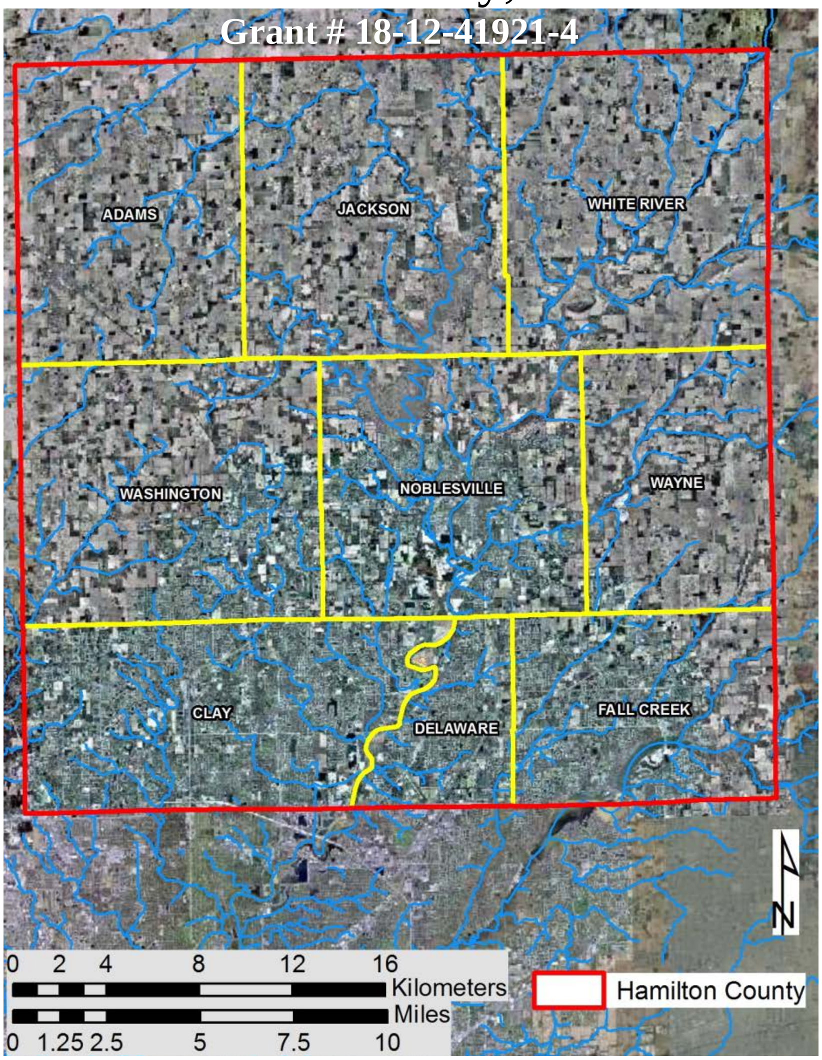
Distributional Analysis of Archaeological Remains in the Upper White River Basin: An Archaeological Survey of Hamilton County, Indiana



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June 2013

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Distributional Analysis of Archaeological Remains in the Upper White River Basin: An Archaeological Survey of Hamilton County, Indiana

Grant # 18-12-41921-4

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This survey of Hamilton County, Indiana could not have been completed without the help of the various landowners that allowed us to survey their properties. A special thanks to [redacted] We are indebted to your kindness.

The field work and laboratory processing was completed by the authors and the following Ball State students: Joe Miller, Oliver Firestone, Josh Donaldson, Brad Painter, Khyrstin Chance, Mary Farrell, Trey Hill, Katie King, John Monger, Eli Orrvar, Lakota Sells, and Adam Zajac.

ABSTRACT

The Applied Archaeology Laboratories (AAL) of Ball State University conducted an archaeological reconnaissance project for archaeological materials in Hamilton County, Indiana, for an FY2012 Historic Preservation Fund Grant (Grant #18-12-41921-4). This Historic Preservation Fund grant project investigated the archaeological resources of Hamilton County, Indiana. This specific project focused on the White River and its associated tributaries, as well as the southern half of the county. Approximately 565 acres (228.55 ha) of agricultural land underwent pedestrian survey, uncovering 230 new archaeological sites and 1625 artifacts. Over 157 acres (63.54 ha) underwent soil phosphate survey, revealing multiple possible prehistoric agricultural fields or gardens. The project recovered 1154 prehistoric artifacts and 471 historic artifacts from 9 different parcels of land within Hamilton County. Multiple cultural periods are represented in the artifact assemblage, including diagnostics of the Early Archaic, Middle Archaic, Late Archaic, Middle Woodland, Late Woodland, and Historic periods. The average site density recorded for the project was one archaeological site per 2.46 acres (0.41 sites/acre). The average artifact density was one artifact per 0.34 acres (2.9 artifacts/acre).

