University of Cincinnati

Date: 5/12/2011

I, Angela L. Haines, hereby submit this original work as part of the requirements for the degree of Master of Arts in Anthropology.

It is entitled:
Determining Prehistoric Site Locations in Southwestern Ohio: A Study in GIS Predictive Modeling

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Determining Prehistoric Site Locations in Southwestern Ohio:

A Study in GIS Predictive Modeling

A thesis submitted to the

Division of Graduate Studies and Advanced Research

of the University of Cincinnati

in partial fulfillment of the

requirements for the degree of

Master of Arts

in the Department of Anthropology

of the McMicken College of Arts and Sciences

2011

by

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Abstract

This study evaluates anthropological assumptions about prehistoric human use of the landscape with a spatial analysis in a Geographical Information Science (GIS) environment. Through a multi-stage, multi-method, cross-cultural analysis, this study proves that it is possible to predict where prehistoric archaeological sites are located on a highly dynamic landscape. Using each archaeological site found within a local scale as data points, the variables of elevation, slope aspect, distance from water and soils are statically evaluated and modified using GIS. The results of this analysis proves that not only is it possible to produce a predictive model of prehistoric landscape use, but it is also possible to make conclusions about prehistoric land use strategies.
Acknowledgements

First, I would like to thank Dr. Kenneth B. Tankersley for making this study possible and for all of the guidance he gave me throughout this process. I would like to thank Dr. Sarah E. Jackson for being a second reader and for focusing me. For their constant support during my entire time at UC, I would like to thank Dr. Vernon Scarborough and Dr. Getzel Cohen. I would like to thank Hamilton County Parks for granting me permission to wander around Shawnee Lookout and perform my archaeological research. The UC Geography Department deserves special thanks for teaching me all of the GIS and remote sensing and, further, for taking such great care of me. I would also like to thank: Nuha Nasrallah for being the departmental superwoman; Jay Noel for being the best and most supportive coffeetender in the world; Brian Lane for helping me dream larger and for choosing a time zone in which 4 AM is not late; Angie Hood for being my Louise; Emily Culver for keeping me company and commiserating; Benjamin Thomas and Kevin McGee for answering the random questions associated with my growing pangs; and Tyler Swinney, Andrew J. Zucker, Matt Maley, Abby Jump and the 2009 UC field school for following me deeper into the woods and never complaining when I led them further into the thorns. A special thank you goes to my family for their continual support throughout all of my endeavors. Finally, to Sibling, I would like to say Meow.
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Chapter 1: Introduction

The spatial pattern of prehistoric archaeological sites within a landscape is predictable (Binford 1980:4). The ways in which a culture utilizes and modifies their landscape can be attributed to the both the physical manifestation of the natural landscape and the resources available within the ecosystem necessary for life and cultural sustainability (Binford 1980:19, 1983:29). Thus, if it can be proven that archaeological sites within a local landscape are not random spatially and that the environmental characteristics attributed to each site are also not random within the natural landscape, then it is possible to model where additional sites may be located. This study aims to prove that it is possible to generate a predictive model that illustrates where archaeological sites will be located within a particular landscape.

The area chosen for this study is Shawnee Lookout Archaeological District (Figure 1). Shawnee Lookout is located in Southwestern Ohio at the confluence of the Ohio and Great Miami Rivers and is owned and managed by Hamilton County Parks. This area was chosen for several reasons. First, within the borders of the park are over 40 archaeological sites that span over 13,000 years of history and prehistory. Second, every time period within Ohio Valley prehistory is represented in the archaeological record. Third, the presence of a hilltop enclosure and numerous other modifications discussed below make this a unique landscape. Finally, due to the nomination as an archaeological district, the archaeological record is well-preserved and protected.

In order to accomplish the goal of creating a useful predictive model of human landscape use, an opportunistic surface survey to determine where the prehistoric archaeological sites were located within the test area was undertaken. The purpose of this survey was to acquire the
geographic coordinates of each known prehistoric site, to approximate the size of each known site, to determine the time periods in which each known site was occupied and to record previously undocumented archaeological sites. All of the sites located within this survey were then mapped in a Geographical Information Systems (GIS) program. Next, the sites were evaluated for usefulness in the predictive model as set forth by criteria that will be discussed below. By performing an average nearest neighbor distance analysis, it was determined that the prehistoric sites were not randomly distributed within the area.

Each pertinent archaeological site known within the test area was used as an indicator of preference for the environmental variables of elevation, slope, aspect, distance from water and soil type. These variables were then tabulated for each archaeological site. Using univariate and multivariate statistics, the significance of each of the environmental attributes was evaluated. Then, the variables were modified in a GIS environment with the intention of modeling the probability of additional site locations within the test area.

This multi-stage analysis resulted in a predictive model of prehistoric landscape use at the local scale with a gain of 0.82, which predicts where the majority of known sites held as a test are located. From this spatial analysis, it was possible to chronologically evaluate site locations, to determine where others will probably be located and to ask additional intersite and intrasite research questions.

This research is important for several reasons. First, as a result of this study, all of the archaeological sites within the study area were cataloged and the archaeological and natural attributes of each site briefly described. Second, the local landscape has been visualized using the latest mapping technology. And third, not only was it proven that it is possible to predict where sites occur within this test area, but as a consequence a map was generated that ranks the
probability of each 10 meter area containing a prehistoric archaeological site. The significance of this research at the basic level is its usefulness in subsequent archaeological studies within Shawnee Lookout. At a more theoretical level, this study is significant because it proves that the choice of location utilized by prehistoric cultures was highly influenced by the environmental landscape.

In the next chapter, I briefly discuss the theories behind predictive archaeology, modeling the archaeological landscape utilizing GIS based technologies and the anthropological assumptions necessary for testing the hypothesis. In the Chapter Three, I will describe the geologic history of the region and the history of the local area and introduce the archaeological studies performed within the test area that were used for the catalog. In Chapter Four, I will outline the methodologies for testing the anthropological assumptions, the data acquisition methodologies and a catalog of the archaeological sites used in this study. In Chapter Five, I will provide the initial archaeological trend analysis, discuss the results, the categorization rationales and the GIS manipulation. In Chapter Six, I will describe the secondary analysis, the results from that and the GIS modification. Additionally, the results of the modeling and the three different analyses will be discussed. The final conclusions and recommendations will be contained in Chapter Seven.
Figure 1. Shawnee Lookout Park location
Chapter 2: Theoretical Background

Archaeology examines the ways that humans inhabit their naturally and culturally constructed world (Barrett 2004:30). According to Chapman (2006), landscapes are surfaces upon or within which the archaeological record is located. Thus, the ways in which a landscape is formed and modified both naturally and anthropogenically play a crucial role in the understanding of the archaeological record. Natural formation processes not only influence the way in which the archaeological record manifests in the present, but also the way in which it was formed in the past. A landscape that is prone to flooding or landslides is not as desirable for daily activities as a dry and flat environment. Further, when given a choice, a flat and barren landscape will most likely be rejected in favor of a fertile one in which all of the necessities of life are readily available. Therefore, though one characteristic of the landscape, such as soil type, may be suitable for a use area, in reality, another characteristic, such as a steep slope, may negate the suitability (Church et al. 2000). By evaluating the environmental attributes of known site locations redundancies, the ability to predict the location of unknown sites is possible (Warren and Asch 2000).

Julian Steward first posited that the physical environment has an affect on a culture and can be linked to where a culture will settle within an environment (Trigger 2007:375). Steward argued that the constraints environmental factors placed upon a population directly influenced the population size and how they utilized their landscape.

J. G. D. (Grahame) Clark was the first anthropologist to posit that the environment was linked to culture (Trigger 2007:354). In 1953, Clark posited that habitat and biome were as important as subsistence strategies arguing that by learning about a culture’s choice in where to
settle in a landscape, one would be able to make inferences about that population’s economy (Trigger 2007:355).

Binford’s (1980, 1983) studies of hunter-gatherer cultures led to theories about the patterns of land use and settlement strategies. Through ethnographic studies of the Nunamiut, Binford postulated that mobile cultures utilize one of three strategies when interacting with the natural landscape. The first strategy is characteristic of foraging societies who ‘map on’ to the landscape by either moving their settlements to where necessary resources are located or adjusting the size of their group depending upon the carrying capacity of the ecosystem (Binford 1980). The second strategy, which Binford (1980) termed ‘logistical,’ is characteristic of a collecting society in which the necessary resources are procured and brought back to a centralized area. The third strategy is one in which both of the aforementioned strategies are utilized and consequently imply greater variability in the archaeological record (Binford 1980:12). In turn, this led Binford (1983) to suggest how long term patterns and changes in a culture may manifest within the archaeological record with respect to the distribution of resources and the dynamics of the habitat.

Landscape archaeology focuses not only on the natural landscape, i.e., the physical environment, but also on the cultural landscape, i.e., anthropomorphic modifications such as earthworks (Beneš and Zvelebil 1999). An archaeological landscape is defined as a set of sites within a larger region. The scale of the region being analyzed depends upon the study. At the largest scale spatially, a geographic region contains several archaeological sites, which vary in size, function and manifestation on the landscape depending upon the culture being studied. Within a region, an individual site typically contains within it several components such as house floors or a series of connected berms. At a smaller scale still, each component within a site may
consist of several small activity areas or features, such as hearths or individual burials, which could be dissected further depending upon how many turtles down the archaeologist wants to venture.

With this framework in mind, the landscape of this particular study is of an arbitrarily defined local region. This study region contains over 40 archaeological sites of varying size, type and cultural affiliation. These individual sites will be used to determine the frequency of environmental characteristics. In turn, the environmental characteristics will be used to predicatively model where other sites could occur within the local region.

