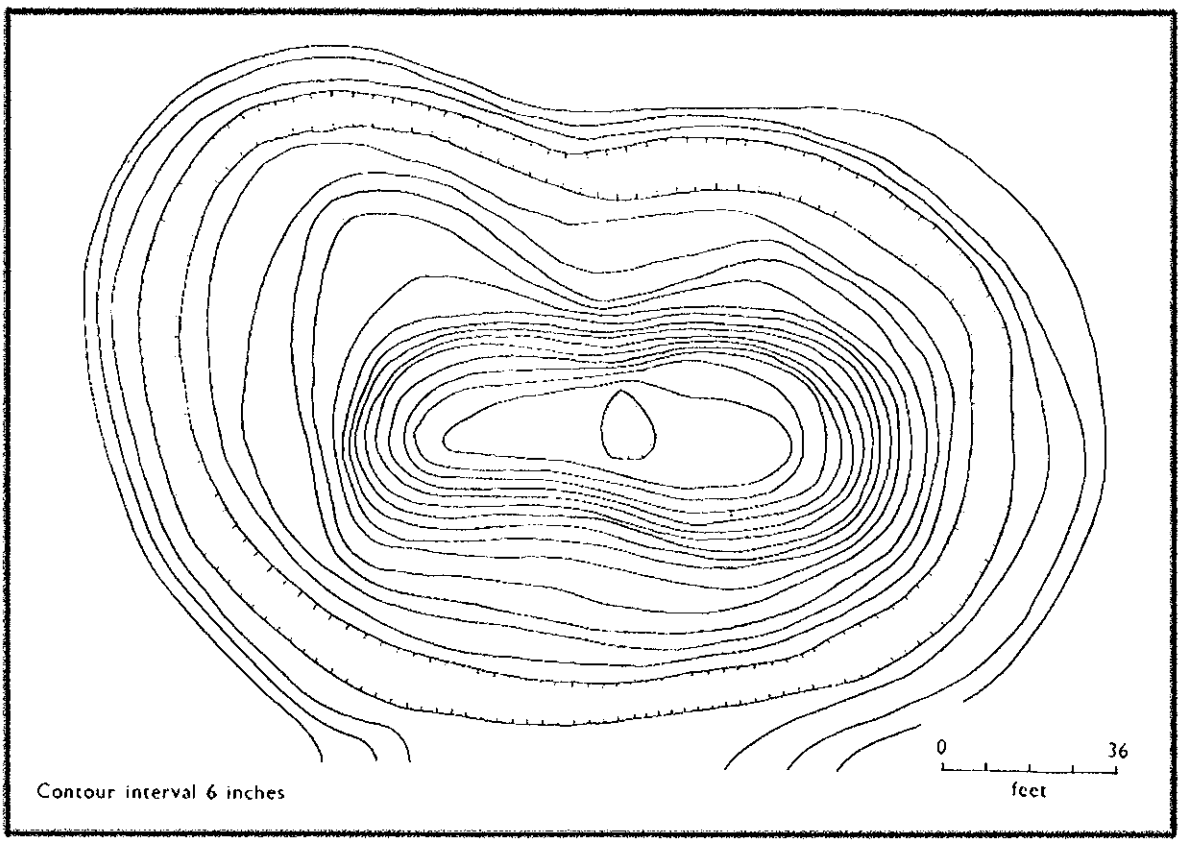


Figure 30. Contour map of Mound 4 (Swartz 1976:66).

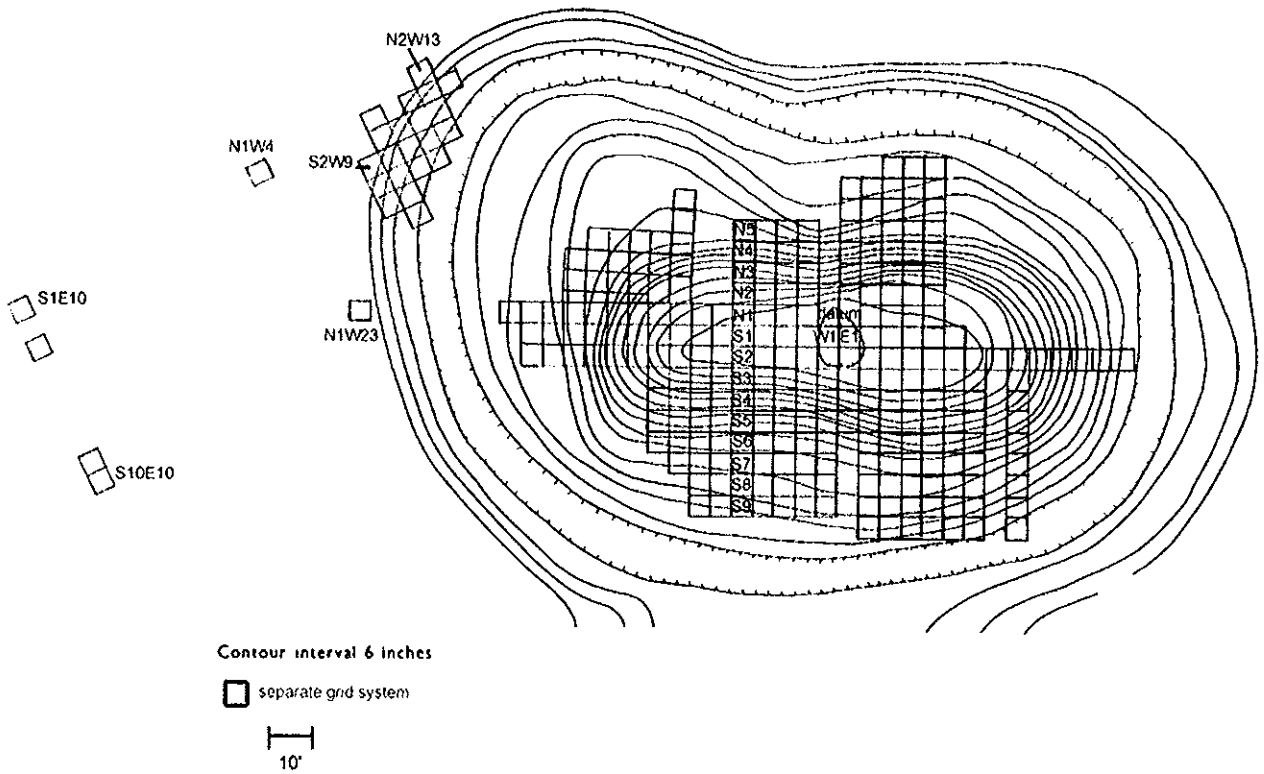


Figure 31. Contour map of Mound 4 showing the location of the excavations in the mound and to the west (after Swartz 1976:66).

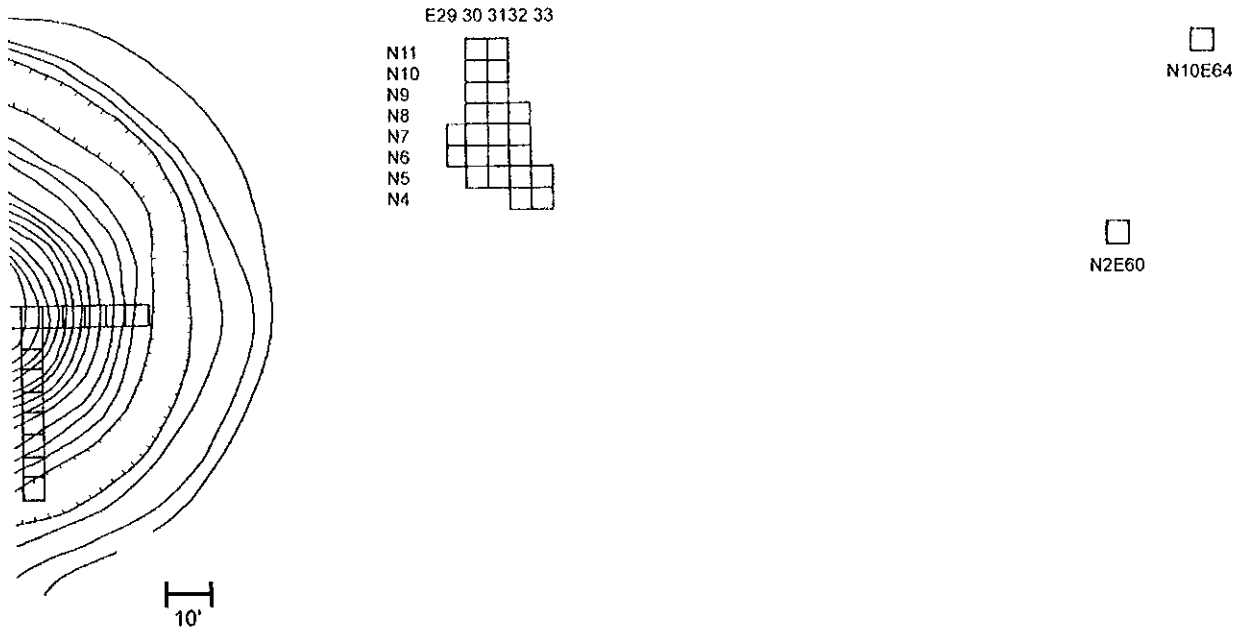


Figure 32. Map showing the excavations east of Mound 4.

Mound 4 was reported to be constructed of 2 primary mounds composed of dark brown sandy clay. Deposits of ash were common and charcoal was scattered throughout the ash. Small burned clay areas were noted, but "extensive burned clay areas, constituting actual layers, was not noted in either primary mound" (Swartz 1976:10). Two artificial deposits of gravel were noted in the western portion of the mound underlying the ash. A circular rock formation was reported at the center of the mound, between the 2 primary mounds. The submounds and area between the mounds were then capped with a light brown to brown clay. Red ocher deposits occurred throughout the mound. Twelve burial areas consisting of 27 individuals were reported in the mound (Swartz 1976:9-16). Figures 33 & 34 summarize the features documented by the field school excavations (Swartz 1976:68 -70).

Mound 4 was the only dated structure at the site. The "Cremation Area" in the western part of the mound was dated to AD 10 +/- 140 (M-1852). The date was directly associated with New Castle Incised ceramics. Charcoal associated with the Hopewell vessel from the eastern part of the mound was dated to AD 40 +/-140 (M-1851). Another date of AD 230 +/- 300 (M-2045) was related to a later intrusive component of the mound (Swartz 1976:58).

Little was found in the excavations in the embankment of Mound 4 and to the west of the mound (Figure 31). A scatter of fire-cracked rock was reported between 24 and 30" below the embankment wall in some locations. No other cultural material was recovered. Reverse stratigraphy of the ditch and bank was reported (Swartz 1976:11, 25).

To the east of Mound 4, a historic dump and possible stable of the Huddleston farm was documented (Figure 32). Several posts were reported in the area, but no discernable pattern was detected. One of the posts was related to be prehistoric (Habart 1976:105-108).

1998 Excavations

Since extensive portions of Mound 4 had been excavated, we had ample area to choose from for reexcavation. However, we had to locate areas that would provide undisturbed profiles. One unit, Unit 4-1, was reexcavated in the mound and one unit, Unit 4-2, was reexcavated in the embankment (Figure 22).

A 10' wide section of the northern half of the western end of the mound was reported to be intact. Unfortunately, the mound datum could not be relocated so the location of this area had to be estimated. Shovel scraping and oakfield probes were used to delimit the backfill from the undisturbed area. Once undisturbed deposits were defined, Unit 4-1 was laid out. The unit overlapped portions of both N2W8 (1965) and N3W8(1967) on the Swartz (1976) grid.

From Unit 4-1, 5 unmodified flakes, 12 pottery sherds including 2 rims, bone, burned bone, fire-cracked rock, ash, reddened soil and charcoal were recovered (Table 6). Some of the burned bone was from a large mammal and could represent a human cremation. The pottery had

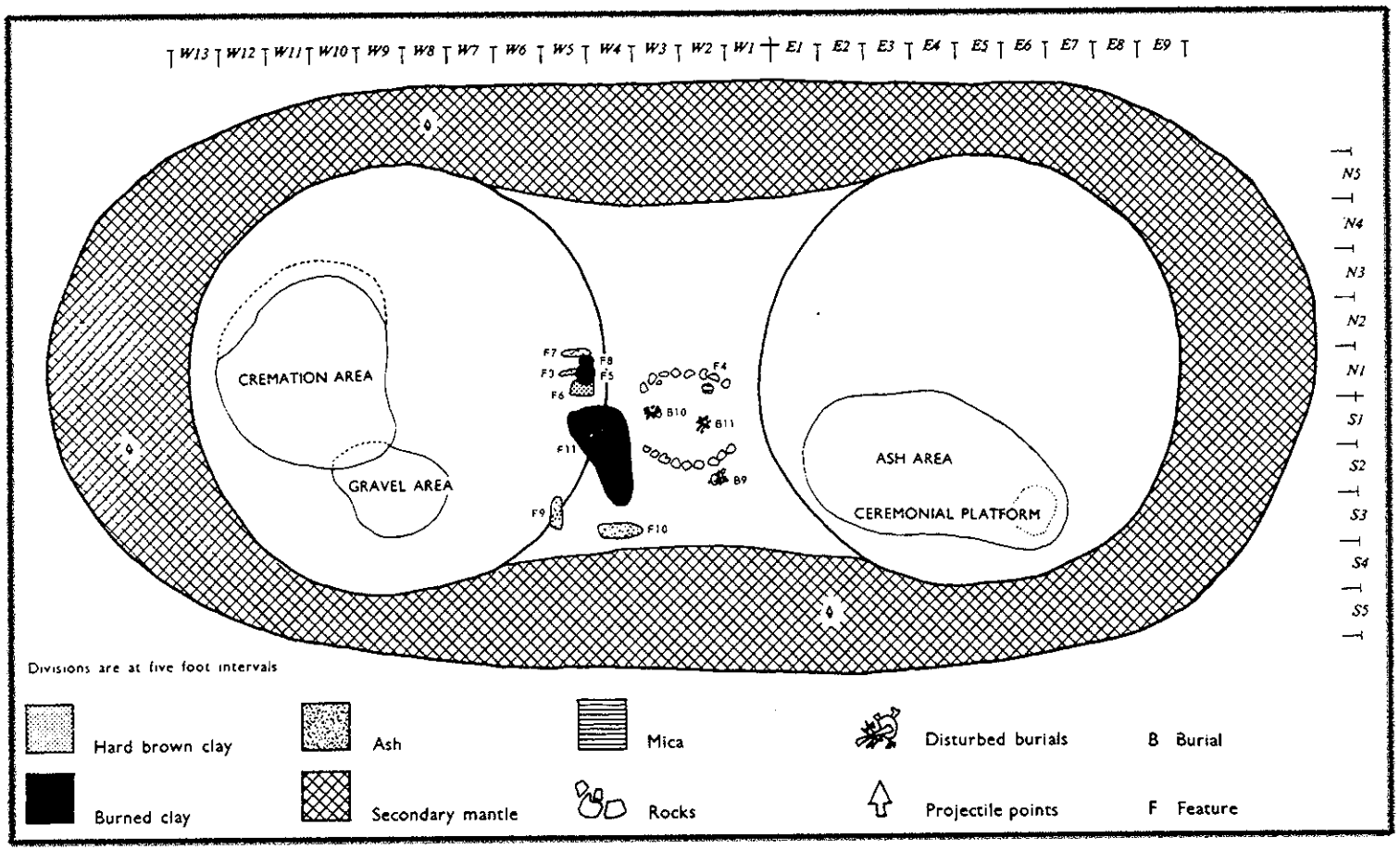
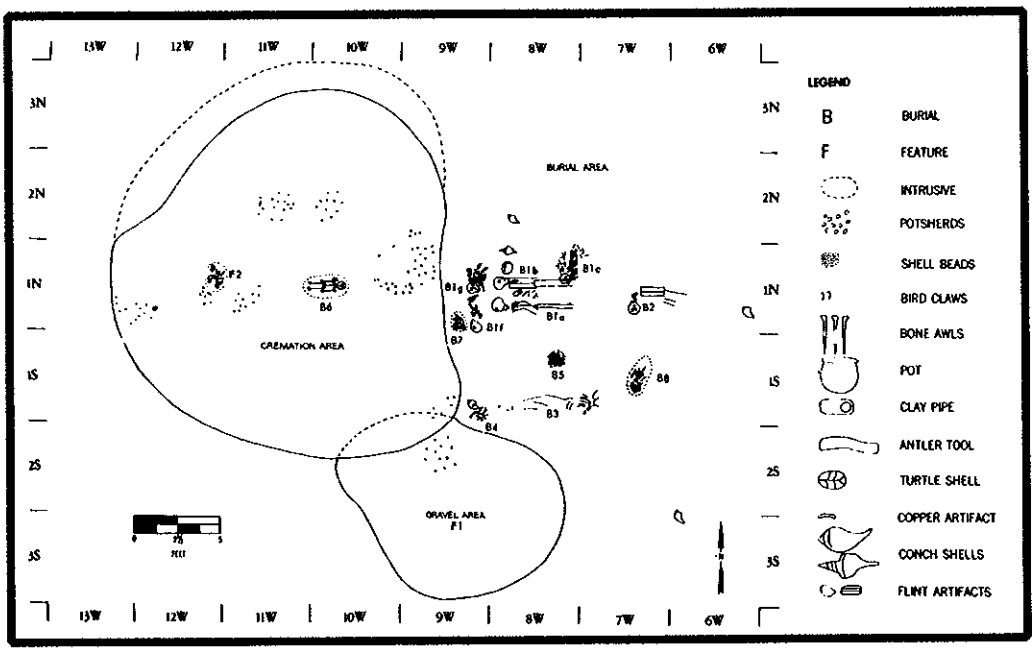
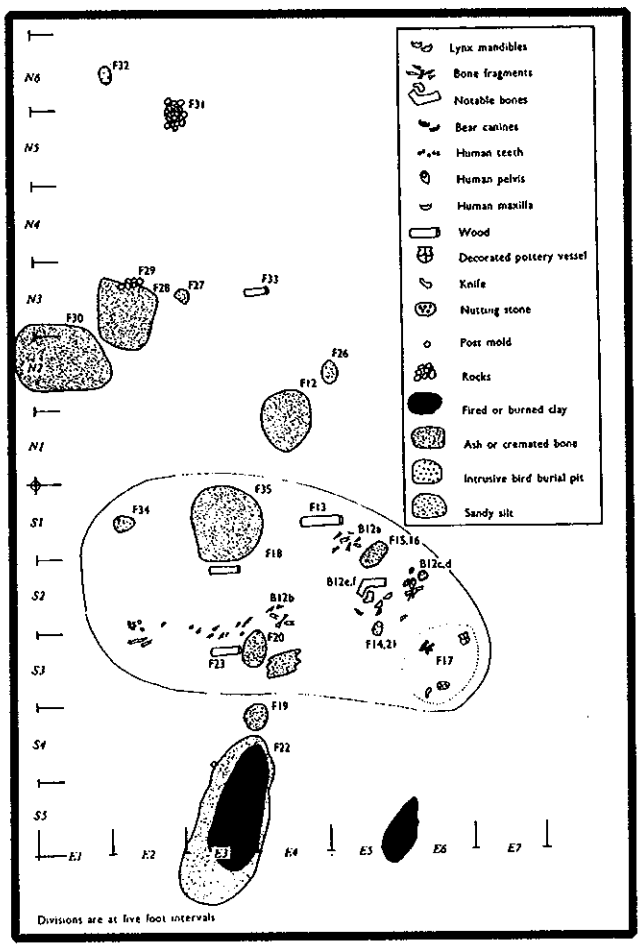


Figure 33. Plan map of Mound 4 (Swartz 1976:68).



a



b

Figure 34. Plan maps of the features documented in Mound 4, a) western portion, b) eastern portion (Swartz 1976:69 & 70).

a plain surface finish and was grit tempered. The pottery was consistent with the assemblage previous recovered from the mound (Swartz 1976). The rims forms were also comparable to sherds recovered previously (Figure 35). An ash substance was found adhering to the pottery. An ash material was reported in various locations throughout the mound (Swartz 1976). Ash or white powder was a common material reported from the earthworks in east central Indiana (Setzler 1931, Vickery 1970, Swartz 1976, Heilman 1976, McCord 1994), but the substance has never been definitively identified to origin. Black (1936:231) identified a white material in the Nowlin Mound as calcium carbonate. Tomak (1990:23) reported a sample from the GE Mound as calcite. Further exploration of this material and how it was obtained is needed.

Table 6
Artifacts recovered from Mound 4

Unit	Level	Identification	No.
4-1	surface	unmodified flake - HD Jeffersonville	1
	scrape	Wyandotte	1
		body sherd, plain - grit temper	1
		ash pieces	4
		fcr - 50.7 g	2
4-1	1	unmodified flake - Laurel	1
		HD Laurel	1
		bone, burned	36
		bone, burned - polished	1
		bone	3
		rim sherd, plain - grit temper	2
		body sherd, plain - grit temper	8
		body sherd, exfoliated - grit temper	1
		fcr - 98.8 g	4
		slag	1
		charcoal	5
		reddened soil sample	1
		ash and charcoal sample	1
		C14 sample from soil anamolie	1
4-1	profile	unmodified flake - HD Fall Creek (Zone --, East Wall)	1
		C14 sample (Zone 8, North Wall)	1

The east wall of Unit 4-1 had a complex profile (Figure 36). At the bottom of the unit, three natural strata were identified. Zones 6 and 7 were unaltered B-horizons. Zone 5 was an A-horizon and represented the original ground surface prior to mound construction. The A-horizon was a silty clay loam. Zone 4 was an altered soil layer and represented the beginning of the artificial mound. Zones 2 and 3 were alternating soil lens, or basket loads, of contrasting hues. Zone 8 was a small soil anamolie and could represent either another basket load or rodent disturbance. Zone 1 was a thick soil layer probably representing the final capping episode for the whole mound. An intrusive pit having the same color and texture as Zone 1 was documented at

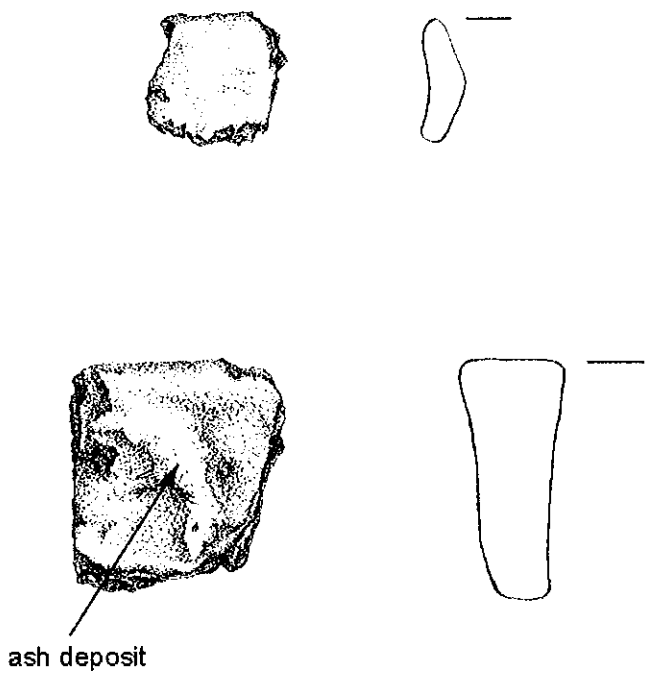
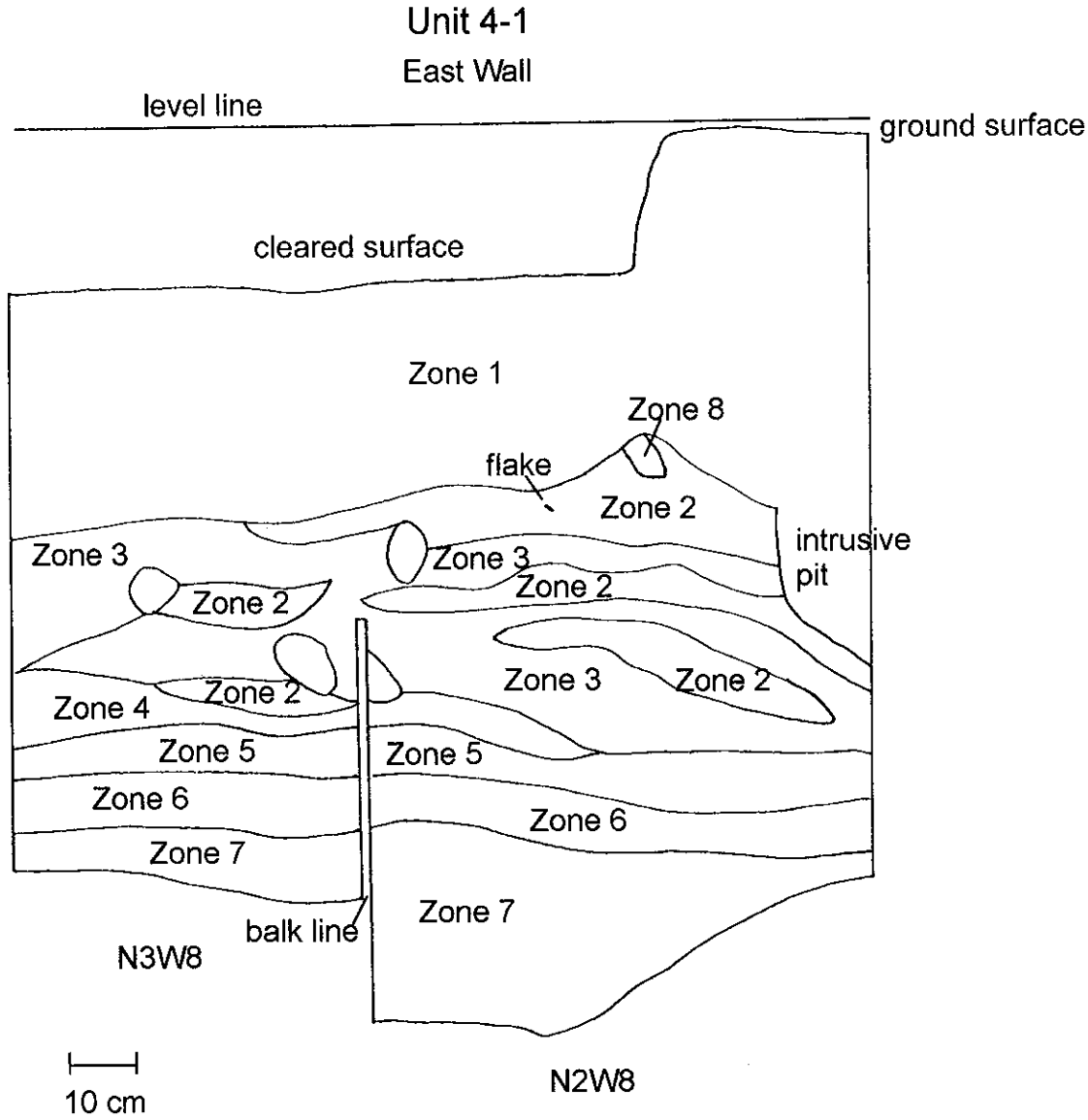


Figure 35. Rim sherds recovered from Unit 4-1.



Zone 1 - 10YR 4/4, silt loam. Granular and friable. Capping.
Zone 2 - Mixed - 10YR 5/1 with 5/8 and 7/2 , silty clay loam. Granular and friable.
Zone 3 - Mixed - 10YR 7/2 with 5/8 and 5/1, silty clay loam. Granular and friable.
Zone 4 - 10YR 5/6, clay loam. Subangular blocky and friable.
Zone 5 - 10YR 3/1, silty clay loam. Granular and friable. A-horizon.
Zone 6 - 10YR 4/3, silty clay loam. Subangular blocky with moderate structure. B-horizon.
Zone 7 - 10YR 4/4, clay loam. Subangular blocky with moderate structure. B-horizon.
Zone 8 - 10YR 5/6, clay loam. Granular and friable.

Figure 36. Profile of Unit 4-1.

the southern end of the profile wall. The pit originated in Zone 1 and likely represents a pothole.

Unfortunately no profiles for this area were recorded during the previous excavations, so the profiles could not be compared. However, curated photographs showed a portion of the east wall of N2W8. The original ground surface was discernable (Figure 37). Units N2W8 and N3W8 were excavated in separate years and did not reach the same depth. No final depth of Unit N2W8 was given, but Unit N3W8 reported a final depth of 84" (214 cm). If this depth was correct than approximately 1 meter of the top of the mound had been removed. The previous excavations and backfilling with a bulldozer had significantly altered the original mound.

No artifacts were recovered from the unit placed in the embankment, Unit 4-2. This unit was reexcavated in a portion of Unit N1W23 on the Swartz (1976) grid. The top 25 to 30 cm were comprised of historic fill of asphalt, concrete and gravel. The profile revealed an A-horizon, Zone 1, with some historic mixing, probably associated with the backfilling (Figure 38). Zone 2 constituted the remainder of the aboriginal embankment wall. A natural B-horizon was encountered approximately 67 cm below the ground surface. No original ground surface or A-horizon was encountered. The ground surface to the west of the unit was approximately 44 cm below the embankment wall. It therefore appears that approximately 20 cm of the original ground surface was removed in this location prior to the wall construction. The profile did not indicate reverse stratigraphy as previously described (Shader 1968:8, Swartz 1976:11). The soils utilized in the embankment construction were mixed and no reversal of natural strata was evident.

Problems Identified

In order to integrate the results of this project into the context of the data from Mound 4, a review of the field notes, site report and photographs from the previous excavations was conducted. While several problems and new interpretations came to light, time constraints did not allow for complete documentation at this time. The major problems were summarized below.

Only one stratigraphic section, N1W16 to N1W2, was published for the entire mound (Swartz 1976:67) (Figure 39). This section was a composite of profiles of the north and south walls of the N1 units excavated from 1965 to 1968. The stratigraphy section purports to demonstrate the construction of two primary mounds joined by a capping episode. However, this interpretation was not substantiated. Based on the field notes and photographs the stratigraphy and, therefore, the construction of the mound was grossly generalized if not inaccurate. It was unfortunate, however, that profile drawings were not completed and photographs were not taken for each excavated unit.

Field notes and photographs from the western portion of the mound did provide enough information to create Figure 40. The following scenario was likely to be overly simplistic, but it was the best that could be done with the available data. The first activity in the mound was a burned layer of soil. This was capped with an ash material. Burial 1 was interred at some point in a submound pit. The strata documented in Unit 4-1 demonstrated that the original ground surface

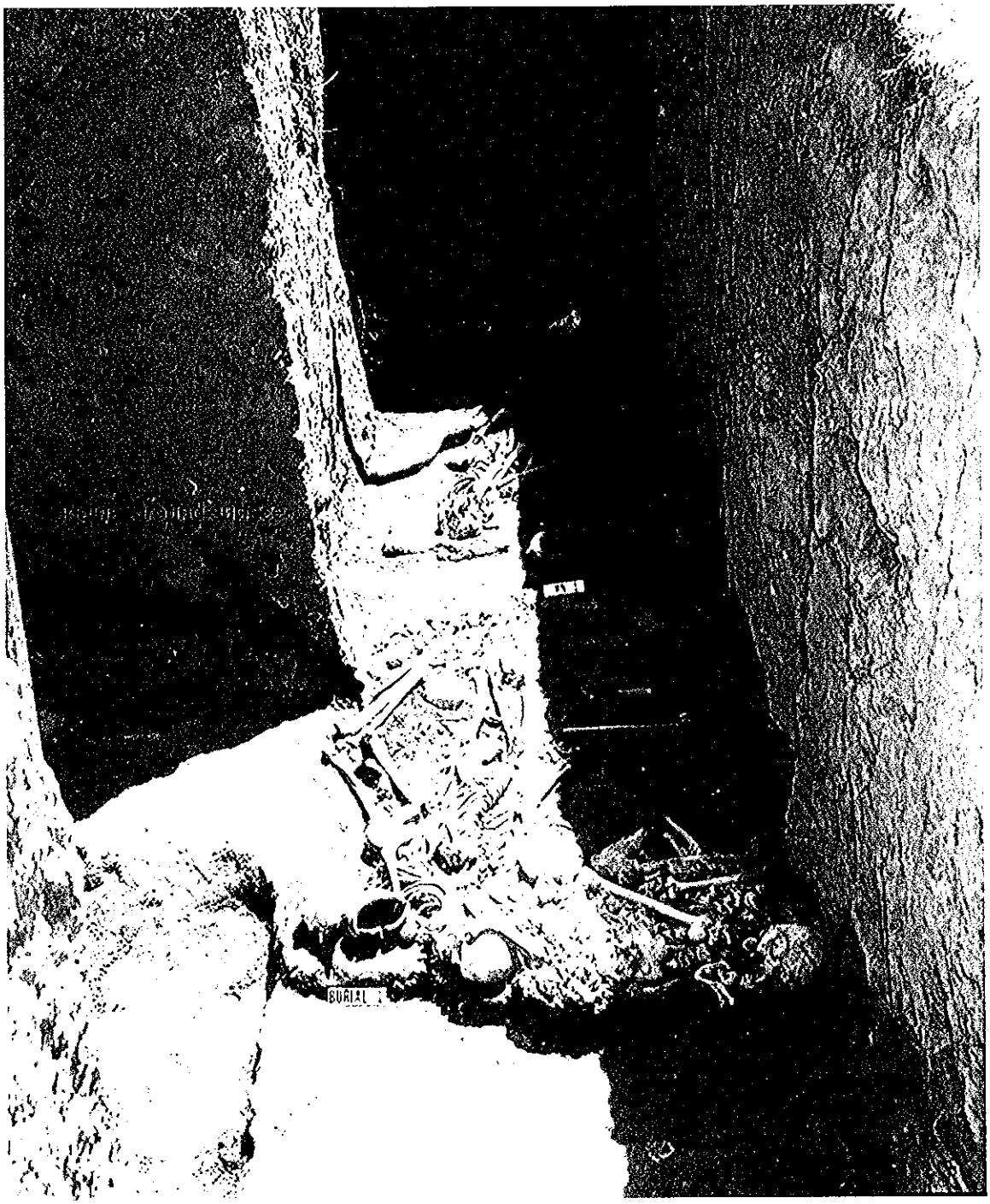
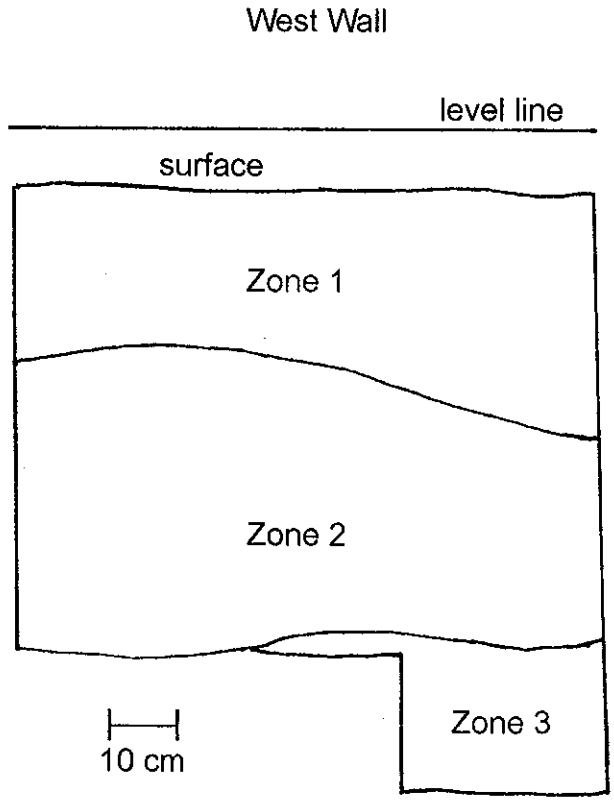


Figure 37. Photograph of Units N1W6 -N1W9, N2W8, and N2W9, looking east, taken 7-7-65. Note the original ground surface.