A total of 13 sites are recommended as potentially eligible for Indiana Register of Historic Sites and Structures or the National Register of Historic Places

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INTRODUCTION

By Matthew R. Swihart

In the fall of 2012 through the spring of 2013, the Applied Archaeology Laboratories conducted an FY2012 Historic Preservation Fund Grant for Hamilton County, Indiana. Hamilton County, specifically the towns of Noblesville, Carmel, Westfield, and Cicero, are currently undergoing rapid construction and growth, requiring that the cultural resources of the area, both historic and prehistoric, be documented before the information is lost. The White River Valley in Hamilton County has been part of various archaeological projects, uncovering thousands of years of use by prehistoric Native Americans. Though the documentation for the county is already relatively dense, there are many developing areas of the county that remain unsurveyed, as seen in the various “roundabouts” set on county roads surrounded by vast amount of unsurveyed agricultural fields.

The project consisted of 564.76 acres (228.55 ha) of pedestrian survey of ten different parcels of land, as well as 157 acres (63.54 ha) of soil phosphate surveys of three different parcels of land. This project differs from the various other county-based projects conducted by the Applied Archaeology Laboratories, or any other Historic Preservation Fund Grant project for that matter, due to the first-ever inclusion of soil phosphate and magnetic susceptibility analysis to locate prehistoric gardens These surveys were introduced to provide the data necessary to test a new method of locating prehistoric agricultural fields developed by Nolan. Phosphate analysis of the soil samples were conducted by both authors. All pedestrian surveys were conducted under the supervision of Nolan with the help of various undergraduate and graduate students under the employ of Ball State University’s Applied Archaeology Laboratories.
The following research questions guided this project:

1. What is the nature of the Early and Middle Woodland occupation?
    a. What is the relationship between mound and non-mound sites?
    b. What are the relationships with the Havana and Scioto heartlands?

2. How is resource exploitation structured during various time periods?
3. Do different contemporary traditions occupy distinct or overlapping niches?

4. What is the general cultural chronology for Hamilton County?

5. What are the densities and distributions of archaeological sites on the various landforms within the county?

6. What is the average site density within the county?

BACKGROUND

By Matthew R. Swihart and Kevin C. Nolan

In order to properly examine the archaeological materials recovered during this project, a review of multiple sets of background data was conducted. The background information presented in this report includes environmental and archaeological information concerning Hamilton County, Indiana.

Location

The project areas are located in Hamilton County (Figure 1). Hamilton County is located south Tipton County, north of Marion County, and between Boone County and Madison County to the west and east. The research universe is approximately 257,509.80 acres (104,210.5 ha) in size. For the proposed research, the grant project targeted areas [redacted]

Geology

The bedrock geology of Hamilton County is made up of Lower and Middle Silurian rocks, Middle Devonian rocks, and lastly a small portion of Devonian and Mississippian period rocks (Cantin 2008:6). The county is predominately made of up Lower and Middle Silurian rocks, specifically siltstones, shales, and limestone dolomite (Cantin 2008:6). The second highest portion of the county are the Middle Devonian rocks, specifically limestones and dolomite (Cantin 2008:6). Lastly, in the very tip of the southwestern corner of the county is a formation of "New Albany Shale", or black shale, from the Devonian and Mississippian periods (Cantin 2008:6).

One specific geological specimen of interest is the Silurian chert, Fall Creek. Fall Creek chert is listed as outcropping within Hamilton County, with the same outcrop also extending into neighboring Madison County (Cantin 2008:26). This chert, only recently identified, closely resembles some Liston Creek chert (Cantin 2008:26). It is noted that, the "fossil assemblages of certain samples are often virtually identical" to Liston Creek cherts, and can also be very similar in luster, color, and texture (Cantin 2008:26). These fossils are quartz-filled crinoid columnella, bryzoa fronds, and fusulinids (Cantin 2008:27). It is noted that this chert source was highly utilized at the Strawtown site located in Hamilton County, as well as in many Woodland sites within the County and surrounding areas (Cantin 2008:27). Examples of the chert are shown in Figure 2.