Modeling where archaeological sites will occur within a landscape has been conducted since the mid-1900s. Nevertheless, prior to 1986, the literature for predictive modeling was “largely unpublished, very recent, and nearly unavailable” (Kohler and Parker 1986:400). Shortly thereafter, especially aided by the continuing maturity of computer-aided techniques, the value of predictive modeling was recognized (Custer 1986; Kvamme 1988). Since then, as will be discussed below, there have been many studies that have used several different methods to evaluate the potential of this powerful tool.

A GIS based predictive model has not been published for this area of the Ohio Valley. The closest area found in the literature is a watershed in the Hocking River Valley in Athens County (Crews 2005; Stump et al. 2005) and the next closest are in west-central Illinois (Warren and Asch 2000) and West Virginia (Duncan and Beckman 2000). There have been predictive models applied in the US in Minnesota (Hobbs 1997), the eastern seaboard (Custer et al. 1996; Westcott and Kuiper 2000), and Alaska (Maschner and Stein 1995). Additional research in this method of prediction has been done in the United Kingdom (Chapman 2006), Greece (Siart et al. 2008), the Netherlands (Brandt et al. 1992) and various other places around the globe. Each of
these scientists had differing methodologies, albeit similar toolboxes, for achieving the same goal. It is from these studies that the GIS based model presented in this study was derived.

Before any modeling of prehistoric use within a landscape can be undertaken, however, certain assumptions must be made. First, the natural landscape is a dynamic entity. The continuous processes of erosion, deposition, bio- and cryoturbation prove to be confounding when attempting to model the prehistoric environment. Thus, it is acknowledged that, without the aid of extensive reconstructive modeling of the prehistoric landscape, “the present day environment is a good place to start, but a poor place to end” (Church et al. 2000:139).

The second assumption is that not only do the aforementioned natural formation processes affect the archaeological record (Schiffer 1987; Barrett 2004), but each successive anthropogenic disturbance also obscures the preceding strata thus modifying the surface scatters (Sullivan 1998). It is implied that if a surface is still reflecting prehistoric land uses then the archaeological record still retains some integrity. Nevertheless, the surface area of the site is relative due to both natural and anthropogenic processes. Further, the extent to which the archaeological record has been disturbed is an unknown without subsurface testing.

The third assumption is that mobility, seasonality, duration, economies, social organization and substance patterns evolve through time within the human population (c.f., Prufer 1964, 1967; Fischer 1974; Pacheco 1996; Dancey and Pacheco 1997; Otto and Redmond 2008) and change drastically when Europeans settled the area. Additionally, it is acknowledged that the cultural requirements for each time period can differ greatly (Barrett 2004). Thus, within this study, only variables that are pertinent to the basic requirements for all of the prehistoric populations utilizing this landscape are considered useful.
Finally, because of the relatively small size of the test area, this study must recognize the local scale of analysis (Allen 2000) and the scale of all of the data must be in concordance with the scale used for the analysis (Harris 2006). Ergo, because the archaeological unit of analysis for this study is defined as use-areas, the cell size used for analysis must be similar in scale, no larger than the smallest area, and distinguishably variable within the landscape (Allen 2000). Further, if this study were to expand to the regional level or contract to the artifact level, the data would need to be modified accordingly.

In addition to the aforementioned assumptions, there are two additional broad anthropological assumptions that need to be tested prior to constructing a useful predictive model. The first of these anthropological assumptions is that site location is not random. Because of the nature of cultural influences, sites will not be random anthropologically, nevertheless, for a spatial analysis, this assumption needs to be valid before a predictive model can be considered useful. A randomly distributed test set would imply that there is the possibility of a heterogeneous sample thereby not only skewing the end result, but possibly negating it. A more homogenous sample would therefore improve the gain of the model. Thus:

Hypothesis 1: From a spatial standpoint, the prehistoric use areas within the test area are not randomly distributed.

Null: Site locations are randomly distributed within the landscape.

The second assumption that needs to be tested is that the environmental variables used in the analysis are significant. In order to ensure the precision of the gain of this model, the variables upon which the analysis is based must be relevant to the data sample. Further, the relevancy must be at the same scale both temporally and spatially as the test area in order for the
variable to be significant. It is for these reasons that the individual variables need to be tested for significance prior to being included as part of the predictive model. Thus:

Hypothesis 2: The environmental variable being tested is relevant for all time periods, at the local level and not random within the data set.

Null: The variable is not significant at one or more levels of analysis.

If both of the hypotheses discussed above are proven valid spatially, then the probability of producing a gainful predictive model is significant.
Chapter 3: The Study Area

The test area chosen to test the hypotheses posed above was Shawnee Lookout Archaeological District. In this chapter, the natural processes that formed the test area and consequently the environmental variables will be described. In addition, the known historical chronology and the history of the archaeological research within the area will be outlined. The archaeological results will be addressed in the next chapter. The purpose of this chapter is to illustrate not only the long history of the area, but also the prehistory.

The Region

Shawnee Lookout is located within the Glaciated Outer Bluegrass region. This region contains Late Ordovician, Silurian, Devonian, and Mississippian age formations dipping outwards with entrenched river valleys and steep, narrow spurs with clay-capped ridges and elongated spurs (Dalby 2007) (Figure 1, inset). The bedrock present is from the Upper Ordovician, Cincinnati Series, Maysville stage, Fairview and the Edenian stage, Kope formations containing both fossiliferous shale and limestone (Tankersley and Haines 2010).

The oldest landforms present are high-elevation, rolling uplands featuring between 30 to 60m of relief. This type of landform is a result of uplift experienced at the end of the late Paleozoic and additional uplift at the end of the Miocene, which accelerated stream erosion. After the late Paleozoic, the bedrock was above mean sea level so no additional Mesozoic or Cenozoic deposits were made. The Parker Strath was an eroded Pliocene valley surface of which regional uplift exposed fragments during the early Pleistocene (Dalby 2007).
The pre-Pleistocene valleys were broad, flat-bottomed depressions with a veneer of fresh alluvium (Dalby 2007). Stream erosion both preceded and followed Pleistocene glacial invasions as debris from glacial moraines filled in valleys left by retreating glaciers (Potter 1996). Resulting glacial outwash and glacial till deposits produced rolling hills while erosion by streams crosscut the alternating layers of shale and limestone.

A majority of the drainage at Shawnee was created approximately 130,000 years ago when the Illinoian glaciation dammed post-Teays Deep Stage rivers on the east side of Cincinnati until eventually the Anderson and other divides were breached, which resulted in the area being flooded with glacial outwash and till (Dalby 2007). Commencing around 10,000 years ago, the southern most lobe of the recent Wisconsin glaciation reached just north of the Shawnee Lookout peninsula. The resulting glacial outwash deposits from this climatic event conclude the major geologic formation processes within the study area.

As a consequence of the geologic history, the Ohio and the Great Miami River Valleys are of low relief and consist of very fertile, seasonally inundated fluvial deposits of the Jules-Stonelick association. The uplands are full of moderately to well-drained glacial deposits, till and loess from the Eden-Pate and the Parke associations. Further, they are highly topographically variable with slopes ranging from 0 to 42 percent and 360° of aspect (see Figure 1). These variables will be discussed and illustrated further in the following chapters.

**History of Shawnee Lookout and Archaeological Studies**

As with most confluence areas around the world, Shawnee Lookout was visited many times by many different people with many different motivations in both prehistory and history. The prehistory will be addressed below.
The first mention of this area in the historical record was an expedition in 1729 (Jilson 1936). In 1749, when the French first arrived at the Great Miami-Ohio confluence, they buried a lead plaque. This political action claimed the river confluence and consequently both rivers as property of Louis XV, king of France (Randall 1908). To date, this plaque has not been found.

Thirty-six years later, Fort Finney was built on the Ohio floodplain while the area was still inhabited by Native American populations. Negotiations between the United States and the Shawnee Nation resulted in the Fort Finney treaty in 1786. Due to this treaty and the Treaty of Greene Ville in 1794, all lands in Southern Ohio were considered the possession of the US (Starr 1960:101-102).

Soon after the influx of American pioneers, the walls of the Miami enclosure became a subject of speculation. When William Henry Harrison settled near the abandoned Fort Finney on the Ohio floodplain, he became curious about the meaning and function of this earthwork and began to map, measure and speculate (Randall 1908). Although Harrison decided the enclosure was made by the Astecks (sic) (Harrison quoted by Fowke 1902), the map he commissioned and presented to the Historical and Philosophical Society of Ohio in 1839 is the one that made it into the Squire and Davis publication (Squire and Davis 1848; Randall 1908).

Antiquarians mapping the extent of earthen mounds included this enclosure into their “Moundbuilders” surveys. Although both Fowke (1902) and Randall (1908) actually dedicate pages to the enclosure, in most other surveys it is mentioned as a mere side note to the nearby and more well-known Fort Ancient (i.e., Wright 1888, 1916; Shetrone 1936). The enclosure was brought back into the news in 1913 when a cemetery was found at the base of the point while Brower Road was being excavated (Koch 1913).
A community known as “Columbia Park” was established in the area prior to 1930 as a result of the building of the Miami Fort Power plant. Remnants of their occupation in the form of terraces and roads can be seen at the Columbia Terrace Shelter and picnic area and in the form of slag remnant piles and hydraulic structures in Dark Hollow, as well. Other historic sites include the Brower farm site off of the Little Turtle trail on the eastern side of the area and two homesteads located on the western side of the test area (see Figure 2).

Figure 2. Historic sites within the test area mentioned in the text.

The first systematic archaeological survey in Shawnee was performed in 1942 by H. Holmes Ellis while working for the Ohio Historical Society. In addition to the survey, he also performed salvage excavations, however the work that he did in this area is unfortunately unpublished, but is alluded to in numerous Ohio Archaeological Inventory forms (OAI, n.d.).
The Miami Fort power plant opened in December of 1949 on the Ohio floodplain south of the point. In order to supply southwestern Ohio with electricity, power lines were installed though the park.