Unit 4-2



Zone 1 - 10YR 3/2, silt loam.
Granular and friable.
A-horizon. Some historic debris.

Zone 2 - Mixed deposit, 10YR 4/4 and 5/4, silty clay loam.
Embankment wall.

Zone 3 - 10YR 4/4, silty clay loam.
B-horizon.

Figure 38. Profile of Unit 4-2.

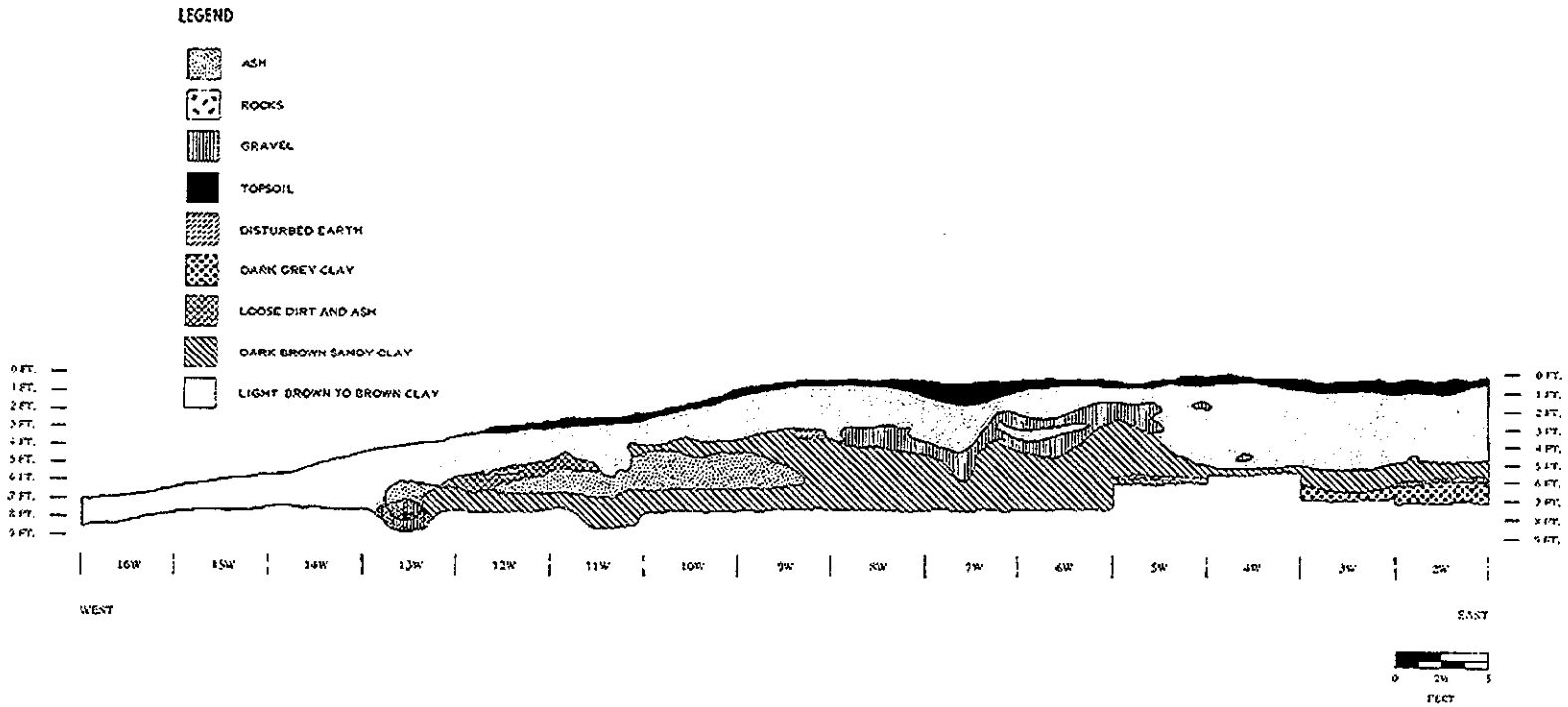


Figure 39. Profile of Mound 4, western portion (Swartz 1976:67).

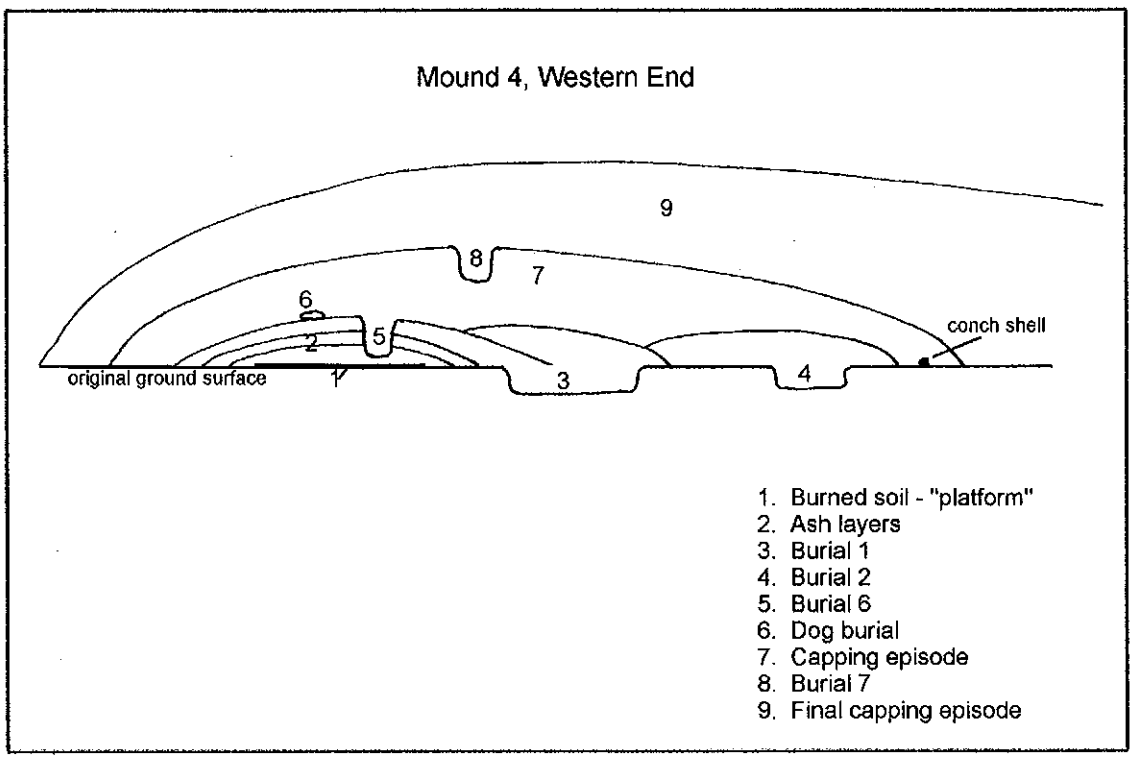


Figure 40. Hypothetical sketch of the western end of Mound 4.

was above Burial 1. Several layers of ash, the so called "Cremation Area", occurred to the west of Burial 1 and at least one of the layers partially covered some of the individuals. Numerous artifacts, particularly ceramics, were mixed in the ash material. Burial 1 was then capped with soil. Burial 2 was placed in a submound pit to the east of Burial 1 and was then capped. A conch shell was placed to the east of Burial 2 on the original ground surface not in direct association with Burial 2. Burial 6 was interred in a pit that intruded through several ash layers in the "Cremation Area" (Figure 41). A dog burial was placed on the surface of the top ash layer. A layer of soil then capped the entire area described. At a later time, Burial 7 was interred in an intrusive pit. The notes and photographs were not detailed enough to allow for other activity areas in the mound to be tied to the western mound activity, but other activities most certainly occurred. It was unlikely that a primary east mound and primary west mound existed, but rather mound construction progressed from the west to the east occurred. The artifacts from the western portion of the mound seem to be somewhat earlier in time than those recovered from the eastern end (Cochran 1996:344). The final stage of mound construction resulted in a thick mantle of soil capping the entire structure.

Based on the model provided above, a few interpretations directly conflict with the site report (Swartz 1976). First, more than 2 primary mounds existed. Several primary activity areas were defined and more likely existed. Ash deposits were extensive and sometimes were found as layers (Figure 42). Second, areas of burned soil were extensive and did occur in layers. The photographs documented a layer of reddened soil occurring below every large ash deposit. This type of construction is analogous to the construction of the mound on the central platform of the Great Mound at Anderson. Vickery (1970) reported the primary mound was composed of three alternating layers of burned soil and ash.

The circular rock formation documented in the center of the mound was found to be an erroneous interpretation. No intentional rock formation occurred at the center of the mound. The rocks were found at various depths and photographs actually show some of the rocks in different soil zones or constructional episodes.

The context of two of the dated radiocarbon samples (Swartz 1976) was also found to be inaccurate. The AD 230 +/- 300 (M-2045) date was not associated with an intrusive component. The sample was recovered 9" below the surface in Unit N1W7 in the final mound capping. The AD 40 +/-140 (M-1851) date was from the eastern part of the mound in Unit S1E5 at a depth of 55 to 60". However, this sample was not in direct association with the Hopewell vessel, as it is not from the same unit. The context of the final date, AD 10 +/- 140 (M-1852), was accurate. The sample was from an ash deposit in the western part of the mound, Unit N1W9 (74" deep) directly associated with New Castle Incised ceramics (Swartz 1968:15, Swartz 1971a:34, Swartz 1976:58).

One last problem was intriguing. The mound had reported been potted on numerous occasions and Redding (1892) conducted substantial excavations (Figure 16). However, very few disturbances were documented by the field school excavations. The areas of major disturbance

Figure 41. West wall of Unit N1W10, taken 7-15-65. Note the intrusive pit, Burial 6, through the layers of ash and reddened soil.

Figure 42. Southwest quadrant of Mound 4, looking north. Photograph taken 7-12-66. Note the layer of reddened soil and layers of ash.

were reported to be in Unit N1W7 (1965), Units S1 to S3W5 & W6 (1969), Units N2E3 to S1E3 (1971) and N6E2 (1971). Most of these disturbances were attributed to Redding's (1892) excavation, but do not fit his descriptions.

A few patterns not previously documented at the site were worthy of notation. First, disarticulation of human remains was noted as part of the mortuary practice. Burials 1b, 2 and 3 were found in an extended position, but some elements of the body were not in correct anatomical position. Most of the burials in the mound were bundled interments. Second, not all the burials occurred in submound pits or on a primary floor. Burial 6 was in an intrusive pit, added at a later stage of the mound building. Burial 7 was also added at a later stage of building. Third and finally, in Unit 4-1 a high instance of heat altered materials were found: heat damaged lithics, fire-cracked rock and charcoal. Fire-cracked rock was not previously reported from the mound fill, but field notes record finding them. These materials were found scattered throughout the mound fill and had not been burned *in situ*. The incidence of heat altered material in the mound fill was also documented in the panduriform at Anderson Mounds (Kolbe 1992a).

The excavations conducted to the east of Mound 4 found historic debris and several posts. The findings were interpreted to be the remains of a historic dump and possible stable (Habart 1976:105-108). The shovel probes in this area did encounter historic disturbance. One of the shovel probes encountered a charcoal and cinder layer described by Habart (1976:106) as a burned layer relating to the historic dump. There is no evidence that a stable or barn existed in this location. Some of the posts that were documented were actually holes used to burn garbage (1968 field notes). All of the debris recovered could be related to the Epileptic Colony era. A significant dump in a borrow area immediately to the north of the Mound 4 exists. A stone bar-b-que grill also exists just to the north of the area identified to be a stable.

Earthwork 6

Previous excavations

The southern half of Earthwork 6 was subjected to extensive excavations in 1970 and 1971 by Ball State University field schools (Olson 1971, Heathcoate 1972, Swartz 1976). The BSU field schools had identified the structure as Earthwork 7, but the 1998 mapping project (McCord 1998) identified the structure as Earthwork 6. The field schools excavated 1875 ft^2 or 75 - 5 x 5' units over the southern half of the enclosure (Figure 43).

Artifacts recovered from the surface included 1 Kanawha point, 1 Matanzas point, 1 bifurcate point, and 1 point fragment. Artifacts recovered from the excavations included 2 point fragments, 1 bipolar artifact, 2 anvils and pottery. Reanalysis of several of the "artifacts" from the enclosure revealed that they were natural. Once again several items were missing from the collection. One of the missing artifacts, identified as a micro-blade fragment on the catalogue, was identified in the field notes as a lamellar blade fragment of Flint Ridge (Appendix C). Illustrations of the artifact did suggest this was a lamellar blade (1970 field notes).

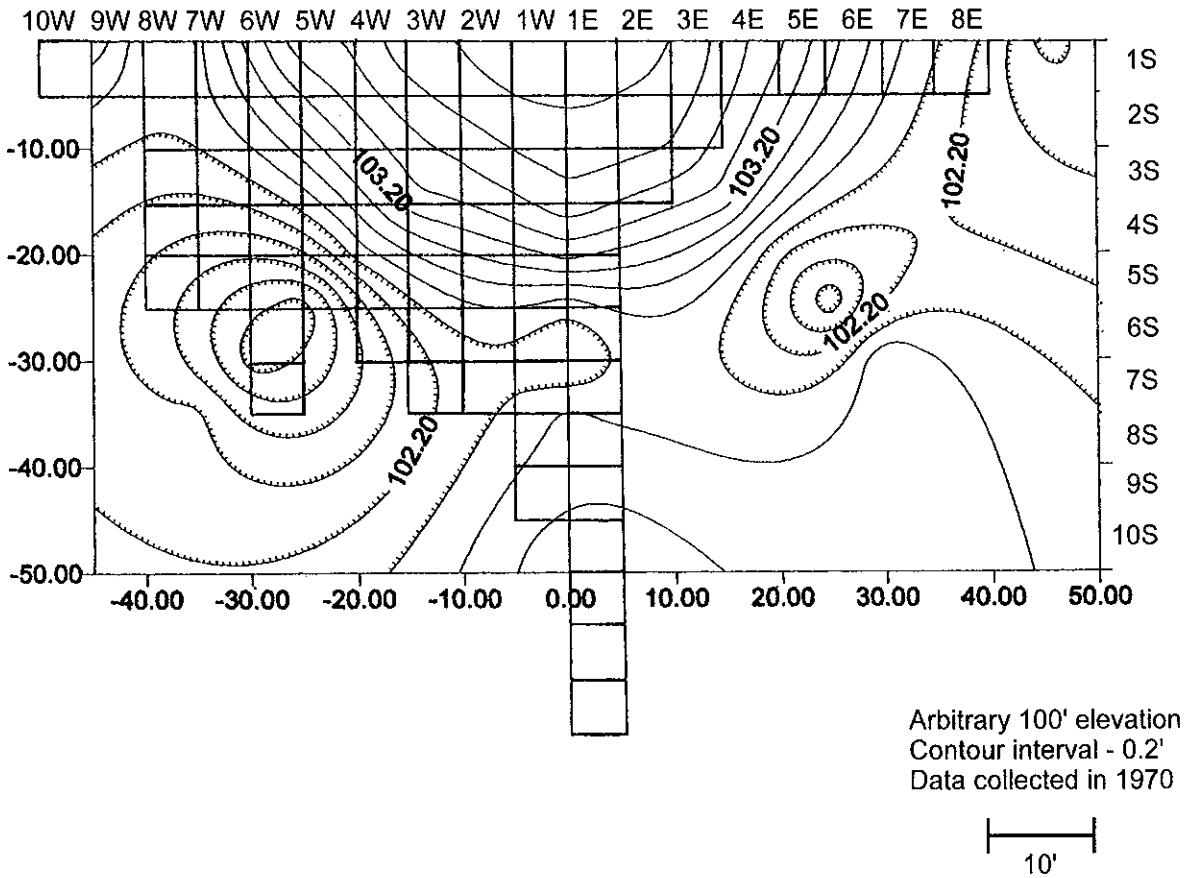


Figure 43. Contour map of the south half of Earthwork 6 showing the location of the 1970 and 1971 excavation units.

The majority of the artifacts recovered from the enclosure were ceramic. The notes reported approximately 150 sherds. Swartz (1976) reported 128 sherds representing two vessels were recovered. Johnson's (1995) reanalysis of the ceramics noted approximately 90 sherds related to the enclosure. Numerous sherds were not catalogued at the time of her assessment and the remaining assemblage was probably mixed with sherds from Mound 4. The ceramics were recovered in two locations in the enclosure, on the central platform and in the ditch. Over 100 sherds were reported from the central platform, primarily from unit S2W3. The ceramics from the enclosure were plain and grit tempered. Two rims, 1 from the ditch and 1 from the platform, were recovered (Figure 44).

The 1970 excavations in the southwest quarter were conducted under the assumption that an artificial mound was located on the central platform. Therefore, excavations were excessively deep. Artifacts were, however, only reported from the first three strata or top 25". All of the artifacts, except 1 point fragment, were found on the central platform (Olson 1971, 1970 field notes).

The 1971 excavations in the southeast quarter documented that the central platform was natural in origin. Therefore, the interpretation of the strata differed. One anvil was recovered from the central platform and the remaining artifacts were from the ditch (Heathcoate 1971). Heathcoate (1976:24) wrote the stratigraphy section for Swartz's (1976) site report and, disregarding the 1970 excavations, mistakenly stated that most of the artifacts from the enclosure were recovered from the ditch.

1998 Excavations

The 1998 mapping project (McCord 1998:58 & 60) documented that the enclosure was severely damaged. This occurred not only from the 1970 and 1971 excavations, but from the backfilling of those excavations with a bulldozer (1971 field notes). The 1998 excavations consisted of a 1 x 1m unit (Unit 6-1) on the central platform north of the 1970 excavations and a 1 x 1 m unit (Unit 6-2) in the ditch to confirm the presence of a gateway (Figure 22).

Unit 6-1 was in the approximate area of N1W3 on the 1970 & 1971 grid. The excavation recovered fire-cracked rock and a small amount of charcoal scattered throughout the unit (Table 7). In the southern-most portion of the unit a disturbance was encountered. The unit had apparently overlapped the 1970 excavation. The stratigraphy of the unit was a natural soil profile as documented by Heathcoate (1971) (Figure 45). Artifacts were recovered in both the A and B-horizons. Bioturbation and natural soil formation were responsible for artifacts occurring in the B-horizon. The artifacts originally occurred at or near the surface but due to the addition of organic material and chemical weathering presently occur deeper in the soil. No artificial mound structure was documented.

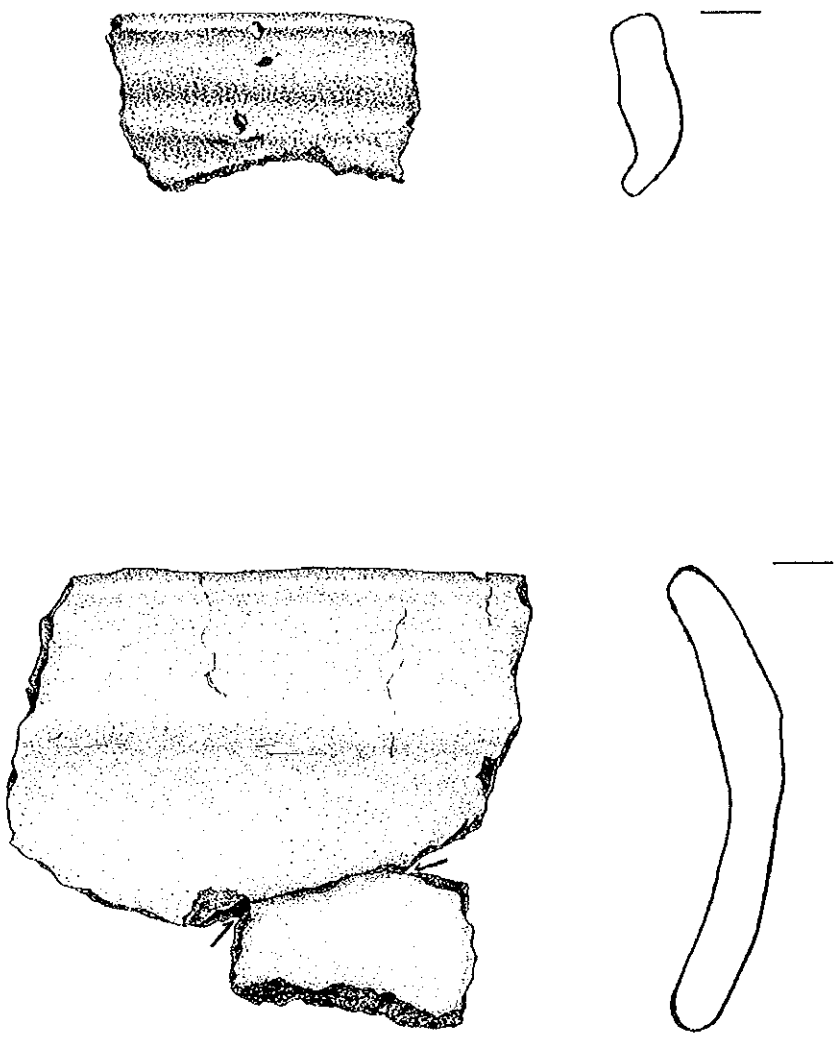
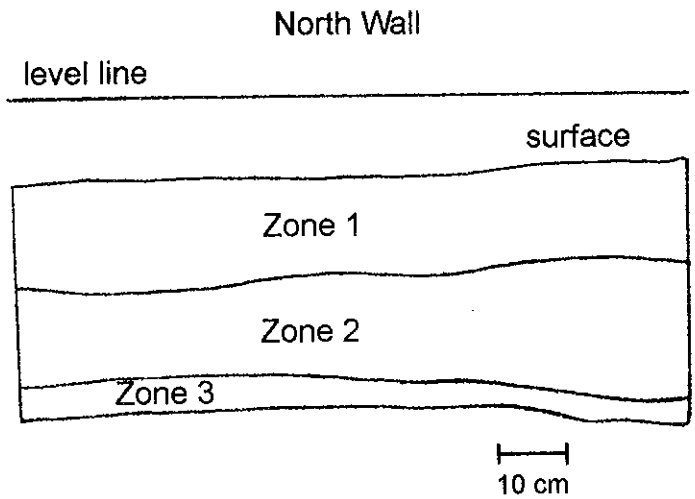


Figure 44. Rimsherds recovered from Earthwork 6 in 1970 and 1971.

Unit 6-1

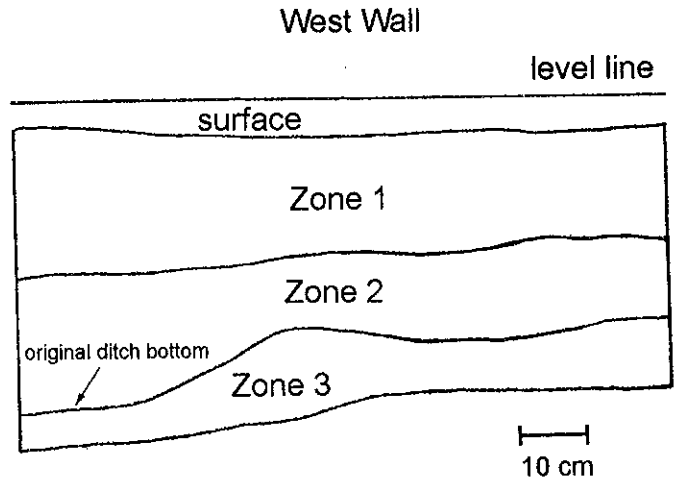


Zone 1 - 10YR 3/3, silt loam.
A-horizon.

Zone 2 - 10YR 4/4, silt loam.
B-horizon.

Zone 3 - 10YR 4/4, gravelly loam.
B-horizon

Unit 6-2



Zone 1 - 10YR 3/2, silt loam.
A-horizon.

Zone 2 - 10YR /3, loam.
Ditch fill.

Zone 3 - 10YR 4/4, gravelly loam.
B-horizon.

Figure 45. Profile of Unit 6-1 and 6-2.

Table 7 Artifacts Recovered from Earthwork 6			
Unit	Level	Identification	No.
6-1	1	cvs sample - charcoal	1
6-1	2	fcr - 244.4 g cvs sample - charcoal	8 2
6-1	3	fcr - 573.3 g C14 sample cvs sample - charcoal	9 1 4
6-1	4	fcr - 96 g C14 sample	2 1
6-2	1	drain tile fcr - 22 g	2 2
6-2	2	cvs sample - charcoal	5
6-2	3	fcr - 1167.2 g cvs sample - charcoal	4 2
6-2	4	fcr - 176.6 g cvs sample - charcoal microflake - HD unknown	9 1 1
6-2	5	fcr - 90.9 g	4

A small carbon sample collected from Zone 2 was submitted for AMS dating. The resultant date was 860 +/- 50 BP (Beta-127455) or AD 1090 +/- 50 (cal AD 1195 +/- 50). The date falls within the Late Woodland time frame for this region. The sample appeared as a charcoal fleck in the soil and was unassociated with a feature. The sample may have originated from natural burning or a later occupation of the site.

Unit 6-2 was located in the ditch along the eastern edge of an apparent gateway. The excavation recovered 1 piece of drainage tile, fire-cracked rock, 1 microflake and a small amount of charcoal. The bottom of the ditch was approximately 42 cm below the present ground surface (Figure 45). In the profile, the floor of the ditch rose in elevation toward the north, the direction of the suspected gateway. While the change was subtle in profile, it seemed to confirm the existence of the gateway. The soil at the bottom of the ditch was very compact.

Earthwork 7

Earthwork 7 was the largest of the southern enclosures. Redding (1892:102) reported a mound in the center that was 3 to 5' high. A 1 x 1m unit (Unit 7-1) was placed in the approximate center of the central platform avoiding several potholes. Another 1 x 1m unit (Unit

7-2) was placed in the ditch aligned opposite the gateway (Figure 22).

The excavation of Unit 7-1 recovered 4 unmodified flakes, 1 modified flake, 1 microflake, 1 block flake, 1 pottery sherd, other chipped stone, fire-cracked rock and a small amount of charcoal (Table 8). One of the unmodified flakes was of Burlington chert suggesting a Middle Woodland use of the enclosure (Hicks 1992:25). A fire-cracked rock concentration along the north wall of the unit was designated Feature 1 (Figure 46). The feature was defined in level 3 at the interface of the A and B soil horizons. Several other fire-cracked rocks were recovered from levels 1, 2 and 3 but they were scattered throughout the unit. The feature was simply a cluster of fire-cracked rock. There was no change in the soil and no associated artifacts.

Table 8
Artifacts Recovered from Earthwork 7

Unit	Level	Identification	No.
7-1	1	unmodified flake - HT Laurel fcr - 134.8 g	2 5
7-1	2	body sherd, exfoliated - grit temper modified flake - Wyandotte unmodified flake - HT Burlington unknown block flake - HD Laurel charcoal fcr - 35.4 g	1 1 1 1 1 24 2
7-1	3	other chipped stone charcoal fcr - 974.8 g cvs sample - microflake - HD unknown	1 2 20 1
7-1	Feature 1	fcr - 302.9 g C14 sample	14 1
7-2	shovel probe	bone fcr - 167.5 g	12 2
7-2	2	fcr-32.4 g	1
7-2	3	unmodified flake - Wyandotte Laurel bipolar - Jeffersonville fcr - 260 g	1 1 1 14
7-2	4	lamellar blade - HT Flint Ridge fcr - 345.8 g	1 9

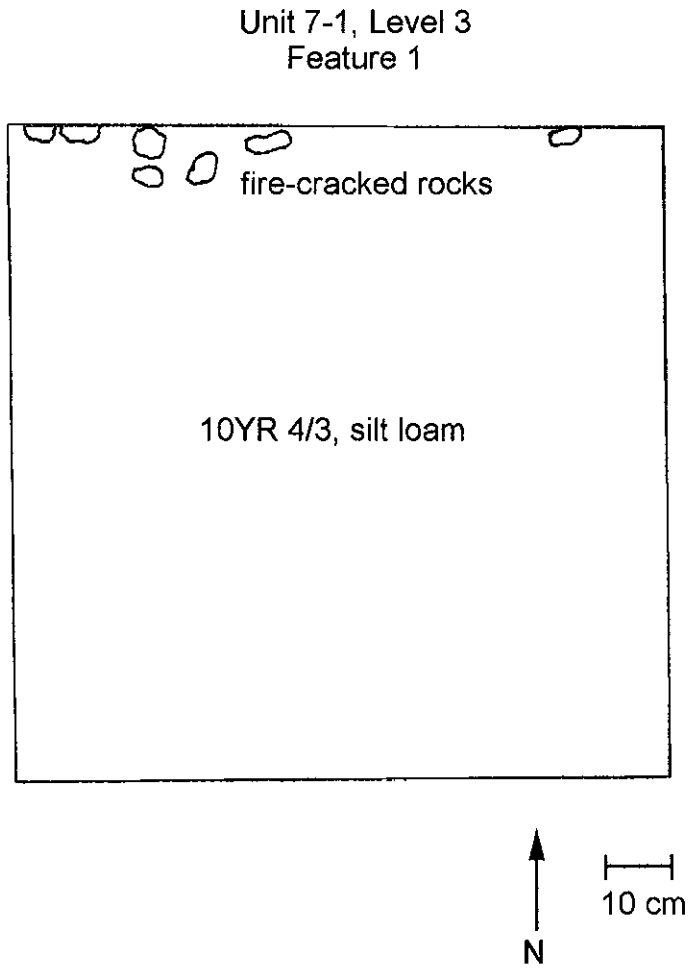


Figure 46. Plan of Feature 1.

The profile of Unit 7-1 showed natural soil development (Figure 47) even though artifacts were found in the B-horizon. Bioturbation and natural soil formation were responsible for artifacts occurring deeper in the soil. No artificial mound construction was documented. The enclosure was built around a naturally higher elevation.

The carbon sample collected from Feature 1 was submitted for AMS dating. The resultant date was 4070 +/- 60 BP (Beta-127456) or 2120 +/- 60 BC (cal 2585 +/- 60 BC). This date falls within the Late Archaic time period within this region. The charcoal sample did not date the construction or the use of the earthwork.

The excavation of Unit 7-2 began with the excavation of a shovel probe. This was the first unit excavated in a ditch and it was anticipated that the ditch would be greater than 50 cm deep. The shovel probe was excavated to define the natural levels, so we would not waste resources screening erosional fill in the ditch. The bottom of the ditch was encountered much shallower than anticipated, so the excavation proceed in 10 cm arbitrary levels.

The excavation recovered 2 unmodified flakes, 1 bipolar artifact, 1 lamellar blade, bone and fire-cracked rock. The bone recovered from the shovel probe appeared to be the recent remains of a deer. The lamellar blade of Flint Ridge was the most diagnostic lithic artifact recovered during the excavations of the site (Figure 48). The blade was found on the floor of the original ditch bottom. The context of the blade suggested, not surprisingly, that the enclosure was utilized during the Middle Woodland period.

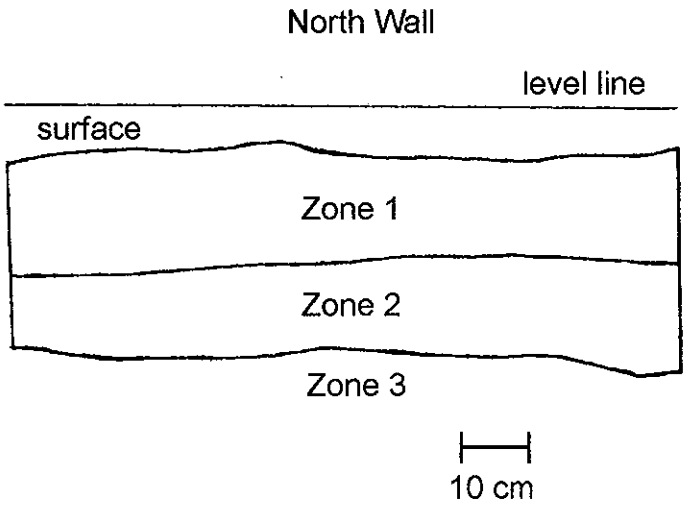
The original bottom of the ditch was approximately 40 cm below the present ground surface (Figure 48). The erosional fill in the ditch was organic and dark in color. The soil at the bottom of the ditch was lighter in color, compact and contained more gravel and clay.

Earthwork 8

Earthwork 8 was the smallest of the southern enclosures. Redding (1892:102) reported a small mound in the center of the enclosure. A 1 x 1m unit (Unit 8-1) was placed in the approximate center of the central platform. Another 1 x 1m unit (Unit 8-2) was placed in the ditch aligned opposite the gateway (Figure 22).

Unit 8-1 contained 1 microflake, fire-cracked rock and charcoal (Table 9). The unit had a shallow A-horizon, approximately 10 cm deep, compared to the 15 to 20 cm depth of the other southern enclosures. A shovel test was excavated at the bottom of level 3 to confirm the natural deposits. The strata documented a natural soil profile (Figure 49).