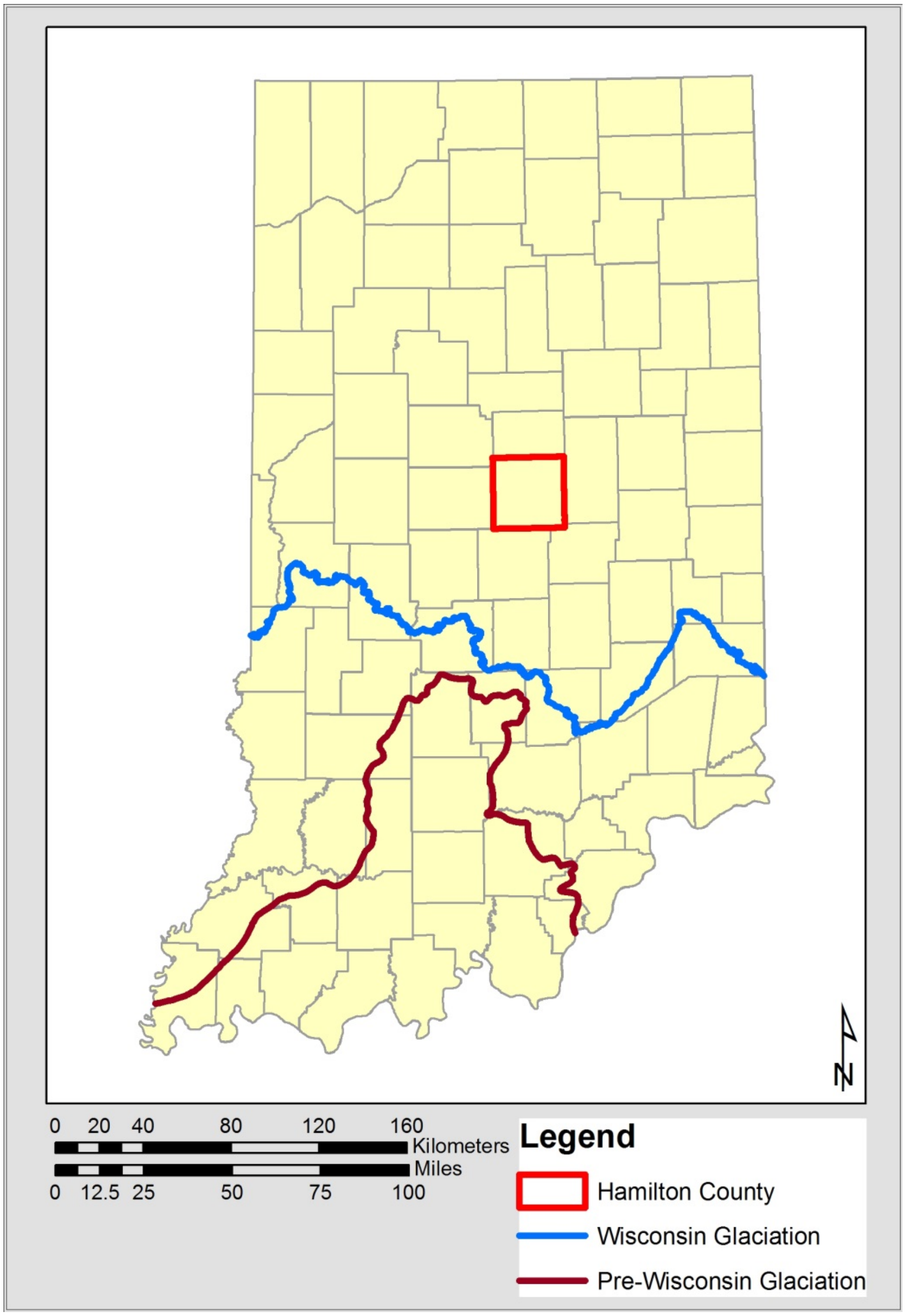

Figure 1: Hamilton County within the state of Indiana. Glacial limit shapefiles by Gray and Letsinger (2010).