After the dissolution of the Columbia Park settlement, Cincinnati Gas and Electric donated the area to the City of Cincinnati. It was during this time that the property was used as a Boy Scout campground (Starr 1960:47; Fischer 1968:31).

In the late 1950s, S. Fredrick Starr (1960), working under the guidance of Gustav Carlson of the University of Cincinnati and the Cincinnati Museum of Natural History, conducted a surface survey in the area now known as Shawnee Lookout Park as part of his *Archaeology of Hamilton County* publication. Starr’s (n.d.) notes for this publication are on file at the Ohio Historical Society (NADB 11245) and the artifacts are curated at the Cincinnati Museum Geier Collections and Research Center. Starr (1963) argues for the importance of saving this valuable archaeological resource in his subsequent and final publication regarding the area.

Starting in the mid 1960s and ending in the early 1970s, Fred Fischer (1965, 1966, 1968, 1970, 1974) of the University of Cincinnati carried out numerous surveys and excavations. The majority of his work is contained in mimeographed reports submitted to the Hamilton County Parks department, which are on file at the Cincinnati Museum Geier Collections and Research Center and the University of Cincinnati, Department of Anthropology. The data recovered from these excavations can be found in Master’s theses (Lee 1972; Bennet 1986; and Kalthenhaler 1992) and publications (Hawkins 1996; Dalbey 2007; and Vickery 2008).

In 1968, at the request of the Hamilton County park officials, Sam Benedict, Louis Nippert, and Justin A. Rollman, with the aid of Fred Fischer and Gustav Carlson, conducted an aerial survey of the park in order to attempt to remotely sense possible site locations within the
The secondary purpose of this survey was to determine how to landscape the newly acquired Shawnee Lookout Park with the most minimal disturbance to the archaeological record.

Working for the Miami Purchase Association the early 1970s, Elizabeth Schuerer conducted a surface survey of the area and nominated the park for the National Register of Historic Places, which, in 1974, made Shawnee Lookout the first archaeological district in the state of Ohio. The majority of the archaeological inventory forms were completed by Schuerer at this time, with the aid of reports generated by Fischer.

Then, in 1971, a salvage excavation was conducted by Vickery and his students at the Headquarters site (33Ha151 (65)) (Lee and Vickery 1972). It was during this time that the eastern Twin Mound was tested (Lane 2009).

Kenneth B. Tankersley of the University of Cincinnati, Department of Anthropology, resumed work at Shawnee Lookout Park in 2007. In the 2008 field season, an excavation at the Twin Mounds East site (33Ha43, 110 (24) East) was performed as part of the University of Cincinnati archaeological field school. Testing of the Miami Enclosure in the form of drill coring and magnetic susceptibility was also performed (Ballentine 2009; Tankersley and Balantyne 2010). Additionally, ground penetrating radar was utilized in a habitation area (33Ha355 (269)), which resulted in the discovery of a burial mound and a circular enclosure (data on file at Indiana University, Indiana Geological Survey; Tankersley 2008). In the 2009 field season, the Twin Mounds West site (33Ha43, 110 (24) West) was the locus of Tankersley’s archaeological field school excavations (Tankersley 2009). Additionally, magnetic susceptibility tests on a mound (33Ha37), drill coring to determine clay sources (Tankersley and Haines 2010) and a surface survey of the test area were also undertaken (Tankersley 2009).
As illustrated above, this area was considerably modified in historic times. Presumably, the historic modifications resulted in a loss of archaeological data. Nevertheless, the prehistoric component of the area was recognized, which resulted in over a century of punctuated archaeological studies. The results of these studies will be discussed further in the next chapter.
Chapter 4: Methodology and Data

Because there are two hypotheses that must be tested prior to the building of the predictive model, and the second hypothesis is dependent upon the first not being rejected, this study has several different layers of analysis. In this chapter, the data and the methods used to test the hypotheses are described. The archaeological survey and the sites used as indicators of human behavior in the predictive model are described first, and then the environmental data, acquisition and GIS modification are illustrated.

Archaeological Surface Survey

In order to determine whether sites are spatially random within the landscape, the sites within the test area needed to be located and georeferenced. Several resources and methodologies were utilized. First, the literature outlined above were consulted, the sites organized and the locations were plotted on a United States Geologic Society (USGS) 7.5 minute topographic map.

Under the permit acquired by Dr. Tankersley from the Hamilton County Park Board, field work was conducted in Shawnee Lookout Archaeological District during the summer of 2009 and the spring of 2010. With the assistance of trained students and volunteers, I conducted an opportunistic pedestrian surface survey of the land within Shawnee Lookout Park. Because a grid system within the park was virtually impossible due to the topography, park modifications, and thorny underbrush, we systematically checked the base of each tree, animal burrows, erosional channels and creek cuts for artifacts on the assumption that cultural materials would be pulled up from the subsurface via the processes of root displacement, rodent burrowing, stream erosion and bioturbation. If artifacts or features were found, we would walk concentrically
around the area until the edge of the surface scatter was found, which was determined by the absence of locatable material remains. If anything of archaeological significance was found within an area, that area was physically flagged and marked on the topographic map so that exact locations could be recorded and analyzed at a later date; the method of recording will be discussed below. This survey resulted in the relocation of known archaeological sites, the discovery of others and the determination of whether or not all of the sites recognizable on the surface within the park had been represented.

Once the site locations were established, the geographic centroid of each site was determined using a geographic positioning system (GPS) averaged waypoint and the perimeter of the surface scatters was determined by using the GPS track function. These points were taken using both a Trimble GEO HX and a Garmin GPSMAP 76 CSX GPS unit.

In the lab, all of the artifacts from the surface survey were carefully analyzed. Pottery temper and composition were both macroscopically and microscopically analyzed in order to determine the accepted temporal classification (Tankersley and Haines 2010). Lithics were analyzed for temporal classification of the retouched artifacts.

It should be mentioned that there were some sites within the park that were not included in this study. Not included, for obvious reasons, were the sites that were not relocated since the geographic location, which could be hypothesized, could not be acquired. The Earthworks within the park were not included. Though there are several reasons for this decision, the main factors included that it was virtually impossible to determine the centroid, the Parallel and Ridge berms have never been tested for archaeological significance thus no information could be gleaned, it seemed more reasonable to focus the study on the smaller areas and, most importantly, the individual earthworks were not within the scale of the study. The historic sites
within the park were not included in the study, either, for two reasons. The first reason was because these sites have just recently been recognized as archaeologically significant and, second, to keep the scope of the study prehistoric in nature.

From this fieldwork, the x and y coordinates (points), the surface scatter area (polygons), the temporal designation(s) and the unique SHPO number (attributes) for each use area and mound that was relocated were determined. The points were imported into a GIS environment by using the add x, y data function and the polygons were drawn by using the tracks with both shapefiles having the site number as the common field (Figure 3). The location and attributes for the points and polygons were populated in Excel. Because several sites are considered multi-component, these sites were repeated in the data base for each time period in which the site was used effectively weighing specific use areas.

Figure 3. Archaeological sites within the test area
## Site Descriptions

### Table 1. Site Numbers and Attributes

<table>
<thead>
<tr>
<th>Site Number</th>
<th>Elevation</th>
<th>Slope</th>
<th>Aspect</th>
<th>Water Distance</th>
<th>Soils</th>
</tr>
</thead>
<tbody>
<tr>
<td>33Ha595, 149 (63b)</td>
<td>205.74</td>
<td>15</td>
<td>171</td>
<td>287.12</td>
<td>EcE</td>
</tr>
<tr>
<td>33Ha149 (63a)</td>
<td>207.87</td>
<td>11</td>
<td>110</td>
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The “Cemetery:” 33Ha595, 149 (63b). A stone slab “cemetery” is located south of the enclosure on the southern most slope of the point and continues all the way down the hill side on slight terraces. It has been temporally designated as Woodland due to limestone lined graves (Benedict et al. 1968), however, Starr (1960:99) mentions a concentration of Archaic artifacts in the lower elevations of the point. This area has been known since at least 1913 when numerous burials were unearthed while Brower road was being constructed (Koch 1913) and was reportedly “excavated” by Boy Scouts prior to 1958 (Starr 1960:47). This area is currently protected by the park via a prairie restoration project and thick, thorny undergrowth. When surveyed, prehistoric artifacts were still present, but not collected due to the possible nature of
the site. The limestone slabs observable are relatively rectangular in shape, the largest are approximately 1 x 3 meters in size, and they are in clusters of three or more. Some of the slabs do appear to have been anthropogenically altered. Significant looting has occurred as evidenced by potholes and backfill piles especially near the road. Alternatively, it is possible that this area was also a prehistoric limestone quarry not only because of the amount of disturbance, but also the fact that limestone throughout the park does not appear like this anywhere else.