Unit 7-1

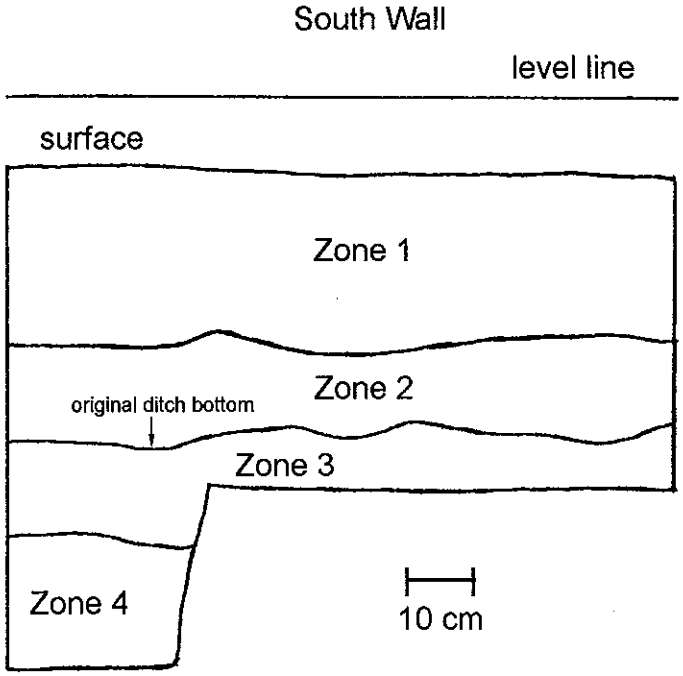


Zone 1 - 10YR 3/3, silt loam.
A-horizon.

Zone 2 - 10YR 4/3, silt loam.
B-horizon.

Zone 3 - 10YR 4/3, gravelly loam.
B-horizon.

Unit 7-2



Zone 1 - 10YR 2/2, sandy loam.
A-horizon.

Zone 2 - 10YR 3/3, sandy loam.
Ditch fill.

Zone 3 - 10YR 4/4, gravelly loam.
B-horizon.

Zone 4 - 10YR 4/4, clay loam.
B-horizon.

Figure 47. Profile of Unit 7-1 and 7-2.

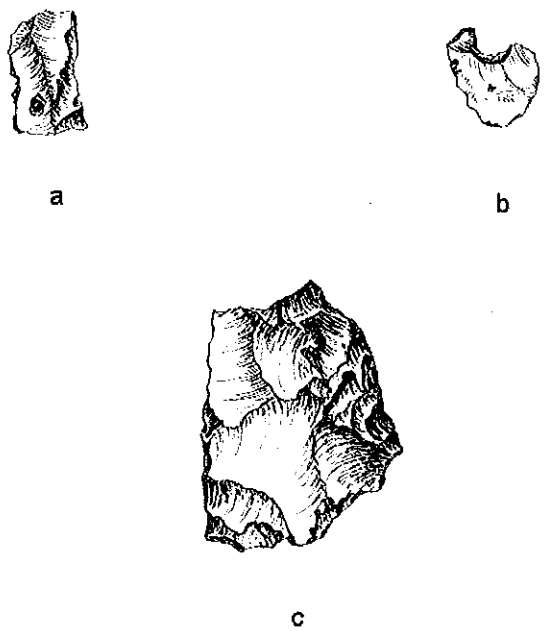
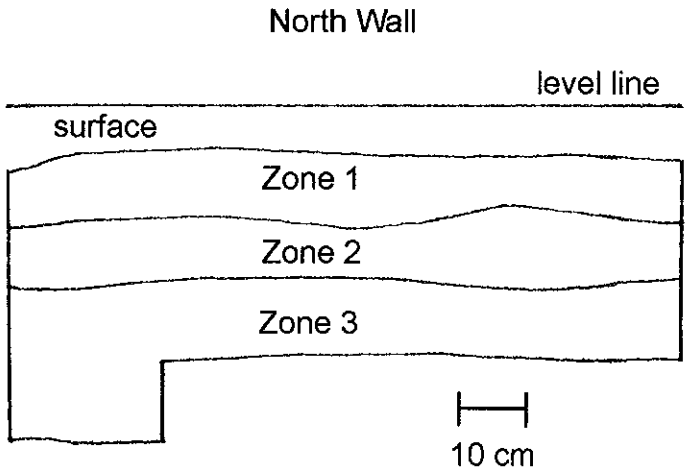


Figure 48. Artifacts; a) lamellar blade (Unit 7-2), b) notch flake (Earthwork 8), and c) biface fragment (Unit 12-2).

Unit 8-1

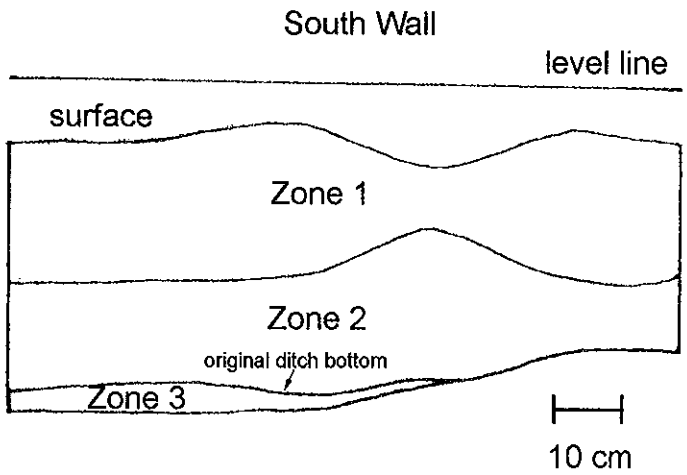


Zone 1 - 10YR 3/4, sandy loam. A-horizon.

Zone 2- 10YR 4/3, silty clay. B-horizon.

Zone 3 - 10YR 4/4, gravelly clay loam. B-horizon.

Unit 8-2



Zone 1 - 10YR 3/3, silt loam. A-horizon.

Zone 2- 10YR 3/4, loam. Ditch fill.

Zone 3 - 10YR 4/4, gravelly clay loam. B-horizon.

Figure 49. Profile of Unit 8-1 and 8-2.

Table 9 Artifacts Recovered from Earthwork 8			
Unit	Level	Identification	No.
--	surface	notch flake - Flint Ridge	1
8-1	1	fcr -56.9 g	3
8-1	2	fcr - 499.3 g cvs sample - microflake - Laurel charcoal	5 1 2
8-1	3	fcr - 191.4 g charcoal cvs sample - charcoal	4 1 2
8-2	1	unmodified flake - HD unknown fcr - 31.5 g	1 1
8-2	2	unmodified flake - HT Laurel HD unknown fcr - 67 g cvs sample - microflake - unknown charcoal	1 1 4 1 2
8-2	3	fcr - 735.2 g	12
8-2	4	unmodified flake - Laurel Fall Creek fcr - 999.4 g	1 1 10

A broad notch flake (Titmus 1985:251) of Flint Ridge chert was recovered on the surface of the central platform, near the east wall of Unit 8-1 (Figure 48). Middle Woodland Snyders points have broad notches. A review of the ARMS collection found 8 Snyders points from east central Indiana. Four of the points were manufactured from Flint Ridge, 3 were from Burlington and 1 was from Wyandotte. It seemed highly probable that the notch flake was the result of the manufacture of a Snyders point.

Unit 8-2, in the ditch, recovered 5 unmodified flakes, 1 microflake, fire-cracked rock and charcoal. The bottom of the ditch was encountered approximately 38 cm below the present ground surface (Figure 49). The ditch had been filled by the erosion of organic soil. The bottom of the ditch was compact and gravelly.

Earthwork 9

Earthwork 9 was partially covered with thick vegetation and fallen trees. A fairly recent pothole was located on the south side of the central platform (McCord 1998:60). A 1 x 1m unit (Unit 9-1) was placed in the approximate center of the central platform, avoiding the vegetation.

Another 1 x 1m unit (Unit 9-2) was placed in the ditch aligned opposite the gateway (Figure 22).

In Unit 9-1, 1 other chipped stone flake and fire-cracked rock were recovered (Table 10). The strata documented a natural soil profile (Figure 50). Very few artifacts and a natural soil profile were consistent with the findings of the other units excavated on the central platform.

Table 10
Artifacts Recovered from Earthwork 9

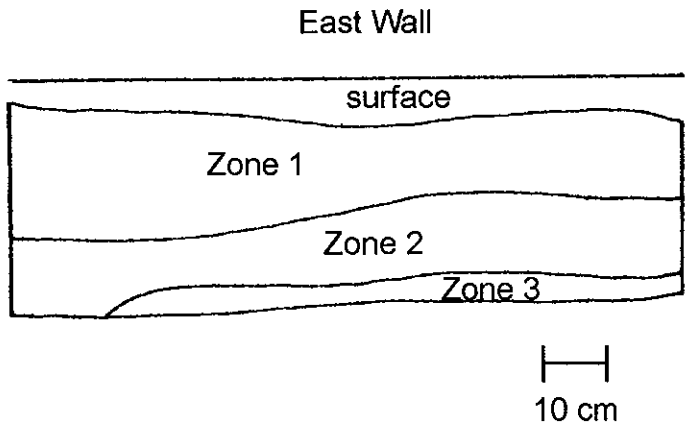
Unit	Level	Identification	No.
9-1	2	fcr - 484.5 g	8
9-1	3	other chipped stone fcr - 53.5 g	1 2
9-2	1	cvs sample - microflake - Wyandotte charcoal	1 24
9-2	2	unmodified flake - Laurel body sherd, eroded - grit temper fcr - 317.5 g cvs sample - charcoal	1 1 16 9
9-2	3	unmodified flake - Fall Creek fcr - 509.7 g cvs sample - microflake - HD unknown charcoal	1 7 1 12
9-2	Feature 2	fcr - 44 g C14 sample charcoal	4 1

Unit 9-2 recovered 2 unmodified flakes, 2 microflakes, a pottery sherd, fire-cracked rock and charcoal. The pottery sherd was grit tempered, but the surface was eroded. It appeared to be consistent with other ceramics recovered from the site (Swartz 1976, Johnson 1995).

The bottom of the ditch was encountered approximately 40 cm below the present ground surface (Figure 50). The ditch had been filled by the erosion of organic soil. The bottom of the ditch was lighter in color and gravelly.

A dark soil stain (10YR 2/1), Feature 2, became apparent at the bottom of the A-horizon in Unit 9-2 (Figure 51). The anomaly was circular in plan view and contained wood charcoal and a few fire-cracked rocks. The feature was tapered in cross-section and extended to the bottom of the ditch (Figure 51). The feature was undefined as to origin and was restricted to the ditch fill (Zone 2). It was above the original bottom of the ditch and, therefore, not likely to be aboriginal in origin. A charcoal sample was submitted for dating to clarify the context of the feature. The

Unit 9-1

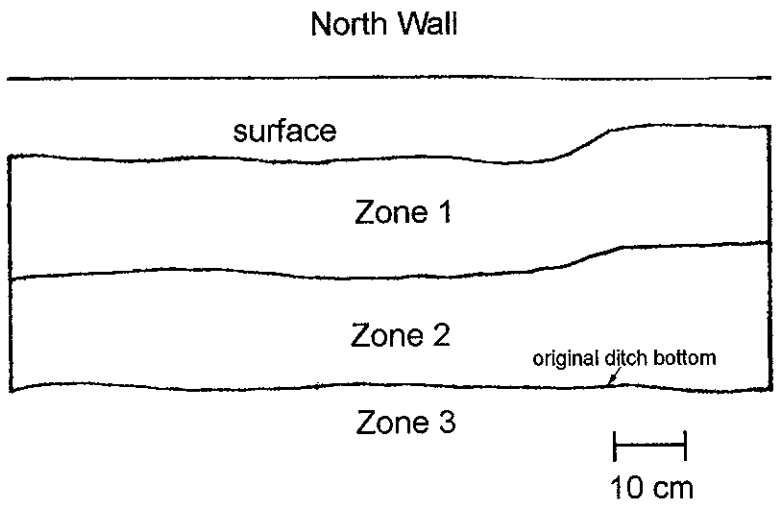


Zone 1 -10YR 3/3, silt loam. A-horizon.

Zone 2 - 10YR 4/4, silt loam. B-horizon.

Zone 3- 10YR 4/4, gravelly loam. B-horizon.

Unit 9-2



Zone 1 -10YR 3/2, silt loam. A-horizon.

Zone 2 - 10YR 3/4, sandy loam. Ditch fill.

Zone 3- 10YR 5/6, gravelly loam. B-horizon.

Figure 50. Profile of Unit 9-1 and 9-2.

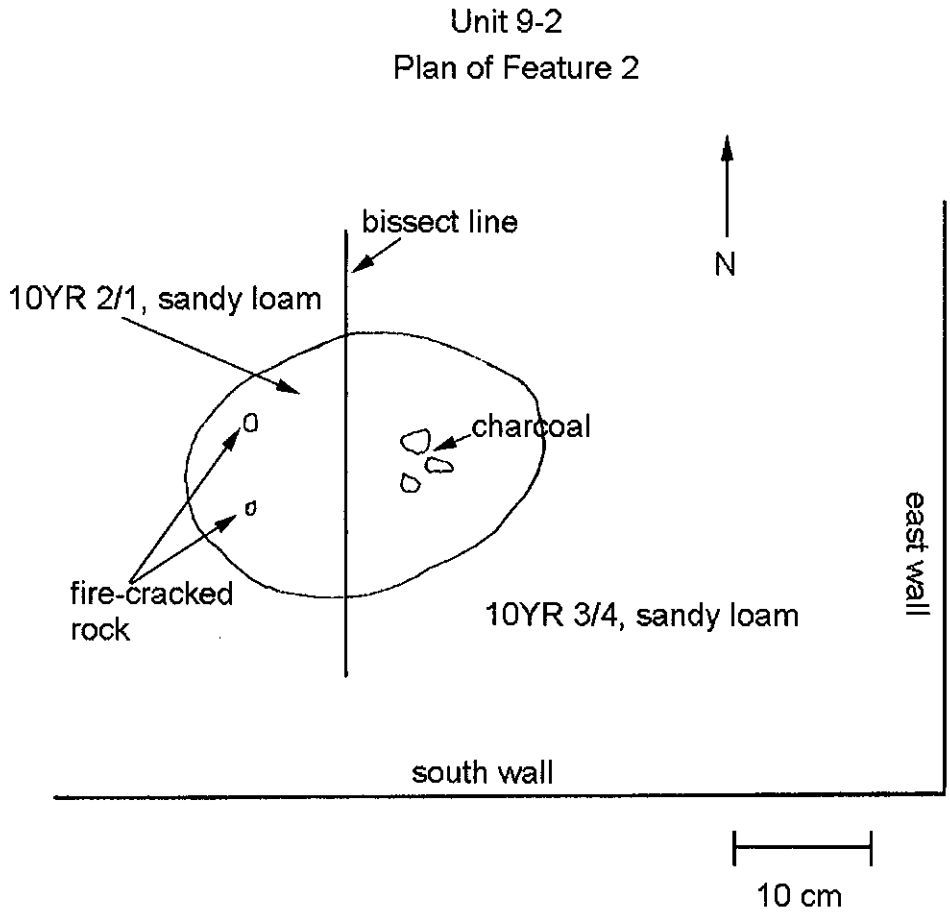


Figure 51. Plan and profile of Feature 2.

resultant date was modern (Beta-12457). The modern date corresponds to its location in the ditch fill.

Earthwork 12

Earthwork 12 was located to the northeast of the main area of earthworks on a ridge spur (Figure 11). Redding (1892:101) reported this structure as a mound 6' high surrounded by a ditch 3' deep and embankment 2 ½' high. The earthwork was heavily overgrown with raspberries and multiflora roses at the time of this project. A 1 x 1m unit (Unit 12-1) was placed in the approximate center of the central platform, avoiding the vegetation. Another 1 x 1m unit (Unit 12-2) was placed in the ditch aligned opposite the gateway (Figure 22).

Unit 12-1 recovered 1 unmodified flake and fire-cracked rock (Table 11). Numerous tree roots and rocks made the excavation difficult. A natural soil profile was documented (Figure 52). The central platform was a natural glacial formation, not an aboriginal mound.

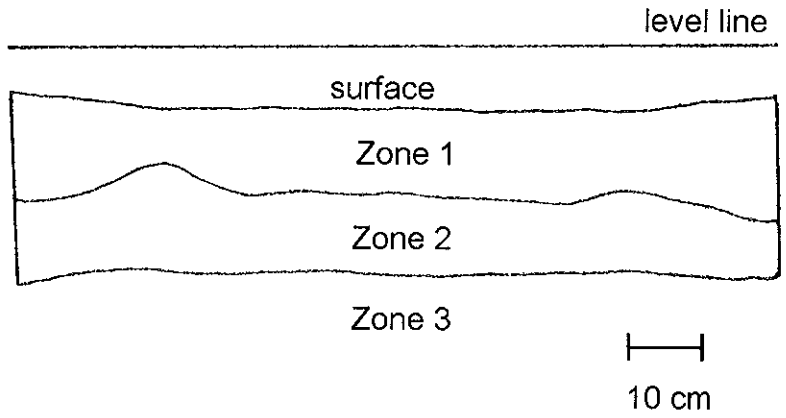
Table 11
Artifacts recovered from Earthwork 12

Unit	Level	Identification	No.
12-1	1	fcr - 39.2 g cvs sample - charcoal	3 2
12-1	2	unmodified flake - HD Wyandotte fcr 83.2 g cvs sample - charcoal	1 3 11
12-2	1	fcr -83.2 g	3
12-2	2	unmodified flake - HT Burlington fcr - 120.5 g cvs sample - charcoal	1 5 8
12-2	3	biface fragment - Burlington unmodified flake - Laurel Fall Creek unknown fcr - 34.1 g cvs sample - block flake - HD Laurel charcoal	1 1 1 1 3 1 41

Unit 12-2 recovered 4 unmodified flakes, 1 biface fragment, fire-crack rock and charcoal (Table 11). The biface fragment of Burlington at the bottom of the ditch suggested a Middle Woodland use of the enclosure (Hicks 1992:25) (Figure 48). The bottom of the ditch was encountered at 30 cm below the depth of the original ground surface (Figure 52). The soil was

Unit 12-1

East Wall



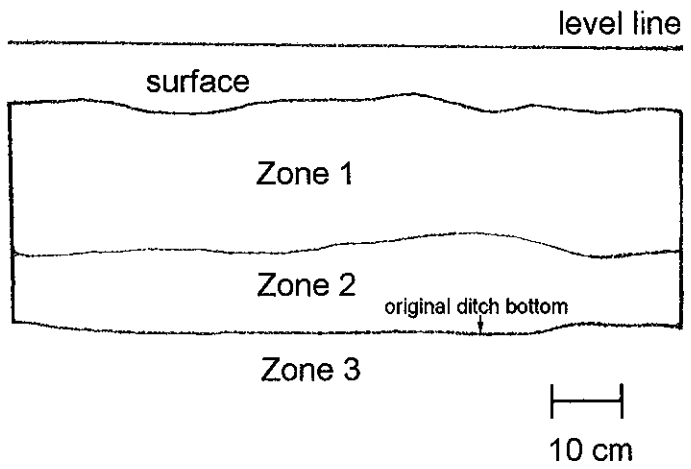
Zone 1 - 10YR 3/3, silt loam. A-horizon.

Zone 2 - 10YR 4/6, silty clay. B-horizon.

Zone 3 - 10YR 5/6, gravelly silty clay. B-horizon.

Unit 12-2

South Wall



Zone 1 - 10YR 3/2, sandy loam. A-horizon.

Zone 2 - 10YR 3/3, sandy loam. Ditch fill.

Zone 3 - 10YR 5/6, gravelly sandy loam. B-horizon.

Figure 52. Profile of Unit 12-1 and 12-2.

fairly gravelly like the soil encountered on the central platform. The ditch fill was comprised of eroded organic soil. The soil at the bottom of the ditch was lighter in color and very gravelly.

Earthwork 13

Earthwork 13 was an apparent earthern wall and ditch constructed along the side of a ridge spur. The structure was unlike anything reported for Early/Middle Woodland earthworks in east central Indiana. A 1 x 1 m unit was excavated on the ditch side of the wall in an effort to determine the origin of this structure (Figure 22).

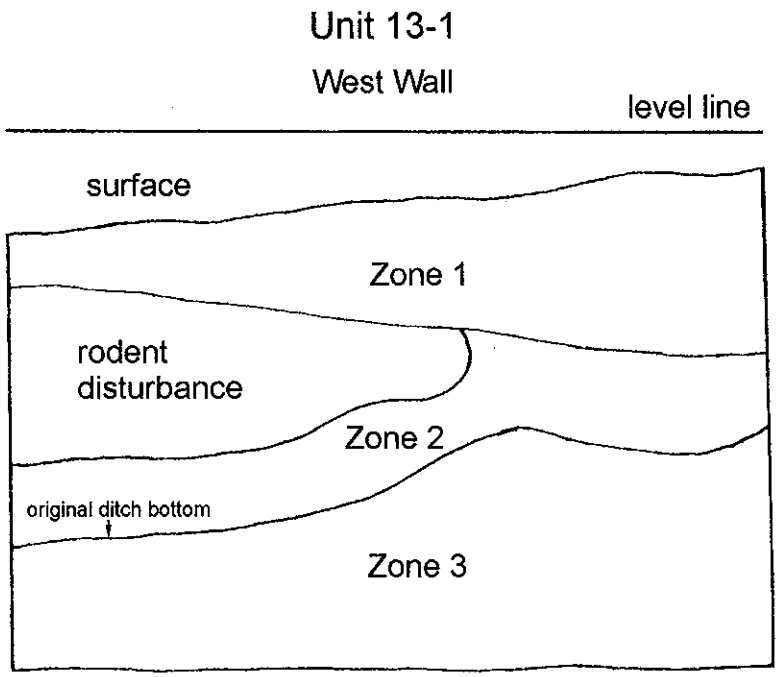
Unit 13-1 recovered 1 microflake, fire-cracked rock and charcoal (Table 12). The soil was fairly gravelly. The base of the ditch occurred approximately 40 cm below the base of the ground surface (Figure 53). The ditch depth and fill were comparable to that documented in the circular enclosures. The natural B-horizon documented below the ditch had a blocky structure and the mottles indicated a poorly drained soil. The test unit documented that this structure was not natural in origin. Given the soil development and similarity to the other earthworks at the site, the structure appeared to be contemporaneous.

Table 12
Artifacts recovered from Earthwork 13

Unit	Level	Identification	No.
13-1	1	cvs sample - microflake - Wyandotte charcoal	1
	2	fcr - 29.7 g cvs sample - charcoal	1 1
	3	fcr - 24.4 g cvs sample - charcoal	1 2
	4	fcr - 332.4 g cvs sample - charcoal	3 1
	5	fcr - 501.8 g	3
	7	fcr - 265.7 g	1

Excavation Summary

The test excavations greatly enhanced our knowledge of the New Castle site. Each of the extant structures was tested. The testing was very limited, only 15m^2 of new excavation occurred. While the excavations did not recover large amounts of artifacts or obtain carbon samples for dating from each enclosure, consistent patterns of artifacts and earthwork



Zone 1 - 10YR 3/3, loam.
A-horizon.

Zone 2 - 10YR 4/2, gravelly loam.
Ditch fill.

Zone 3 - 10YR 5/4 with 10YR 4/4 and 7/2 mottles, gravelly sandy clay loam.
B-horizon.

Figure 53. Profile of Unit 13-1.

construction were documented. The reexcavation of some units documented the previous excavations, clarified some problems, and offered new interpretations.

Artifacts

Lithic artifacts recovered by the excavations were manufactured from local and exotic materials. Laurel, Fall Creek and Jeffersonville were locally available in the glacial gravels. The exotic materials included Burlington, Flint Ridge and Wyandotte. Exotic materials were recovered from most of the earthworks. Wyandotte was recovered from Mound 1, Earthwork 2, Mound 4, Earthwork 7, Earthwork 9 and Earthwork 12. Burlington was recovered from Mound 4, Earthwork 7 and Earthwork 12. Flint Ridge was recovered from Mound 1, Mound 4, Earthwork 7 and Earthwork 8.

The exotic materials were believed to be directly related to the Early/Middle Woodland use of the site. The modified flake of Wyandotte from Unit 7-1 was a large biface thinning flake and suggested the manufacture of large bifaces or points, such as Snyders. Burlington has only been associated with the Middle Woodland period in this region (Hicks 1992:25). The lamellar blade of Flint Ridge from Unit 7-2 was the most diagnostic lithic artifact recovered during the testing. It was highly probable that another lamellar blade of Flint Ridge was found at Earthwork 6, but unfortunately the artifact was missing.

The ceramics recovered during this project were very similar to the plain sherds recovered previously from Mound 4 and Earthwork 6 (Swartz 1976, Johnson 1995) and ceramics from the regional mounds and earthworks (Vickery 1970, Kolbe 1992a, Johnson 1995, McCord and Cochran 1996:131-147). In Johnson's (1995) reanalysis of the ceramics from the New Castle site and Anderson Mounds, the ceramics were recognized as similar to Adena Plain and McGraw Plain, but not definitive of either. The ceramics recovered from the mounds and earthworks of east central Indiana have never conclusively been assigned a ceramic type other than the New Castle Incised type (Swartz 1976:42-43). It seems apparent that these ceramics are similar to Early and Middle Woodland ceramics recovered from other areas, but represent a regional variation of those types documented in Ohio and Kentucky. This integrates and substantiates the east central Indiana mounds and earthworks as representing a regional variation of the Adena and Hopewell core areas (Cochran 1996:349).

Fire-cracked rock was somewhat ubiquitous throughout the units excavated. However, a few general trends seemed apparent. Based on the units excavated in the enclosure ditches, a higher density of fire-cracked rock was encountered near the bottom of the ditch. The units excavated on the central platform encountered the highest density of fire-cracked rock at the interface of the A and B soil horizons.

The paucity of artifacts and a natural soil profile were a consistent result of the excavations conducted on the central platforms. While artifacts were recovered from the B-horizons, bioturbation and natural soil formation were believed to be responsible for this

phenomena. The recovery of large numbers of artifacts have not been documented from Middle Woodland enclosures in the Ohio River Valley (Prufer 1977, Pacheco 1996:32).

Excavations in the northern enclosures recovered more historic artifacts. As previously noted, this area was more accessible because of the road and more historic disturbance was documented in this area by the shovel probes. Higher phosphate levels were also documented in the areas of historic disturbance.

Construction

The circular enclosures generally had broad, relatively shallow ditches, ranging from approximately 30 to 40 cm below the present ground surface. An estimate of the ditch depth below the original ground surface was roughly 65 to 75 cm deep. The shallow ditch depth contrasts with deeper ditches of 60 to 100 cm deep for the circular enclosures at Anderson Mounds (Cochran 1988:19, Kolbe 1992:21) and the Chrysler Enclosure (McCord 1998:31).

No aboriginal features were documented by the excavations. No aboriginal mound construction was documented on the central platforms of the circular enclosures. No posts or other activity areas were defined. The testing that was conducted was very limited. The lack of features may be a reflection of the small sample size.

Earthwork 13 was documented to be an aboriginal construction.

The radiocarbon dates were disappointing. Very little charcoal was recovered from the excavations. Only three structures had enough charcoal to submit for dating (Table 13). Unfortunately, the results were a Late Archaic, Late Woodland and modern date. The charcoal that was submitted had nothing to do with the construction or use of the enclosures. The sample from the ditch of Earthwork 9 was suspect given its stratigraphic location. The other samples were from the central platforms of Earthworks 6 and 7. Mound 4 remains the only dated structure at the site. Table 13 provides a summary of the radiocarbon dates from earthworks in the region.

Table 13
Radiocarbon Dates

Site	Sample Location	Conventional Age	Calibrated Age* (intercept date)	Sample No.	Reference
New Castle	Unit 6-1	860 +/- 50 BP (AD 1090)	AD 1155 to 1235 (AD 1195)	Beta-127455	
	Unit 7-1	4070 +/- 60 BP (2120 BC)	2845 to 2820 BC 2670 to 2555 BC 2535 to 2490 BC (2585 BC)	Beta-127456	
	Unit 9-2	modern	modern	Beta-127457	
	east side	1910 +/- 140 BP (AD 40)	41 BC to AD 253 (AD 88, 98, 115) AD 303 to 314	M-1851	Swartz 1976
	west side, bottom	1940 +/- 160 BP (AD 10)	102 BC to AD 249 (AD 76)	M-1852	Swartz 1976
	west side, top	1720 +/- 300 BP (AD 230)	2 BC to AD 647 (AD 341)	M-2045	Swartz 1976
Anderson Complex	Great Mound post 3	2110 +/- 140 BP (60 BC)	365 to 265 BC 265 BC to AD 60 (114 BC)	M-2429	Vickery 1969
	Great Mound post 2	1720 +/- 130 BP (AD 230)	AD 146 to 446 (AD 341)	M-2428	Vickery 1969
	Great Mound embankment	2170 +/- 90 BP (160 BC)	369 to 58 BC (193 BC)	Beta-22129	Cochran 1988
	Fiddleback embankment	2090 +/- 90 BP (140 BC)	196 BC to AD 12 (90, 67 BC)	Beta-22130	Cochran 1988
	Fiddleback ditch	2070 +/- 150 BP (120 BC)	353 to 303 BC 208 BC to AD 84 (50 BC)	Beta-27169	Kolbe 1992a
	Fiddleback mound	2070 +/- 70 BP (120 BC)	174 BC to AD 12 (50 BC)	Beta-27170	Kolbe 1992a
	Great Mound post 2	2200 +/- 70 BP (250 BC)	373 to 164 BC (337, 324, 202 BC)	Beta-45955	McCord and Cochran 1996
	Great Mound log tomb	1910 +/- 80 BP (AD 40)	AD 19 to 223 (AD 88, 98, 115)	Beta-52612	McCord and Cochran 1996

Table 13 (cont.)
Radiocarbon Dates

Site	Sample Location	Conventional Age	Calibrated Age* (intercept date)	Sample No.	Reference
	Circle Mound embankment	1955 +/- 75 BP (5 BC)	32 to 16 BC 9 BC to AD 130 (AD 69)	I-11, 848	Buehrig and Hicks 1982
	Circle Mound under s. mound	1880 +/- 60 BP (AD 70)	AD 75 to 231 (AD 130)	Beta-2416	Buehrig and Hicks 1982
	Circle Mound under s. mound	1870 +/- 60 BP (AD 80)	AD 134 to 261 (AD 235)	Beta-2417	Buehrig and Hicks 1982
	Circle Mound embankment	1560 +/- 80 BP (AD 390)	AD 419 to 606 (AD 538)	Beta-24115	Buehrig and Hicks 1982
Chrysler Enclosure	bottom of ditch	1790 +/- 40 BP (AD 160)	AD 220 to 265 (AD 245) AD 290 to 320	Beta-110202	McCord 1998
White	fire area	1910 +/- 140 BP (AD 40)	41 BC to AD 253 (AD 88, 98, 115) AD 303 to 314	M-2017	Swartz 1973
	fire area	1920 +/- 140 BP (AD 30)	45 BC to AD 249 (AD 84)	M-2018	Swartz 1973
	primary mound 2	1860 +/- 200 BP (AD 90)	45 BC to AD 412 (AD 141)	M-2015	Swartz 1973
	primary mound 1	1740 +/- 140 BP (AD 210)	AD 129 to 439 (AD 264, 281, 329)	M-2016	Swartz 1973
	log tomb 1	1400 +/- 130 BP (AD 550)	AD 547 to 728 (AD 654) AD 732 to 772	M-2021	Swartz 1973
	timber	1490 +/- 130 BP (AD 460)	AD 427 to 665 (AD 600)	M-2019	Swartz 1973
	timber	1550 +/- 150 BP (AD 400)	AD 381 to 654 (AD 541)	M-2020	Swartz 1973
Windsor	near bottom	2020 +/- 70 BP (70 BC)	91 to 85 BC 68 BC to AD 72 (2 BC)	Beta-25224	Cochran 1992

Table 13 (cont.)
Radiocarbon Dates

Table 13 (cont.) Radiocarbon Dates					
Site	Sample Location	Conventional Age	Calibrated Age* (intercept date)	Sample No.	Reference
Glidewell	near bottom	1960 +/- 110 BP (10 BC)	50 BC to AD 147 (AD 66) AD 170 to 194	Beta-50830	Kolbe 1992b
* Calibrated by CALIB v. 3.0.3, Stuvier and Pearson 1993					

Reexcavation

The four units that were excavated in previous units helped clarify the previous work and the construction of the Mound 1 and Mound 4. The reexcavation provided detailed profiles that were previously unavailable. The work documented that the construction of both Mound 1 and Mound 4 was far more complex than previously reported. The work also provided the impetus to critically review the previous interpretations of the site.

CONCLUSIONS AND RECOMMENDATIONS

This project was undertaken to address several goals including an assessment of disturbance, documentation of associated activity areas, acquisition of an excavated sample from each earthwork, recovery of additional radiocarbon dates, and increasing our understanding of the structure and organization of the site. This project contributed to all of these goals although all were not realized to the extent anticipated.

Historic disturbance to the site area was more clearly delimited. Disturbance outside of the enclosures was extensive and included major borrowing around and on the earthworks as well as construction related to the hospital complex. Remarkably, the enclosures were the overall best preserved portions of the site area.

A few prehistoric artifacts were recovered outside of the earthworks, but no activity areas directly associated with the enclosures were defined. These artifacts along with phosphate analysis demonstrated prehistoric use of the site area, both before and after construction of the earthwork complex. Given the extensive historic disturbance, any associated activity areas may have been destroyed long ago.

All of the visible earthworks at the site were tested. The circular enclosures were found to have broad, shallow ditches with no artificial mounds on the central platform. Earthwork 13 was documented to be an aboriginal construction and was found to be the only extant structure of its type within the region. A consistent artifact assemblage was recovered from the enclosures. The lithic materials were manufactured from local and exotic cherts. Exotic cherts consisting solely of Burlington, Flint Ridge and Wyandotte. The ceramic assemblage appeared to be a regional variation of documented Early and Middle Woodland types from Ohio and Kentucky. We were not able to date the construction or use of the enclosures through radiocarbon samples, but the radiocarbon dates that were obtained reinforced the data indicating multicomponent use of the site area.

Overall, this project is a very modest investigation, but the results are illuminating. The project stimulated an indepth review of the previous excavations which in turn demonstrates that the site is far more complex than previously characterized. This new appreciation of the complexity of the site adds to the range of research questions that can be asked of the site data. Essentially, this project has been a catalyst for a greater understanding of the New Castle site within its regional context. But, many new questions are raised. Only Mound 4 has been radiocarbon dated and it is not yet possible to model the sequence of earthwork construction at the site. Additional radiocarbon dates are, therefore, needed from the other enclosures. Also, all but three of the reported earthworks at the site have now been substantiated. Since it seems likely that the ditches of the enclosures are only filled in, a subsurface reconnaissance is recommended at the reported locations of Earthworks 5, 10 and 11. In addition, the reexcavation of three small units has demonstrated the wealth of data that remains in the undisturbed profiles in Mounds 1 and 4. It is recommended that larger areas of these profiles be recorded to further document the

construction of the mounds. Finally, this project shows that archived information from the site contains valuable data. It is, therefore, recommended that a complete and thorough review of these materials be undertaken.