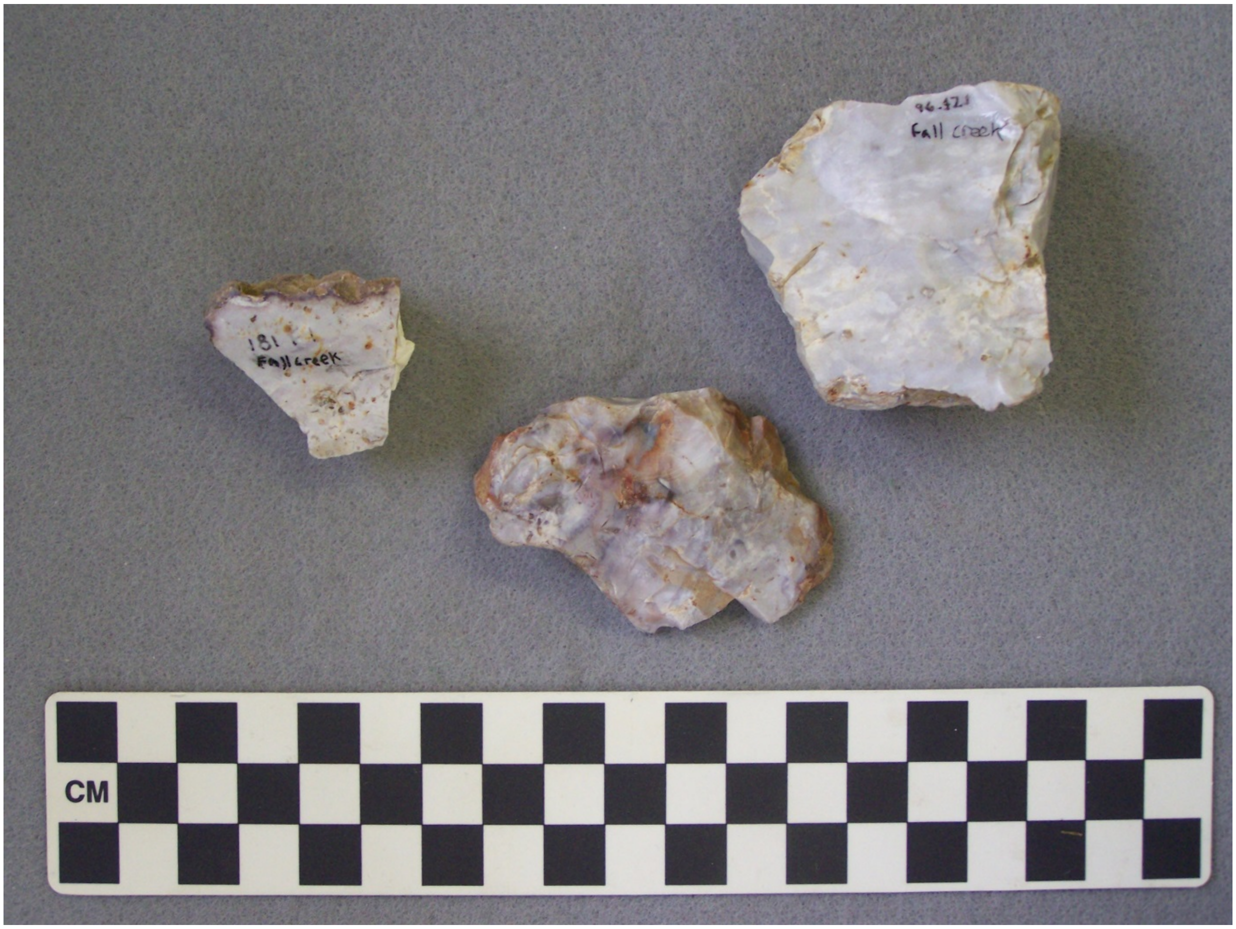

Figure 2: Examples of Fall Creek Chert from the AAL Comparative Chert Collection

Glacial History

Modern Indiana has been shaped by the cumulative effects of three glaciations: the Kansan, Illinoian, and the Wisconsin glacial episodes (Shurig 1970:6; see Figure 1). The glaciers were formed in the upland east area near the Hudson Bay and spread out across the North American continent, reaching its farthest in the Wabash and Ohio Valleys – south of the 38th parallel – farther than anywhere else in the Northern Hemisphere during the Pleistocene Epoch (Wayne 1966:21). Each new glacial migration brought with it tons of glacial drift that resurfaced the face of Indiana. The current homogenous appearance of Indiana's central region is misleading because underneath the surface lies a blending of bedrock and glacial drift that indicates its volatile glacial past.

The Kansan Age glaciation was the first to impact Indiana and dates from approximately 350,000 to 400,000 years ago (Melhorn 1997:18). It extended southward towards the Scottsburg Lowland. The glaciation was responsible for the formation of the Ohio River. The pre-glacial Teays River valley was the main drainage system across the country stretching from North Carolina to Illinois. The waterway was dammed in western Ohio by the encroaching glacier and forced to find alternative outlets. The drainage was diverted to what is now the Ohio River (Shurig 1970:6). The Kansan glaciation was also responsible for some of the deepest valley-cutting during the Ice Age and deposited roughly 75 to 100 feet of glacial drift (Wayne 1966:32).