Stone “Mound” on the Point: 33Ha149 (63a). On the ridge top above the “Cemetery” is another example of limestone slabs similar to those mentioned above. Starr (1960:47) states that originally there was a mound that was two and a half feet tall, however Fischer (1968:30-31) disagrees due to an informant and attributes the limestone slabs to rough burial chambers associated with the cemetery mentioned above. Starr (1960:47) and Fischer (1968:31) both mention bones being found in this area and agree that the Boy Scouts destroyed any viable archaeological evidence prior to 1958 in this area as well. The surface of this area is highly pockmarked by years of abuse. When surveyed, 44 limestone slabs were observed on the surface covering an area of approximately 270 m². There were no other artifacts observed, however Matt Maley (Personal communication 2009) states that burnt limestone, human bones and teeth were scattered in the area in 1959. The burial aspect of the area is further confirmed by artifacts curated at the University of Cincinnati and photographs on file at the Cincinnati Museum Geier Research and Collections Center taken in the late 1960s that provide evidence of additional human bones being scattered, which alludes to the fact that looters have known about this area for a long while and any information has unfortunately been carried or tossed away.
Western Point Mound over Habitation: 33Ha33. Located east of the Stone Cemetery and Stone “Mound” and west of the enclosure on a ridge spur, this mound was excavated (Fischer 1966:3-7). At the time of his initial survey, it was about six feet tall and was riddled with looters pits. Results of the Fischer excavations showed that the mound was built in at least two phases over top of a habitation area, which will be discussed below. The first building phase of the mound probably contained a central grave, however this area was irrecoverably damaged by pot-hunters (Fischer 1966:5, 1968:7; Dalbey 2007:54). The second building phase of this mound utilized habitation midden to cover at least five interred individuals, one of whom was a juvenile associated with a rolled copper bracelet (Dalbey 2007:54; Fischer 1966:3-7). Due to the pottery, lithics and “Adena” and late Middle Woodland midden fill, this mound was determined to have been built after the Late Middle Woodland (Fischer 1966:4).

Habitation Under Western Point Mound: 33Ha62C. While excavating the mound described above, Fischer noted an undisturbed midden approximately 0.2 meters in depth. In the midden, Fischer excavated three hearths and a cache of chert cores (Fischer 1966:4, 7-8; 1968:20). Accordingly, although the analysis was neither published nor reported, preliminary categorization of the ceramic and lithic artifacts in this area indicated two separate occupation periods ranging temporally from both “‘Early Middle’ Adena” and Middle Woodland (Fischer 1966:8; 1968:20). Due to the public nature of this area currently, this area was not surveyed, however aerial photographs indicate that this area could be as large as an acre in size (Benedict, et al. 1968:3).
**Eastern Point Mound (EPM).** This mound, located on the northern edge of the ridge, was tested, however, after encountering horizontal limestone slabs in the mound fill, the excavation was discontinued due to time and labor constraints (Fischer 1966:8-9; 1968:9). Other than the limestone slabs, nothing notable is known about this mound. Because of the location of this mound in relation to the steep ridge line, it is possible that some of this mound has been lost to erosional slumping.

**Western Enclosure Habitation: 33Ha62B.** Located by Fischer in 1965, this habitation site is just inside the western walls of the enclosure. Two test units in this area revealed two limestone hearths and cultural materials indicative of a single component, Middle Woodland occupation (Fischer 1965:4-5; 1968:18). Currently, this approximately 1.5 acre area is covered by secondary growth forest. Because of the public walking trails surrounding this area, it was not reevaluated in this survey.

**Eastern Enclosure Habitation: 33Ha62A.** Also located by Fischer in 1965 and excavated in 1965, 1966, and 1967, this relatively flat area on a terrace above the Western Enclosure Habitation is inside of the eastern walls of the Enclosure and is estimated to be 37,500 sq ft. (3483 m²) in size (Fischer 1965:4-6; Fischer 1966:9-11; Fischer 1968:18-20). The excavations revealed a pit feature and limestone hearths. Fischer determined that the cultural material represented two separate occupations that can be attributed to both the Early and the Middle Woodland time periods (Fischer 1965:5-6, 1968:19). According to an informant of Fischer’s, none of the area within the enclosure has ever been plowed, but rather used as a cow pasture and then as the Cincinnati Gas and Electric picnic grounds (Fischer 1968:19).
**Miami Enclosure: 33Ha4, 148 (62).** By far the best known and most impressive prehistoric site within Shawnee Lookout is the Miami Enclosure. Since William Henry Harrison published his report in 1838, this site has been visited and described countless times in the last two centuries. Though noted in countless volumes about “the Moundbuilders,” only Fowke (1902) and Randall (1908) dedicate more than a mention to this earthwork. In 1958, Starr visited the area and surveyed it from an archaeological point of view. As a result, the “Miami Fort” appeared in his 1960 publication. In a subsequent article, Starr (1963) argued against the preconceived ‘fortress’ function and temporal range of this site. Starting in 1965, Fischer searched for empirical evidence to determine the significance and temporal range. For the first time a documented professional excavation into the walls was performed and the first radiocarbon date was acquired from a sub-earthwork embankment, which dated the sub-strata to the Middle Woodland (1680 ± 130 ^{14}C yr B.P., calibrated at two-sigma to A.D. 77 to A.D. 617, β decay, M-1869, Crane and Griffin 1968:84).

Archaeological work on the enclosure was not performed again until 2008 by Tankersley of the University of Cincinnati. These investigations focused on the building episodes, temporal range and functionality of the earthwork. Cores taken from two separate earthen berms were analyzed and wood charcoal from theses two berms were submitted for radiocarbon dating. The resulting ages are: 1360 ± 40 ^{14}C yr B.P. (A.D. 620 to A.D. 690 calibrated at two-sigma, AMS, Beta 249597), 240 ± 40 ^{14}C yr B.P. (A.D. 1573 to A.D. 1787, calibrated at two-sigma, AMS, Beta 248352) and 270 ± 40 ^{14}C yr B.P. (A.D. 1530 to A.D. 1652, calibrated at two-sigma, AMS, Beta 249682). Because of the strata evident in the cores and the age determinations, Tankersley concluded that the earthwork was built in three separate episodes corresponding with the Middle Woodland, the Late Woodland and the Protohistoric Fort Ancient cultural periods. In addition to
the core analysis, excavations were conducted at the terminus of two berms. The investigation revealed logs and bark-impressed burnt clay, which are interpreted as the remains of a dam. As a result of these findings, an alternate theory to either the “fort” or the “ceremonial center” theories was posed: an ancient hydraulic structure built during climatically stressful events (Ballyantine 2008; Tankersley and Balantyne 2010).

Table 2. Shawnee Lookout Radiocarbon Dates

<table>
<thead>
<tr>
<th>Site</th>
<th>Context</th>
<th>Sample</th>
<th>Method</th>
<th>(^{14}\text{C} \text{ yr B.P} )</th>
<th>Calibrated at (2\sigma)</th>
<th>Lab</th>
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<td>A.D. 77 to A.D. 617</td>
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Dual Mounds (DM1 and DM2). Just east of the northeastern corner of the Enclosure are two mounds that have not been previously mentioned in the literature. Similar to the Twin Mounds, which will be addressed below, these two mounds were conjoined in prehistory and share a central base. Because of their location at the termination of the Graded Way leading to the Twin Mounds site, if they are mortuary in nature, it is quite probable that they were contemporaneous with the Twin Mounds.

The Graded Way (GW). Leading from the northeast opening of the Miami Enclosure, utilizing the ridge top and terminating at the western edge of the Twin Mounds site is a Graded Way. Unlike most of the other ridge tops in the park, this ridge has been leveled off. Due to the Dual Mounds at the western terminus, the Twin Mounds at the eastern terminus, the four mounds in between and the fact that it is a direct route between the Enclosure and the Twin Mounds sites, it is quite possible that this pathway has been utilized numerous times in prehistory. Nevertheless,
when and why the Way was designed is unknown though examples of this type of landscape modification are evident around other Ohio Valley earthworks.

*Stone Mounds on the Way (SMW1 and SMW2).* Approximately mid-way between the Twin Mounds site and the Dual Mounds on the path of the Graded Way is evidence of two limestone “mounds” that were destroyed prior to this survey. These mounds have never been mentioned in the literature, however evidence of these mounds are in the form of many looters pits and limestone slabs similar to those found around the location of the former Point Stone Mound discussed above.

*Earthen Mound on the Way (EMW).* East of the Stone Mounds on the Graded Way is a small earthen mound. This mound, not mentioned in any of the literature, is clearly discernable during leaf-off conditions. Further, it is possible that this mound was originally larger, but natural and anthropogenic processes have reduced it to its present state.

*Single Mound West of the Twin Mounds Site (SMWTM).* East of the Earthen Mound on the Way and south of the Graded Way on a ridge spur is yet another mound not previously mentioned in the literature. This mound is within the western extent of the Twin Mounds site and is similar in shape and size to the Western Point Mound described above.

*The Twin Mounds Site: 33Ha43, 110 (24); 33Ha420.* With the exception of the Miami Enclosure, the Twin Mounds site is by far the most studied area within Shawnee Lookout Park. Starr (1960:104) describes this site as the most important Hopewell site in the county due to the
amount of cultural material collected from the surface during his survey. Fischer (1965) separated the site into Eastern and Western components for ease of discussion in his initial survey.

The Eastern area was tested in 1967 and excavated in 1968 revealing pits and artifacts from the Archaic period (Lee 1972; Vickery 1996) and diagnostic lithics from both the Middle Woodland and Protohistoric Ft. Ancient periods (Fischer 1968:15). The Western area was tested in 1968 and excavated in 1969 and 1970 (Fischer 1970:2). In these two excavation seasons, 55 post molds and six hearths from a Middle Woodland occupation and evidence of either an Early Archaic or Paleoindian occupation were revealed (Fischer 1970). The Middle Woodland pottery from these two excavations were later analyzed by Bennett (1986; Hawkins 1996), and the Middle Woodland lithic assemblage was analyzed by Kaltenthaler (1992).