One additional recommendation is also warranted. The northern enclosures are currently covered in secondary growth of briars, weeds, brush and small trees. The vegetation is now at a manageable stage so that it can be mowed to clear the site. If the vegetation is allowed to grow unchecked it will adversely affect the integrity of the structures. Annual mowing of the northern enclosures is strongly recommended. In addition, Earthwork 9 is being buried under dead trees. These should be cleared.

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APPENDIX A

Environmental and Ceremonial Setting

by
Donald R. Cochran

Appendix A
Environmental and Ceremonial Setting of the New Castle Site

It is generally agreed that the New Castle site represents a ceremonial complex (e.g. Swartz 1976, Cochran 1992, McCord 1998). While there is no doubt that the natural resources surrounding a habitation site figure prominently in the choice of that site location (e.g. Jochim 1976), I wanted to investigate whether there are definable features of the environment that affected the choice of the location of the New Castle site (Romain 1993). To that end, a review of the site setting and the surrounding natural features was undertaken. In addition, since the New Castle site is one component in the ceremonial landscape of east central Indiana (Cochran 1992), the investigation was conducted in reference to the settings of the other earthworks in the region (McCord & Cochran 1996). In the analysis that follows, natural features around sites are identified from USGS 7.5' topographic maps. Environmental zones are identified from the 1 degree X 2 degree Muncie and Cincinnati geologic maps (Burger et al. 1971, Gray et al. 1971)

Location

The New Castle site is situated on a prominent ridge with the Blue River sluiceway to the north, west and southwest (Figure 1). The till plain upland is to the east of the site. Immediately north of the site and forming the northern boundary of the ridge spur, the Little Blue River Valley enters the Blue River sluiceway. The southern boundary of the site is defined by an intermittent drainage that flows from east to west. In general, the mounds and enclosures in the site are organized along the edges of the northern and southern boundaries of the ridge spur (Figure 2).

The vegetation at the New Castle site is recorded as the beech-maple association (Petty & Jackson 1996: 280) although the west-facing slope of the Blue River Sluiceway may have favored locally developed oak-history forests (Petty & Jackson 1966:286). Sugar maple, beech, yellow-poplar, white oak, red oak and ash are specific tree types associated with locations like that of the New Castle site (Hillis and Neeley 1987:74). Although woody vegetation covered the valley slope immediately west of the site and the Pleistocene terrace along the edge of the valley, the valley floor is recorded as "prairie" in the GLO notes (Hillis 1820).

Some particular natural features that are associated with the choices of locations for ceremonial sites include intersecting environmental zones, river confluences, river terraces and special soils, and special rock outcroppings (Romaine 1993). Relationships with aboriginal trails have also been proposed as factors in the siting of ceremonial sites (e.g., Goad 1979:244). In addition to these particular features, I compared the locations of the East Central Indiana sites with associated springs. All of these areas are explored in the following discussion.

Intersecting Environmental Zones

The New Castle and the other earthwork complexes in east central Indiana are all within

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Figure 1. A portion of the USGS 7.5' New Castle East Quadrangle showing the location of the New Castle Site.

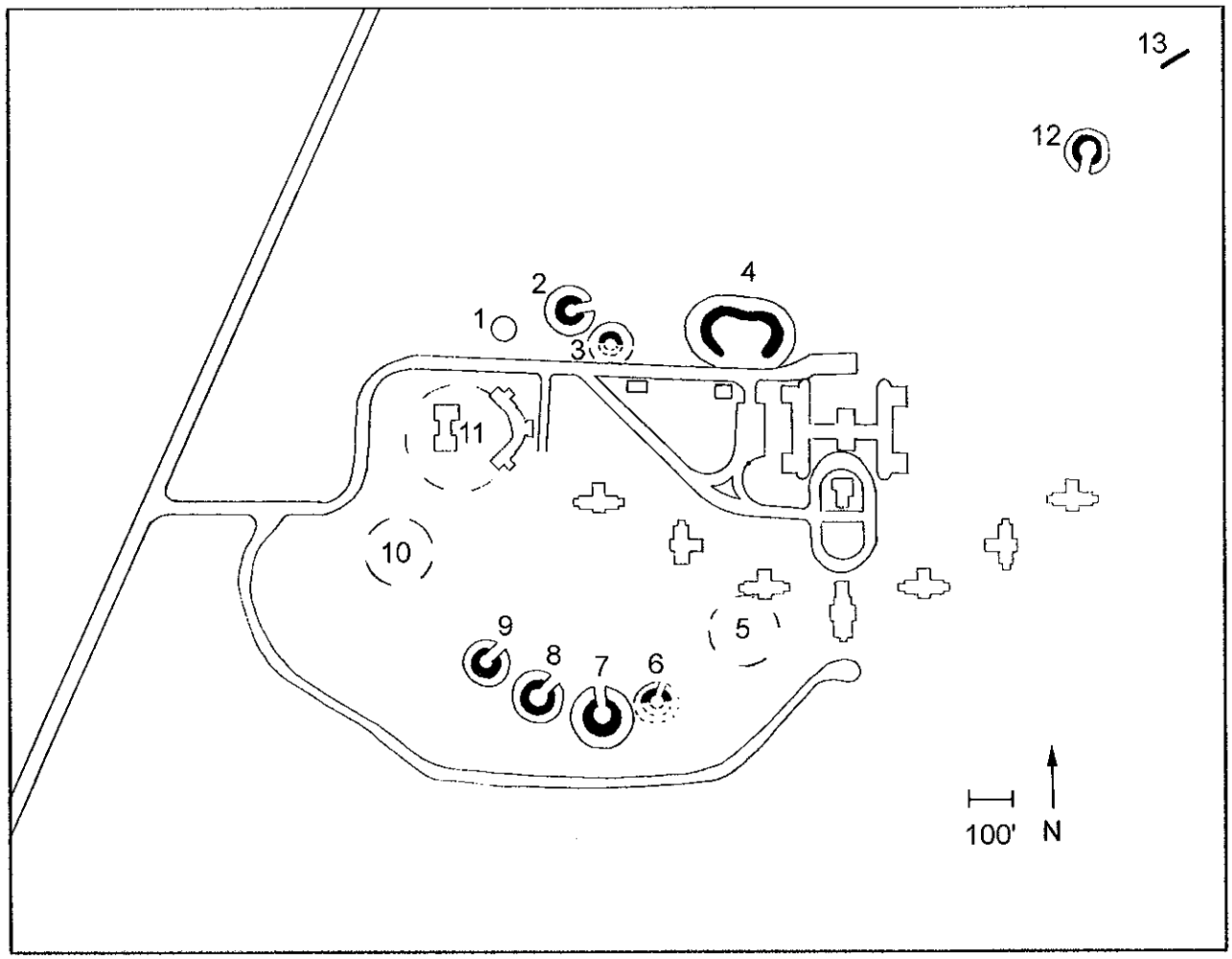

Figure 2. Map of the New Castle site (after McCord 1998).

the Tipton Till Plain physiographic region, an area well known as an almost featureless glacial plain (Schneider 1966:49-50). As a group, the east Central Indiana ceremonial complexes are not situated at the margins of the till plain zone and no individual complex is at the edge of the till plain zone. While a number of environmental zones exist within the till plain region of central Indiana (e.g. Buehrig and Cochran 1985), none of the earthwork complexes are at apparent boundaries between them.

Although no correlation between natural boundaries and the locations of earthwork complex sites was found, a cultural boundary was suggested. All of the earthwork complex sites are within the Upper White and Whitewater drainage basins, but none are situated in the adjacent Upper Wabash drainage. In fact, the distribution of earthworks of all types are clearly restricted to the White and Whitewater drainages with a virtual absence in the adjacent upper Wabash drainage (Cochran 1992:26, Figure 1).

Thus, there was no apparent association between the individual earthwork complex sites nor the regional grouping of sites with environmental boundaries. Therefore, the locations of earthwork complex sites in east central Indiana were not at boundaries.

River Confluences

Romain (1993) suggests that river confluences are similar to intersecting environmental zones in that they represent places of transition. In east central Indiana, only the New Castle site is situated at a river confluence, and even that confluence is more appropriately characterized as an intersection of a small stream with the Blue River Valley. At the New Castle site, the Big Blue River did not have a well defined channel as it flowed through a large marsh/prairie (Hillis 1820). Although small streams enter the adjacent rivers in the vicintiy of the other east central Indiana earthwork complexes, none are of sufficient size to actually change the character of the river. Again, this characteristic of the locations of ceremonial sites in Ohio is not supported in the east central Indiana site locations.

River Terraces and Special Soils

According to Romain (1993:37), most of the Middle Woodland ceremonial sites in Ohio are situated on river terraces with most of them located on Fox soils. Again, these features of site location are not supported in east central Indiana. Two of the earthwork complexes, New Castle and Anderson, are situated at the edge of the upland intersection with the river valley. The Bertsch site and the Graves earthwork are situated on Pleistocene terraces while the Fudge site is on an end moraine. There is no consistent pattern of soil selection represented in the east central Indiana enclosures.

Rock Outcrops

No bedrock is exposed at the New Castle site nor at any of the other enclosure complex

sites in the region. Bedrock exposures are present in the Upper White and White Water drainages (Cumings and Shrock 1928) but the Parkinson Stone Mound (12-DI-12) is the only earthwork near one of these exposures. Thus, the locations of the enclosure complex sites in east central Indiana were apparently not chosen in reference to bedrock outcrops.

Trails

Guernsey (1932) shows several trails in the upper reaches of the White and Whitewater Rivers (Figure 3). One follows the north side of the White River from Strawtown to about the mouth of Prairie Creek in Delaware County where the trail crosses to the south bank and proceeds to Greenville, Ohio. In addition, a branch of the Whitewater trail cuts cross country and appears to pass near the New Castle site on its way to Anderson. However, these appear to be the only trails that pass near earthwork complexes. No trail is recorded near the Bertsch site nor the Graves enclosure. However, the trails recorded by Guernsey predominantly link Delaware villages in the early 1800's and may not accurately reflect trail systems almost 2,000 years earlier. But, the earthwork complexes in east central Indiana were regularly situated near trails.

Springs

Burkett and Hicks (1986:12) note that several springs are reported from the vicinity of the New Castle site. A large spring was situated near the circular enclosure complex at Anderson Mounds (Cox 1879:132) and Squire and Davis (1848) show a spring surrounded by a circular enclosure near Fudge Mound. Springs are not reported near the Bertsch (MacPherson 1878) or Graves (Setzler 1930) sites. While the presence of springs near enclosure complexes may reflect associations made by the builders of the sites, it is important to note that springs were formerly much more common along the margins of the valleys in the region (e.g., Netterville 1925, Cox 1879). Historic lowering of the water table through artificial drainage has reduced the number of springs that are currently active. Therefore, any contemporary associations between springs and enclosures may be assume more meaning than they had 2,000 years ago when springs were more plentiful.

Summary of Natural Features

An evaluation of the associations between a variety of features of the natural landscape and the locations of aboriginal trails with the locations of the earthwork complexes in east central Indiana suggests that the identified features were either not of primary importance or they played different roles at different sites, ie., there was no consistent pattern. For instance, although springs have been recorded near three of the five complexes, there is no indication that the springs were integral to the choice of the site locations. The same can be said for rock outcrops and trails. While other natural features may have played roles in selecting the site locations, they were not identified during this review. One possibility not investigated here is that the location for each enclosure complex site was chosen in relation to a specific natural feature rather than a pervasive pattern of associations for all five of the complex sites. This could account for the lack of

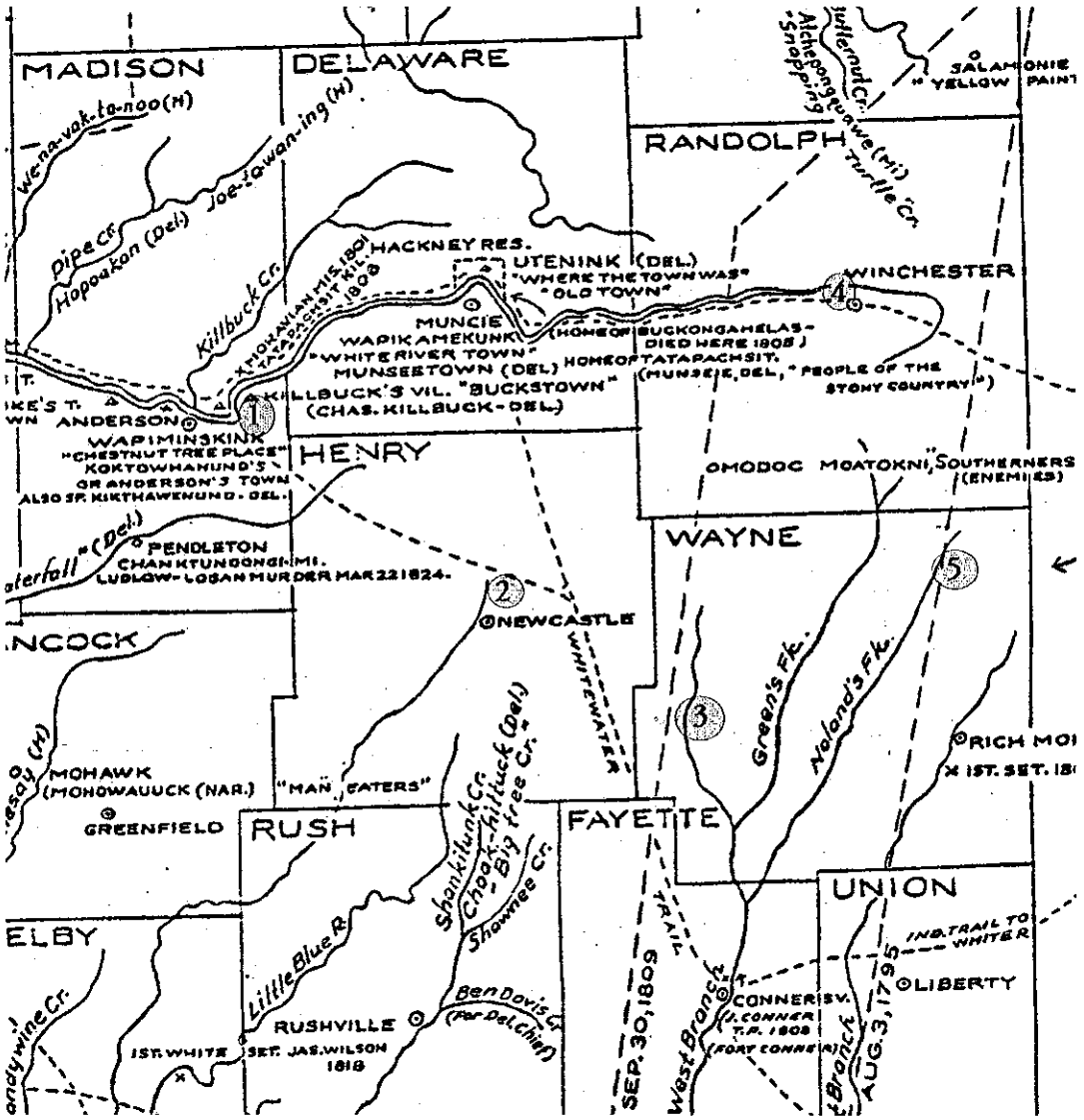

Figure 3. Guernsey's (1932) map showing trails in east central Indiana. Enclosure complex sites identified as follows: 1 - Anderson, 2 - New Castle, 3 - Bertsch, 4 - Fudge and 5 - Graves.

apparent patterning in the associations of sites and natural features.

Since the investigations of the associations between the earthwork complexes and some of the natural features of the landscape did not reveal definable patterns, I wanted to investigate the comparable features of the locations of the earthwork complex sites in relation to each other within the ceremonial landscape in which they occur. This investigation is presented in the following discussion.

Ceremonial Landscape

Astronomical alignments in and between the mounds and enclosures in the region are both inter site and intra site (Cochran 1992, Kolbe 1992, Cochran 1996, Waldron 1997, McCord 1998). Aligning sites across the regional landscape would obviously limit the choices for site locations and could affect perceptions of the choices for particular local features around a site. Site choices in such a system would be limited to particular places although we do not know the range of flexibility for alignment choices, i.e., were alignments fixed to certain astronomical events or were there choices for alignments. Currently, the only alignments documented between the enclosure complexes are lunar alignments from New Castle to Bertsch and Bertsch to Anderson (Waldron 1996:D-3, D-4). However, each earthwork complex is aligned to several other sites (Waldron 1996).

The fact that all three of the circular earthwork complexes in the region are located on the east side of the river valley certainly suggests that views to the sunset are important to the placement of these sites. This argument is strengthened by the fact that the generally flat terrain of east central Indiana was covered by a mature deciduous forest throughout the Woodland Period and the only places where sunrise or sunset could be clearly viewed for any distance was across a river valley. The documentation of solar alignments at the enclosure complexes suggested that we should investigate their presence at the New Castle site.

One unique natural feature identified near the New Castle site was the prairie that occupied the valley floor to the west of the site. Since the valley floor of the Blue River sluiceway was a prairie, sunset throughout the year would be visible across the valley from the New Castle site (Figure 4). The Blue River Sluiceway bends to the southwest below the mouth of the Little Blue River Valley and this change in direction permits a two mile-long view from the New Castle site down the sluiceway valley. Interestingly, the winter solstice sunset would be visible along this sight line (Figure 4).

Although alignments to the winter and summer solstice sunsets are documented between enclosures at Anderson Mounds (Cochran 1992, 1996), no long view is definable there or at the other earthwork complex sites. However, a similar long view is evident at Mound Camp in Franklin County (Figure 5). From Mound Camp an alignment to sunset at summer solstice is evident up the Whitewater River Valley (Figure 5). Although Mound Camp is not an enclosure complex and it is outside the east central Indiana ceremonial landscape, it is very similar to the

Site Locations Conventional
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Figure 4. Portions of the USGS 7.5" New Castle East and West Quadrangles showing Solstice Alignments from the New Castle Site.

Site Locations Conventional
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Figure 5. Solstice alignments from Mound Camp showing the long view up the Whitewater River Valley at Summer Solstice.

enclosure complexes by having burials placed on a burned clay platform that was covered with ash and as one of three sites containing ceramics with a nested diamond design (Setzler 1930).

Summary and Conclusions

The choice of the location for the New Castle site appears related to a variety of factors as should be expected. In this investigation, three elements of the natural environment, springs, rock outcrops and trails, were compared with the locations of the earthwork complex sites in east central Indiana. None of the three elements were consistently associated with each of the regional earthwork complexes. In addition, astronomical alignments associated with the earthwork complex sites were explored in relation to site locations. At New Castle and Mound Camp, long views to winter and summer solstice sunsets were found that took advantage of bends in the river valleys to provide unusually long views across the landscape. However, this situation was not repeated at other sites. In essence, this investigation revealed that there were no consistent, definable patterns between the earthwork complex sites and relationships between the natural landscape nor the ceremonial landscape. While interesting circumstances were found, patterns of site locational preferences were not defined. It is possible that sites were chosen in relation to individual or unique features rather than to patterned associations. At a minimum, this investigation revealed that the decision making process involved in the selection of locations for ceremonial sites was more complex than anticipated.

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APPENDIX B
Redding's (1892) Description of the New Castle Site

Appendix B
Excerpt pertaining to the New Castle site (Redding 1892:99-103).

On the north-east quarter of this same section [N.E quarter of S.W. quarter Sec. 2, T. 17, R. 10], mostly on the southwest quarter of the quarter and less than half a mile to the northeast from the above named enclosure, is the largest group of enclosures and mounds found in the county [12-Hn-1]. They are situated on the eastern part of the farm of John C. Huddleson, and cover an area of ten to twenty acres. There are in the group nine well defined enclosures, and one or two apparent enclosures which have been so completely obliterated by the plow that I cannot be certain about them. I have visited and measured all of these. The largest is situated farthest east, near the line and very near the N. E. corner of the quarter. It is 650 feet in circumference and is an ellipse, longest east and west. Its east and west diameter is 215 feet. The north and south is about 150 feet. Within this enclosure is a large mound [Mound 4], longest east and west and having much the appearance of two mounds joined to each other, the western mound being the highest. The length of the mound, east and west, is 140 feet and it is about 100 feet wide, north and south. The height of the mounds above the general original surface is about ten feet; above the bottom of the ditches [is] about fifteen feet. The ditch varies in depth but is probably six feet in [the] deepest place, and shallows off into three feet at places. It is mostly in the original forest, but has its south embankment in a cultivated field. On each side of the eastern part of the mound there are slight elevations, whether natural or artificial I cannot tell. They give the mound an appearance of an attempt to imitate a cross. I have a map of this whole group, and an elevation showing [the] shape of the large mound. This mound has been dug into in four or five places at different times.

In the fall of 1890 myself and several others made an exploration of parts of this mound. We dug a trench six to eight feet deep from the east side to the center, and one from north to south through the western end of the mound. We found two places in the last, one within eight or ten feet of each end, where the clay had been burned hard, and yet there were no ashes. Between these two places about thirty feet apart we found deposits of ashes but no burnt clay, indicating that the ashes had been removed from the places of fire and thrown in heaps at a distance of a few feet. These places of burnt earth were about two by three feet in size and burned to a depth of ten or more inches. One of them had the appearance of having been raised above the surrounding earth seven or more inches. It was longest east and west and had somewhat the appearance of the figure 8. Near the center of the mound in the trench dug from the eastern side we found, at a depth of nearly nine feet, a large bed of ashes some six by seven feet in diameter. The bed was slightly hollowed out and the ashes at [the] deepest place, near the center, were not less than four to five inches in depth. Among these ashes we found much charcoal and many fragments of bones, some of which I have with me. I am not able to say from what animal they are. A little to the northwest of this bed of ashes was another bed of ashes and burnt clay which had been explored at some time by other parties, but I cannot give results. The large bed found by us was

burned hard, of a dull red color, [and] to a depth of about eight inches.

At the time of making the exploration of the large mound we discovered another small mound [Earthwork 12] about sixty rods [900 - 1000 feet] to the northeast of the large one, 100 feet in diameter and about six feet high, situated upon a point of a hill overlooking Blue river valley, and in front of which was formerly a marsh of several acres. The ditch and enclosure around the mound are very distinct, it having only recently been cleared of timber. The ditch at places is three feet deep and the embankment averages about two and a half feet in height.

To the east of this a few rods, just across a deep ravine on the north edge of a hill, is an embankment of about six feet in height and nearly two hundred feet long [Earthwork 13]. To the south of the ditch behind the embankment, which is not less than forty to fifty feet wide, the hill rises about twenty feet. The excavation behind [the] embankment is longest east and west. It is wholly unlike anything else found in the county, and no one is able to give any account of its origin.

Ten rods west of this large mound and enclosure is another enclosure, partly in the woods but mostly in the cultivated field [Earthwork 3]. The ditch is well preserved in that part in the woods, but is almost wholly obliterated in that part within the field. As near as I could determine this enclosure was about one hundred and fifty feet in diameter. The ditch on the north side is now about two to two and one-half feet in depth. I am inclined to the opinion that there was also a mound probably two or three feet high within its enclosure, but if so it is nearly leveled. One hundred feet to the northwest of the last is another enclosure [Earthwork 2], all in the woods, ninety-four feet in diameter and with shallow inside ditches at present one to three feet deep, and having a gateway on [the] east, opening toward the large mound already described. Near the gateway, on the south, is the appearance of a small mound about twelve feet in diameter and twelve to eighteen inches high. It has been dug into recently and seems to be a mass of gravel. I am in doubt whether it is natural or artificial. One hundred feet from the last is an artificial mound [Mound 1] forty feet in diameter and about six feet high. The south edge is in the cultivated field but the main body of the mound is in the woods. It has been recently dug into by Joshua Holland, of North Carolina, and Mr. Reynolds, of the Smithsonian Institute, but work was not completed and nothing of importance was found. This is the only clearly identified mound in the whole group not within a circular enclosure. About one hundred and fifty feet south of this little mound, within the cultivated field, are the remains of a large circular enclosure [Earthwork 11] with a gateway facing the east and the large enclosure already described. It is two hundred and fifty feet in diameter and the ditches are from three to five feet or more in depth, notwithstanding years of cultivation under the plow. There is the appearance of a mound in the western part of this enclosure, about forty feet in diameter and about two feet high.

One hundred feet south of the above is another enclosure one hundred and fifty feet in diameter, with ditches two or three feet in depth [Earthwork 10]. It has also an opening to the east, but not so well marked as the others. This enclosure is almost immediately east of the house on said tract and just east of the old orchard. A long period of cultivation has doubtless much

lowered its walls. There is a slight indication of a mound near by [Possible Mound], but if it is one the plow has so completely obscured the evidence that it is not safe to call it one. About two hundred and fifty feet to the southeast, in the edge of the grove, is another enclosure [Earthwork 9] one hundred feet in diameter, with [a] ditch on [the] inside two to two and one-half feet in depth. It has also a gate or opening on the east facing the large enclosed mound. Sixty feet to the southeast of the above is another enclosure [Earthwork 8] ninety feet in diameter, with [an] inside ditch eighteen to twenty-four inches in depth, and having an opening to the northeast facing the large enclosure and mound. There is also a small mound in the center of this enclosure.

Going another hundred feet to the southeast we find another enclosure one hundred and twenty feet in diameter, with a mound in the center from three to five feet high [Earthwork 7]. The ditch is from two to three feet deep. There is an opening on the northeast facing the large enclosure and mound. East, slightly north of the above and adjoining it is another enclosure one hundred feet in diameter [Earthwork 6]. The ditch is shallow, not more than eighteen to twenty-four inches in depth. The embankment on the west and adjoining the preceding seems to be common to both enclosures. The space between the ditches of the two is about twenty to twenty-five feet. To the northeast is a low, wet place. The opening is not very clearly marked in this last enclosure but it seems to be to the east. North of this last, about three hundred feet in the cultivated field, are very strong evidences of another enclosure [Earthwork 5], but it has been so disfigured by the plow and long cultivation that I do not feel safe in saying positively that it is an artificial enclosure, but it is very suggestive of one, and is about one hundred and sixty feet in diameter.

Reference Cited

Redding, Thomas B.
1892 Prehistoric Earthworks of Henry County, Indiana. Proceedings of the Indiana Academy of Science, 2:98-106. Indianapolis.

APPENDIX C

Reanalysis of the New Castle Materials, 1965-1971
(after Kolbe 1990 and Johnson 1995)

APPENDIX C
Material Recovered from Mound 1

Catalog #	Original	Reanalysis	Material	XU	Association	No.
08F-04-01	mica sheet	same		*S1W1		1
08F-04-02	potsherd	body sherd, plain		*S1W1		1
08F-04-03	chert flakes	unmodified flakes	Wyandotte	*S1W1		2
08F-04-09	bones	discarded		*S1W1		2

APPENDIX C
Material Recovered from Mound 4

Catalog #	Original	Reanalysis	Material	XU	Association	No.
08-F-01-07	not on catalogue, # assigned to Hn2	shoulder sherd, incised				1
08-F-01-61	potsherds	body sherd, plain		N1E5		6
08-F-01-62	bone fragments	animal bone		N1E5		45
08-F-01-63	bone fragments	animal bone - burned		S1E5		212
08-F-01-64	chert	missing		S1E5		12
08-F-01-65	problematic	bone - burned, fcr, charcoal, 3 flakes, 1 rim	flakes not identified	S1E5		9
08-F-01-66	bone fragments	bone - some burned, burned clay, 1 core	core not identified	N1E4		
08-F-01-67	problematic	rock		N1E5		
08-F-01-68	problematic	fcr, rock, shell		N1E5		
08-F-01-69	charcoal, bone	animal bone		N1E5		
08-F-01-70	white fibrous material	same		N1E5		
08-F-01-71	bone	animal bone		N1E5		
08-F-01-72	historic objects, fossils	same		N1E5		
08-F-01-73	burned bone	bone - burned, 1 flake, 1 rock	flake not identified	N1E5		
08-F-01-74	chert and shell	missing		N1E5		
08-F-01-75	burned bone	bone - burned, 2 unmodified flake, 1 block	flakes not identified	N1E5		
08F-02-01	burial 1A skeleton and skull	same		N1W8	B1a	140+
08F-02-02	round beads, some charred	same		N1W8	B1a	30
08F-02-03	pipe, half-platform	same		N1W8	B1a	1
08F-02-04	small charred pointed teeth	missing		N1W8	B1a	7
08F-03-01	bear canine, copper sheathed	same		S2E6	B12c	1
08F-03-02	bear canine, copper sheathed	same		S2E6	B12c	1
08F-03-03	Lynx mandible, drilled	same		S2E6	B12c	1
08F-03-04	Lynx mandible	same		S2E5	B12c	1
08F-03-05	human bone	same		S2E5	B12c/F17	33
08F-03-06	human bone	same		S2E5	B12c/F17	12
08F-03-07	potsherd	rim sherd, plain		S2E6	B12c	1
08F-03-08	shell	same		S2E5	F17	2
08F-03-09	potsherds	body sherd, plain - hopewell vessel		S2E5		2
08F-03-10	bone	same		S2E5	B12	1
08F-03-11	bone	same		S2E5		
08F-04-04	mica	same		N1W6	B2	5
08F-04-05	potsherd	body sherd, plain		N1W7		2
08F-04-06	chert flake	missing		N1W7		2
08F-04-07	ochre, yellow	missing		N1W7		1
08F-04-08	problematic	discarded		N1W7		1
08F-04-10	burial 1B	same		N1W8	B1b	
08F-04-11	shell	missing		N1W8	B1b	1
08F-05-01	point, chert	Brewerton	HT Laurel	S5E1		1
08F-05-02	mano	natural		S3W1		1
08F-05-03	mica	same		S3W1		1
08F-05-04	bone, fragmented	discarded		S3W1		
08F-05-05	scraper	1 other chipped stone and 1 natural		S3W1		2
08F-05-06	bone, long	discarded		S1W1		1
08F-05-07	bone, curved	missing		S1W1		1
08F-05-08	bone, long	missing		S1W1		1
08F-05-09	shell, snail	missing		S1W1		1
08F-05-10	blade, utilized	missing		S1E1		1
08F-05-11	tooth, incisor	discarded		N1W7		1
08F-05-12	shell, mussel	same		N1W6		1
08F-05-13	shell, snail	discarded		N1W6		
08F-05-14	bone, awl	same		N1W8	B2	1
08F-05-15	chert drill, white, broken	natural		N1W8	B2	1
08F-05-16	bundle burial 1	same		N1W8	B2-gravel	
08F-05-17	bone awl	same		N1W8	B1c-e	1
08F-05-18	bone awl	same		N1W8	B1c-e	1
08F-05-19	bone awl	same		N1W8	B1c-e	1
08F-05-20	bone awl	same		N1W8	B1c-e	1
08F-05-21	bone awl	same		N1W8	B1c-e	1
08F-05-22	bone awl	same		N1W8	B1c-e	1
08F-05-23	bone awl	same		N1W8	B1c-e	1
08F-05-24	bone awl	same		N1W8	B1c-e	1
08F-05-25	bone awl	same		N1W8	B1c-e	1
08F-05-26	bone awl	same		N1W8	B1c-e	1
08F-05-27	bone awl	same		N1W8	B1c-e	1
08F-05-28	bone awl	same		N1W8	B1c-e	1
08F-05-29	bone awl	same		N1W8	B1c-e	1
08F-05-30	bone awl	same		N1W8	B1c-e	1
08F-05-31	bone awl	same		N1W8	B1c-e	1

APPENDIX C
Material Recovered from Mound 4

Catalog #	Original	Reanalysis	Material	XU	Association	No.
08F-05-32	bone awl	same		N1W8	B1c-e	1
08F-05-33	bone awl	same		N1W8	B1c-e	1
08F-05-34	bone awl	same		N1W8	B1c-e	1
08F-05-35	bone awl	same		N1W8	B1c-e	1
08F-05-36	bone awl	same		N1W8	B1c-e	1
08F-05-37	bone awl	same		N1W8	B1c-e	1
08F-05-38	bone awl	missing		N1W8	B1c-e	1
08F-07-05	shells, conical and clam-like	discarded		N1W8		
08F-07-06	potsherds	body sherds, plain		N1W8		3
08F-07-07	incised potsherd	missing		N1W8		1
08F-07-08	potsherd	body sherd, plain		N1W8		1
08F-07-09	conch shell	same		N1W6	B2	1
08F-07-10	burial 2	same		N1W6 -W	B2	228
08F-08-01	burned bone	missing		N1W6		1
08F-08-02	potsherd	shoulder sherd, plain		N1W6		1
08F-08-03	right femur	same		N1W9	B7	1
08F-08-04	left femur	same		N1W9	B7	1
08F-08-05	right pelvic bone (broken)	same		N1W9	B7	1
08F-08-06	burned and unburned bone	same		N1W9	B7	45
08F-09-01	window glass fragment	discarded		N1W8		1
08F-09-02	32 shell case	same		N1W8		1
08F-09-03	rat-tail file fragment	same		N1W8		1
08F-09-04	piece of steel gromet	discarded		N1W8		1
08F-09-05	coal, small piece	discarded		N1W8		1
08F-09-06	coal, ash, clinker	discarded		N1W8		1
08F-09-07	window glass fragment	same		N1W8		1
08F-09-08	coal, ash, clinker	discarded		N1W8		1
08F-09-09	coal, small piece	same		N1W8		1
08F-09-10	ocher, yellow	discarded		N1W8		1
08F-09-11	charcoal remains	missing		N1W7	B1	
08F-09-12	c14 sample, charcoal	discarded		N1W9	ash pit	
08F-09-13	beads, freshwater pearl	same, but shell & pearl		N1W10	B6	104
08F-09-14	beads, freshwater pearl	same		N1W10	B6	110
08F-09-15	beads, shell	same		N1W10	B6	666
08F-09-16	beads, shell	missing		N1W10	B6	51
08F-09-17	beads, shell	same		N1W10	B6	69
08F-09-18	beads, shell & pearl	same		N1W10	B6	43
08F-09-19	beads, shell	same, but shell & pearl		N1W10	B6	145
08F-09-20	beads, shell, fragments	same		N1W10	B6	198
08F-09-21	jawbone of small carnivore	same		N1W9		3
08F-09-22	pot, complete, warped	same		N1W8	B1b	1
08F-11-01	burial 1, bundle burial 2	same		N1W9	B1f-g	
08F-11-02	infant burial	missing		N1W10	B6	
08F-11-03	soil sample A: ashy layer	same				1
08F-11-04	soil sample B: topsoil	same				1
08F-11-05	soil sample C: clay loam	same				1
08F-11-06	soil sample D: charcoal-ash-oc	same				1
08F-11-07	soil sample E: charcoal-ocher	same				1
08F-11-08	soil sample F: red soil	same				1
08F-11-09	soil sample G: charcoal-ash-oc	same				1
08F-11-21	pollen sample	missing		N2W8		1
08F-11-22	pollen sample	missing		N1W7	Redding?	1
08F-11-23	pollen sample	missing		N1W7	Redding?	1
08F-11-24	pollen sample	missing		S1E5		1
08F-11-25	pollen sample	missing		S1E5		1
08F-11-26	pollen sample	missing		S1E5		1
08F-11-27	pollen sample	missing		S1E5		1
08F-11-28	pollen sample	missing		S1E5		1
08F-11-29	pollen sample	missing		S1E5		1
08F-11-30	pollen sample	missing		S1E5		1
08F-11-31	pollen sample	missing		S1E5		1
08F-11-32	pollen sample	missing		S1E5		1
08F-11-33	pollen sample	missing		S1E5		1
08F-11-34	pollen sample	missing		S1E5		1
08F-11-35	pollen sample	missing		S1E5		1
08F-11-36	pollen sample	missing		S1E5		1
08F-11-37	pollen sample	missing		S1E5		1
08F-11-38	pollen sample	missing		S2E5		1
08F-11-39	pollen sample	missing		S2E5		1