Glaciations are followed by years of warming, which result in differences in fossils and soil deposits. These differences make it possible to clearly delineate various glacial episodes. The Yarmouth Age was the warming period that followed the Kansan Age and lasted for 200,000 years (Melhorn 1997:18); it was later followed by the second glacial episode, the Illinoian Age.

The Illinoian Age began 125,000 years ago (Wayne 1966:32). This is the glaciation that was responsible for delving the farthest into the Northern Hemisphere. The glacier margin fluctuated three times from its origin in the Lake Michigan Lowland to just south of the 38th parallel (Wayne 1966:33). Each fluctuation resulted in distinct till coloration as well as types of fossils present. The warming period known as the Sanagon Age preceded this glaciation (Wayne 1966:34).

The final glaciation, the Wisconsin Age, began its encroachment upon Indiana from the northeast 70,000 years ago and produced the Trafalgar Formation (Wayne 1966:34). The glacier was approximately 1,700 feet thick in certain areas (Wayne 1966:27). Hamilton County is part of the Cartersburg Till Member of the Trafalgar Formation with pockets of Outwash and Dune facies (Wayne 1966:26). The Trafalgar Formation was deposited between 21,000 and 15,000 years ago burying a thin layer of silt which had accumulated over the Pre-Wisconsinan Till. The Trafalgar formation is composed primarily of conglomeratic mudstone with gravel, sand, and silt (Wayne 1963:17, 45). Fossils indicate that central Indiana was a tundra-like setting at this time (Wayne 1966:34).

Physiography

Hamilton County is predominately located within the physiographic region known as the Tipton Till Plain (Figure 3), with a considerable portion of the southeastern portion of the county being located within the New Castle Till Plains and Drainageways (Gray 2000). The Tipton Till Plain is generally considered to have low relief with occasional hill provided by ice-disintegration features (Gray 2000). The New Castle Till Plains and Drainageways is also generally flat with the addition of several major tunnel-valleys formed under the ice sheets (Gray 2000). Wayne (1966) comments on the Tipton Till Plain’s flat to gently rolling topography, noting that the Wisconsin glaciation also created a number of end moraines that cross throughout (Wayne 1966:34). Schneider (1966:49) notes that as a result of the glacial history of the region, the Tipton Till Plain is “virtually featureless”.

Hamilton County occupies two bedrock physiographic units (Schneider 1966). The western half of the county falls within the Scottsburg Lowlands and the eastern half of the county is within the Bluffton Plain (Schneider 1966:Figure 16). The Scottsburg Lowland is a strike valley composed of an outcrop of nonresistant late Devonian and early Mississippian shales covered by up to 150 feet of till. In the northern portion (where Hamilton County resides) this bedrock lowland is ill-defined, blanketed by surface till deposits, and thus the bedrock exerts little influence on surface geomorphology.

The Bluffton Plain (Schneider 1966:56), or Rensselaer Plain (Wayne 1956:30) is composed of middle Silurian dolomites and limestones underlain by Devonian and Mississippian limestones. Glacial deposits within the plain vary from 50 to almost 300 feet (Wayne 1956:31). The bedrock of this zone shows little relief.