In 2008 and 2009, the East and West respectively were excavated by the University of Cincinnati archaeological field school under the direction of Dr. Tankersley. In the 2008 season, the field school participants hand excavated 29 1 x 1 meter units in the Eastern site and submitted three samples for radiocarbon dating. The resulting ages are: 1510 ± 40 14C yr B.P. (A.D. 410 to A.D. 590, calibrated at two-sigma, on a cut elk atlas, AMS, Beta 265365); 210 ± 50 14C yr B.P. (A.D. 1560 to A.D. 1960, calibrated at two-sigma, on charcoal, AMS, Beta 254474); and 130 ± 40 14C yr B.P. (A.D. 1660 to A.D. 1900, calibrated at two-sigma, on charcoal, AMS, Beta 253779) (Tankersley 2008). In 2009, the UC field school worked in the Western site where 15 1 x 1 meter units were excavated by hand and 28 units were shovel scraped until a feature was uncovered at which point the feature was hand excavated. The excavations resulted in 25 post molds, six features including a pit kiln and two radiocarbon dates (1180 ± 40 14C yr B.P., A.D. 690 to A.D. 950, calibrated at two-sigma, on charcoal, AMS, Beta 263536 and 1220 ± 70 14C yr
B.P., A.D. 650 to A.D. 970, calibrated at two-sigma, on charcoal, β decay, Beta 264061) (Tankersley and Haines 2010).

*The Twin Mounds: 33Ha31, 191 (105); 33Ha32, 191 (105).* The earliest mention of these two mounds is Fowke (1902:254) who states that there are two mounds a few hundred yards eastward of the fortification, 8 and 11 feet high. Like the Dual Mounds at the southern terminus of the Graded Way, these two mounds seem to have grown together over time. These mounds have gone through significant looting. In 1971, a test unit was excavated through the center of the Eastern mound revealing a Middle Woodland cremation and associated burial goods (Lee and Vickery 1972:5-6). Included in these goods were a copper breast place (Lane 2009) and a drilled canine (*Ursus Americanus*), which was submitted for AMS radiocarbon dating (2030 ± 40 ^{14} C yr B.P., B.C. 160 to A.D. 60, calibrated at two-sigma, Beta 247820) (Tankersley 2008).

![Figure 5. Western sites](image_url)
South Bottom Terrace: 33Ha147 (61); 33Ha150 (64); 33Ha54. This site is located north by northeast of the Twin Mounds site on the northern terminus of the ridge leading to the point. This area was visited by Fischer (1968:20-21), Starr (1960:106) and, prior to Ellis’ 1942 survey for the Ohio Historical Society (OAI, n.d.), burials (33Ha54) were removed from the northwestern extent of this site as a result of a gravel quarry; it is quite possible that additional burials are located on a point spur of this site. Although considered one contiguous site, this site is delineated into a western wooded section (33Ha147 (61)) and an eastern section (33Ha150 (64)), which is under the power lines and covered by dense foliage in the summer months. It was determined from the diagnostic artifacts collected in the 2009 survey that this is a multi-component site with diagnostic artifacts representing the Late Archaic, Middle and Late Woodland periods.

Power Line Site: 33Ha352 (266). Located on a ridge spur north by northeast of South Bottom Terrace across a deep erosional gully is the Power Line Site. This site is aptly named because of its location within the easement tract developed by Cincinnati Gas & Electric and maintained by Duke Energy. Although there is a very small component of this site in the wooded terminus of the ridge spur, the majority of the site extent is covered in the summer months by dense foliage and thus was unnoticeable and virtually impassable during the summer survey. Fischer (1968:22-23) referred to this site as 33Ha266, however, he never field checked this area due to high weeds. The temporal designation has yet to be determined for this site, however Fischer (1968:22-23) states that his source’s surface collection included Archaic artifacts.
Middle Bottom Terrace: 33Ha49; 33Ha51. North by northeast of South Bottom and west of the Power Line is Middle Bottom Terrace (MBT). Like the Power Line Site, MBT is bordered to the north and south by deep erosional gullies containing intermittent streams. When this area was visited by Ellis in 1942, a row of fire pits was excavated. Starr (1960:107) also surveyed here for his publication and, although the majority of the artifacts he examined are currently in private collections, many diagnostic artifacts for Archaic, Woodland and Ft. Ancient (Madisonville) periods were represented. Fischer (1968:16-18) used information from collectors, but, in addition, excavated a 10 x 15 foot test unit. The results of Fischer’s test indicated that this is a multi-component site, but any other data from this test are virtually unknown (Fischer 1968:17). In 1976, when the archaeological inventory forms were being filled out, this site was separated into two areas, yet it seems to be one continuous site, albeit with a minimal drop in artifact quantity in between the two seemingly arbitrary divisions. When surveyed over the summer of 2009, the surface area produced the greatest quantity and the most interesting surface artifacts than any other area in the park. Temporally, this is a multi-component site with diagnostic artifacts from the Paleoindian, Early and Late Archaic, Middle and Late Woodland, and Ft. Ancient (Madisonville) periods present. Additionally, although not confirmed for obvious reasons, it is possible that there is a burial on the western tip of this site, indicated by the presence of large limestone slabs similar to the Cemetery. On the eastern edge of the site, a historic house foundation and several brick scatters are present.

North Bottom Terrace: 33Ha353 (267). This site, located north of Middle Bottom Terrace across a deep erosional gulley, is bounded on the north by a ridge toe. Although mentioned by Fischer (1968:23), there is no previous archaeological knowledge about this site other than
Fischer’s informant. Brower Road may have cut through this site and a component may be on the other side of the road, but this has not been confirmed. This area has been considerably disturbed in historic times as is evidenced by a historic house mound, several driveways, a barn, and miscellaneous historic debris. Regardless, the temporal range for this site was determined by the pottery collected, which represented the Late Woodland and Ft. Ancient (Madisonville) periods. It is possible, because of the proximity to South Bottom, Middle Bottom and the Headquarters, that additional temporal ranges are present in the subsurface. A few meters in elevation above and to the northeast of this site—noted as NBTNW on the map—a small cluster of artifacts was collected. Whether the artifact cluster is a continuation of the North Bottom site or another site entirely is unknown.

*Blue Jacket Site: 33Ha354 (268).* In a commanding location above North Bottom is a small site, which is currently dissected by the Blue Jacket Trail. The archaeological inventory form mentions this site as a “limited habitation site,” however the form is for the “mound,” which actually is part of the parallel berms mentioned below. Fischer (1968:24) describes a site in this area and temporally assigns it to the Late Archaic determined by artifacts collected by his informant. When surveyed in 2009, the site was determined to have been dissected by a foot path and that it also contained a Late Woodland component due to pottery typology. It is possible that this site is larger in extent than observed, however the dense undergrowth and the proximity to public areas prohibited the testing of this hypothesis.

*The Headquarters Site: 33Ha151 (65).* Because of the park headquarters, landscaping and a road being located on top of this site, information about this area is limited. Originally established as
a private residence, the current Park Ranger headquarters basement was excavated in 1958, during which archaeological recognizance was prohibited by the land owner (Starr 1960:107; Fischer 1968:21-22). Nevertheless, Starr (1960:107) observed Archaic, Middle Woodland and Ft. Ancient artifacts in this location. After the park bought the property, a road being built in 1971 uncovered a historic cemetery, which prompted a salvage excavation (Lee and Vickery 1972). Lee and Vickery (1972:3-4) confirmed the Middle Woodland period designation as evidenced by three “commoner” burials, burial fill, pottery sherds and associated midden deposits. A $\beta$ decay radiocarbon date of 1785 ± 345 $^{14}$C yr B.P. (B.C. 199 to A.D. 558, calibrated at two-sigma, UGA 318) (Noakes and Brandau 1974:139) was obtained from charcoal in the midden fill in a grave during this salvage excavation. In addition, they uncovered a Late Woodland period cache (Lee and Vickery 1972). Photographs taken during this excavation show the presence of postmolds and concentrations of limestone slabs.

North of the Headquarters Site: 33Ha226 (140). Separated from the Headquarters site by a ridge, which will be discussed below, is a site about which very little is known. According to a hand drawn map by Starr (n.d.), the northern extent of the site had a house built on it prior to 1958 and is currently in the golf course as part of the 14th and 15th holes. It is possible that there is a mound component, however the possibility has not been confirmed and could be part of the golf course landscape. When the entire site was surveyed over the summer of 2009, there was too much landscaping to make any determinations on the northern extent of the site, however the southern extent may still have integrity. Two pieces of worked chert and a dark layer of soil with charcoal flecks were observed in a bank on the southern edge of the site that had been eroded by an intermittent stream and the golf course drainage system.
**Parallel Berms.** Two ridges line both sides of the steep graded road entering the park. At the apex of these ridges are short, presumably anthropomorphic berms unmentioned in previous literature. The temporal or functional aspects of these berms are yet unknown.

![Map of Eastern sites](image)

**Figure 6. Eastern sites**

**Tobacco Field Site: 33Ha355 (269).** The Tobacco Field site seemingly spans the moderately flat area on top of the northern ridge mentioned above. This site is in the Waterhole picnic area and adjoining playground, however the exact location of this site is unknown since Fischer (1968:24-25), Benedict et al. (1968:3-12), Koleszar (1971) and the archaeological inventory form, place this site in four different, albeit relatively close, places. Because of this problem, for mapping
purposes, the four have been averaged since it is quite probable that the three descriptions are for one contiguous site, which places the site under the Waterhole picnic shelter, associated playground and the Little Turtle trailheads. According to Fischer (1968:24-25), the cultural material in this area was sparse with the exception of many mussel shells and what are suggested to be both Archaic and Woodland artifacts. Fischer (1968:25) also mentions a stone cistern and an old fence in this area that could be associated with the Brower Farm historic site located on the Eastern edge of the prehistoric sites. This area was not able to be surveyed by myself due to the amount of landscaping, recent modifications, and the prairie and wildlife restoration project.