APPENDIX C
Material Recovered from Mound 4

Catalog #	Original	Reanalysis	Material	XU	Association	No.
08F-11-40	pollen sample	missing		S2E5		1
08F-11-41	pollen sample	missing		S2E5		1
08F-11-42	pollen sample	missing		S2E5		1
08F-11-43	pollen sample	missing		S2E5		1
08F-11-44	pollen sample	missing		S2E5		1
08F-11-45	pollen sample	missing		S2E5		1
08F-11-46	pollen sample	missing				1
08F-11-47	pollen sample	missing				1
08F-11-48	pollen sample	missing				1
08F-11-49	pollen sample	missing		N1W10		1
08F-11-50	pollen sample	missing		N1W10		1
08F-11-51	pollen sample	missing		N1W10		1
08F-11-52	pollen sample	missing		N1W10		1
08F-11-53	pollen sample	missing		N1W10		1
08F-11-54	pollen sample	missing		N1W10		1
08F-11-55	pollen sample	missing		N1W10		1
08F-11-56	pollen sample	missing		N1W10		1
08F-11-57	pollen sample	missing		N1W10		1
08F-11-58	pollen sample	missing		N1W10		1
08F-11-59	pollen sample	missing		N1W10		1
08F-11-60	pollen sample	missing		N1W10		1
08F-11-61	pollen sample	missing		N1W10		1
08F-11-62	pollen sample	missing		N1W10		1
08F-11-63	pollen sample	missing		N1W10		1
08F-11-64	pollen sample	missing		N1W10		1
08F-11-65	flint chip	missing		S3E1		
08F-11-66	problematic	shell		N1W8		
08F-11-67	shell, bone	discarded		N1W8		
08F-11-68	chert, bone, potsherd	chert - see attachment, other missing		N1W8		
08F-11-69	chert	missing		N2W8		
08F-11-70	ash and glass	biface fragment	HD unknown	N1W6		
08F-11-71	burned pieces of skull	same		N1W9	B7	
08F-11-72	ocher, bone, chert sample	chert - see attachment, other missing		N1W6		
08F-11-73	charcoal and shell	missing		N1W6		
08F-1-74	burned bone, problematic objec	missing		N1W6		
08F-11-75	burned bone	same		N1W8	B1	
08F-11-76	burned bone under skull A	missing		N1W8	B1a	
08F-11-77	burned bone on burial	missing		N1W8	B1	
08F-11-78	rock in burial L	missing		N1W8	B1	
08F-11-79	bone & problematic object	bone and body sherd, plain		N1W8	B1	
08F-12-01	problematic object	discarded		N1W8		1
08F-12-02	tile particles	discarded		N1W8		1
08F-12-03	rodent bones	same		N1W8		17
08F-12-20	shell, Busycons	same		N2W8		1
08F-12-21	shell, Strombus	same		N1W8	B1b	1
08F-12-22	fresh water clam shell	same		N1W8	B1	1
08F-12-23	polished stone	missing		N1W8	B1	1
08F-12-24	broken projectile point	point fragment	Flint Ridge	N1W8	B1	1
08F-12-25	antler rubbing (flaking) tool	antler, modified		N1W8	B1b	1
08F-12-26	flint ridge material, knife?	unmodified flake	HT Flint Ridge	N1W8	B1b	1
08F-12-27	fllint flake	missing		N1W8	B1b	1
08F-12-28	bone awl	same		N1W8	B1b	1
08F-12-29	stone scraper?	discarded		N1W8		1
08F-12-30	animal jaw	same		N1W9	ash pit	1
08F-12-31	fragments of bone and shell	discarded		N1W9	ash pit	1
08F-12-32	bone awl	same		N1W8	B1b	1
08F-12-33	bone awl	same		N1W8	B1b	1
08F-12-34	chunk of worked clay	daub		N1W10	ash pit	1
08F-12-35	coil of clay	same and natural chert		N1W10	ash pit	1
08F-12-36	stone, found in scapula	missing		N1W10	B6	
08F-12-37	sherds	missing or uncatalogued		N1W9	ash pit	
08F-13-01	radiocarbon sample	missing		N2W9		
08F-13-02	radiocarbon sample	missing		N1W7		
08F-13-03	radiocarbon sample	submitted for dating		S1E5		
10F-01-01	chert, charcoal, ash	discarded		N1W12		
10F-01-02	potsherds	missing or uncatalogued		N1W12		3
10F-01-03	vertebrae & deer tarsal	missing		N1W12		2
10F-01-04	fresh water shell	shell		N1W12		2
10F-01-05	potsherds	same		N1W12		5

APPENDIX C
Material Recovered from Mound 4

Catalog #	Original	Reanalysis	Material	XU	Association	No.
10F-01-06	bone, small pieces	missing		N1W12		
10F-01-07	charcoal and red ochre	discarded		N1W12		
10F-01-08	potsherds, with inscribed	missing or uncatalogued		N1W12		
10F-01-09	bone	discarded		N1W12		
10F-01-10	chert	same		N1W12		
10F-01-11	yellow and red ochre	discarded		N1W14 - W15		
10F-01-12	snail shells, bone, possilbe r	discarded		N1W12		4
10F-01-13	stone chips	discarded		N1W12		
10F-01-14	potsherds - 1 thick, 1 thin	missing or uncatalogued		N1W12		2
10F-01-15	bone and soft stone	missing		N1W12		
10F-01-16	sharp edged rock, 3" diam.	discarded		N1W12		1
10F-01-17	large vertebrae, bison or elk	animal bone		N1W13		1
10F-01-18	squared stone with depression	natural		N1W12		1
10F-01-19	potsherds - 1 pc. with diamond	same		N1W12		
10F-01-20	bone fragments, charcoal, cher	same		N1W12		
10F-01-21	bone fragments, rodent	discarded		N1W12		
10F-01-22	iron bolt	discarded		N1W12		1
10F-01-23	wood stake pieces	discarded		N1W12		
10F-01-24	rim sherd and soft white pebbl	missing or uncatalogued		N1W13		1
10F-01-25	rabbit bone, charcoal, ocher	discarded		N1W13		
10F-01-26	stone chips, chert	same		N1W13		
10F-01-27	potsherds	missing or uncatalogued		N1W13		
10F-01-28	rim sherd - inscribed	missing or uncatalogued		N1W13		2
10F-01-29	potsherd	missing or uncatalogued		backfill		
10F-01-30	woodchuck mandible	same		backfill		1
10F-01-31	yellow ochre, slate	discarded		N1W14		1
10F-01-32	sharp stone - flat	discarded		N1W15		1
10F-01-33	yellow and red ochre, stone ch	missing		N1W14		
10F-01-34	potsherds, 1 with lines	missing or uncatalogued		N4W12		2
10F-01-35	burnt bone, charcoal, red ochr	same		N4W12		
10F-01-36	potsherds and black flat stone	missing		N4W12		
10F-01-37	dog rib and ulna	discarded		N4W12		
10F-01-38	blackened and chipped stone	missing		N4W12		
10F-01-39	potsherds	missing or uncatalogued		N4W12		
10F-01-40	potsherds	missing or uncatalogued		N1W11		
10F-01-41	rabbit and lg animal bone	small animal bones		N1W12		
10F-01-42	bones, burnt and charcoal	discarded		N1W12		
10F-01-43	bone fragments	discarded		N1W12		
10F-01-44	bone frags, crushed rabbit skull	same - animal		N1W12		
10F-01-45	bone fragments, pottery	same		N1W11		
10F-01-46	pottery sherds	missing or uncatalogued		N1W11		4
10F-01-47	potsherds	missing or uncatalogued		N1W11		7
10F-01-48	bones	same and point fragment - burned		N1W11		
10F-01-49	stone chips, chalk	discarded		N1W11		11
10F-01-50	potsherds	missing or uncatalogued		N1W11		11
10F-01-51	chert	unmodified flake	Wyandotte	N1W16		2
10F-01-52	bone fragments	discarded		N1W11		13
10F-01-53	sherds	missing or uncatalogued		N1W11		
10F-01-54	bone fragments	discarded		N1W11		
10F-01-55	bone fragments	discarded		N1W11		
10F-01-56	potsherds	missing or uncatalogued		N1W12		
10F-01-57	animal bones, rodent	discarded		N1W11		
10F-01-58	sherds	missing or uncatalogued		N1W11		
10F-01-59	sherds	missing or uncatalogued		N1W11		
10F-01-60	assorted fragments	flake	not identified	N1W11		
10F-01-61	pottery sherds	missing or uncatalogued		N1W11		
10F-01-62	pot sherds	missing or uncatalogued		N1W11		
10F-01-63	bone fragment	discarded		N1W11		
10F-01-64	bone	discarded		N1W11		9
10F-01-65	rimsherd	missing or uncatalogued		N1W12		1
10F-01-66	dog skeleton and woodchuck bone	same		N1W11		
10F-01-67	potsherds	same		N1W12		3
10F-01-68	slate and red ochre, chert	missing		N1W11		
10F-01-69	bone fragment	natural chert		N1W11		
10F-01-70	bone fragments	discarded		N1W13		
10F-01-71	potsherds	missing or uncatalogued		N1W11		10
10F-01-72	potsherds	missing or uncatalogued		N1W13		6
10F-01-73	bone fragments, sm mammal	discarded		N111		
10F-01-74	wood fragment	bone awl - wood discarded		N1W12		3

APPENDIX C
Material Recovered from Mound 4

Catalog #	Original	Reanalysis	Material	XU	Association	No.
10F-01-75	charcoal, elk bone	missing		N1W11		
10F-01-76	pottery fragments	missing or uncatalogued		N1W11		2
10F-01-77	inscribed sherd	missing or uncatalogued		N1W11		1
10F-01-78	soil sample	discarded		N1W11		
10F-01-79	bone fragments	discarded		N1W12		
10F-01-80	potsherds	missing or uncatalogued		N1W13		2
10F-01-81	potsherds	missing or uncatalogued		N1W11		30
10F-01-82	potsherds	missing or uncatalogued		N1W11		
10F-01-83	potsherds	missing or uncatalogued		N1W12		4
10F-01-84	bone fragments, some charred	discarded		N1W12		
10F-01-85	cherts and flakes	unmodified flake	HD unknown	N1W12		
10F-01-86	red ochre and sherds	missing		N1W11		
10F-01-87	bone fragments, lg animal and dog tooth	discarded		N1W11		
10F-01-88	sherd	missing or uncatalogued		N1w12		2
10F-01-89	bone fragments, some charred	small animal bone		N2W10		18
10F-01-90	potsherds	missing or uncatalogued		N2W11		
10F-01-91	bone fragments	discarded		N2W11		
10F-01-92	stone chips	discarded		N1W11		
10F-01-93	bone fragments	discarded		N1W12		2
10F-01-94	potsherds	missing or uncatalogued		N1W11		
10F-01-95	potsherds	missing or uncatalogued		N2W10		1
10F-01-96	scrapers	missing		N1W11		1
10F-01-97	glass	same		N2W11		
10F-01-98	bone fragments	missing		N2W11		
10F-01-99	stone of slate	discarded		N1W13		
10F-01-100	bone fragments	unmodified flake	glacial	N2W10		
10F-01-101	stone scraper	missing		N2W11		1
10F-01-102	bone fragments	discarded		N2W10		
10F-01-103	stone chips	discarded		N2W10		
10F-01-104	rabbit bone	small animal bone		N2W10		1
10F-01-105	stone	missing		N2W10		
10F-01-106	acher?	discarded		N2W10		
10F-01-107	bone	discarded		N3W10		3
10F-01-108	potsherds	missing or uncatalogued		N5W10		
10F-01-109	potsherds	missing or uncatalogued		N2W10		
10F-01-110	bone fragments, deer and rabbit	discarded		N2W10		
10F-01-111	elk or deer bones & mica sliver	discarded		N2W10		
10F-01-112	potsherds	missing or uncatalogued		N1W10		
10F-01-113	bone	discarded		N1W10		
10F-01-114	bone fragments	missing		N2W10		16
10F-01-115	bone fragments	discarded		N2W10		
10F-01-116	bone fragments	discarded		N2W10		
10F-01-117	potsherds	discarded		N2W10		
10F-01-118	potsherds	missing or uncatalogued		N2W10		
10F-01-119	stone chips	discarded		N2W10		
10F-01-120	bone chips and slate	discarded		N2W10		
10F-01-121	potsherds	missing or uncatalogued		N2W10		
10F-01-122	potsherds	missing or uncatalogued		N2W11		
10F-01-123	flat stone	discarded		N1W11		
10F-01-124	potsherds	missing or uncatalogued		N2W11		2
10F-01-125	bone fragment	discarded		N2W11		1
10F-01-126	rabbit and lg. mammal bones	discarded		N2W11		
10F-01-127	potsherd	missing or uncatalogued		N2W10		1
10F-01-128	stone chip	discarded		N2W10		1
10F-01-129	bone fragment	discarded		N2W10		3
10F-01-130	bone fragment	discarded		N2W11		
10F-01-131	chipped rock (ocher?)	missing		N2W10		5
10F-01-132	potsherds	missing or uncatalogued		N2W10		
10F-01-133	bone chips	same		N2W10		
10F-01-134	potsherds	missing or uncatalogued		N2W10		
10F-01-135	bones	discarded		N2W11		
10F-01-136	bone fragments	discarded		N2W10		2
10F-01-137	potsherds	missing or uncatalogued		N2W10		
10F-01-138	bone and stone chips	missing		N2W10		
10F-01-139	potsherds	missing or uncatalogued		N2W10		2
10F-01-140	potsherds	missing or uncatalogued		N2W11		
10F-01-141	potsherds	missing or uncatalogued		N2W10		5
10F-01-142	bone and stone chips	discarded		N2W11		

APPENDIX C
Material Recovered from Mound 4

Catalog #	Original	Reanalysis	Material	XU	Association	No.
10F-01-143	rabbit bones	missing		N2W11		
10F-01-144	potsherds	missing or uncatalogued		N2W11		
10F-01-145	potsherds - bone fragment	? pottery, bone - same		N2W11		2
10F-01-146	chert	missing		N2W11		
10F-01-147	large pieces of ash	discarded		N1W11		
10F-01-148	walnuts	discarded		N2W11		44
10F-01-149	bone chips	discarded		N2W11		
10F-01-150	potsherds	missing or uncatalogued		N2W11		
10F-01-151	bone fragments	missing		N2W11		
10F-01-152	stone scraper	missing		N1W11		
10F-01-153	potsherds	missing or uncatalogued		N2W11		2
10F-01-154	red and yellow ocher	missing		N2W11		
10F-01-155	potsherds	missing or uncatalogued		N2W11		
10F-01-156	bone and stone chips	missing		N2W11		
10F-01-157	potsherds	missing or uncatalogued		N2W11		
10F-01-158	bone chips	missing		N2W11		
10F-01-159	mica sliver	missing		N2W11		
10F-01-160	bone and stone chips	missing		N2W11		
10F-01-161	bone chips	missing		N2W11		
10F-01-162	potsherds	missing or uncatalogued		N2W11		
10F-01-163	stone scraper?	missing		N2W10		
10F-01-164	potsherds	missing or uncatalogued		N2W10		
10F-01-165	bone and stone chips	missing		N2W10		
10F-01-166	snail shell	missing		N2W10		
10F-01-167	potsherds	missing or uncatalogued		N2W10		
10F-01-168	bone chips	missing		N2W10		
10F-01-169	bone chips and yellow ocher	missing		N2W10		
10F-01-170	potsherds	missing or uncatalogued		N2W10		
10F-01-171	bone chips	missing		N2W10		
10F-01-172	potsherds	missing or uncatalogued		N2W10		
10F-01-173	bone chips	missing		N2W10		
10F-01-174	red ocher	missing		N2W10		
10F-01-175	bone fragments	1 bone awl		N2W10		3
10F-01-176	snail shell	missing		N2W10		
10F-01-177	bones, charcoal	missing		N2W10		
10F-01-178	potsherds	missing or uncatalogued		N2W10		
10F-01-179	potsherds	missing or uncatalogued		N2W10		
10F-01-180	potsherds	missing or uncatalogued		N2W10		
10F-01-181	bone chips	missing		N2W10		
10F-01-182	mouse bones	discarded		N1W11		
10F-01-183	potsherds	missing or uncatalogued		S2W10		6
10F-01-184	sherd	missing or uncatalogued		S3W9		1
10F-01-185	chert and bone flakes	same		S2W9		
10F-01-186	potsherds	missing or uncatalogued		S2W9		
10F-01-187	potsherds	missing or uncatalogued		S2W10		
10F-01-188	inscribed sherd	missing or uncatalogued		S2W10		
10F-01-189	bone chips, chert flakes	unmodified flake	HD unknown	S2W10		
10F-01-190	rodent bones?	same		S1W7		
10F-01-191	potsherd	missing or uncatalogued		S3W8		
10F-01-192	bone, ocher, chalk	discarded		S3W8		
10F-01-193	stone chips and bone chip	missing		S3W13		
10F-01-194	chert flake	see attachment		S1W7		
10F-01-195	wire	same		S5W8		
10F-01-196	potsherd	missing or uncatalogued		S1W12		
10F-01-197	curved stone	carved stone? - missing		S3W10		
10F-01-198	stone chip	see attachment		S1W11		
10F-01-199	charcoal	discarded		S1W11		
10F-01-200	bone fragments	discarded		S1W11		
10F-01-201	potsherds	missing or uncatalogued		S1W11		
10F-01-202	incised sherds	missing or uncatalogued		S1W11		
10F-01-203	shell fragments	discarded		S1W7		
10F-01-204	chert flakes	see attachment		S1W7		
10F-01-205	chert flakes	see attachment		S1W7		
10F-01-206	coal	same		S1W7		
10F-01-207	sherds	missing or uncatalogued		S1W10-W11		
10F-01-208	burnt bones	missing		S1W10-W11		
10F-01-209	shell flake	discarded		S1W10-W11		
10F-01-210	problematic	missing		S1W10-W11		
10F-01-211	chips	missing		S1W10-W11		

APPENDIX C
Material Recovered from Mound 4

Catalog #	Original	Reanalysis	Material	XU	Association	No.
10F-01-212	bone with red pigment	discarded		S1W9		
10F-01-213	bone and stone chips	discarded		S2W10		
10F-01-214	potsherds	missing or uncatalogued		S2W10		
10F-01-215	potsherds	missing or uncatalogued		N2W11		
10F-01-216	bones - burnt	discarded		N2W11		
10F-01-217	chert flake	unmodified flake	Wyandotte	N2W11		
10F-01-218	sherd	missing or uncatalogued		S2W10		
10F-01-219	bone chips	discarded		S2W10		
10F-01-220	sherds	missing or uncatalogued		S3W8		
10F-01-221	cherts	missing		S3W8		
10F-01-222	sherd	missing or uncatalogued		S4W11		
10F-01-223	carbon 14 sample	discarded		S1W11		
10F-01-224	jawbone and tooth	missing		S1W11		
10F-01-225	bone chip	discarded		S5W9		
10F-01-226	sherds	sherds missing or uncatalogued and chert		S2W9		
10F-01-227	sherds	missing or uncatalogued		S3W11		
10F-01-228	javlin or arrowtop	missing		S1W15		
10F-01-229	bone fragments	discarded		S2W10		
10F-01-230	flakes	see attachment		S3W11		
10F-01-231	bone fragments	discarded		S1W10		
10F-01-232	sherds	missing or uncatalogued		S2W10		
10F-01-233	sherds	missing or uncatalogued		10-11-12-13		
10F-01-234	bones	same		S1W7		
10F-01-235	bone	discarded		unknown		
10F-01-236	bone	discarded		S2W11		
10F-01-237	bone	discarded		S1W11		
10F-01-238	pottery fragments	missing or uncatalogued		S2W11		
10F-01-239	pottery and bone	missing or uncatalogued		S2W11		
10F-01-240	potsherd	missing or uncatalogued		S1W15		
10F-01-241	bone chip and flake	unmodified flake	Wyandotte	S5W9		
10F-01-242	bone fragment	discarded		N2W11		
10F-01-243	bone fragment	discarded		S2W9		
10F-01-244	potsherds	missing or uncatalogued		N2W11		
10F-01-245	bone fragments	chert?		N2W11		
10F-01-246	bone fragments	discarded		W8		
10F-01-247	roots	discarded		W11		
10F-01-248	sherds	missing or uncatalogued		S2W1-		
10F-01-249	bone fragments	bone and shell		S1W7		
10F-01-250	bone fragments	discarded		S1W10		
10F-01-251	bone fragments	discarded		N2W11		
10F-01-252	bone fragments	discarded		S1W7		
10F-01-253	bone fragments	missing		S1W11		
10F-01-254	sherds	missing or uncatalogued		N2W11		
10F-01-255	sherds	missing or uncatalogued		N2W11		
10F-01-256	modern	glass		S3W8		
10F-01-257	finger bone & hardened ash	discarded		S1W8	B3	2
10F-01-258	mica	missing		S1W10		
10F-01-259	mica	discarded		S1W9		
10F-01-260	shells and sherds	missing?		S1W9		
10F-01-261	sherds	discarded		S1W9		
10F-01-262	fill	discarded		S1W10-W11		
10F-01-263	potsherds	missing or uncatalogued		S1W9		
10F-01-264	bone fragments	discarded		S1W9		
10F-01-265	potsherds	missing or uncatalogued		S1W9		
10F-01-266	potsherds	missing or uncatalogued		S1W9		
10F-01-267	chips	see attachment		S1W9		
10F-01-268	bone	discarded		S1W9		
10F-01-269	ocher etc.	discarded		S1W8		
10F-01-270	bone chip and sliver of mica	misssing		S1W10-W11		
10F-01-271	stone chert, chips	1 unmodified, 1 modified flake, 1 point frag	unmod-glacial, others-HD unk	S1W11		
10F-01-272	potsherds	missing or uncatalogued		S1W9		
10F-01-273	bone fragments	missing		S1W9		
10F-01-274	chips	missing		S1W10-W11		
10F-01-275	bone	claw core		S1W10-W11		
10F-01-276	problematic	see attachment		S1W10-W11		
10F-01-277	sherds	missing or uncatalogued		S1W10-W11		
10F-01-278	sherds	missing or uncatalogued		S2W9		
10F-01-279	bone chips	missing		S2W9		

APPENDIX C
Material Recovered from Mound 4

Catalog #	Original	Reanalysis	Material	XU	Association	No.
10F-01-280	fire hardened clay	discarded		S1W10, W 11, W12		
10F-01-281	bone fragments	human bone		S1W10, W11, W12		
10F-01-282	potsherds	missing or uncatalogued		S1W10, W 11, W12		
10F-01-283	rock-fire hardened etc.	discarded		S1W10, W 11, W12		
10F-01-284	chert	missing		S1W10, W 11, W12		
10F-01-285	pearls - beads 2 vials	same		S1W7	B8	1034
10F-01-286	black sherds	missing or uncatalogued		S1W10, W 11, W12		
10F-01-287	stone fragments	missing		S2W9		
10F-01-288	stone fragments	see attachment		S1W10, W 11, W12		
10F-01-289	slate	missing		S3W10		
10F-01-290	bone fragments	same and potsherd and fcr		S1W10, W 11, W12		
10F-01-291	stone flakes	discarded		S1W10, W 11, W12		
10F-01-292	potsherds	missing or uncatalogued		S1W10, W 11, W12		
10F-01-293	rodent bone and stone chips	missing		S2W11		
10F-01-294	potsherds	missing or uncatalogued		S2W11		
10F-01-295	stone fragments	see attachment		S2W11		
10F-01-296	bone fragments	bone frags and unmodified flake	Laurel	S2W11		
10F-01-297	burnt rock	discarded		S1W10		
10F-01-298	sherd and bone	missing or uncatalogued		S1W11		
10F-01-299	stone flakes	missing		S2W9		
10F-01-300	bundle burial #4	same		S1W8	B5a-c	
10F-01-301	conch shell	same		S1W9	B4	
10F-01-302	extended burial	same		S1-S2W8	B3	
10F-01-302	ribs from ext. burial	same		S1-S2W8	B3	
10F-01-303	bones and chips	animal bone, burned		S1W11		
10F-01-304	potsherds	body sherd, plain		S1W11		1
10F-01-305	bones	animal bone, burned		S1W10-W11		
10F-01-306	potsherds	missing or uncatalogued		S1W10-W11		
10F-01-307	bundle burial #2	same		S1W8	B4	
10F-01-308	potsherds	missing or uncatalogued		backfill		
10F-01-309	bones	same		S2W11		
10F-01-310	shell	same		S1W9		
10F-01-311	spiral shell	same		S1W8	B3	
10F-01-312	loose dirt	flake		S2W9		
10F-01-313	rodent jaw	same		S1W11		
10F-01-314	bone and potsherds	animal bone, 4 unmodified flakes, 1 fcr	HD unknown	S1W10, W11, W12		
10F-01-315	bone fragments	infant skull		S1W7	B8	
10F-01-316	potsherds	pottery -missing or uncatalogued, other		S1W10, W11, W12		
10F-01-317	burial #3	same		S1W7	B8	
10F-01-318	bone fragments	same		S1W9		
10F-01-319	sherds	missing or uncatalogued		N1 W11		
10F-01-320	chunky stone?	natural		S1W9	B4	
10F-01-321	burial # 3	missing		S1W9	B?	
10F-01-322	blades	3 unmodified flakes, 1 chert	1 unknown, 2 HD unk	S1W9		3
10F-01-892	not on catalog	1 unmodified flake	HD unknown			1
10F-01-896	not on catalog	1 unmodified flake	HD unknown			1
27F-01-01	point - adena point	missing		N6W8		1
27F-01-02	worked bone fragment	missing		N2W12		1
27F-01-03	utilized flake	missing		N2W11		1
27F-01-04	pottery sherd	body sherd, plain		N1W11		1
27F-01-05	pottery sherd incised	body sherd, incised		N1W11		1
27F-01-06	pottery sherd	7 rims, 7 body, 1 shoulder - incised		N1W12		15
27F-01-07	pottery sherd	body sherd, plain		N1W12		2
27F-01-08	pottery sherd	1 rim & 4 body- incised, 1 rim & 1 body,		N1W12		7
27F-01-09	pottery sherd	1 body - incised, 48 body -plain, 2 daub		N1W12		51
27F-01-10	pottery sherd	1 rim, 45 body - plain		N1W12		46
27F-01-11	pottery sherd	1 body - incised, 3 shoulders & 14 body		N1W12		18
27F-01-12	pottery sherd	1 rim & 38 body - plain, 7 body - incise		N1W12		56
27F-01-13	pottery sherd incised	body sherd, incised		N1W13		2
27F-01-14	pottery sherd	1 body & 1 shoulder - incised, 8 body &		N2W9		11
27F-01-15	pottery sherd	7 rim, 7 body & 1 shoulder - incised, 70		N2W10		68
27F-01-16	pottery sherd	body sherds, plain		N2W10		28
27F-01-17	pottery sherd incised	1 rim, 1 shoulder & 4 body - incised		N2W10		6
27F-01-18	pottery sherd	1 rim, 3 shoulder & 6 body - incised, 1		N2W11		61
27F-01-19	pottery sherd	1 rim, 1 shoulder & 3 body - incised, 35		N2W11		40
27F-01-20	pottery sherd	3 rim, 2 body - incised, 44 body - plain		N2W11		50
27F-01-21	pottery sherd	2 body, 1 shoulder - incised, 49 body -		N2W12		52
27F-01-22	pottery sherd	body sherds, plain		N2W12		2
27F-01-23	pottery sherd	15 body - plain, 1 daub		N2W12		16

APPENDIX C
Material Recovered from Mound 4

Catalog #	Original	Reanalysis	Material	XU	Association	No.
27F-01-24	pottery sherd	body sherd, plain		N2W12		3
27F-01-25	pottery sherd	body sherd, plain		N2W12		3
27F-01-26	pottery sherd	body sherd, plain		N3w8		1
27F-01-27	pottery sherd	body sherd, plain		N3W8		5
27F-01-28	pottery sherd	body sherd, plain		N3W9		1
27F-01-29	pottery sherd	body sherd, plain		N4W8		3
27F-01-30	pottery sherd	body sherd, plain		N3W10		3
27F-01-31	pottery sherd	1 shoulder & 1 body - incised, 1 rim -pl		N3W11		3
27F-01-32	pottery sherd	body sherd, plain		N3W11		1
27F-01-33	pottery sherd	1 body - incised, 1 body - plain		N3W12		3
27F-01-34	pottery sherd	body sherd, plain		N3W12		3
27F-01-35	pottery sherd	1 shoulder & 22 body - plain		N3W12		23
27F-01-36	pottery sherd	body sherd, plain		N3W12		4
27F-01-37	pottery sherd	body sherd, plain		N3W12		9
27F-01-38	pottery sherd	body sherd, plain		N3W12		1
27F-01-39	pottery sherd	missing or uncatalogued		N4W11		1
27F-01-40	pottery sherd	1 rim - incised, 2 body - plain		N4W11		3
27F-01-41	pottery sherd	body sherd, plain		N5W8		2
27F-01-42	pottery sherd	body sherd, plain		N6W8		5
27F-01-43	pottery sherd	body sherd, plain		N6W8		1
27F-01-44	pottery sherd incised	missing or uncatalogued		N5W8		1
27F-01-45	coil- possible piece of mouldi	pottery coil		N2W11		1
uncat		cut bone - pig or cow		N3W11		1
uncat		cut bone - pig or cow		N4W12		1
27F-01-46	flake	modified flake	Wyandotte	N6 W8		1
27F-01-47	flake	modified flake	HT Burlington	N6 W8		1
27F-01-48	flake	unmodified flake	HD unknown	N6 W8		1
27F-01-49	flake	unmodified flake	glacial	backfill		1
27F-01-50	worked chert	modified flake	Wyandotte	N2W12		1
27F-01-51	utilized flake	modified flake	Wyandotte	N2W12		1
27F-01-52	flake blank	unmodifed flake	Wyandotte	N2W11		1
27F-01-53	utilized flake	unmodifed flake	Wyandotte	N2W11		1
27F-01-54	utilized flake	unmodifed flake	Wyandotte	N2W11		1
27F-01-55	utilized flake	unmodifed flake	HD unknown	N1W12		1
27F-01-56	core	natural		N1E12		1
27F-01-57	flake	natural		N1E12		1
27F-01-58	worked bone	unmodified bone		N2W11		1
27F-01-59	worked rib	unmodified bone		N2W11		1
27F-01-60	horn coral	missing		N5W8		1
27F-01-61	fossil impression	same		N1E4		1
27F-01-62	cut bone	unmodified bone		N2W10		1
37F-01-01	possible hand axe	natural		N1W3		2
37F-01-02	small bone	discarded		N1W2		1
37F-01-03	small shell	discarded		N1W5		1
37F-01-04	flint chips	discarded		N4W5		3
37F-01-05	bone fragment	discarded		N5W4		1
37F-01-06	bone fragment	discarded		N2W5		4
37F-01-07	bone fragment	discarded		N4W4		14
37F-01-08	bone fragment	discarded		N2W2		21
37F-01-09	bone fragment	discarded		N5W5		4
37F-01-10	bone fragment	discarded		N5W4		1
37F-01-11	bone fragment	discarded		N5W3		13
37F-01-12	bone fragment	discarded		N3W5		2
37F-01-13	pot sherd	body sherd, plain		N4W5		5
37F-01-14	pot sherd	missing or uncatalogued		backfill		1
37F-01-15	bone fragment	discarded		N3W4		2
37F-01-16	bone fragment	body sherd, plain		N5W3		1
37F-01-17	bone fragment	discarded		N5W4		1
37F-01-18	bone fragment	discarded		N5W5		4
37F-01-19	chert flake	modified flake	HD unknown	N5W5		1
37F-01-20	bone fragment	discarded		N1W5		6
37F-01-21	bone fragment	discarded		N1W4		1
37F-01-22	chert flake	see attachment		N3W5		1
37F-01-23	bone fragment	discarded		N3W5		1
37F-01-24	pot sherd	body sherd, plain		N5W2		1
37F-01-25	chert flake	see attachment		N1W5		2
37F-01-26	pot sherd	missing or uncatalogued		N1W2		3
37F-01-27	pot sherd	body sherd, plain		N3W4		3
37F-01-28	chert flake	unmodified flake	Burlington	N3W5		1