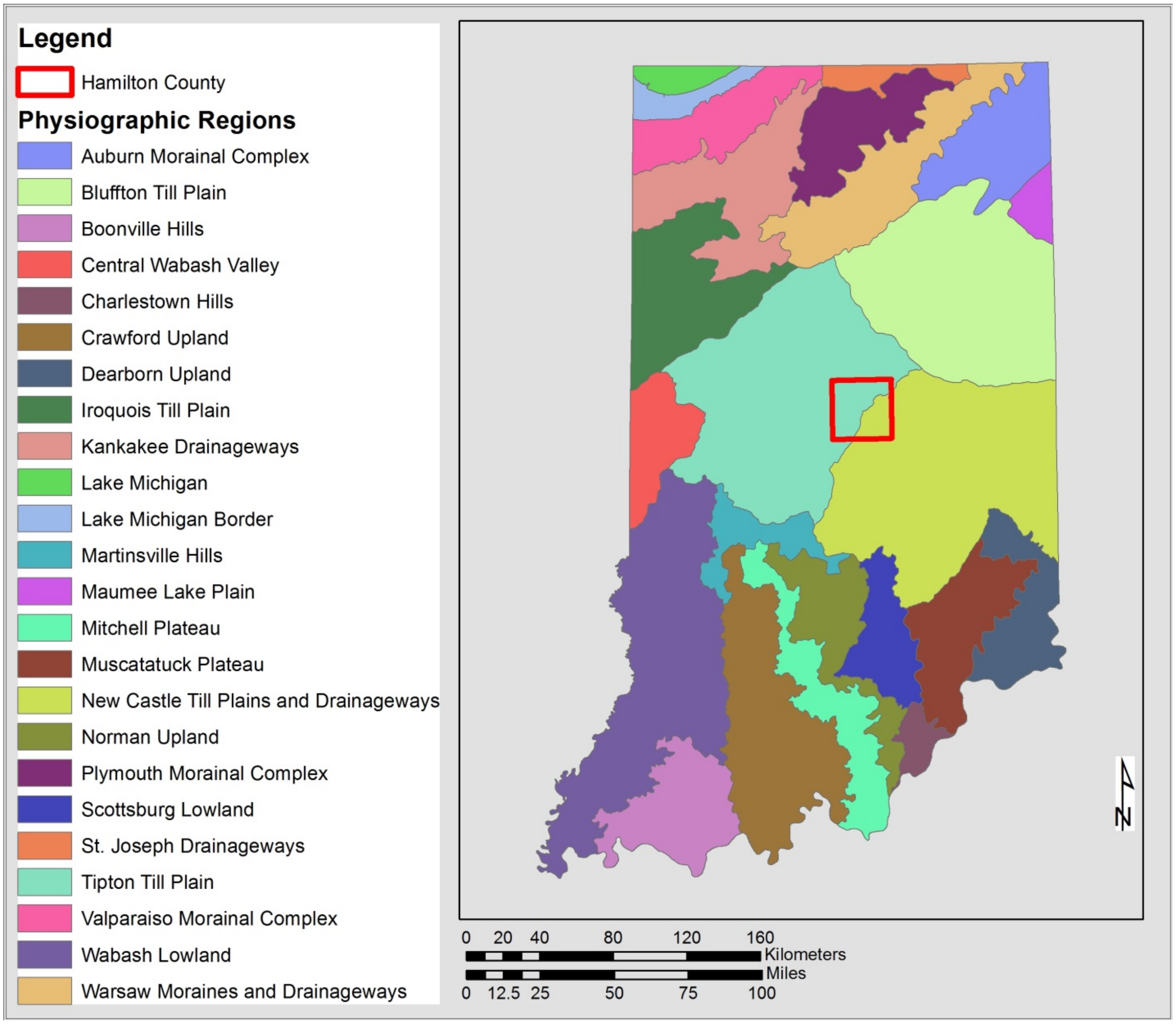

Figure 3: Physiographic Regions of Indiana (Gray and Sowder 2002).

Soils

The soils in Hamilton County are of primarily glacial parent material. There are five general soil map units (associations) in Hamilton County (Soil Survey Staff et al. 2013): Crosby-Treaty-Miami, Fox-Ockley-Westland, Miami-Crosby-Treaty, Patton-Del Rey-Crosby, and Sawmill-Lawson-Genesee (Figure 4). Hosteter (1978:3-4) describes the soils as nearly universally deep, and relatively level. Some upland soils are formed in thin layers of loess (e.g., Crosby). The Ockley-Westland-Fox soils occupy glacial outwash terraces. Floodplain soils (Sawmill-Lawson-Genesse) are generally well drained and productive.

Figure 4: Soil Associations within Hamilton County.
Note: Hosteter (1978) only shows four associations and these bear a general similarity to the current STATSGO (Soil Survey Staff et al. 2013) map units; however, each specific description would be different.

There are thirty-one soil map units (SMUs) of twenty-one soil series recognized within Hamilton County (Figure 5, Table 1). Soils range from very poorly drained to well drained, with the majority (70.3% by area) somewhat poorly or poorly drained. These SMUs are formed on till plains (79%), terraces (5.6%), outwash plains and terraces (2.3%), lake plains (5%), floodplains (5.3%), and miscellaneous and modified soils (2.9%) (Figure 6). Flooding is limited to a small proportion of the county, with 90.8% of the area classified as never flooding. Ponding occurs on frequently on 31.3% of the county's surfaces. Erosion is noted for 16.4% of the county. Soil texture includes muck (0.2%), clay loam (2.1%), silty clay loam (31.8%), silty loam (59.7%), and loam (3.1%).