Bean Field Site: 33Ha358 (272). Like the Tobacco Field site above, the Bean Field site location is also relatively unknown. This site is on the remainder of the moderately flat area that contains the Tobacco Field site, which would place this site southwest of the Waterhole picnic area and playground and in vicinity of the Springhouse School, the historic log cabin and the Blue Jacket trailhead. Again, this area was not surveyed over the summer of 2009 due to the amount of landscaping, modifications and the prairie and wildlife restoration project. For mapping purposes, the description by Fischer (1968:25), the archaeological inventory form location and the aerial survey (Benedict et al. 1968) were combined. The temporal designation of this area is currently unknown, however it is probably related to the mounds in the immediate vicinity. It is possible that both the Bean Field and the Tobacco Field sites represent several individual sites from several different temporal spans that have been mixed up and spread out due to agricultural disturbances in historic times. There has been no subsurface testing in either location that is evident in any of the literature.
Large Public Road Mound: 33Ha38, 199 (113). This mound is located on the western edge of the connection between the Tobacco and the Bean Field sites. It is surrounded by a ditch and was possibly connected to the Small Public Road Mound by a small earthen berm. Unfortunately, whether the two mounds were spatially connected is unknown because the earthwork is now merely a remnant due to the placement of a public rest area.

Small Public Road Mound: 33Ha37. This mound is west of the Bean Field site and may represent the edge of that site. In the summer of 2009, Tankersley tested this mound utilizing magnetic susceptibility. The data from that test are on file in the University Of Cincinnati Department Of Anthropology.

Mystery Mound North: 33Ha 35, 198 (112) and Mystery Mound South: 33Ha36, 197 (111). According to a hand-drawn map by Starr (n.d.), both of these mounds seem to have been located on ridge spurs connected to the Bean Field site. The South mound (33Ha111) was relocated by a ranger working with Fischer (1968:12), but the North mound (33Ha112) was never relocated. Unfortunately, neither mound was relocated during this survey.

Roadside Mound Remnant (RMR). Located northeast of the Large Public Mound and thus neither of the Mystery Mounds, this little mound is on the side of the road. It is probable that this mound was larger, but years of being ran over has reduced it to its present state. This mound was tested with ground penetrating radar by Tankersley in the summer of 2008 (data on file, Indiana University, Indiana Geological Survey).
**GPR “Mound” (GPR).** Located south of the Roadside Remnant mound, this “mound” was found in the current Waterhole playground in the summer of 2008 while utilizing ground penetrating radar (GPR) technology. The radar interpretation demonstrated that the mound was at least as large basally as the Large Public Road mound, had a ring around it and still contained several bodies (data on file, Indiana University, Indiana Geological Survey). When this mound was razed is unknown, however, Starr (1960:103-104) mentions a mound that had been razed prior to his survey that had contained a since lost human-faced effigy pipe. Whether this mound is the one to which Starr refers is unknown.

**Small Ridge Mound North (SMRN).** Discovered in the summer of 2009, this mound is to the east of the historic Brower House site and north of the Large Ridge Mound. Nothing is known about this mound. It could be a result of the Brower occupation, which would be archaeological, albeit historical.

**Large Ridge Mound: 33Ha194 (108).** This large mound, located at the terminus of the berms described below, is on the eastern side of the park and precariously balanced on the ridge line. According to Fischer (1968:10) and Starr (1960:103), this mound was originally seven to ten feet tall and conical. The center and eastern side of this mound has been badly potted and is in serious danger of eroding down the hill. In 2008, the void was filled with a considerable amount of branches and twigs as both a preventative and protective measure. When surveyed in 2009, trash was found in the pit and limestone slabs were observed in the backfill below the mound. Luckily, the looters pit does not seem to have disturbed the integrity of the mound due to the relatively shallow depth of the pit.
Small Ridge Mound: 33Ha195 (109). Located south of the Large Ridge mound, this mound was described by Starr (1960:103) and Fischer (1968:11). This mound is on the southern tip of the ridge spur containing the Eastern berms and the two ridge mounds.

Little Turtle Mound: 33Ha41, 196 (110). On the loop of the Little Turtle trail, this mound is clearly marked. When Starr (1960:103) surveyed this formerly conical mound, it was approximately seven feet in height, but had been plowed significantly in previous years. In Fischer’s (1968:11) survey, this mound had been severely pitted and was approximately five feet in height. It has been speculated that there is a habitation near this mound because of the relatively flat area and the presence of flake ‘knives’ nearby (Starr 1960:103). Nevertheless, evidence of a habitation in this area was not found by me or anyone else surveying the park.

Mystery Ridge Mound Northeast: 33Ha39. The archaeological inventory form for this mound places it near the Public Ridge Mound and at a height of 6.5 feet. However, this mound was never field checked, was in an area of cultivation and the information for the inventory report is from the Ellis (OAI, n.d.) survey of 1942. This mound has never been mentioned in any other literature and was not found in any subsequent survey thus far. Thus, it is quite possible that this mound has been destroyed due to agricultural cultivation, though it still might be discernable utilizing ground penetrating radar or a similar method.

Mystery Ridge Mound Southwest: 33Ha40. According to the archaeological inventory form, this mound was 200 yards southwest of 33Ha39 and 3.8 feet high. Just like 33Ha39, above, this mound has not been relocated thus far.
Ridge Berms. Running along the ridge overlooking the Ohio River are anthropogenic berms similar to those found in the enclosure and along the parallel ridges. These berms have been modified in recent time with the building of the Little Turtle Trail, however the original lines are still discernable. The berms were mentioned in both the Archaeological District nomination form and the Photo-Interpretation Study of Archeological Sites and Aerial Mapping report (Benedict et al. 1968) as “fortification lines,” but have not been mentioned elsewhere previously. The temporal designation and function of these berms are still yet unknown. Because of their similarity to the enclosure and the water raceways to the west of these berms, it is possible that this was another prehistoric water management strategy.

![Figure 7. Time periods represented within Shawnee Lookout Park](image)

**Environmental Data, Acquisition and Modification**

Because the sites listed above are not spatially random within the local landscape, the environmental variables utilized for the evaluation of the second hypothesis are elevation, slope, aspect, distance from permanent water source and soil type (Kvamme 1995). These particular
environmental variables were chosen because they were all able to be analyzed at the same local scale as the archaeological sites and were relevant for all of the time periods represented within the data.

Initially, other variables were considered. Distance from chert resources was going to be included in the study, but, after much searching, there was not a readily available shapefile for chert outcrops within Ohio, Indiana, Kentucky and Tennessee. Though I could have made a distance from chert shapefile, this variable would have been outside of the scale of this study. The land cover within the test area was considered as a variable; however the presence of various invasive species, the confounding factor of European deforestation, known periods of agricultural disturbance and park landscaping would not be indicative of the prehistoric conditions. The distance to resources such as clay or various tempers within and immediately outside of the area was considered, as well. It was determined that the data would have to be separated by time period utilizing the specific clay/temper combinations. The data set was not robust enough in any specific time period to allow for this type of analysis (see Figure 7). The distance to the Enclosure was also pondered, but, like above, neither the temporal nor cultural components were statistically significant enough to allow for accurate conclusions. Additionally, a view shed analysis could be a possible variable, but seasonality and the visibility due to land cover would be a confounding factor. This problem was also a deterrent to using vantage points as a variable.

All of the cartographic modifications were performed using ESRI ArcGIS 9.3. For the sake of continuity, the geographic projection for the LiDAR was set to North American Datum (NAD) 1983 HARN, State Plane Ohio South, which was retained throughout the study.
**Elevation.** The first base map acquired for the elevation variable was a one arc second digital elevation model (DEM) from the USGS seamless data server (see inset, Figure 1). Though this resolution is useful for a regional study, the resolution of 30m resulted in only 3,609 pixels to cover the area. Considering the variation in the topography in the park and the size of the test area, this scale was too coarse for this study (Bevan and Conolly 2006).

The second base map was acquired from the State of Ohio Office of Information Technology, Ohio Geographically Referenced Information Program (OGRIP). This base map was a bare-earth DEM interpolated by OGRIP from the LiDAR data collected during the spring (leaf-off conditions) of 2007 (ogrip.oit.ohio.gov). Nine 5,000 x 5000 foot tiles that covered the entire peninsula were downloaded from OGRIP and mosaiced in GIS resulting in a high-resolution (2.5’ pixel) DEM. This DEM was then masked to the study area, which resulted in a 4,603,882 pixel raster. Because the downloaded file was 32bit, floating point data, the mosaic was transformed into integer data for ease of use. From this raster, a high-resolution hillshade was made to be used as a 2.5 dimensional background for all maps.

Although an initial study was performed using these data, it was determined that the resolution needed to be resampled. The high resolution LiDAR is appropriate for intrasite or artifact analysis, detail (especially of the Miami Enclosure and the location of mounds, see Figure 1) and for visual representation, but, because humans require more space than a 2.5’ square, the cell size need to be larger. Thus, the DEM was resampled and the cell size was set to 10 meters using cubic convolution averaging. This type of averaging determines the resulting cell value by fitting an algorithm between the nearest 16 cell values. The resulting image consisted of 26,308 pixels covering the test area. The cell size was set at 10 meters for two reasons. First, this scale is reasonable for intersite analysis while still providing topographic
detail (Allen 2000) and, second, 10 meters was the smallest cell value that could still be visually analyzed sans magnification when mapped.

*Slope and Aspect.* The variables of slope and aspect were derived from the resampled (10m) LiDAR DEM using the Spatial Analyst slope and aspect tools.

*Distance from Permanent Water Source.* Although Shawnee Lookout is punctuated by several seasonally inundated streams, the distance from permanent water source variable was evaluated using the current path of the Great Miami and Ohio Rivers. This variable was evaluated by using a river shapefile acquired from Cincinnati Area Geographic Information System (CAGIS). The vector file was then converted into a raster format and the Euclidian distance tool was used to determine the distance from the rivers.