APPENDIX C
Material Recovered from Mound 4

Catalog #	Original	Reanalysis	Material	XU	Association	No.
37F-01-29	conglomerate of shell	discarded		N1W2		9
37F-01-30	pot sherds	body sherd, plain		N4W5		7
37F-01-31	possible core	missing		N1W4		1
37F-01-32	pot sherd	body sherd, plain		N3W5		1
37F-01-33	chert flake	missing		N3W5		1
37F-01-34	pot sherd	body sherd, plain		N1W5		1
37F-01-35	pot sherd	body sherd, plain		N3W5		18
37F-01-36	chert flake	see attachment		N3W5		3
37F-01-37	ocher	missing		N2W5		
37F-01-38	pot sherd	missing or uncatalogued		N1W3		5
37F-01-39	bone fragment	discarded		N3W4		2
37F-01-40	mica sheet and fragments	same		N1W2	B9	2
37F-01-41	pot sherd	discarded		N1W3		3
37F-01-42	chert flake	missing		N2W3		1
37F-01-43	pot sherds	body sherd, plain		N3W4		18
37F-01-44	snail shell	missing		N1W3		1
37F-01-45	bone fragment	discarded		N2W4		2
37F-01-46	pot sherd	missing or discarded		N2W5		1
37F-01-47	bone fragment	discarded		S1W3		8
37F-01-48	snail shell	body sherd, plain		N2W2		1
37F-01-49	pot sherd	body sherd, plain		N3W5		1
37F-01-50	bone fragment	discarded		S2W2		59
37F-01-51	snail shell	discarded		N2W4		15
37F-01-52	pot sherd	body sherd, plain		N1W4		3
37F-01-53	bone fragment	discarded		N2W4		1
37F-01-54	pot sherd	body sherd, plain		N2W4		4
37F-01-55	chert flakes	modified flake	Wyandotte	N2W4		2
37F-01-56	chert flake	see attachment		N2W3		1
37F-01-57	pot sherd	missing or uncatalogued		N2W3		21
37F-01-58	chert flakes	discarded		N2W3		2
37F-01-59	chert flake	modified flake	HT Liston Creek	N3W5		1
37F-01-60	bone fragment	discarded		N3W5		2
37F-01-61	bone fragment	discarded		N1W4		4
37F-01-62	pot sherds	1 shoulder & 1 body - plain		N1W4		7
37F-01-63	pot sherds	body sherd, plain		N2W4		3
37F-01-64	bone fragment	discarded		N1W5		3
37F-01-65	snail shell	discarded		N1W5		1
37F-01-66	pot sherd	body sherd, plain		N1W5	hopewell v	1
37F-01-67	copper	copper panpipe w/ cordage		S1W2	B9	1
37F-01-68	copper imprints	discarded		S1W2		
37F-01-69	pot sherd	body sherd, plain		N3W5		12
37F-01-70	chert core	core	Laurel	N3W5		1
37F-01-71	polished stone, olivine	missing		S1-S2W2	B9	1
37F-01-72	cremation burial 1	missing		S1-S2W2	B9	
37F-01-73	cremation burial 2	missing		S1W3	B10	
37F-01-74	cremation burial 3	discarded		S1-S2W2	B11	
49F-04-01	point	missing		S5W1		1
49F-04-02	scraper	missing		S6W1		1
49F-04-03	awl	point fragment		S2W5		1
49F-04-04	problematic	natural		S4W7		1
49F-04-05	scraper	natural		S6W1		1
49F-04-06	scraper	see attachment		S4W7		1
49F-04-07	pot sherd	see attachment		S5W7		1
49F-04-08	braciopod	same & 1 body sherd, plain		S5W7		1
49F-04-09	sherd	missing or uncatalogued		S5W7		1
49F-04-10	sherd	missing or uncatalogued		S5W7		1
49F-04-11	sherd	body sherd, plain		S5W7		1
49F-04-12	sherd	body sherd, plain		S5W7		1
49F-04-13	sherd	body sherd, plain		S5W7		1
49F-04-14	sherd	body sherd, plain		S5W7		1
49F-04-15	iron bolt	bolt and spring		S7W3		2
49F-04-16	glass	same & 1 body sherd, plain		S8W3		2
49F-04-17	glass	same		S8W3		1
49F-04-18	light bulb base	discarded		S8W3		1
49F-04-19	bone fragments	discarded	unknown	S9W3		6
49F-04-20	collection of chips and bone	1 block flake	unknown	S4W7		18
49F-04-21	collection of cow bones	same & 1 block flake		S5W7		10
49F-04-22	flake	natural		S3W5		1
49F-04-23	bone	discarded		S4W3		1

APPENDIX C
Material Recovered from Mound 4

Catalog #	Original	Reanalysis	Material	XU	Association	No.
49F-04-24	flake	discarded		S4W3		1
49F-04-25	flake	discarded		S5W7		1
49F-04-26	flake	natural		S5W7		1
49F-04-27	flake	unmodified flake	Zaleski	S4W7		1
49F-04-28	flake	natural		S4W7		1
49F-04-29	flake	block flake	unknown	S4W7		1
49F-04-30	flake	unmodified flake	HD unknown	S4W7		1
49F-04-31	flake	natural		S4W7		1
49F-04-32	flake	modified flake, 1 body sherd -plain, natural	HT Burlington	S5W5		2
49F-04-33	carbon	discarded		S3W3		1
49F-04-34	carbon	discarded		S5W3		3
49F-04-35	broken plate	same		S8W3		1
49F-04-36	bone	discarded		S10W3		1
49F-04-37	pot sherd	same		S6W5		10
49F-04-38	flakes	body sherd, plain		S6W5		1
49F-04-39	sherds	body sherd, plain		S5W7		3
49F-04-40	flakes	unmodifed	unknown	S5W7		1
49F-04-41	celt, banded slate	missing		S3W6		1
49F-04-42	bone fragmetn	discarded		S2W5		3
49F-04-43	flake	modified flake	HT Wyandotte	S5W5		1
49F-04-44	conch shell	same		S2W6		1
49F-04-45	flake	unmodified flake	Burlington	N4E4		1
52F-01-01	grinding stone	natural		S10E5		1
52F-01-02	charcoal and wood	discarded		S10E5		
52F-01-03	bone, deer astragulus	missing		S10E5		1
52F-01-04	bone fragment	discarded		S8E3		1
52F-01-05	broken scraper	modified flake	HT Wyandotte	S6E7		1
52F-01-06	use scraper	unmodified flake	HD unknown	S7E7		1
52F-01-07	bone fragment	missing		S2E7		1
52F-01-08	problematic gorget	discarded		S4E7		1
52F-01-09	sandstone tablet	discarded		S4E7		1
52F-01-10	broken projectile point	point fragment	HD unknown	S1E7		1
52F-01-11	leg and pelvic fragments	missing		S1E7	B12g	
52F-01-12	bone fragment	missing		S1E7	B12g	
52F-10-13	cremation	missing		S2E6	B12d	
52F-01-14	probable mortatr	anvil		S3E6	F17	1
52F-01-15	bear canine effigy	same, sheated in copper		S3E6	F17	1
52F-01-16	bear canine effigy	same, sheathed in copper		S3E6	F17	1
52F-01-17	human molar	same, w/ copper staining		S3E6	F17	1
52F-01-18	human pre-molar	same, w/ copper staining		S3E6	F17	1
52F-01-19	shell frags.	missing		S3E6		
52F-01-20	blade	retouched flake	Wyandotte	S3E6	F12	1
52F-01-21	hopewell pot remains	Hopewell vessel - decorated and plain sherds		S3E6	F17	
52F-01-22	cremation	missing		S2E4		
52F-01-23	turtle skull fragments	discarded		S2E2		3
52F-01-24	mica flake	same		S2E4		1
52F-01-25	pot sherds	missing or uncatalogued		S2E4		2
52F-01-26	pot sherds	body sherd, plain		S2E4		1
52F-01-27	polished charred bone	discarded		S2E4		3
52F-01-28	stone and bone fragments	discarded		S2E4		
52F-01-29	bone fragments	discarded		S2E2		
52F-01-30	bone fragment	discarded		S3E2		1
52F-01-31	problematic stone object	natural		S5E4		2
52F-01-32	maxilla and some teeth	missing		S1E7	B12g	
52F-01-33	scraper	stage 2 biface	Laurel	S3E5		1
52F-01-34	pecked ground stone	hammerstone		S6E3		1
52F-01-35	pottery sherds	body sherd, plain		S3E6		2
52F-01-36	pottery sherds	body sherd, plain		S4E6		1
52F-01-37	chert worked	point fragment	unknown	S6E3		1
52F-01-38	---- bones	same		S10E5		
57F-01-01	red ochre	discarded		N1E5		
57F-01-02	scraper	stage 3 biface	glacial	N8E5		
57F-01-03	filler for post hole	discarded		N2E5		
57F-01-04	chip flint	natural		N8E3		
57F-01-05	core	discarded		N3E5		
57F-01-06	core	natural		N8E5		
57F-01-07	scraper	natural		backfill		
57F-01-08	scraper	stage 3 biface	glacial	N7E5		

APPENDIX C
Material Recovered from Mound 4

Catalog #	Original	Reanalysis	Material	XU	Association	No.
57F-01-09	scraper	modified flake	Wyandotte	N4E1		
57F-01-10	scraper? core	natural		N8E5		
57F-01-11	possible utilized flake	unmodified flake	Burlington	N5E3		
57F-01-12	scraper	natural		N7E5		
57F-01-13	point	missing		N3E5		
57F-01-14	broken point	point fragment	HT Burlington	N5E2		1
57F-01-15	turkey bone	same		N6E2		
57F-03-01	projectile point	Kanawha	Liston Creek	surface		1
57F-03-02	projectile point	Matanzas	HT Laurel	surface		1
57F-03-03	point (mid-section)	point fragment	Flint Ridge	surface		1
57F-03-04	point (basal section)	Bifurcate	HT Flint Ridge	surface		1

Attachment for Mound 4 Materials

Numerous materials did not have catalog numbers written on it. Therefore, when the material were mixed the context was also mixed. The following provides the identification for these mixed materials.

Catalog numbers 8F-11-68, 8F-11-72, 10F-1-194, 10F-1-204, 10F-1-205, 37F-1-22 and 37F-1-25 included the following:

8 unmodified flakes - 2 Laurel, 4 HD unknown, 1 unknown
1 block flake - Laurel
6 natural chert pieces

Catalog numbers 37F-1-36, 37F-1-56, 49F-4-7, 49F-4-6 and 49F-4-9 included the following:

21 unmodified flakes - 1 Flint Ridge, 7 Wyandotte, 4 Burlington, 6 unknown, 3 HD unknown
7 block flakes - unidentified
13 natural chert pieces

Catalog numbers 10F-1-10, 10F-1-19, 10F-1-20, 10F-1-26, 10F-1-35, 10F-1-45, 10F-1-50, 10F-1-60, 10F-1-89, 10F-1-100, 10F-1-133, 10F-1-185, 10F-1-189, 10F-1-198, 10F-1-213, 10F-1-226, 10F-1-230, 10F-1-238, 10F-1-245, 10F-1-267, 10F-1-271, 10F-1-276, 10F-1-295 and 10F-1-312 included the following:

145 unmodified flakes - 5 Flint Ridge, 9 Burlington, 1 Attica, 30 Wyandotte, 5 Laurel, 1 unknown, 94 HD unknown
10 block flakes - 2 Laurel, 9 HD unknown
3 fire-cracked rocks
1 burned mussel shell
28 natural chert pieces

The following material was not catalogued but was reported from the Mound 4 East Trench:

12 block flakes - unidentified
12 natural chert pieces

The following material was not catalogued but was reported from Mound 4 East:

12 unmodified flakes - 2 Flint Ridge, 2 Wyandotte, 1 Liston Creek, 7 unknown
14 block flakes - unidentified
1 other chipped stone fragment

The following material was not mixed and catalogued under 10F-1-288 from Units S1W10, S1W11 and S1W12:

310 unmodified flakes - 1 Flint Ridge, 35 Wyandotte, 2 HT Wyandotte, 17 Laurel, 1 HT Laurel, 3 Liston Creek, 9 unknown, 240 HD unknown
4 block flakes - HD unknown
9 natural chert pieces

APPENDIX C
Material Recovered from "Trenches"

Catalog #	Original	Reanalysis	Material	XU	Association	No.
27F-02-01	chert core	natural chert		@N1E4		1
27F-02-02	chert core	natural chert		@N2E13		1
27F-02-03	bone fragment, vertebra	discarded		@S2E12		6
37F-02-01	bone	discarded		@S2E10		8
37F-02-02	fossil	same		@S2E10		1
37F-02-03	chert chips	natural		@S2E10		2
37F-02-04	bone	discarded		@S3E9		3
37F-02-05	chert flakes	missing		@S3E9		3
37F-02-06	fossil rock	same		@S3E9		1
37F-02-07	coral fossil	same		@S2E10		2
37F-02-08	coal	same		@S1W10		12
37F-02-09	chert core	missing		@S3E9		1
37F-02-10	point	LA point	Liston Creek	@surface		1
37F-02-11	bone	same		@N11E64		6
37F-02-12	chert chips	missing		@S1W10		6
37F-02-13	rock fragment, ground	discarded		@S1W10		2
37F-02-14	worked chert	natural		@S10W10		2
37F-02-15	bone	same		@N11E31		1
37F-02-16	charred bone	discarded		@N7E30		16
37F-02-17	bone	same		@N7E31		1
37F-02-18	bone	same		@N7E31		1
37F-02-19	cement	discarded		@N7E31		1
37F-02-20	ball jar cap	same		@N6E32		4
37F-02-21	bone	discarded		@N6E32		1
37F-02-22	bone, porcelain, rubber	same		@N8E32		45
37F-02-23	charcoal, c14 sample	discarded		@N8E30		
37F-02-24	iron	same		@N8E32		2
37F-02-25	bone	same		@N8E30		1
37F-02-26	yellow sample	discarded		@N8E30		
37F-02-27	wood	discarded		@N8E32		2
37F-02-28	wood, post hole	discarded		@N8E32		2
37F-02-29	bone	missing		@N8E32		2
37F-02-30	bone	same		@N7E29		3
37F-02-31	char-bone, post hole	discarded		@N7E32		1
37F-02-32	bone, buckle, porcelain	same		@N7E31		3
37F-02-33	char-bone, post hole	discarded		@N7E31		18
37F-02-34	bone	same		@N7E29		10
37F-02-35	bone	same		@N7E29		1
37F-02-36	carbon 14 sample	discarded		@N7E29		1
37F-02-37	bone	same		@N7E29		1
37F-02-38	bone	same		@N7E29		1
37F-02-39	cement, ball jar pieces	same		@N7E29		6
37F-02-40	bone	same		@N7E29		1
37F-02-41	brick, porcelain, chert point	same		@N7E29		
37F-02-42	metal	same		@N5E33		1
37F-02-43	iron, bone, porcelain	same		@N4E32		3
37F-02-44	bone, brick, iron, glass	same		@N4E32		15

APPENDIX C
Material Recovered from Earthwork 6

Catalog #	Original	Reanalysis	Material	XU	Asssociation	No.
52F-03-01	broken chert point	point fragment	glacial	^S4W1		1
52F-03-02	broken chert point	bipolar	Flint Ridge	^S3W1		1
52F-03-03	charcoal sample	missing		^S1W1		1
52F-03-04	charcoal sample	missing		^S1W2		1
52F-03-05	charcoal sample	missing		^S7W1		1
52F-03-06	hammerstone	anvil		^S1W5		1
52F-03-07	pottery sherds	body sherd, plain		^S2W5		1
52F-03-08	pottery sherds	body sherd, plain		^S2W4		3
52F-03-09	chert flake, pressure flaked	natural		^S1W6		1
52F-03-10	charcoal sample	missing		^S2W4		1
52F-03-11	broken chert point	point fragment	HD unknown	^S2W6		1
52F-03-12	pottery sherd	body sherd, plain		^S2W3		2
52F-03-13	pottery sherd	body sherd, plain		^S2W3		1
52F-03-14	pottery sherds	rim sherd, plain		^S2W3		1
52F-03-15	charcoal sample	missing		^S2W3		1
52F-03-16	pollen sample (from pot)	missing		^S2W3		1
52F-03-17	micro-blade fragment	missing		^S1W2		1
57F-03-01	projectile point	Kanawha		^surface		1
57F-03-02	projectile point	Matanzas		^surface		1
57F-03-03	point (mid-section)	point fragment		^surface		1
57F-03-04	point (basal section)	Bifurcate		^surface		1
57F-03-05	game ball?	natural		^S1E2		1
57F-03-06	problematic diortie hammerstone	anvil		^S1E1		1
57F-03-07	worked flake	missing		^S1E3		
57F-03-08	possible worked rock	natural		^S6E1		1
57F-03-09	possible worked rock	natural		^S2E1		1
57F-03-10	charcoal	missing		^S2E1		
57F-03-11	piece of chert (Harrison Co.?)	natural		^S3E2		1
57F-03-12	scraper	natural		^S12E1		1
57F-03-13	broken unfinished point (mid-section)	natural		^S2E3		1
57F-03-14	piece of chert	anvil & natural chert		^S1E8		2
57F-03-15	piece of worked chert	natural		^S1E8		1
57F-03-16	utilized core with pressure flaking	natural		^S6E1		1
57F-03-17	problematic gameball	natural		^S7E1		1
57F-03-18	"worked" chert fragment	natural		^S10E1		1
57F-03-19	"worked" chert fragment	natural		^S4E1		1
57F-03-20	pottery sherd	shoulder sherds, plain		^S7E1		3
57F-03-21	pottery sherd	body sherd, plain		^S7E1		1
57F-03-22	pottery sherd	body sherd, plain		^S7E1		1
57F-03-23	pottery sherd	body sherd, plain		^S7E1		1
57F-03-24	partially broken pot	body sherd, plain		^S7E1		26
57F-03-25	rim sherd	rim sherd, plain		^S7E1		1
57F-03-26	charcoal sample	missing		^S7E1		2
57F-03-27	chert flake	natural		^S7E1		1

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APPENDIX D

Human Remains from Mound 4, New Castle Site

by
Michele Greenan

Appendix D
Human Remains

Table of Contents

Introduction

The New Castle skeletal series was from Mound 4 of the New Castle site (12Hn1). Excavation of this mound was conducted from 1965 to 1971 by the Ball State University summer archaeological field school, under the direction of Dr. B.K. Swartz, Jr. Three radiocarbon dates were obtained from Mound 4. Two of the dates were from the west lobe: 10 AD +/- 160 (M-1852) and 230 AD +/- 300 (M-2045). The date from the east lobe was 40 AD +/- 140 (M-1851) (Swartz 1976:9-11). These dates, added with information on the artifact types that were found in Mound 4, indicated that the individuals from the New Castle skeletal series represented a sample of the Middle-Woodland population in East Central Indiana (Swartz 1976).

The purpose of this analysis was twofold. First, it was necessary to review the current inventory (Glenn 1973, Swartz 1976) in order to incorporate modern methods of analysis that would assist in estimating the sex and age of each individual, and a minimum number of individuals (MNI) for the entire mortuary site. Second, this analysis was carried out to model the general health for this group of individuals. Information concerning the diseases and disorders (e.g., developmental disorders, anemia, etc.) that were identified on individuals was obtained by locating, identifying, and describing pathological changes on the bones. This information, added with the estimations of age, sex, and the MNI for the mortuary site was integral to the study of East Central Indiana's prehistoric population. There were, however, some limitations involved with the analysis of the New Castle skeletal series.

This analysis is limited because of three main factors. First, most of the burials in the New Castle series are cremated secondary burials. Thus much of the material is heavily fragmented, which makes an assessment of age, sex, and health very difficult. Second, the small number of individuals represent an extremely small sample of the local Middle Woodland population. Hence, any association between individual pathologies and an assessment of health for the entire population is difficult. Third, age and sex estimations are based on "ranking" or scoring morphological features. Ranking morphological features is highly subjective and difficult because the traits themselves are highly variable, both within a group and between groups. This often causes misidentification by the observer. Even with these impediments, however, assessing the basic parameters of age, sex, and health is valuable, especially for research that incorporates human populations into a study of prehistoric society.

Methods of Analysis

Inventory

All of the forms used for this assessment were from Buikstra and Ubelaker (1994). The inventory forms used were for complete skeletons, commingled remains, juvenile remains, and teeth, along with their visual counterparts. The form for commingled remains was used extensively as all duplicate bones where placed on this form. This form was also used when less than 10% of an individual was represented for a catalogue

number. All of the above forms allowed for an accurate and consistent inventory of the skeletal material from the site.

There are 12 burials consisting of 27 individuals recorded in the site report for 12Hn1 (Swartz 1976). Not all of the burials, however, are present in the curated collection. Burials 4, 6, 9, 10, and 11 are missing. Neither the identification nor the condition of the material in Burials 4, 9, and 10 are given in the previous inventory or catalogue records. Burial 6, however, can be partially analyzed because Dr. E. Glenn recorded this burial (Glenn 1973, Swartz 1976). Also, pictures of Burial 6 that were taken during excavation are available for analysis. Burial 6, therefore, is a part of this analysis although no information concerning pathology could be obtained. Burial 11 is noted as "discarded" in the catalogue records. All of the assessed burials are summarized in Table A.

Also, specific individuals that were recorded in burials are not found in the collection. The 12 burials discussed by Swartz (1976) contained individuals that were given letter designations (e.g., Burial 1a). This presented two main problems. First, Burial 12 is represented by individuals a, b, c, d, e, f, and g. Only individual c, however, is present in the collection. Second, this analysis showed that some of the letters represented more than one individual. These two problems resulted in a discrepancy between the number of individuals discussed in the site report (Swartz 1976) and the number reported in this analysis. This discrepancy is discussed in greater detail in the MNI section.

Methods for Estimating Age

In estimating the age of each individual, the pubic symphyses and the auricular surfaces were scored in accordance with age related changes. For adolescents and infants, age could be assessed in accordance with epiphysis union and tooth eruption. Tooth eruption analysis considered crown formation, enamel completion, eruption, and root completion. The last event of epiphysis union or tooth eruption to take place represents the earliest age, and the next event to take place (within the confines of the available material) represents the oldest age.

Secondary aging techniques included the scoring of sternal rib changes and cranial suture closure. When all points of suture closure could be scored, a composite system was used. Scores were given for the amount of closure that had taken place, and then correlated with age estimates for both the vault sites and lateral-anterior sites. For a complete discussion on all the above aging techniques, see Buikstra and Ubelaker (1994).

Because most of the individuals were fragmentary and cremated, it was impossible to utilize all of the above methods. If none of the aging techniques could be utilized, but a bone in which a late fusion event had taken place (e.g., the fusion of the basilar to the sphenoid) or a dental arcade where a third molar had erupted, the designation of "Adult ?" was given. Naturally, this designation incorporates young, middle-aged, and older adults. Also, if only one technique could be used on a bone, than a "?" is given after the age.

Methods for Estimating Sex

In estimating the sex of each individual, morphological traits of the pelvis and cranium were scored; low scores indicated female and high scores indicated male. For the pelvis, the ventral arc, subpubic concavity, ischiopubic ramus ridge, greater sciatic notch, and preauricular sulcus were scored. In the cranium, the nuchal crest, supraorbital margin, mastoid process, glabella, and mental eminence were scored. These traits were the primary indicators of sex in this assessment, with pelvic traits carrying slightly more weight in the conclusion. Some secondary traits were also scrutinized, such as the gonial angle, orbit appearance (square vs. oblique), and the angle of the ilium when in anatomical position. For a complete discussion of all the above sexing techniques, see Buikstra and Ubelaker (1994).

Given the fragmentary, burned remains that represent the majority of the individuals in the New Castle site, not all of these points could be fully assessed. Because of this fact, some of the individuals were tentative identified with a "?" after their sex designation in the tables. Most of the other individuals where based on an average of 3-4 primary traits, and 1-2 secondary traits.

Minimum Number of Individuals (MNI)

It is difficult, or impossible, to give a definitive MNI to a mortuary site when many of the individuals are represented by fragmentary, cremated material. In order to help alleviate this problem for the New Castle series, it was decided to ascertain an MNI for each catalogue number (Table B), then for each burial number (Table A). The MNI for the entire mortuary site is the result of adding together the MNI's from each burial. This allowed for a MNI for the mortuary site to be given while keeping the original catalogue numbers intact. The correlations between the catalogue numbers and the burials are shown in Table C. The following sections discuss the individuals in each burial.

Burial 1

Swartz (1976) indicates that Burial 1 was comprised of seven individuals; individuals a through g. In this analysis, however, the minimum number of individuals for Burial 1 is 10. In the skeletal material for individual a, two individuals are represented. One individual is a male between 33.5-45 years, and the second is a juvenile. Two individuals are also represented in the material for individual b, a male who is 30-50 years old, and a male of unknown age. In Bundle 1, the material for individuals c, d, and e each consist of one individual, which is consistent with Swartz's (1976) inventory. Individual c is of unknown sex between 24.5-31 years. Individual d is a male between 22-34 years. Individual e is a male about 24 ? years. The MNI for Bundle 2 is not consistent with Swartz's (1976) report, which shows two individuals, f and g. This analysis revealed three individuals instead of two, and it could not be determined which of the individuals represented f and g. Therefore, in the tables, f and g are associated with all three individuals. In this analysis, individual 1 is a male between 42-50 years. Individual 2 is a

male between 25-29 years. The third individual is an adult ? male ?.

Burial 2 and Burial 3

Burial 2 is reported to contain one individual. However, there are definitely two individuals seen in the material for Burial 2: a male between 17-25 years and an individual of unknown sex and age. Burial 3 contains one individual, which is consistent with Swartz's (1976) report. This individual is an adult ? of unknown sex.

Burial 5

In Burial 5, there are three individuals, a, b, and c. This is consistent with the number of individuals documented by Swartz (1976). It is important to state that individuals a and b are infants, but there is little doubt that they were indeed two separate infants (Glenn 1973, 1976). Infant a is 7-18 months while infant b is 6-11 months. Individual c is an adult ? of unknown sex.

Burial 6

The skeletal material for Burial 6 is not present in the laboratory. However, it seems fairly clear from the notes taken during the excavation by McCrumb (1966), the report by Swartz (1976), the report by Glenn (1973) and the photographs taken during excavation, that the skeletal material was of a child, and was in good condition. From looking at the photographs of the child, an age range of 4.5-7 years could be given. Unfortunately, it could not be ascertained whether or not another individual was represented in Burial 6. However, this child was the only inhumation located in the cremation area rather than in the Burial Area, where the other inhumations were found. Therefore, it is probable that the MNI for Burial 6 would indeed be one.

Burial 7

Burial 7 is represented by one individual, which is consistent with Swartz's (1976) report. The remains for this individual were somewhat scattered within the excavation unit which probably lead to the designation of many different catalogue numbers for small amounts of skeletal material. In fact many of the catalogue numbers that represent this burial, 8F 11-71 and 8F 8-3 through 8F 8-6, contain only one bone. However, after measuring each bone it was probable that they did indeed represent a single individual. This is consistent with the findings by Glenn (1973, 1976). The individual is an adult ? female ?; the only female in the New Castle skeletal series.

Burial 8

Swartz (1976) indicates that Burial 8 contained one cremated individual. This is not consistent with the results of the current analysis. This analysis revealed two individuals, an adult of unknown sex, and an infant that is between 6 months *in utero* to 1.5 months old. It should be noted that this infant may have been overlooked because it

was encased in hardened ash. The infant was found only after chipping away the ash.

Burial 12

Swartz (1976) indicates that Burial 12 contains individuals a through g and that all of these individuals are cremated except for c and d. None of the cremated material from this burial is found in the curated collection from the site. Only one of the non-cremated individuals, individual c, is present for analysis. However, the material for individual c represents two individuals, an adult ? of unknown sex and a child between 2-6 years. It is possible that these individuals represent individual d since it is one of the two that is not cremated. But this is unlikely given the fact that the material is heavily commingled, and the only diagnostic signs of the child are non-fused long bone epiphyses, a deciduous incisor, and possible juvenile shaft fragments, all of which were imbedded in the ash. Although individual c is recorded in the report (Swartz 1976) as "not cremated," some of the bones did display mild-moderate burn marks. The extent of cremation on individual c, as well as the other individuals, is shown in Table A.

Unknown Burial

One of the bags from the New Castle site read "unknown," and contained skeletal material that was embedded in hardened ash. This material was recorded from 1S/10-11-12W. This provenience is not consistent with any other burial. In fact, it would have been located south of Burial 6 where no burials were recorded (Swartz 1976). This location would make it unreasonable to associate this material with any other burial. Therefore, the skeletal material, which is of a child who is less than 18 years old (the proximal femur epiphysis was not fused and was 24.4 mm at the maximum diameter of the head), constitutes one burial.

Feature skeletal material

In addition to the skeletal material noted above, three teeth were found that were not in association with a burial, but were associated with copper sheathed, wooden, effigy bear canines. The copper sheathing caused the teeth to be stained. Because there is no association between the teeth and a burial, it can not be ascertained whether or not they belonged to a specific individual. However, when looking at the feature maps in the site report (Swartz 1976:70), the teeth could possibly have been associated with Burial 12, individual e or f. Because association cannot be definitively stated, the teeth; a right maxillary PM1, a right maxillary M2, and an unknown molar, represent 1 individual.

Descriptions of Abnormal Bone
Introduction

The majority of the individuals in the New Castle skeletal series were either secondary inhumations or cremations. Because of context and preservation factors, only a small handful of the individuals could be assessed for bone abnormalities. Furthermore, no complete individuals existed in the collection. Only two individuals were represented by

over 75% skeletal material. However, even with these limitations, a number of bone abnormalities were noted. These abnormalities can be divided into two categories, those that are non-pathological "variations," and those that are caused by pathological processes. The occurrences of both types are summarized in Tables D and E, respectively.

Non-Metric Variations

Non-pathological variations are slight alterations in the morphology of bones that had little or no effect on the biological function of an individual. These are recorded because of their potential genetic or cultural etiology. In the New Castle series there are several variations. The most common are asterionic bones, lambdoid ossicles, mastoid foramen, partial metopic sutures, and laterally placed bridging on the arches of the atlas. Less common variations are also important to note. Tympanic Dehiscence, which is shown by either large or small foramen in the tympanic area of the parietal is noted in 2 individuals. A parietal foramen is noted in 1 individual. Two transverse foramen in the 7th cervical vertebra are exhibited in 2 individuals. A sternal foramen, which appears as a "bullet hole" in the body of the sternum, is noted in 1 individual. Enameloma, which is a small nodule of enamel found on the roots of teeth (Hillson 1986:321), is exhibited on 1 individual. Extra facets on C5 and C6, which articulated with each other, are noted in one individual.

Also of interest, is the presence of cranial deformation associated with cradle boarding. It is probable that this would have been expressed in many of the individuals. However, because of preservation factors, only one cranium shows this definitively. Another important point is that supraorbital notches are more common than supraorbital foraman at a ratio of 4 to 2. Both of these traits are commonly found in skeletal material. However, it is the ratio between the two that may give information concerning familial inheritance.

Paleopathology

Abnormalities caused by pathological processes are assessed and documented in order to record the general state of health in this group of individuals. Although the number of individuals that could be assessed was small (n = 7), the New Castle skeletal series displays a variety of pathological changes. These pathologies were fractures, periodontal disease, a dental abscess, osteoporosis, partial spina bifida occulta, sinusitis, osteoarthritis, periostosis, and a possible benign tumor.

In the New Castle skeletal series, periostosis and osteoarthritis are more common than any other pathology (5 instances of periostosis and 6 instances of osteoarthritis). Second only to dental caries, osteoarthritis and periostosis are the most common paleopathological abnormalities. However, the usage of periostosis and osteoarthritis is often allusive.

Osteoarthritis is common to the New Castle skeletal series. Osteoarthritis is often referred to as "degenerative joint disease," and "legally" should only be used when the

affected area is a synovial joint (Steinbock 1976:287). In the vertebral column, all of the joints are synovial except for the joints between the vertebral bodies, which are fibrous joints. Hence, changes seen in the body of the vertebra should not be listed as osteoarthritis, but vertebral osteophytosis. However, this causes problems since changes to the vertebral body and vertebral facets are often found in association. Alternating between the two terms is difficult. Therefore, many researchers simplify the usage by labeling both conditions osteoarthritis. This terminology was adopted in this analysis as well, keeping in mind, however, that changes observed on the vertebral bodies are caused from changes in a fibrous rather than a synovial joint.

Periostosis is also common in the New Castle skeletal series. The term is often used synonymously with periostitis. However, periostitis refers to "peripheral bone inflammation" (Ortner 1981:38). Naturally, this is not identifiable in dry skeletal remains and refers not to what is *seen* on the bone, but the process that *caused* abnormalities on the bone. Periostosis is the term for the addition of new bone to the periosteum. Therefore, the term periostosis is used in this analysis.

Periostosis is caused by an inflammatory response to either an infectious disease or trauma (Ortner 1981:40). Generally, when the condition occurs in a limited area it is considered to be "local." This is normally caused by trauma to the affected area. However, an infectious disease that was in the beginning stages of affecting the bone can also cause localized periostosis. Naturally, this is difficult determine macroscopically. Stages of bone changes from disease processes can be more readily identified microscopically. When periostosis is found on many bones, the condition is considered to be "general." An infectious disease process normally causes this.

When looking at periostosis as a consequence of an infectious disease, one important point needs to be further addressed. Any infection that affects the bones must be chronic. For example, fast moving infections such as small pox and influenza are rarely seen in dry bone specimens. Therefore, the individuals from the New Castle skeletal series who display generalized periostosis had suffered from an infectious disease for a substantial amount of time (depending on the type of infection and the health of the individual at the time of exposure). The following section describes the pathological lesions on seven individuals.

8F 2-1
Burial 1a
Individual 1

Individual 1 is an adult male, aged between 33.5 - 45 years, and about 90% complete. On the cranium, there is minimal porotic hyperostosis on the squamous portion of the occipital. There is only1 caries and slight amounts of calculus on most of the molars. This is consistent with the moderate amount of wear seen in the dentition.

On the long bones, it appears as though some ligaments have ossified to the bone tissue. This is especially visible on the posterior aspect of both tibias. Here, located on

the superior 1/3 of the shaft, the attachment makes the bone look quite massive. It is possible that this also occurs on the fibulas, but the preservative applied to the bones makes this hard to assess.

On the vertebral column, which is complete minus C1, there is severe osteoarthritis. Osteophytes and marginal lipping are present in almost all the vertebra. Also, on the thoracic vertebra the rib facets have been severely remodeled. These facets appear to have ossified cartilage on them rather than being resorbed. This could indicate that the ribs had also been substantially affected. One interesting note concerning the severity of the vertebral osteoarthritis is evident on the left inferior facet of L2. There is polished eburnation present on less than ¼ of the facet. The amount of arthritis in the vertebral column is substantial and probably relates to an abnormality observed in L5.

The vertebral arch of L5 is not fused to the body and occurs separately. This condition is called bilateral spondylolysis. Recently, this abnormality has been noted as a type of stress fracture (for a complete discussion see Ortner and Putchard 1981:357-358, and Arriaza 1997). As a fracture, the structural integrity of the vertebral column is questioned, as L5 may have been unable to adequately support the individual. Occurrences of ossified cartilage on the long bones, specifically the tibias, may support this conclusion as this condition can be a secondary consequence of trauma. In conclusion, the individual probably was not completely immobile, although certain movements must have been painful.

8F 5-16
Burial 1
Bundle 1
Individual 1 (c)

This individual is an adult (24.4-31) that is represented by 30% skeletal material. The sex is unknown. The only noted pathology is periostosis on the left fibula. Here, added bone is visible on the mid-shaft. Because of the limited amount of representative material, it is uncertain whether the condition is local or general. Therefore, either infection or trauma could be the cause of this abnormality.