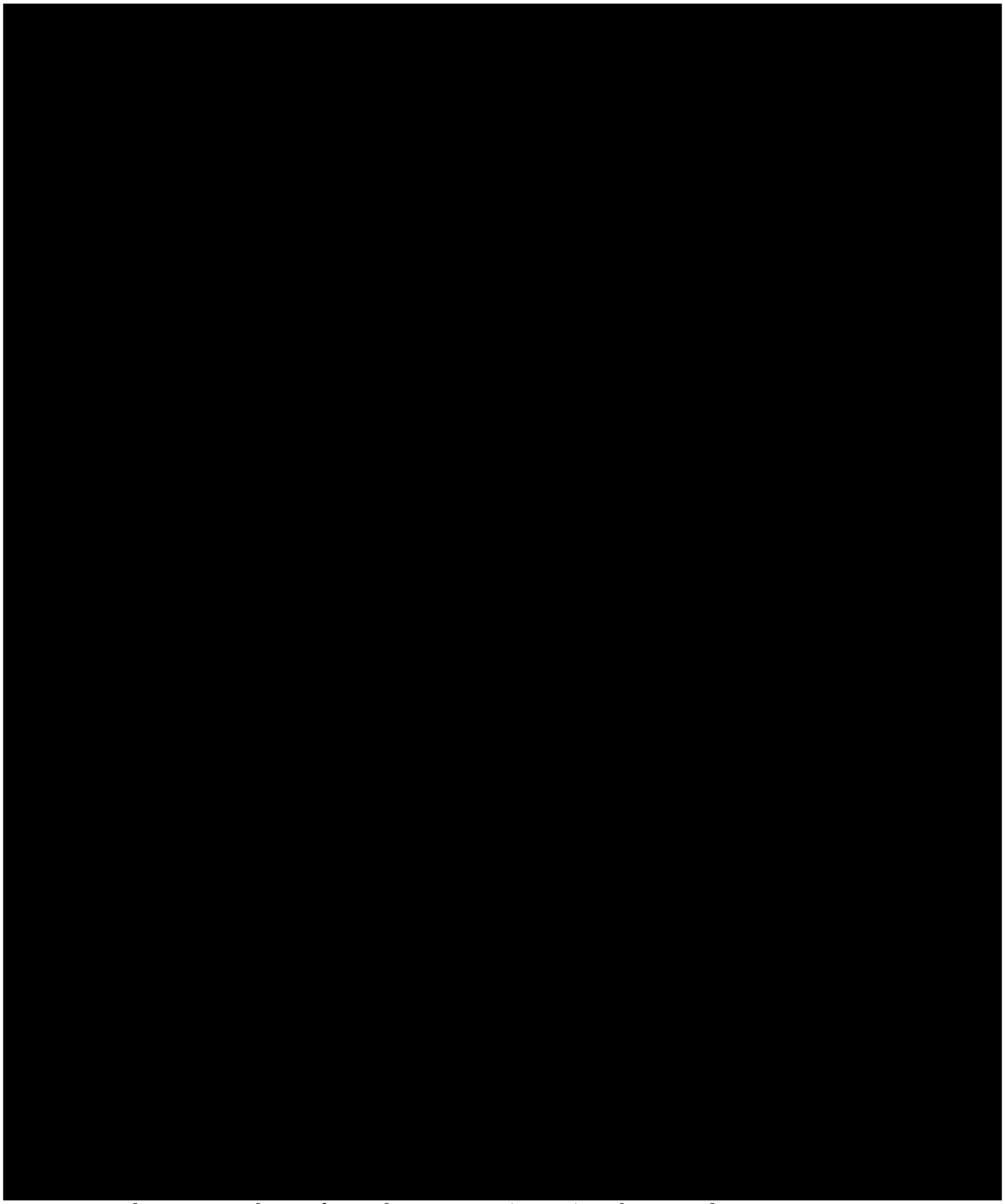

Figure 5: Soil Drainage Classes for Soil Map Units (SMUs) within Hamilton County.
Note: Miscellaneous includes water, orthents, and pits; source: SSURGO (Soil Survey Staff et al. 2011).