*Soils.* The soils variable shapefile was acquired from CAGIS. The shapefile was then clipped to the study area and the data were mapped.
Internal Testing

As an internal background test of the significance of the archaeological data and the correlations between the archaeological and environmental data, two methods for detecting bias were used. First, random points within the park were generated using the “create random points” tool. These points were used throughout the study. Thus, every modification and statistical analysis of the sites shapefile and database was also performed on the random points shapefile and database. Second, when testing the validity of the predictive model, the data were separated randomly into two groups: a training set consisting of 60 percent of the sites and a testing set of the remaining 40 percent. This internal test was used so that there was no bias in the testing of the model.
Methods for Populating the Attribute Table

The first attribute table population was to determine the exact measurements of the variables for all of the archaeological sites. Thus, the layers were kept in raster format and the site attribute table was populated using the extract values to points tool. Once the data from this iteration were statistically analyzed, the rasters were reclassified and converted into vector format. The attribute table for the sites was then populated with the classified variables using the identity tool.

Spatial Statistics and Trend Analysis

To test the first assumption, the spatial variation of the sites was analyzed using the nearest neighbor statistical analysis. Once the determination of rejecting or accepting the null was determined, using the data generated from the first iteration of the attribute population, general trends in the archaeological data were explored using descriptive statistics. These data were tested against the random points to determine significance. After the trends were determined, the environmental layers were able to be classified for further analysis.

Classified Analysis

The second iteration of the attribute table population was used to determine two things. First, this step tested the second assumption by determining the significance of each of the variables using a Chi-squared test. The second reason was to determine how to recode the variables for use in the predictive model.
Final Classification and Modeling

In order to avoid the possibility of rejecting a location based upon one variable, each cell within each raster layer was coded as either high, medium, low or improbable of site presence. The rasters were then added together to give a numeric value to each cell within the study area. This method of weighing was chosen over giving a binary value to each cell or a percentage weight to each layer in order to not give a single variable more of a “culturally conceived” bias over another.

With the exception of the earthworks and unidentified sties, the archaeological sites described in this chapter will be used to test the first hypothesis, which states that the prehistoric use areas are spatially clustered. Further, the environmental characteristics of each of these archaeological sites will be tabulated, which will determine whether the environmental variables are relevant for all time periods at the local level as posited in the second hypothesis. After those analyses have been performed, the methods outlined above will be used to build the predictive model. These analyses will be discussed in the next chapter.
Chapter 5: Trend Analysis and Discussion

Because the predictive model is based on two spatial hypotheses that must be tested sequentially prior to building the model, the first hypothesis will be tested, followed by the rational for classification of the environmental variables. Finally, the second hypothesis will be tested.

Spatial Analysis of Archaeological Sites

After all of the sites were brought into GIS, using the spatial statistics tool in ESRI ArcGIS 9.3, an average nearest neighbor distance analysis was performed to determine if the archaeological sites being considered for the model were clustered or random. The results of the statistical analysis were a z-score of -13.67 σ, which indicates that the sites are clustered with less than a 1 percent (p < 0.0001) chance that the sites were randomly placed within the landscape. Thus, the first spatial hypothesis can be considered valid.

In order to test the second hypothesis, the attribute tables for the sites and the random points were populated as described above with the exact measurement of each variable (elevation, slope, aspect, distance from water and soils) so that the initial classification of the data could be determined. Then, a univariate analysis was used to generalize the data set into six classifications.

Elevation

The elevation of the study area ranges between 142.6 and 228.9 meters. The use areas exhibited a tri-modal distribution, ranged from 155 and 228.6 meters with a mean elevation of 187.1
meters and had a standard deviation of 25 meters. The random points ranged from 154.5 and 220.6 meters with a mean of 185.0 meters and standard deviation of 20.1 meters.

Although the descriptive statistics seem similar, when a histogram was generated and compared, there were significant differences between the sites and the random points. The final conclusion was to separate the elevation into six classes using the equal intervals classification (Connoly and Lake 2006).

Figure 11. Elevation of sites

Figure 12. Elevation of random points

*Slope*

The slopes in the study area range from flat to 42 percent. The general statistics for the sites ranged from one to 23 percent. The data is skewed to the left indicating a higher tendency for the landscapes that have a lower slope. The outlier is a mound that is in significant danger of eroding down slope. For the random points, the slopes ranged between two and 25 percent. This variable was separated into six classes using the natural breaks classification method (Connoly and Lake 2006).
Aspect

The aspects for the study area cover the full compass. The sites and random points both also covered the full compass. The distribution of the sites was skewed to the right indicating a general preference of western to northwestern facing landscapes; nevertheless, aspect was classified into six classes using the equal intervals method. Because there were only 11 cells that were considered flat (-1), these cells were included in the first category.
Distance from Water

Because of the location between two rivers, the distance from water does not exceed 961 meters. The minimum distance from water within the test area is 64.6 meters. For the sites, the minimum distance was 106.7 meters and the maximum was 858.2 meters. The random points ranged from 91.4 to 951.3 meters from water.

There did seem to be a general tendency for being closer to water. Of the sites that were furthest from water, only two were use areas and the remaining were mortuary. The variable was classified into six equal interval classes.

Soils

As mentioned, all of the soils within the study area are moderately to well-drained and neither prone to ponding or flooding. Further, in order to run the initial statistics, this variable had already been coded corresponding to the variations in soil type, which included the percentage of slope (see Figure 6). Since the variable of slope was already incorporated and thus would already be evaluated in the study, in order to be consistent with six classifications, the soils were classed by Series type.
Table 3. Variable Classifications

<table>
<thead>
<tr>
<th>Elevation</th>
<th>Slope</th>
<th>Aspect</th>
<th>Water Distance</th>
<th>Soil</th>
</tr>
</thead>
<tbody>
<tr>
<td>Meters ASL</td>
<td>Percentage</td>
<td>Degrees</td>
<td>Meters</td>
<td>Series</td>
</tr>
<tr>
<td>1</td>
<td>142.6-157.2</td>
<td>0 - 5</td>
<td>-1-59</td>
<td>64.6-214.2</td>
</tr>
<tr>
<td>2</td>
<td>157.3-171.5</td>
<td>6-10</td>
<td>60-119</td>
<td>214.3-363.5</td>
</tr>
<tr>
<td>3</td>
<td>171.6-186.2</td>
<td>11-15</td>
<td>120-179</td>
<td>363.6-512.9</td>
</tr>
<tr>
<td>4</td>
<td>186.3-200.5</td>
<td>16-20</td>
<td>180-239</td>
<td>513.0-662.2</td>
</tr>
<tr>
<td>5</td>
<td>200.6-214.8</td>
<td>21-26</td>
<td>240-299</td>
<td>662.3-811.6</td>
</tr>
<tr>
<td>6</td>
<td>214.9-228.9</td>
<td>27-42</td>
<td>300-359</td>
<td>811.7-961.0</td>
</tr>
</tbody>
</table>
**GIS Modification**

After the coding decisions were made, all of the vectors were changed to raster format. In this format, the variables were classified manually according to the methodologies and rationales outlined above. Then, the rasters were reclassified in ESRI ArcGIS desktop extension Spatial Analyst according to their numeric codes. The rasters were then converted back into vector format so that a new attribute table could be populated using the method described above.

**Frequency with Coded Variables**

After classification, a chi-squared test was administered to both the sites and the random points to determine the probability of each environmental variable being random. The results are in Table 3. From this analysis, it was determined that all of the variables of elevation, slope, aspect, distance from water and soil can reject the null hypothesis.

<table>
<thead>
<tr>
<th>Sites (n = 79):</th>
<th><strong>Elevation</strong></th>
<th><strong>Slope</strong></th>
<th><strong>Aspect</strong></th>
<th><strong>Water</strong></th>
<th><strong>Soil</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Chi-squared</td>
<td>30.979</td>
<td>64.574</td>
<td>12.872</td>
<td>35.085</td>
<td>17.596</td>
</tr>
<tr>
<td>DF</td>
<td>4</td>
<td>3</td>
<td>5</td>
<td>5</td>
<td>3</td>
</tr>
<tr>
<td>Significance</td>
<td>0.000</td>
<td>0.000</td>
<td>0.025</td>
<td>0.000</td>
<td>0.001</td>
</tr>
</tbody>
</table>
Chapter 6: Secondary Analysis

At this stage, the attribute table was populated for the training set and statistically analyzed to determine categories of high, medium, low or unlikely potential for each of the categorized variables. Once the determination was made, the rasters were reclassified according to their potential for site location. For areas of high probability, the cells were given a value of three, for areas of medium probability, the cells were given a value of two, for areas of low probability, the cells were given a value of one and the improbable cells were given a value of zero. When all rasters were added together, a new raster was produced with a maximum cell value of 15.

As an internal test for the multivariate analysis, the use area data were separated into training and testing sets. The training set, which was used to determine the likelihood of a cell containing an archaeological site, consisted of 60 percent of the data (n = 47). The remaining 40 percent of the data (n = 32) was used to test the accuracy of the final probability map. This testing will be discussed further below.