8F 11-1
Burial 1
Bundle 2
Individual 1 (f and g)

This individual is a male between 42-50 years old, and is represented by 60% skeletal material. In general, the skeleton is in fair condition, and displays pathological changes that need to be addressed.

Periodontal disease is minor to moderate as documented by the amount of alveolar resorption that has occurred. Also, periostosis is seen on the left tibia as healed woven

bone. Given that periostosis is only noted on one bone, it is most likely the result of minor trauma.

The first metatarsals and the distal phalanges of the feet, probably rays 2 and 3, display osteoarthritis. This is seen as marginal lipping and osteophytes. Osteoarthritis is a rather common sign of an aging individual. Interestingly, there is little remodeling on the available vertebra, which are more often affected by osteoarthritis. In conclusion, the bony changes on the individual are consistent with the natural aging process and probably would have caused only mild soreness in the feet and back.

8F 11-1
Burial 1
Bundle 2
Individual 2 (f and g)

This individual is a male between the ages of 25 and 29 years old. He is represented by 60% skeletal material. The amount of attrition in the teeth of this individual is far more severe than on any other individual from 12Hn1, especially considering his age. Most of his maxillary teeth have lost their crowns and there are many interproximal and occlusal caries along with a small abscess on the right maxillary P1.

The right frontal sinus has suffered from inflammation. This is quite apparent as the sinus cavity has been enlarged. Also, periostosis is evident on the right superciliary arch. These changes indicate a sinus infection, which had healed since the periosteal reaction does not appear to have been active at time of death.

Osteoarthritis is present in the ribs, the left navicular and left 1st cuneiform of the feet, and in the vertebral column. In the vertebral column, the condition is severe on C5 through T4, where osteophytes, marginal lipping, and coalesced microporosity are found. On C5 and C6 there is also diffuse bone loss on the centrums. C5 also displays a "clefting" in the middle of the anterior rim of the superior body. The rest of the vertebra display only mild osteoarthritic changes.

The left fibula and right ulna display healed periostosis. There is also some loss of bone density to the right tibia and right femur, both of which are very light with a loss of trabecular and cortical bone. This is indicative of osteoporosis.

In conclusion, osteoporosis is defined as a reduction of bone mass (Ortner 1981:289). The "clefting" appearance in C5 is not a developmental defect, but a consequence of the vertebra's inability to withstand the pressure being placed upon it once osteoporosis has reduced it's bone mass. Osteoporosis is normally found in older adults. However, osteoporosis can also occur as a secondary consequence of trauma (i.e., when there is disuse of a limb due to a fracture) or other disease processes. Due to the young age of the individual, these possibilities need to be considered. Osteoporosis is a very painful disease. This condition, along with its consequential osteoarthritis, would probably have rendered the individual somewhat immobile and in a good deal of pain.

8F 4-10
Burial 1b
Individual 1

The individual is a male aged between 30-50 years old. He is represented by around 80% skeletal material. This material is in fair condition, but many of the bones are laminating due to taphonomic processes. Even though this damage hinders analysis, some definite pathological lesions are present.

Osteoarthritis is evident in both the vertebral column and first metatarsals. In the metatarsals, polished eburnation is present on their distal ends, especially on the left where microporosity is also present. In the vertebral column there is also moderate osteoarthritis. T4 through L5 shows both osteophytes and marginal lipping at a slight to moderate degree, without diffuse bone loss.

On the sternum, there has been ossification of the 1st costal cartilage. This appears as a fairly large mass of bone attached to the right costal notch. The fragmentary nature of the ribs, though, makes further assessment very difficult.

Active periosteal lesions are noted on the long bones, ribs, clavicle, and sternum. These lesions are rough, and porotic, indicating that they were still active at time of death. The lesions of the lower legs appear to be more virulent.

Because the periostosis is seen widely dispersed in the body, the probable cause is infection. In this case, the infection was brought into the body via a compound fracture on the right MT1. This fracture is a direct, penetrating fracture as defined by Lovell (1997). Normally, crushing fractures are more common in the tarsals, but here, there is a mark shown on the lateral aspect of the toe where a small object penetrated into the toe. Little healing had taken place and infection is clearly seen within the shaft of MT1. The infection seems to have spread fairly quickly throughout the body, considering the amount of uniform unhealed woven and sclerotic bone.

Another pathology noted is spina bifida occulta. S1 is not fused and forms a cleft until fusion is seen on S2. This defect could be associated with a neural tube defect, but this is doubtful given the morphology of the surrounding bone (for a complete discussion on this difference, see Barnes 1994:46-50). This condition probably did not hinder all mobility, although it may have helped to speed the infection because of the unprotected spinal chord. Therefore, the infection associated with this individual spread from the compound fracture throughout the individual's body, and probably was the cause of death.

10F 1-302
Burial 3

The individual is represented by only about 35% skeletal material. This individual can be recognized as an adult by the epiphyseal unions of the humeri, left ulna, right radius, and distal femurs. However, due to the fragmentary nature of the material, no

specific age range can be indicated.

On the right clavicle there is a bony spur, or exostosis. It projects outward about 8mm and points laterally. This may be a type of benign tumor. However, there is severe arthritic remodeling, including coalesced microporosity, macroporosity, and slight marginal lipping around the distal portion of the sternal articulating surface. The appearance of this remodeling seems consistent with arthritis related osteophytic remodeling. It is not uncommon for surrounding tissue of a fractured bone to form a bony exostosis (Morse 1978). Therefore, the exostosis may be a secondary response to trauma.

In the vertebral column, which is represented by C1-T7, and T10, there is evidence of severe osteoarthritis (without diffuse bone loss), which is shown by marginal lipping, curved spicules around the facets and centrum rims, and microporosity on most of the facets. Given the severity of the arthritic lesions, it is highly probable that this remodeling is a secondary response to some other process. In conclusion, due to the fragmentary nature of the representative material, it is impossible to interpret the lesions associated with this individual.

8F 8-6
Burial 7

This individual, who is tentatively a female, is represented by about 20% fragmentary skeletal material. One lesion is evident on the right acromion process and spine of the scapula. Osteophytes are clearly evident, similar to those that are common to osteoarthritis. This new bone formation leaves an oblique, "scalloped" appearance to the inferior surface. This is most likely due to localized trauma. However, due to the fragmentary nature of the material, this cannot be stated with much certainty.

Conclusions

In conclusion, 24 individuals are represented in the material present for the New Castle site (12Hn1), Mound 4. Only one female is recorded in the report, and this designation is tentative. There are 8 males, one of which is tentative. Nine of the individuals are of unknown sex. Naturally, the 3 children and 3 infants could not be assessed for sex, as they had not yet developed sexually dimorphic characteristics.

Only 15 individuals could be given specific age designations. Five of these individuals are between 17-30. Three individuals are between *in utero*-2 years. Three other individuals are between 2-12 years. The age range of 30-50 years is also represented by three individuals. Only one individual is a juvenile who could be between 2-19 years of age. Therefore, the age range of 17-30 is the most prevalent in the skeletal series.

Osteoarthritis and periostosis were the most frequent pathological abnormalities, but there was difficulty in ascertaining whether these where secondary responses to trauma

or primary responses to age or infectious disease. In conclusion, because of the fragmentary nature of the individuals who were assessed for pathological changes, no statements can be made concerning the general physical health of this sample of the local prehistoric population. There were, however, no patterns of abnormalities that would be indicative of dietary stress, or work related activity recorded in the series.

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Table A
Minimum Number of Individuals for 12Hn1, New Castle Site, Mound 4

	Burial	Individual	Age	Sex	Cremation	Condition
1	1a	1	33.5-45	Male	Mild	90%-Good
2	1a	2	Juvenile <19	Unknown	Severe	10%-Fragmentary
3	1b	1	30-50	Male	Md and Sv	80%-Fair
4	1b	2	Adult ?	Unknown	Md and Sv	10%-Fragmentary
5	1-Bundle 1	1 (c)	24.5-31	Unknown	Severe	35%-Fair
6	1-Bundle 1	2 (d)	22-34	Male	Mild	20%-Good
7	1-Bundle 1	3 (e)	24 ?	Male	Md and Sv	30%-Fragmentary
8	1-Bundle 2	1 (f and g)	42-50	Male	None	60%-Good
9	1-Bundle 2	2 (f and g)	25-29	Male	None	60%-Good
10	1-Bundle 2	3 (f and g)	Adult ?	Male ?	Severe	35%-Fair
11	2	1	17-25	Male	None	85%-Good
12	2	2	Unknown	Unknown	Mild	10%-Fragmentary
13	3	1	Adult ?	Unknown	Mild	35%-Fragmentary
14	5	1 (a)	7-18mnths	**********	Moderate	40%-Fragmentary
15	5	2 (b)	6-11mnths	**********	Severe	20%-Fragmentary
16	5	3 (c)	Adult ?	Unknown	Severe	10%-Fragmentary
17	6	1	4.5-7 years	**********	None	Not present in laboratory
18	7	1	Adult ?	Female?	Md and Sv	20%-Fragmentary
19	8	1	6utero-1 1/2 mnths	**********	None	95%-cranium (+ 7 vert. arches)
20	8	2	Adult ?	Unknown	Md and Sv	2%-Good
21	12	1 (c)	Adult ?	Unknown	Moderate	20%-Fragmentary
22	12	2 (c)	2-6 years	Unknown	Moderate	20%-Fragmentary
23	Unknown	1	<18 (child)	Unknown	Severe	2%-Fragmentary
24	Unknown	1	Unknown	Unknown	None	3 Teeth Only

Table B
MNI Representative of Catalogue Numbers for 12Hn1, New Castle Site, Mound 4

Catalogue Number	Burial Number	MNI
8F 2-1	1a	3
8F 2-2	1a and 1b	2
8F 4-10	1b	2
8F 11-79	1b	1
8F 5-16	1 Bundle 1(c,d,e)	3
8F 11-1	1 Bundle 2(f,g)	3
8F 11-75	1	1
8F 7-10	2	2
10F 1-302	3	1
10F 1-300	5(a,b,c)	1
10F 1-307	5(a,b,c)	2
None	6	1
8F 11-71	7	1
8F 8-3	7	1
8F 8-4	7	1
8F 8-5	7	1
8F 8-6	7	1
10F 1-315	8	1
10F 1-317	8	1
8F 3-5	12(c)	2
8F 3-6	12(c)	2
8F 3-11	12(c)	2
10F 1-281	None	1
57F 1-18/57F 1-19	None	1

Table C
Catalogue Number and Burial Number Correlations

Burial 1

Burial 1a

Catalogue Numbers: 8F 2-1, 8F 2-2, 8F 11-75

Individual 1	Male	33.5-45years
Individual 2	Unknown	<19

Burial 1b

Catalogue Numbers: 8F 4-10, 8F 2-1, 8F 11-79, 8F 2-2

Individual 1	Male	30-50years
Individual 2	Unknown	Adult ?

Burial 1c-e, Bundle 1

Catalogue Number: 8F 5-16

Individual 1c	Unknown	24.5-31
Individual 1d	Male	22-34
Individual 1e	Male	24 ?

Burial 1f-g, Bundle 2

Catalogue Number: 8F 11-1

Individual 1f-g	Male	42-50
Individual 2f-g	Male	25-29
Individual 3f-g	Male ?	Adult ?

Burial 2

Catalogue Number: 8F 7-10

Individual 1	Male	17-25
Individual 2	Unknown	Unknown

Burial 3

Catalogue Number: 10F 1-302

Individual 1	Unknown	Adult ?

Burial 5

Catalogue Numbers: 10F 1-300, 10F 1-307

Individual 1a	Infant	7-18 months
Individual 2b	Infant	6-11 months
Individual 3c	Unknown	Adult ?

Burial 6

No Catalogue Number

Individual 1	Child	4.5-7years

Burial 7

Catalogue Numbers: 8F 11-71, 8F 8-3, 8F 8-4, 8F 8-5, 8F 8-6

Individual 1	Female ?	Adult ?

Burial 8

Catalogue Numbers: 10F 1-315

Individual 1	Infant	6 months in utero-11/2 months

Individual 2	Unknown	Adult ?

Burial 12

Catalogue Numbers: 8F 3-5, 8F 3-6, 8F 3-11

Individual 1c	Unknown	Adult ?
Individual 2c	Child	2-6

Unknown, Newly Found Burial

Catalogue Number: 10F 1-281

Individual 1	Child	<18

Features

Catalogue Numbers: 57F 1-18, 57F 1-19

Individual 1	3 copper stained teeth only

Table D
Non-Metric Variations

Burial Number	Bundle Number	Individual Number			
			Asterionic Bone	***Tympanic Dehiscence***	***Atlas Bridging-Lateral***
1a		1	X		
1b		1	X	X	X
1	1	2			
1	2	1 (f and g)	X	X	X
1	2	2 (f and g)	X		X
2		1			
3					X
			Metopic Suture	***Lambdoid Ossicles***	***2 Foramen-7th C. Vertebra***
1a		1	X	X	X
1b		1		X	X
1	1	2	X		
1	2	1 (f and g)	X		
1	2	2 (f and g)	X		
2		1	X	X	
			Mastoid Foramen	***Parietal Foramen***	***Supraorbital Notch***
1A		1	X		
1B		1	X		
1	1	2			X
1	2	1 (f and g)	X		X
1	2	2 (f and g)	X		X
2		1	X	X	X
			Apical Bone	***Cradle Boarding***	***Supraorbital Foramen***
1a		1		X	X
1b		1			
1	1	2			
1	2	1 (f and g)			
1	2	2 (f and g)	X		
2		1			X
			Sternal Foramen	***Enameloma***	***Extra Facets-Vertebra***
1a		1			
1b		1			X
1	2	1		X	
3			X		

Table E
Paleopathology Summary Table for 12Hn1,
New Castle Site, Mound 4

Catalogue Number	Burial Number	Bundle Number	Individual Number	Pathology
8F 2-1	1A		1	Osteoarthritis
				Periostosis
				Bilateral Spondylolysis
8F 5-16	1	1	1c	Periostosis
8F 11-1	1	2	1(f and g)	Periostosis
				Osteoarthritis
				Periodontal Disease
8F 11-1	1	2	2(f and g)	Sinusitis
				Osteoarthritis
				Periostosis
				Osteporosis
				Dental Abscess
8F 4-10	1B	1		Osteoarthritis
				Periostosis
				Spina Bifida Occulta
				Fracture Rigth MT1
10F 1-302	3			Osteoarthritis
				Exostosis-Clavicle
8F 8-6	7			Trauma to Scapula

APPENDIX E

Chipped Stone Artifact Classifications

Appendix E
Chipped Stone Artifact Classification

Core A core is a nucleus of stone exhibiting one or more negative flake scars (Crabtree 1972:54). Objects categorized as cores may range from a simple nucleus with only one negative flake scar to specialized forms with multiple flake removals. Striking platforms may be prepared or unprepared. Cores can be subdivided into more specific types (cf. Monet-White 1963:6-7; Callahan 1979:41; Wepler and Cochran 1983:38-40).

Biface An artifact with negative flake scars covering both surfaces either partially or wholly is herein termed a biface (Crabtree 1972:38; Tixier 1974:4). As used here, a biface has no modification for hafting and bifaces are viewed as stages in the manufacture of points. In order to avoid confusion, the terms "blank", "blade", and "preform" are not normally applied to bifaces. Blank and preform are general terms that can be applied to a number of manufacturing sequences (e.g., gorget blank or preform, celt blank or preform, etc.). Use of the term blade is restricted to a specific of type flake with parallel sides and a length that is two times greater than width, or a particular portion of a point: the blade element. In the latter case, the term is only used when discussing points. Callahan (1979) separates bifaces into stages or levels of reduction beginning with the selection of the raw material (Stage 1) and continuing through successive levels of refinement (Stages 2, 3, 4, etc.).

Stage 3 Bifaces Stage 3 bifaces represent "that stage (primary thinning) during which a lenticular cross-section is obtained by means of striking so as to drive flakes from the edge to or slightly beyond the center of the biface, contacting or slightly undercutting similar flake scars taken from the opposite margin. . . . Aligned, centered edge-angles of between 40 and 60 degrees should result so that secondary thinning may be effected subsequently" (Callahan 1979:37).

Stage 4 Bifaces Stage 4 bifaces represent "that stage (secondary thinning) in which a flattened cross-section is obtained by means of striking flakes so that they considerably undercut prior flake scars from the opposite margin and so that the width/thickness ratio is made to fall between roughly 4.00 and 5.00 or more. Aligned, centered edge-angles of between 25 and 45 degrees and surfaces without significant humps, hinges, step-fractures, or median convexity. . ." (Callahan 1979:37).

Biface Fragment Biface fragments consist of various portions of bifaces broken either during manufacture or through use.

Flake A flake is "any piece of stone removed from a larger mass by the application of force - either intentional, accidentally, or by nature" (Crabtree 1972:64).

Unmodified Flakes Artifacts in this class have one or more positive or negative flake attributes (Watson 1956:17; Oakley 1957:16). Flake margins show no evidence of use or retouch.

Notch Flakes A notch flake is "the result of pressure flaking to remove notches along the basal and/or lateral margins of a biface in order to create a hafting element" (Austin 1986:96). They are defined as having "a peculiar half-cone shape" (Waldorf 1984:35) that makes them distinctive. "The most recognizable and distinctive characteristic of the flake is the presence of a recessed, U-shaped platform. While most flakes exhibit a relatively straight, continuous margin at the juncture of the striking platform and dorsal flake surface, the notching flake is typified by a deep, semi-circular scallop which is the result of prior notching" (Austin 1986:96).

Block Flakes Block flakes are sharp-edged, irregularly shaped pieces of isotropic stone that lack a striking platform, a positive or negative bulb of percussion, compression rings, or any other attribute associated with conchoidal fracture. Block flakes may occur naturally through frost cracking or uncontrolled heating (Watson 1956:19-21: Oakley 1956:9-11). They can also be produced during chipped stone reduction where the raw material has been exposed to either of the above processes or when the material breaks along internal planes of weakness. In an archaeological assemblage, block flakes would occur in greater percentages where early stages of reduction occurred.

Edge Modified Flakes Edge modified flakes are unspecialized flake tools distinguished by regular edge wear or retouch. The former is most often recognized as a continuous row of small flakes removed along one flake edge. Flake margins can be modified during cultivation of a site, by lake shore erosion, spontaneous retouch during lithic reduction, and a variety of other natural and mechanical processes. Retouched flakes can represent one resharpening of a dulled flake margin to conservation of a flake through extensive resharpening. objects in this class are usually not morphologically distinct, and the class encompasses a wide range of diversity in size, shape, and construction of the retouched edge or edges. It is not normally possible to distinguish between prehistoric utilization and edge damage resulting from other causes without microscopic examination of all flake margins. For this classification, all flakes with regular edge modification were sorted into this class.

Blades A blade is a specialized flake that has more-or-less parallel sides and is at least twice as long as it is wide. Thickness varies little along the length of the blade. Blades also have straight, parallel, or converging ridges on the dorsal surface (Movius et al. 1968:4; Crabtree 1972:42)

Gravers A flake, blade or other artifact that exhibits one or more small sharp points (graver spurs) intentionally retouched from one or more margins of the artifact is classified as a graver (Crabtree 1972:68: Nero 1957:300). The retouching that isolates the graver spur may be unifacial or bifacial.

Denticulate Artifacts in this class are distinguished by a toothed or serrated edge created by the alternating removal of a series of flakes from the margin of a flake, biface or core (Crabtree 1972:58). Cores with unprepared platform edges and nonmarginal areas of applied force may exhibit "denticulate" edges but are not included in this class.

Endscraper Endscrapers are a morphologically distinct unifacial tool form resulting from the concentration of retouch on one end of a flake or blade (Crabtree 1972:60; Movius et al. 1968:9).

Point A point is "any bifacially flaked, bilaterally symmetrical, chipped stone artifact exhibiting a point of juncture on one (distal) end and some facility (notching, constriction, lateral grinding) for hafting on the opposite (proximal) end. Thus, *point* is a morphological defined class of chipped stone tool, and the term . . . does not convey any particular functional interpretation" (Ahler and McMillan 1976:165).

Point Fragments Broken portions of points are sorted into this category. Hafting elements from broken points are, however, when distinctive, classified as points.

Perforator "Bifacially chipped stone artifacts or artifact fragments with extremely narrow, parallel-sided blades and steep angled lateral edges are classified as perforators" (Ahler and McMillan 19766:179). Perforators are equivalent to artifacts frequently referred to as drills. Perforator is herewith preferred due to the more generalized suggestion of function as a piercing tool. Some artifacts in this class may represent exhausted cutting tools.

Bipolar Artifacts This category includes those artifacts that are the result of bipolar flaking. Bipolar flaking involves resting a stone nucleus on an anvil and striking the nucleus with a hammerstone or billet (Flenniken 1982:32). The artifacts that result from bipolar flaking include bipolar cores (Hayden 1980:23), bipolar flakes (Kobuyashi 1975), and pieces esquillees (Hayden 1980:2-3). Bipolar cores exhibit opposing striking platforms of several types (Binford and Quimby 1964) and prominent negative flake scars. Bipolar flakes consist of the flakes detached during bipolar flaking. *Pieces esquilles* are similar to bipolar cores except that they exhibit opposing ridge striking platforms and lack prominent negative flake scars; pieces esquillee tend to be rectangular while bipolar cores may exhibit any number of forms.

There is confusion in the archaeological literature in the use of the terms "bipolar core" and "*pieces esquillee*". Some investigators use them interchangeably while others designate all bipolar nuclei as *pieces esquillee* (Hayden 1980). For the purposes of this classification, all bipolar artifacts are grouped under the single heading "bipolar artifact".

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APPENDIX F

Shovel Probe Descriptions

Appendix F Shovel Probes			
Shovel Probe #	A-horizon	B-horizon	Artifacts
1	10YR 6/4 silt loam 0 to 9 cm	10YR 4/4 clay loam 9+ cm	None
2	10YR 3/3 loam 0 to 9 cm	10YR 4/4 gravelly clay loam 9+ cm	None
3	10 YR 3/3 silt loam 0 to 10 cm	10 YR 4/4 clay loam 10+ cm	None
4	10YR 2/1 silt loam 0 to 3 cm	10YR 3/4 gravelly clay loam 3+ cm	None
5	10YR 3/3 silt loam 0 to 9 cm	10YR 4/6 gravelly sandy loam 9+ cm	None
6	10YR 6/4 gravelly silt loam 0 to 9 cm	10YR 4/4 clay loam 9+ cm	None
7	10YR 3/3 gravelly silt loam 0 to 14 cm	10YR 4/4 gravelly clay loam 14+ cm	None
8	10YR 3/3 silt loam 0 to 14 cm	10YR 4/4 silt loam 14+ cm	2 FCR
9	10YR 2/2 silt loam 0 to 27 cm	10YR 4/4 silt loam 27+ cm	1 container glass base, aqua - embossed "APRIL"
10	10YR 3/3 silt loam 0 to 13 cm	10YR 4/4 silt loam 13+ cm	None
11	10YR 4/4 silt loam 0 to 21 cm	10YR 6/4 silt loam 21+ cm	5 FCR
12	10YR 2/2 silt loam 0 to 22 cm	10YR 5/4 silt loam 22+ cm	None
13	10YR 2/2 gravelly silt loam 0 to 21 cm	10YR 3/6 gravelly silt loam 21+ cm	None
14	10YR 3/2 gravelly silt loam 0 to 19 cm	10YR 4/3 gravelly loam 19+ cm	1 unmodified flake (Attica), 2 FCR
15	10YR 3/2 gravelly loamy sand 0 to 15 cm	10YR 4/3 gravelly sandy loam 15+ cm	1 FCR
16	10YR 4/4 silt loam 0 to 3 cm	10YR 4/6 silt loam 3+ cm	None

17	10YR 3/3 sandy clay loam 0 to 14 cm	10YR 4/4 silt loam 14+ cm	1 unmodified flake (Wyandotte - HD), 3 FCR
18	10YR 3/3 silt loam 0 to 12 cm	10YR 4/4 clay loam 12+ cm	1 unmodified flake (Wyandotte)
19	10YR 3/3 sandy loam 0 to 16+ cm	10YR 4/4 sandy loam 16+ cm	None
20	10YR 2/2 silt loam 0 to 3 cm	10YR 5/4 silt loam 3+ cm	1 cellophane wrapper
21	10YR 3/3 silt loam 0 to 12 cm	10YR 5/4 silt loam 12+ cm	None
22	10YR 3/3 sandy loam 0 to 11 cm	10YR 4/4 sandy loam 11+ cm	None
23	10YR 2/2 silt loam 0 to 9 cm	10YR 4/6 silt loam 9+ cm	None
24	10YR 3/3 silt loam 0 to 11 cm	10YR 5/4 silt loam 11+ cm	1 FCR
25	10YR 3/3 silt loam 0 to 19 cm	10YR 4/4 silt loam 19+ cm	None
26	10YR 2/2 silt loam 0 to 9 cm	10YR 5/4 sandy loam 9+ cm	None
27	10YR 3/3 silt loam 0 to 14 cm	10YR 5/4 silt loam 14+ cm	None
28	10YR 3/3 silt loam 0 to 23 cm	10YR 5/4 silt loam 23+ cm	1 unmodified flake (Fall Creek - HT), 1 FCR
29	10YR 3/4 silt loam 0 to 11 cm	10YR 4/4 silt loam 11 to 23 cm	None
30	10YR 3/2 gravelly silt loam 0 to 17 cm	10YR 5/4 gravelly silt loam 17+ cm	None
31	10YR 3/3 silt loam 0 to 13 cm	10YR 5/4 silt loam 13+ cm	None
32	record lost		None
33	10YR 3/3 silt loam 0 to 15 cm	10YR 4/4 silt loam 15+ cm	None
34	10YR 3/3 silt loam 0 to 14 cm	10YR 4/4 loam 14+ cm	None
35	10YR 3/2 0 to 12 cm	10YR 4/2 12+ cm	None

36	10YR 4/2 0 to 10 cm	10YR 4/4 10+ cm	None
37	10YR 3/2 0 to 14 cm	10YR 4/4 22+ cm	2 FCR
38	10YR 3/2 0 to 18 cm	10YR 4/4 18+ cm	None
39	10YR 3/2 0 to 15 cm	10YR 4/4 15+ cm	1 FCR
40	10YR 3/3 silt loam 0 to 12 cm	10YR 5/4 silty clay loam 12+ cm	None
41	10YR 3/2 silt loam 0 to 14 cm	10YR 4/4 gravelly silt loam 14+ cm	None
42	10YR 2/2 0 to 12 cm	10YR 3/2 22+ cm	1 FCR
43	10YR 3/2 0 to 10 cm	10YR 4/3 10+ cm	None
44	10YR 3/2 0 to 13 cm	10YR 4/2 13+ cm	1 FCR
45	10YR 3/3 silt loam 0 to 15 cm	10YR 4/4 silt loam 15+ cm	None
46	10YR 3/3 silt loam 0 to 17 cm	10YR 4/3 silt loam 17+ cm	None
47	10YR 3/3 sandy clay loam 0 to 15 cm	10YR 4/4 sandy clay loam 15+ cm	None
48	10YR 3/3 silt loam 0 to 12 cm	10YR 4/4 silt loam 22+ cm	None
49	10YR 4/2 silt loam 0 to 13 cm	10YR 4/4 silt loam 13+ cm	None
50	10YR 3/3 gravelly loam 0 to 21 cm	10YR 3/3 gravelly clay loam 21+ cm	None
51	10YR 3/2 silt loam 0 to 17 cm	10YR 4/4 silt loam 17+ cm	None
52	10YR 3/3 silt loam 0 to 20 cm	10YR 4/3 silt loam 20+ cm	1 FCR
53	10YR 3/2 sandy loam 0 to 20 cm	10YR 4/3 loam 20+ cm	1 FCR
54	10YR 3/3 silt loam 0 to 19 cm	10YR 5/4 loam 19+ cm	None

55	10YR 3/3 silt loam 0 to 18 cm	10YR 4/4 silt loam 18+ cm	None
56	10YR 3/2 silt loam 0 to 25+ cm	10YR 4/4 silty clay loam 25+ cm	1 unmodified flake (Laurel -HD)
57	10YR 3/3 silt loam 0 to 17 cm	10YR 4/4 silt loam 17+ cm	None
58	10YR 3/3 silt loam	10YR 4/3 silt loam	None
59	10YR 3/3 silt loam 0 to 20 cm	10YR 5/4 loam 20+ cm	None
60	10YR 3/3 silty clay loam 0 to 13 cm	10YR 5/4 silty clay loam 13+ cm	None
61	10YR 3/3 silty clay loam 0 to 15 cm	10YR 5/4 silty clay loam 15+ cm	None
62	10YR 4/2 silty clay loam 0 to 15 cm	10YR 4/4 silty clay loam 15+ cm	None
63	10YR 4/2 silty clay loam 0 to 28 cm	10YR 4/4 silty clay loam 28+ cm	None
64	10YR 4/2 silty clay loam	10YR 4/4 gravelly silty clay loam - 24+ cm	None
65	10YR 4/2 silt loam 0 to 16 cm	10YR 5/4 silty clay loam	None
66	10YR 4/2 silty clay loam 0 to 19 cm	10YR 5/4 silty clay loam 19+ cm	1 unmodified flake (unknown), 1 FCR
67	10YR 4/2 silty clay loam 0 to 15 cm	10YR 4/4 silty clay loam 15+ cm	1 metal disk, corroded
68	10YR 3/3 silty clay loam 0 to 29 cm	10YR 4/4 silty clay loam 29+ cm	None
69	10YR 4/3 silt loam 0 to 18 cm	10YR 5/4 silt loam 18+ cm	None
70	10YR 3/3 silty clay loam 0 to 18 cm	10YR 4/4 silty clay loam 18+ cm	None
71	10YR 3/3 silty clay loam 0 to 20 cm	10YR 4/3 silty clay loam 20+ cm	None
72	10YR 3/3 silty clay loam 0 to 31 cm	10YR 4/4 silty clay loam 31+ cm	None
73	10YR 3/2 silty clay loam 0 to 15 cm	10YR 4/3 silty clay loam 15+ cm	1 pottery sherd (body - plain, grit temper), 1 FCR

74	10YR 4/2 silt loam 0 to 18 cm	10YR 4/4 silty clay loam 18+ cm	None
75	10YR 3/2 silt loam 0 to 16 cm	10YR 4/4 silty clay loam 16+ cm	None
76	10YR 3/3 silty clay loam 0 to 16 cm	10YR 4/4 silty clay loam 16+ cm	1 other chipped stone, 1 FCR
77	10YR 4/2 silty clay loam 0 to 28 cm	10YR 4/4 silty clay loam 28+ cm	None
78	10YR 3/2 silty loam 0 to 15 cm	10YR 5/4 silty clay loam 15+ cm	None
80	10YR 3/2 silty clay loam 0 to 25 cm	10YR 4/4 silty clay loam 25+ cm	Disturbed. 1 container glass frag.-aqua
81	10YR 3/2 silty clay loam 0 to 11 cm	10YR 4/4 silty clay loam 11+ cm	Disturbed. Concrete
82	10YR 3/2 silty clay loam 0 to 22 cm	10YR 4/4 silty clay loam 22+ cm	1 milk glass frag.
83	10YR 3/3 silt loam 0 to 21 cm	10YR 4/4 silty clay loam 21+ cm	2 zinc canning jar lids
84	10YR 3/3 silty clay loam 0 to 37 cm	10YR 4/3 silty clay loam 37+ cm	None
85	10YR 3/3 silty clay loam 0 to 31 cm	10YR 4/3 silty clay loam 31+ cm	None
86	10YR 3/3 silty clay loam 0 to 24 cm	10YR 4/3 silty clay loam 24+ cm	None
87	10YR 3/3 silt loam 0 to 33 cm	10YR 4/3 silty clay loam 33+ cm	None
88	10YR 3/3 silty clay loam 0 to 27 cm	10YR 5/4 silty clay loam 27+ cm	1 unmodified flake (Fall Creek), 1 FCR, 1 milk glass canning lid liner frag.
89	10YR 3/2 silt loam 0 to 22 cm	10YR 5/4 silty clay loam 22+ cm	2 square head nails - corroded, 13 metal can frags. - corroded
90	10YR 3/3 silty clay loam 0 to 32 cm	10YR 4/4 silty clay loam 32+ cm	1 container glass frag. - clear
91	10YR 3/3 silt loam 0 to 6 cm	10YR 4/3 clay loam 6+ cm - mottled with 10YR 5/6	Disturbed. 1 milk glass frag.