Elevation

Of the 47 training sites, 21 were between the elevations of 157.3 and 171.5 meters thus that range was classified as high potential of site location and each cell was given a weight of three. Cells falling within categories four and six were given a weight of two and classified as a medium potential with 11 and 13, sites respectively. Categories three and five each had one site within their ranges so these elevation cells were classified as low potential and given a weight of one. The cells within category one were given a weight of zero.
Slope

Thirty five of the 47 training sites were on slopes ranging from zero to five percent; the cells within that range were given a value of three. A value of two was given to the cells that represented a slope of six to 10 percent slope, since nine of the training sites were found within this range. One site was located in the 11 to 15 percent range and two sites were within the 16 to 20 percent range, thus these cells were given a value of one. There were no sites that were located on slopes greater than 20 percent, so these cells were given a value of zero.
Aspect

There was a tendency for north to northeastern and western aspects, so these aspects were rated as high potential and given a cell value of three. Southern and northwestern exposures were classified as medium and eastern exposures were classified as low. Because all categories were represented in the data, there were no cells classified as improbable.
Distance From Water

Classifications one (64.6 to 214.2 meters) and two (214.3 to 363.5 meters) contained 18 and 16 sites, respectively, and were given a cell value of three. Distances between 363.6 and 512.9 meters and between 662.3 and 811.6 meters were considered medium probability, since 11 of the training sites were located in this range. Two sites were located in the remaining two classifications so each of those cells were given a value of one. Since all the categories were represented in the data, there were no cells with a zero value.

Soils

Almost half of the training sites were found on the Parke series soils. This soil series was given a value of three. Ten sites were found to be on the Eden series and 11 on the Martinsville series, so these cells were given a value of two. A cell value of one was assigned to the Ava series, since three sites were atop of this type of soil. There were no sites representative of either the Urban or the Pate series soils. Thus cells representing these soils were given a value of zero.
Site Probability Model Generation

All five of the reclassified rasters were added together. For mapping purposes, cell values between three and eight were considered low, nine to 11 were considered medium and 12 to 15 was considered high (Table 5, Figure 30). There were no cells with values less than three. This resulted in a single raster with a maximum cell value of 15 (Table 6).

Once the probability map was generated, the extract values to points tool was used to determine the values of the 32 sites that were set aside as the testing set.
Figure 31. Results of all five rasters

Table 5. Percentage of Sites Explained by the Probability Model

<table>
<thead>
<tr>
<th>Category</th>
<th>% of Test area</th>
<th>Test sites</th>
<th>% Test Sites</th>
<th>Total Sites</th>
<th>% Total Sites</th>
</tr>
</thead>
<tbody>
<tr>
<td>3 to 8</td>
<td>27.041</td>
<td>1</td>
<td>3.125</td>
<td>1</td>
<td>1.266</td>
</tr>
<tr>
<td>9 to 11</td>
<td>57.789</td>
<td>6</td>
<td>18.75</td>
<td>13</td>
<td>16.456</td>
</tr>
<tr>
<td>12 to 15</td>
<td>15.170</td>
<td>25</td>
<td>78.125</td>
<td>65</td>
<td>82.278</td>
</tr>
</tbody>
</table>
Discussion

The predictive gain, as described by Kvamme (1988), is 0.82, which indicates that this predictive model has a high predictive utility. A total of 15.2 percent of the study area is categorized as high probability of containing sites, 57.8 percent of the study area has a medium probability of having a site and 27 percent has a low probability.
Of the 32 sites held as a test, 25 (71.8 percent) were located within the cells in the high range, six (18.8 percent) in the medium and one (3.1 percent) in the low. Of the entire population (n = 79), 65 (82.3 percent) were in the high probability category, 13 (16.5 percent) were in the medium probability category and one site (1.2 percent) was in the low probability category. To clarify, 15 percent of the study area contains 82 percent of the known sites used to create this prediction model.

The relative total area covered by the sites used for this study is 5.4 percent. Considering the fact that the prehistoric Enclosure and berms cover a considerable portion of the test area, the mounds mentioned in the literature that have not been accounted for with ground truthing, the high probability of prehistoric sites that have not been located, and the historic sites within the test area that have not been cataloged, it seems likely that over half of the test area has an archaeological component. Further, considering that this test area is at the confluence of two major river systems, it seems likely that over half of the land area has the potential of testing positive for anthropogenic disturbance.

This model predicted the location of the Miami Earthwork, the historic Columbia Settlement, the Ridge Berms, the parallel berms, the Brower House site and the Graded Way in addition to the known sites in either the medium or the high category of probability (see Figures 2 and 3).
Chapter 7: Conclusions and Recommendations for Further Research

As Binford (1980:4) stated, the spatial patterning of archaeological sites is predictable due to the human pursuit of food, shelter and satisfaction with the environment. Because non-random behaviors can be attributed to cultural influences, the first hypothesis of this study was posed to test whether the sites within the study area were indeed randomly placed spatially within the landscape. There is a high probability that the site locations within this local region are not random. The reasons for the clustering could be a cultural preference for a particular amount of space, a perceived generational relationship to this particular geographic area, or because this area is a part of a greater macroregion of annual occupation (Binford 1983). Or, as the second hypothesis of this study posits, the location of sites could be linked to environmental characteristics. It was determined that there is a high probability that the environmental characteristics associated with the individual site locations were not random, either. Again, the cultural implications are many: the possible preference for certain elevations, lower slopes, warmer or cooler aspects, shorter distances from water, a proclivity toward a certain soil or because of the subsistence resources that manifest due to this particular ecosystem. Regardless of the rational, the ultimate goal of this study was to determine if it was possible to predict the where archaeological sites are likely to occur. I have shown that by importing known archaeological sites that have known environmental characteristics into a GIS environment, it is possible to predict where sites can most probably be located.

Because this model considers all of the prehistoric populations that have visited this area, it would be considered erroneous to make inferences about specific time periods or meanings of land use. Nevertheless, there are several conclusions that can be gleaned from this analysis.
First, it is safe to conclude that Shawnee Lookout is a highly modified landscape. Due to the lack of evidence, not much is known about the landscape modifications within the Paleoindian period. In the Archaic, mortuary features were added to the landscape and specific use areas probably started to become more suitable for human land use. Usable area continued to enlarge during the Woodland period. In the Early and Middle Woodland, additional burial mounds of earth were added to the landscape. In the Middle Woodland, the first iteration of the Enclosure was added and the usable area continued to expand due to population growth and agriculture. The Enclosure was enlarged in the Late Woodland and again in the Protohistoric Ft. Ancient period. The Historic period was responsible for extensive flattening of the landscape and mixing of the archaeological record due to the introduction of the plow and need for suitable land for permanent residences.

It is unknown when the other landscape modifications were added. These unknowns include: the berms, which have never been tested; the graded way, which may have been ‘constructed’ by continuous use; and numerous other modifications that are possible depending upon the questions being asked of the landscape.

A second conclusion that can be made from this analysis is that some areas were considered more suitable for different functions than others. To be more specific, 33Ha43, 110 (24) (Figure 4) and the Western sites (Figure 5) are all multicomponent, multifunction uses areas, whereas the other use areas exhibit only one or two time periods. Further, the Eastern sites (Figure 6) and Point sites (Figure 4)—excluding 33Ha43, 110 (24)—are all single function sites that are mostly mortuary in manifestation. Additionally, the earthworks present in Shawnee Lookout are all at higher elevations, which could be indicative of function.
Another conclusion that can be made from this study is that there are sites within the study area that have not been identified. If we assume that population increases through time, then, when compared to the amount of Middle Woodland sites, there should be more Late Woodland and Protohistoric Fort Ancient sites than are currently known (see Figure 7). This discrepancy could be a result of the study area focusing only on the upland, non-floodplain locations. Likewise, the low proportion of Middle Archaic and Early Woodland sites indicate either a lack of identification within the test area or another influence altogether.

Finally, this analysis proves that this landscape was ‘mapped onto’ by foragers, utilized ‘logistically’ by collectors and, as subsistence strategies evolved, provided the necessary resources required for a more complex system of interaction with the ecosystem (Binford 1980). This theory is evident not only because of the proportion of archaeological sites, but also through the archeological record, especially at 33Ha43, 110 (24) (Fischer 1965, 1968, 1970; Tankersley 2008, 2009).

This analysis can be used as a starting point for further research. At a larger territory level, because this test region is located at a major river confluence, other confluences along either the Ohio River or the Great Miami River that had similar attributes could be compared to determine if the same percentage of site probability is inherent.

If this study area were to be expanded in order to make the data set more robust then specific time periods could be evaluated at the local scale. A plethora of additional questions could be asked within this area that concentrated on a specific culture or specific artifact assemblages. Nevertheless, intersite comparisons could be studied with the current data set.

Considering that the field work for this study was based on surface scatter, one test for the accuracy of this model would be to perform subsurface testing such as coring or shovel test
pits in the areas of high potential to determine if a site exists. Thus, this project could serve as a starting point for additional associations within the park at the artifact level.

This test area included a hilltop enclosure. If the study area were expanded to include all of the sites within the temporal range of the Enclosure, a similar study could be performed—starting with the two enclosures within the immediate proximity—to determine if there are local patterns in the site locations surrounding the earthworks. This type of analysis could be expanded to other hilltop enclosures in the distant vicinity.

Another consideration is the sites within the floodplain. Though these sites would be difficult to test due to the deep alluvial deposits, data do already exist for this area, especially on the Ohio River side. These floodplain sites could be compared to the sites mentioned in this study.

For cultural resource management, a gainful predictive model saves both time and money. The significance of this type of study at the academic level is its utility. Not only are the sites within this test area georeferenced, but they are also described, assigned environmental attributes and analyzed for general trends. This regional site inventory allows for additional archaeological research questions to easily be posed. Additionally, because the local landscape has been visualized using the latest mapping technology, intrasite areas and intersite distances are able to be easily conceptualized, which provides a better understanding of the anthropological ‘network.’ Finally, because it proven that it is possible to predict where sites occur within this test area, and a map was generated that ranks the probability of each 10 meter area containing a prehistoric archaeological site, the possibility of a site being destroyed is significantly decreased while the possibility of discovering a new site is increased. At a more theoretical level, this type of anthropological study is significant because not only does it prove
that prehistoric cultures were highly influenced by their environmental landscape, but it also empirically illustrates the choices that these populations made concerning the landscape.
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