92	10YR 3/3 silt loam 0 to 17 cm	10YR 5/4 silt loam 17+ cm	2 milk glass canning lid liner frag.
93	10YR 4/2 silt loam 0 to 17 cm	10YR 4/3 silt loam 17+ cm	1 FCR
94	10YR 3/3 silt loam 0 to 19 cm	10YR 4/3 silt loam 19+ cm	5 milk glass canning lid liner frags., 1 slag
95	10YR 3/3 silt loam 0 to 19 cm	10YR 5/4 silt loam 19+ cm	1 unmodified flake (Laurel - HT), 2 FCR, 1 slag
96	10YR 3/3 silt loam 0 to 20 cm	10YR 5/4 silt loam 20+ cm	3 FCR
97	10YR 3/3 silt loam 0 to 21 cm	10YR 5/4 silt loam 21+ cm	2 FCR, 1 animal bone, 42 milk glass canning lid liner frags.
98	10YR 3/3 silt loam 0 to 19 cm	10YR 5/4 silt loam 19+ cm	None
99	10YR 3/3 silt loam 0 to 21 cm	10YR 5/4 silt loam 21+ cm	None
100	10YR 3/3 silt loam 0 to 23 cm	10YR 5/4 silt loam 23+ cm	None
101	10YR 3/2 silt loam 0 to 8 cm	10YR 4/3 gravelly clay	Disturbed. None
102	10YR 3/3 silt loam 0 to 26 cm	10YR 5/4 silt loam 26+ cm	None
103	10YR 3/3 silt loam 0 to 27 cm	10YR 4/4 silt loam 27+ cm	None
104	10YR 3/3 silt loam 0 to 27 cm	10YR 5/4 silt loam 27+ cm	None
105	10YR 3/3 silt loam 0 to 21 cm	10YR 5/4 silt loam 21+ cm	2 milk glass canning lid liner frags.
106	10YR 3/3 gravelly silt loam 0 to 20 cm	10YR 3/2 silt loam 20+ cm - mixed with cinders	Disturbed. None
107	10YR 3/3 clay loam 0 to 4 cm	10YR 4/4 gravelly clay loam 4+ cm - mottled with 10YR 4/3	Disturbed None
108	10YR 3/3 gravelly silt loam 0 to 9 cm	10YR 4/4 gravelly loam 9+ cm	Disturbed? None

109	10YR 3/3 gravelly silt loam 0 to 18 cm	10YR 4/4 gravelly clay loam 18+ cm	Disturbed? 1 container glass frag.-clear
110	10YR 3/3 silt loam 0 to 22 cm	10YR 4/3 silt loam 22+ cm	None
111	10YR 3/3 silty clay loam 0 to 18 cm	10YR 4/4 silt loam 18+ cm	Disturbed? 1 slag
112	10YR 3/3 silt loam 0 to 22 cm	10YR 4/3 silt loam 22+ cm	1 field tile frag.
113	10YR 3/2 silt loam 0 to 30 cm	10YR 4/3 silt loam 30+ cm	None
114	10YR 3/3 silt loam 0 to 9 cm	10YR 4/3 silt loam 9+ cm - mottled with 10YR 5/4	Disturbed 1 concrete, 9 slag
115	10YR 3/3 silt loam 0 to 18 cm	10YR 4/4 silt loam 18+ cm	None
116	10YR 3/3 silty clay loam 0 to 28 cm	10YR 4/4 silty clay loam 28+ cm	1 brick frag.
117	10YR 3/4 silty clay loam 0 to 21 cm	10YR 4/4 silty clay loam 21+ cm	None
118	10YR 3/3 silt loam 0 to 16 cm	10YR 4/3 silt loam 16+ cm	None
119	10YR 3/3 silt loam 0 to 14 cm	10YR 4/6 silty clay loam 14+ cm	None
120	10YR 3/3 silt loam 0 to 27 cm	10YR 4/3 silty clay loam 27+ cm	None
121	10YR 3/3 silt loam 0 to 21 cm	10YR 4/6 silt loam 21+ cm	None
122	10YR 3/2 silt loam 0 to 23 cm	10YR 4/3 silty clay loam 23+ cm	None
123	10YR 3/3 silty clay loam 0 to 20 cm	10YR 4/3 silty clay loam 20+ cm	None
124	10YR 3/3 silty clay loam 0 to 18 cm	10YR 4/4 silty clay loam 18+ cm	1 container glass frag. - aqua
125	10YR 3/3 silty clay loam 0 to 15 cm	10YR 4/4 silty clay loam 15+ cm	None
126	10YR 3/3 silty clay loam 0 to 19 cm	10YR 4/4 silty clay loam 19+ cm	None

127	10YR 4/4 silty clay loam 0 to 15 cm	10YR 4/6 silty clay loam 15+ cm	None
128	10YR 3/3 silt loam 0 to 18 cm	10YR 4/4 silty clay loam 18+ cm	1 unmodified flake (Fall Creek)
129	10YR 3/3 silt loam 0 to 22 cm	10YR 4/4 silty clay loam 22+ cm	3 unmodified flakes (1 Burlington, 1 Jeffersonville, 1 Laurel)
130	10YR 3/3 silty clay loam 0 to 24 cm	10YR 4/3 silty clay loam 24+ cm	1 unmodified flake (Wyandotte)
131	10YR 3/3 silty clay loam 0 to 17 cm	10YR 4/4 gravelly silty clay loam, 17+cm	None
132	10YR 3/3 silty clay loam 0 to 16 cm	10YR 4/6 gravelly silty clay loam, 16+ cm	None
133	10YR 3/3 silty clay loam 0 to 18 cm	10YR 4/4 silty clay loam 18+ cm	None
134	10YR 4/3 silt loam 0 to 21 cm	10YR 5/4 silty clay loam 21+ cm	None
135	10YR 3/3 silt loam 0 to 20 cm	10YR 4/4 silty clay loam 20+ cm	2 unmodified flakes (1 Laurel, 1 Laurel - HT)
136	10YR 3/2 silty clay loam 0 to 14 cm	10YR 4/4 silty clay loam 14+ cm	None
FCR - fire-cracked rock HT - heat treated HD - heat damaged			

APPENDIX G

Phosphate Analysis

by
Nikki Waters

INTRODUCTION

In November of 1998, test excavations of the New Castle earthwork complex were begun. The primary goal of these excavations was to learn more about the extent, nature and significance of the prehistoric activities that took place in and around the earthworks (McCord 1999:1). In order to meet this goal, test units were excavated into several of the earthworks, and a systematic shovel probe survey was undertaken in sections of the remaining portions of the site.

ARCHAEOLOGICAL APPLICATIONS

Soil phosphate analysis has been extremely useful in archaeology. For example, phosphate analysis has proven to be a practical and relatively inexpensive means of large-scale chemical survey (Solecki 1950:256; Spoerry 1992:72). Soil phosphate surveys can therefore be used in preliminary site identification and evaluation with a minimal impact on budget.

Phosphate analysis has also provided information not available through other techniques. For example, the organic components of prehistoric occupation debris (the primary evidence that a particular landscape was ever used) rarely survive. It has been estimated that the materials recovered archaeologically represent less than 10% of the original cultural deposit (Hastorf 1998; Scudder 1996:57; Schiffer 1987:163-164). Although the high decay rate of organic remains would appear to limit their accessability to archaeologists, this limit is not absolute. Through chemical analysis, the components of these remains (such as phosphates) can still be identified. Phosphate analysis can therefore be used to identify sites which otherwise might not be recognizable (Cavanagh et al. 1988:81-83; Eidt 1977:1327; Renfrew and Bahn 1991:87).

Phosphate analysis can also be used to prevent the misinterpretation of archaeological sites based on a lack of recognizable or observed artifacts or features. For example, although no cultural features were identified from strata 17 and 21 of a tell at Sitagroi in north-eastern Greece, phosphate analysis of the soil indicated that these strata were occupied by humans. As a result, archaeologists concluded that despite more "traditional" evidence to the contrary, this tell had not been abandoned (Davidson 1973:146).

Phosphate analysis can also be used to more accurately determine the spatial distribution of human settlements (Cavanagh et al. 1988:83). Commonly, artifact distributions are used to delineate site limits, but this technique is problematic. First, as mentioned before, approximately 90% of material culture decays prior to archaeological recovery. As a result, site size may not be accurately represented by the modern distribution of artifacts. Second, not all artifacts will be present on the surface of a site; many will be buried. Surface visibility will also limit the ability of the archaeologist to effectively define the limits of a site based on surface artifact distribution alone (Schiffer 1983:345). The relatively simple chemical analysis of soil phosphate levels is often a more accurate and effective means of accomplishing the same task.

Soil phosphate analysis can also be used as an additional method for dating archaeological deposits. For example, analysis of the vertical distribution of phosphate anomalies can be used to establish the relative ages of settlements within a site (Eidt 1977:1332; Lillios 1992:495).

Phosphate analysis can also provide information concerning feature function, different activity areas within a site, intensity of occupation, season of occupation, population size, diet and subsistence, and the locations of sites and burials where more conventional archaeological indicators--such as artifacts and features--are no longer present. For example, archaeological studies have shown that soils in areas of intensive human occupation can contain as such as 50 times the proportion of phosphate as the normal, background soils (Davidson 1973:143; Lillios 1992:501; Solecki 1950:255).

Body waste, burials and refuse will all also leave different "phosphate signatures" behind. These signatures can then be used to identify different activity areas. For example, phosphate anomalies produced by the deposition of animal food remains and bones can be used to separate butchering locations, food caches or middens from sleeping areas. Phosphate anomalies produced by the decay of human remains can be used to identify battleground or cemeteries (Eidt 1984:29 and 1977:1328). In 1948, Ralph Solecki used phosphate analysis at an Adena burial mound. The elevated phosphate levels recorded from features lacking extant skeletal material demonstrated that burials had once been present, but had since decayed. Without this technique, Solecki would have underestimated the number of burials on the site (Solecki 1950:255).

LIMITATIONS

A successful soil phosphate analysis must be undertaken with an appropriate sampling strategy (Cavanagh et al. 1988:67; Conway 1983:118-119). Both field collection and laboratory technique must fit within a well-organized research design in order to insure that the questions asked of the data are appropriate.

Background phosphate levels for the survey area must also be established. Often this is done with the collection of control samples taken outside of the site boundary. This will enable the analyst to determine when a measured soil phosphate level represents a culturally produced anomaly and when the level is normal. A background survey should include comparison of the soil chemical properties, leaching rate, types of parent material and the land-use history (Griffith 1980:328).

Sources of modern contamination or alteration must also be accounted for. Activities such as borrowing or fertilization can alter the phosphate levels in the soil, which could result in misinterpretation. All of these factors must be accounted for before any analysis or interpretation of a soil phosphate survey can be made (Walker 1992:67-68).

RESEARCH OBJECTIVES

Since the majority of cultural materials decay prior to archaeological recovery (see, for example, Schiffer 1987:163-164; Scudder 1996:57; Hastorf 1998), a soil phosphate survey was performed to test for the presence of anthrosols[1] in the shovel probed regions. Evidence for utilization of these areas would be critical since the prevailing model of earthwork utilization in east-central Indiana--which describes these sites as Adena/Hopewell ceremonial complexes--does not include the use of the landscapes between the earthworks themselves (McCord 1998:18). Since evidence of prehistoric activity is not always preserved on archaeological sites (Broadbent 1981; Bullard 1985; Eidt 1984, 1985; Farrand 1975; Lippi 1988; Mora 1991), identification, classification and interpretation of archaeological sites cannot be based on extant artifact distribution alone (Brown 1998; Drooker 1998). In addition, the lack of prehistoric utilization of the areas between east-central Indiana earthworks is only a hypothesis. Due to low artifact recovery rates (McCord 1998:39), earthwork use is considered extremely specialized with activities restricted to the earthworks themselves. As a result, the areas surrounding or between the earthworks at the New Castle site have largely been ignored (McCord 1999:1), and test excavations of these interlying areas have never been conducted. As a result, the artifact density and distribution of these areas is unknown.

DESCRIPTION OF SOILS IN THE PROJECT AREA

The New Castle site is on the nearly level, well drained Eldean silt loam, 0% to 2% slopes (EdA); and the strongly sloping, deep, well drained Losantville silt loam, 12% to 18% slopes, eroded (LeD2)(Hillis and Neeley 1987:17-24, map sheet 28). Eldean silt loam (EdA) forms on broad outwash plains and terraces along glacial meltwater streams. Also included in this mapping unit are small areas of the somewhat poorly drained Sleeth soils, found in slightly lower landscape positions, and small areas of the very poorly drained Westland soils in depressions. These soils include 5 to 10% of the total mapping unit. The native vegetation most common to Eldean silt loam is hardwoods (Hillis and Neeley 1987:17).

Losantville silt loam (LeD2) forms on irregularly shaped knolls and narrow elongated breaks along drainageways and depressions on moraines. Also included in this mapping unit are numerous small areas of severely eroded soils in which the clay loam subsoil has been exposed. These soils include 5 to 10% of the total mapping unit. The native vegetation most common to Losantville silt loam is mixed woods and pasture (Hillis and Neeley 1987:24-25).

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[1]Anthrosols are defined as soils modified through human activity (Eidt 1977).

METHODS

Field

A total of 136 shovel probes were laid out at ten meter intervals around and between the New Castle earthworks (Figure 1). All shovel probes were excavated to subsoil and screened through 1/4" mesh. In addition, soil samples for phosphate analysis were collected from the A soil horizon of each probe and stored in plastic bags. Soil samples for phosphate analysis were not screened.

Laboratory

Labware Preparation

All glassware, plasticware and storage racks were acid washed prior to use in a 10% hydrochloric acid solution. Labware was then rinsed in fresh tapwater and rinsed again in deionized water, and allowed to air dry on drying paper. Labware in need of reuse during the analysis was acid washed again between samples.

Soil Sample Preparation

Soil samples were laid out on clean plastic bags and allowed to air dry at room temperature. Once dry, they were picked through with clean tweezers and obvious intrusions such as roots were removed. Each sample was then ground with a ceramic mortar and pestle until all aggregates were broken down and the sample was then screened through 2 mm mesh. All equipment was cleaned with tap water and thoroughly dried between samples. A digital scale was then used to weigh out 1.0 g of soil from each sample for phosphate analysis.

Phosphorous Testing Method

The Bray P-1 Soil Test for Phosphorous was used for this analysis. The Bray soil procedure tests for adsorbed phosphorous, and was first published in 1945 by Roger H. Bray and L. Touby Kurtz of the Illinois Agricultural Experiment Station. This procedure is used by all state soil testing agencies within the North Central Region (Figure 2), with the exception of North Dakota. The Bray P-1 soil test for phosphorous has been proven to work effectively on acid and neutral soils. Although the Bray P-1 test can be performed with several different reducing agents, the ascorbic acid method was utilized for this analysis (Knudsen and Beegle 1988:12). In order to minimize error, all samples were run through each step concurrently before proceeding to the next.

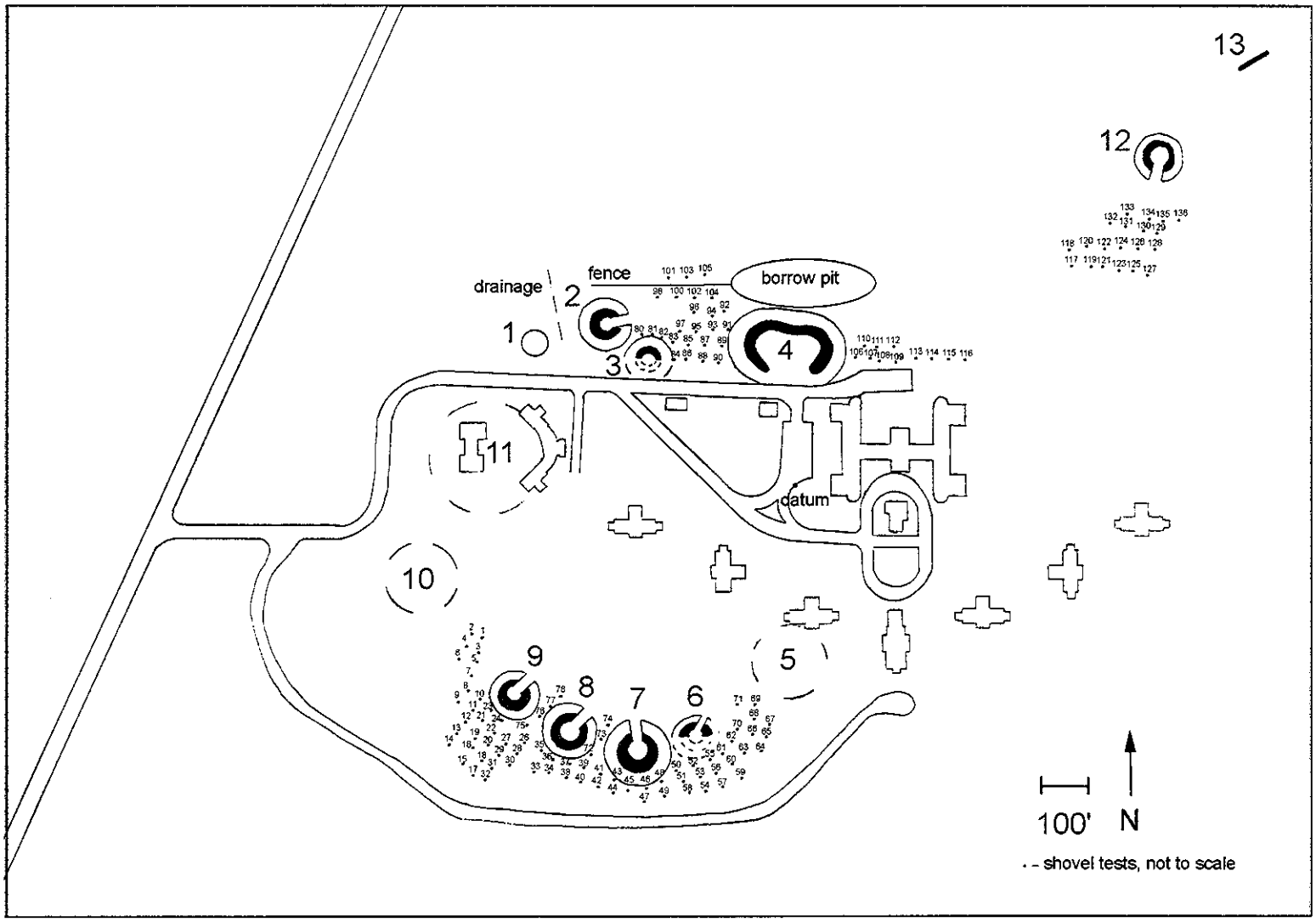

Figure 1. Location of the shovel test probes.

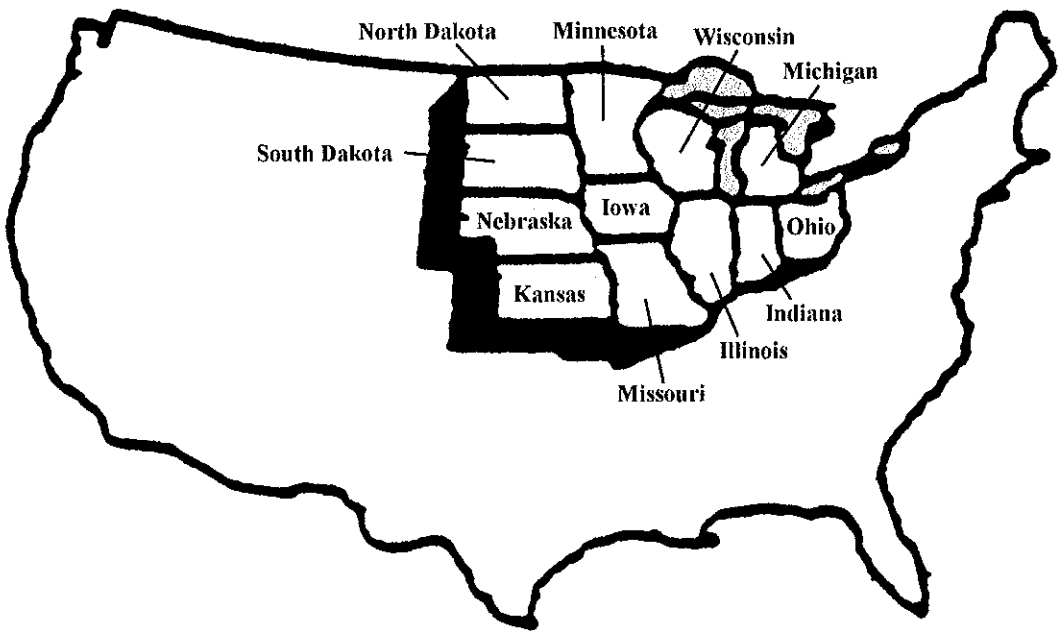

Figure 2. The North Central Region.

Extraction

Measured soil samples of 1.0 g each were placed into acid washed plastic centrifuge tubes and 10 ml of extractant solution[2] was added. Once this solution had cleared, 1.455 g of antimony potassium tartrate was added, followed by 700 ml of concentrated sulfuric acid. This solution was then cooled and diluted to a final volume of 1000 ml.

The centrifuge tubes were securely capped and the resulting soil mixture was mechanically shaken for five minutes and centrifuged for ten minutes, or until the soil/extractant solution was clear. A 2 ml pipette was used to remove 2 ml of the resulting leachate, which was placed into acid washed test tubes. Eight milliliters of working solution[3] was then added, and the mixture was allowed to sit for 15 minutes to allow for full color development. A series of 8 blanks were also prepared as controls (see Tables 1 and 2). Blanks were prepared as above, except the extractant was substituted for the leachate.

Once color had developed, the solutions were transferred to acid washed colorimetric cuvettes and the percent transmittance at 880 nm was read. In order to minimize error, blanks were rechecked before every ten readings, and all cuvettes were cleaned with chemwipes prior to each reading to remove surface moisture or other residue (such as fingerprints) which could interfere with the transmittance. Since the number of samples was so large, and the color stability of the blanks is limited, a second series of blanks was prepared for the second half of the samples, and the spectrometer was re-calibrated accordingly.

RESULTS

Since the disturbed nature of the New Castle site did not allow for the collection and analysis of background soil samples[4], only those samples showing extremely high levels of soil phosphates (5.0 ppm or above) were analyzed further.

One area of extreme phosphate concentration--possibly indicative of prehistoric human activity--was identified (Figure 3). This area was roughly between Earthworks 8 and 9, and to the south of Earthworks 7, 8 and 9. Although flakes and FCR were also recovered in this general area, the majority of shovel probes indicating high levels of soil phosphates did not produce such "classic" artifactual evidence (Figure 4). This would suggest that information critical to

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[2] The extractant solution consisted of an acid molybdate stock solution, prepared by dissolving 60 g ammonium molybdate, $(NH_4)_6Mo_7O_{24} * 4H_2O$ in 200 ml of distilled water.

[3] The working solution was prepared by adding 25 ml of acid molybdate stock solution to 800 ml of distilled water. This solution was thoroughly mixed, and 10 ml of ascorbic acid stock solution was added, to equal a final volume of 1000 ml.

[4] Background soil samples are used in phosphate analysis to determine the range of naturally occurring soil phosphate levels for the area under study (Griffith 1980:328).

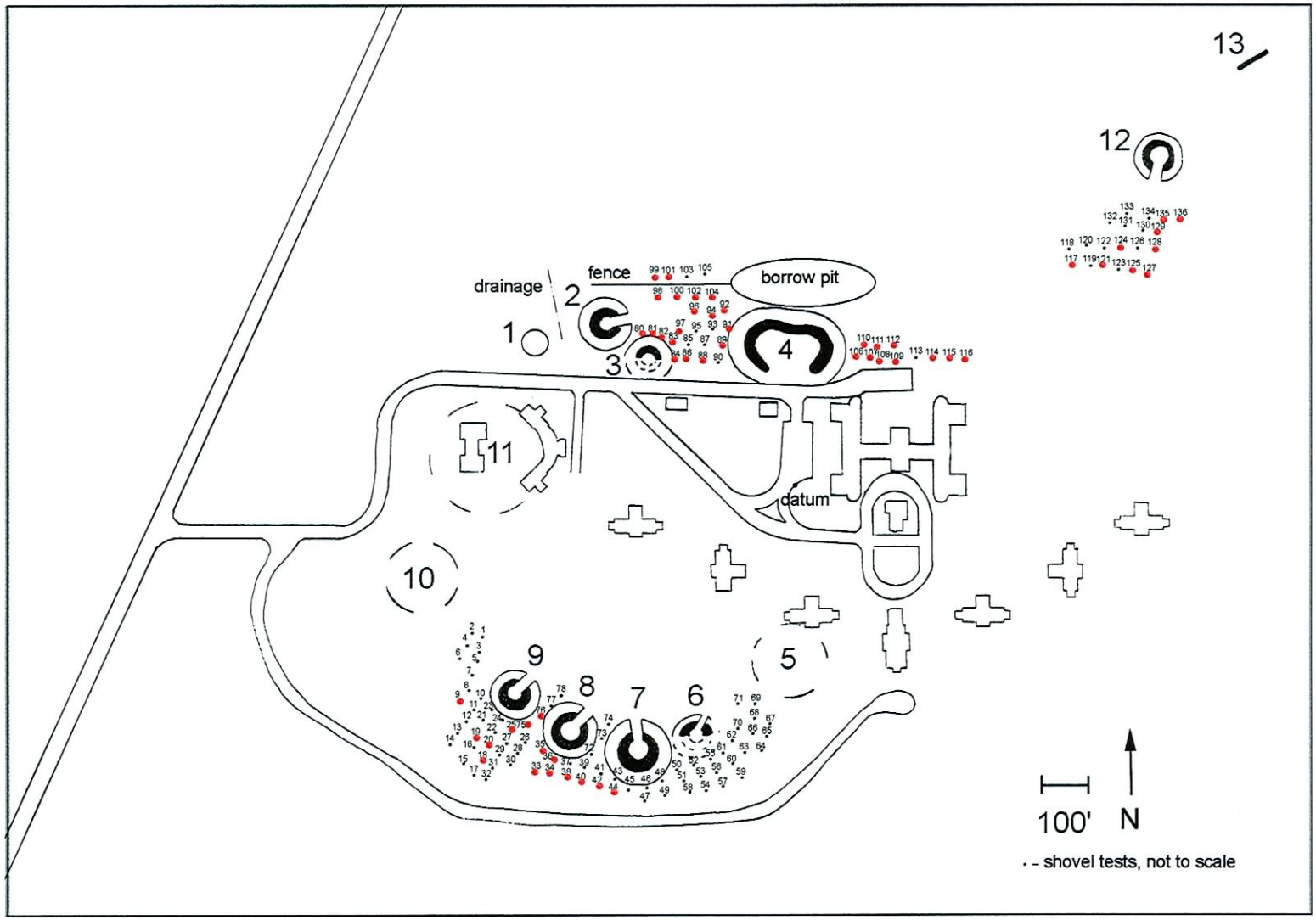

Figure 3. Distribution of phosphate levels 5 ppm and higher.

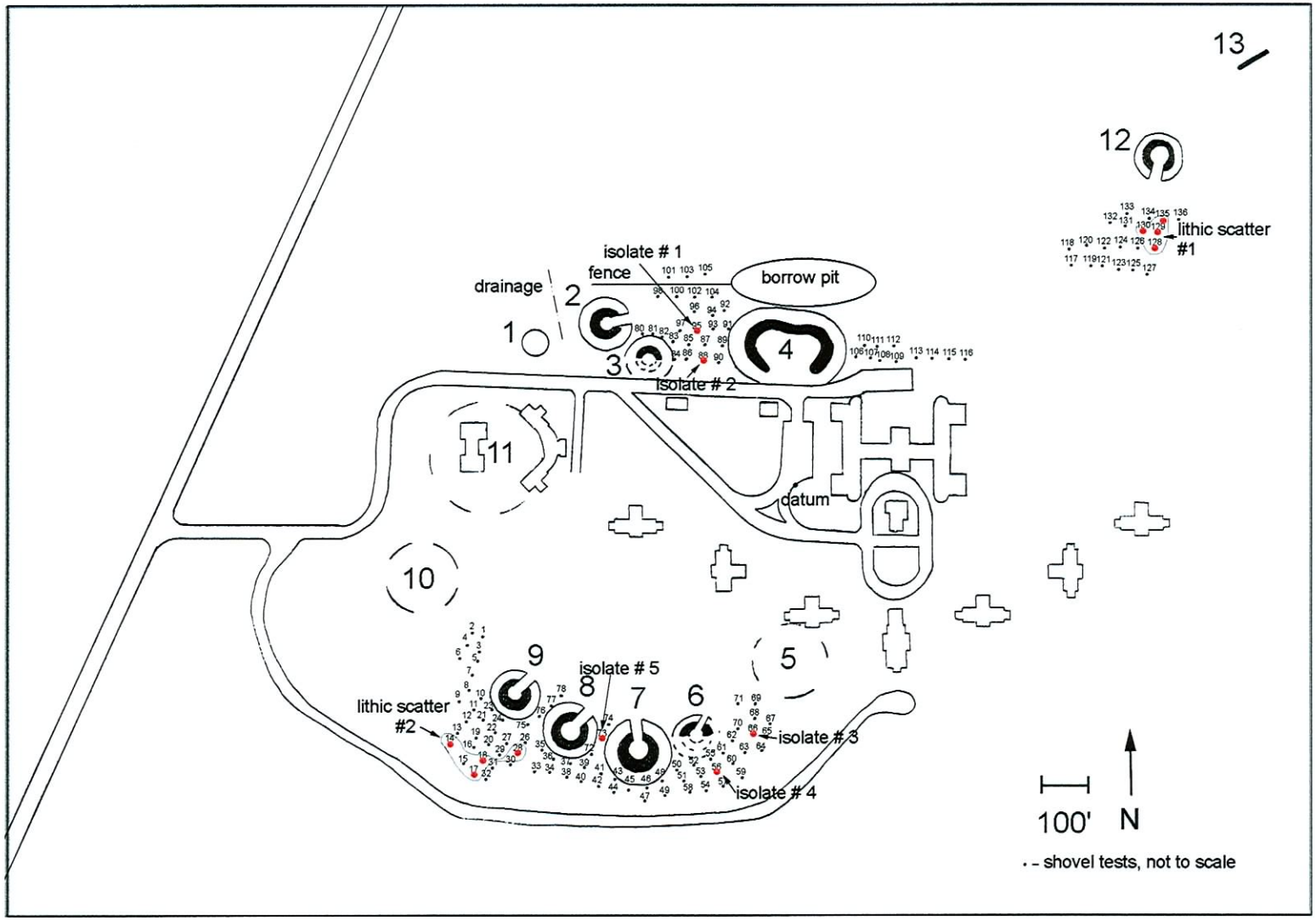

Figure 4. Distribution of prehistoric artifacts in the shovel probes.

understanding the kinds of activities that took place at this site can be found in areas overlooked by traditional archaeological methods[5].

High levels of soil phosphates (5.0 ppm or above) were also identified in 80% of the shovel probes excavated in the areas around Earthworks 2, 3, 4 and 12 (Figure 3). However, since the landscape to the south of Earthworks 2, 3 and 4 is known to have been cultivated historically, and numerous historic artifacts were recovered from the shovel probes in this region, the elevated soil phosphate levels are concluded to be the result of historic activity and are therefore probably not related to the prehistoric utilization of the site. In addition, the shovel probed area around Earthwork 12 was used historically as an orchard, and the elevated soil phosphate levels in this area have also been concluded to be historically produced.

RECOMMENDATIONS

Since at least one potential area of prehistoric cultural activity has been identified through soil phosphate analysis, the following are recommended:

1.) the area identified during this survey undergo additional archaeological assessment, with a focus on the analysis of chemical traces within the soil;

2.) a systematic archaeological investigation of the areas lying between other east-central Indiana earthwork complexes become part of standard research design; and

3.) an archaeological investigation of these unique sites does not automatically assume utilization of a particular area solely on the failure to recover "traditional" artifactual evidence.

[5] which tend to intensively assess only those areas demonstrating high artifact concentration and distribution of the traditional sort

Table 1 Results of the Phosphate Analysis		
Sample	**Extractable phosphorous (% transmittance)**	**% transmittance over 5.0 ppm***
Control: blank	0.000	
Control: 0.2 ppm	0.047	
Control: 0.5 ppm	0.088	
Control: 1.0 ppm	0.171	
Control: 2.0 ppm	0.329	
Control: 3.0 ppm	0.492	
Control: 4.0 ppm	0.660	
Control: 5.0 ppm	0.825	
STP 4	0.122	
STP 6	0.148	
STP 13	0.241	
STP 14	0.424	
STP 15	0.287	
STP 72	0.436	
STP 84	0.758	
STP 86	0.796	
STP 88	1.160	0.556
STP 92	1.180	0.574
STP 99	1.250	0.644
STP 100	0.865	0.424

STP 101	1.170	0.556
STP 103	0.384	
STP 104	1.280	0.642
STP 105	0.446	
STP 106	1.370	0.710
STP 107	1.310	0.642
STP 109	1.120	0.564
STP 110	1.480	0.766
STP 111	1.220	0.550
STP 112	1.300	0.702
STP 113	0.698	
STP 114	1.180	0.586
STP 115	1.340	0.664
STP 116	1.015	0.502
STP 117	0.905	0.458
STP 118	0.592	
STP 119	0.670	
STP 120	0.586	
STP 121	0.738	
STP 122	0.264	
STP 124	1.050	0.512
STP 125	1.040	0.484
STP 126	0.367	
STP 127	1.720	0.915** (0.452)
STP 129	0.794	
STP 130	0.424	

* samples with a transmittance reading greater than 5.0 ppm were diluted by adding 2 ml of deionized water to 2 ml of sample solution. This diluted sample was then re-run through the spectrometer in order to obtain readings within the range of the control samples.

** sample needed to be diluted using 1 ml of sample solution and three ml of deionized water.

TABLE 2 RESULTS OF THE PHOSPHATE ANALYSIS		
Sample	**Extractable Phosphorous (% transmittance)**	**% transmittance over 5.0 ppm**
Control: blank	0.000	
Control: 0.2 ppm	0.043	
Control: 0.5 ppm	0.091	
Control: 1.0 ppm	0.168	
Control: 2.0 ppm	0.315	
Control: 3.0 ppm	0.496	
Control: 4.0 ppm	0.668	
Control: 5.0 ppm	0.825	
STP 1	0.239	
STP 2	0.143	
STP 3	0.121	
STP 5	0.142	
STP 7	0.260	
STP 8	0.400	
STP 9	0.930	0.378
STP 10	0.562	
STP 11	0.586	
STP 12	0.268	
STP 16	0.466	
STP 17	0.538	

STP 18	1.100	0.506
STP 19	0.930	0.480
STP 20	0.950	0.416
STP 21	0.598	
STP 22	0.568	
STP 23	0.770/0.550/0.758	
STP 24	0.294	
STP 25	1.190	0.576
STP 26	0.504	
STP 27	0.540	
STP 29	0.416	
STP 30	0.580	
STP 31	0.702	
STP 33	1.110	0.422
STP 34	1.160	0.570
STP 35	0.798	
STP 36	1.420	0.712
STP 37	0.420	
STP 38	1.070	0.474
STP 39	0.632	
STP 40	0.860	0.344
STP 41	0.628	
STP 42	0.835	0.408
STP 43	0.778	
STP 44	1.130	0.504
STP 45	0.314	
STP 46	0.235	
STP 47	0.349	

STP 48	0.446	
STP 49	0.106	
STP 50	0.358	
STP 51	0.202	
STP 52	0.283	
STP 53	0.586	
STP 54	0.420	
STP 55	0.259	
STP 56	0.282	
STP 57	0.432	
STP 59	0.174	
STP 60	0.460	
STP 61	0.366	
STP 62	0.267	
STP 63	0.141	
STP 64	0.129	
STP 65	0.125	
STP 66	0.110	
STP 67	0.157	
STP 68	0.156	
STP 69	0.134	
STP 70	0.208	
STP 71	0.474	
STP 74	0.317	
STP 75	1.010	0.464
STP 76	1.115	0.512
STP 77	0.301	
STP 78	0.474	

STP 80	1.310	0.484
STP 81	1.350	0.610
STP 82	1.900	0.825
STP 83	1.220	0.530
STP 85	0.598	
STP 87	0.235	
STP 89	1.300	0.570
STP 90	0.724	
STP 91	1.200	0.560
STP 93	0.510	
STP 94	1.240	0.594
STP 95	0.369	
STP 96	1.040	0.488
STP 97	1.240	0.536
STP 98	1.440	0.510
STP 102	1.460	0.682
STP 108	1.230	0.560
STP 123	0.712	
STP 128	1.095	0.518
STP 131	0.460	
STP 132	0.195	
STP 134	0.234	
STP 135	0.835	0.362
STP 136	1.250	0.588

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