Table 1: Soils of Hamilton County

Map Unit Symbol	Map Unit Name	Acres in County	Percent of County	Slope	Setting	Texture	Drainage	Eroded	Flooding	Ponding	Acres in Survey	Percent of Survey	SA1	SA2	SA3	SA5	SA6	SA7	SA8	SA9	SA10	Sites	Acres/Sites Density	Sites/Acre Density	Mapped Points	Acres/Point Density	Point/Acre Density
Br	Brookston silty clay loam	63,135.20	24.50%	0-2	Till plains, depressions	SiCLm	Poor		Never	Frequent	198.79	35.20%	12.46	46.51	64.76	41.72	22.27	9.64		1.11	0.32	50	3.98	0.25	139	1.43	0.70
CrA	Crosby silt loam, 0 to 3 percent slopes	90,447.70	35.10%	0-3	Till plains	SiLm	Somewhat poor		Never	Never	231.85	41.05%	2.48	47.29	61.47	29.98	29.62	39.6		17.51	3.9	109	2.13	0.47	322	0.72	1.39
FnA	Fox loam, 0 to 2 percent slopes	1,330.30	0.50%	0-2	Terraces	Lm	Well		Never	Never	0.00	0.00%															
FnB2	Fox loam, 2 to 6 percent slopes, eroded	1,447.10	0.60%	2-6	Terraces	Lm	Well	Eroded	Never	Never	5.46	0.97%							5.46			13	0.42	2.38	66	0.08	12.09
FxC3	Fox clay loam, 8 to 18 percent slopes, severely eroded	1,020.90	0.40%	8-18	Terraces	CLm	Well	Severely	Never	Never	0.00	0.00%															
Ge	Genesee silt loam	3,224.50	1.30%	0-2	Flood plain	SiLm	Well		Frequent	Never	0.00	0.00%															
HeF	Hennepin loam, 18 to 50 percent slopes	2,105.70	0.80%	18-15	Till plains	Lm	Well		Never	Never	0.00	0.00%															
Ho	Houghton muck	206.5	0.10%	0-2	Outwash plains, depressions	Mk	Very poor		Never	Frequent	0.00	0.00%															
MmA	Miami silt loam, 0 to 2 percent slopes	7,545.90	2.90%	0-2	Till plains	SiLm	Moderately well		Never	Never	0.00	0.00%															
MmB2	Miami silt loam, 2 to 6 percent slopes, eroded	29,978.60	11.60%	2-6	Till plains	SiLm	Moderately well	Eroded	Never	Never	44.11	7.81%	17.05	1.03	6.3	2.41		4.27	1.02	7.29	4.74	33	1.34	0.75	88	0.50	2.00
MmC2	Miami silt loam, 6 to 12 percent slopes, eroded	3,909.20	1.50%	6-12	Till plains	SiLm	Moderately well	Eroded	Never	Never	0.00	0.00%															
MmD2	Miami silt loam, 12 to 18 percent slopes, eroded	1,550.50	0.60%	12-18	Till plains	SiLm	Moderately well	Eroded	Never	Never	0.00	0.00%															
MoC3	Miami clay loam, 6 to 12 percent slopes, severely eroded	3,533.20	1.40%	6-12	Till plains	CLm	Moderately well	Severely	Never	Never	3.48	0.62%									3.48	6	0.58	1.72	53	0.07	15.23
MoD3	Miami clay loam, 12 to 18 percent slopes, severely eroded	835.4	0.30%	12-18	Till plains	CLm	Moderately well	Severely	Never	Never	0.00	0.00%															
MxA	Milton Variant silt loam, 0 to 2 percent slopes	317	0.10%	0-2	Terraces on till plains	SiLm	Well		Never	Never	2.58	0.46%							2.58			2	1.29	0.78	18	0.14	6.98
NnA	Nineveh loam, 0 to 2 percent slopes	304.2	0.10%	0-2	Terraces on flood plains	Lm	Well		Never	Never	0.00	0.00%															
OcA	Ockley silt loam, 0 to 2 percent slopes	7,363.40	2.90%	0-2	Stream terraces	SiLm	Well		Never	Never	23.23	4.11%							23.23			30	0.77	1.29	70	0.33	3.01
OcB2	Ockley silt loam, 2 to 6 percent slopes, eroded	1,199.40	0.50%	2-6	Outwash terraces	SiLm	Well		Never	Never	13.37	2.37%							13.37			17	0.79	1.27	47	0.28	3.52
Omz	Orthents, earthen dam	11.8	0.00%	0-45	Spoil/Fill				Never	Never	0.00	0.00%															
Or	Orthents	761.5	0.30%	6-12	Till plains, leveled		Well		Never	Never	0.00	0.00%															
Pa	Palms muck	214.2	0.10%	0-2	Terraces, depressions	Mk	Very poor		Never	Frequent	0.00	0.00%															
Pn	Patton silty clay loam	12,640.10	4.90%	0-2	Lake plains, depressions	SiCLm	Poor		Never	Frequent	31.77	5.63%		18.11	5.98	5.48	0.41	1.79				8	3.97	0.25	17	1.87	0.54
Ps	Patton silty clay loam, limestone substratum	314.5	0.10%	0-2	Lake plains, depressions	SiCLm	Poor		Rare	Never	0.04	0.01%							0.04			0	0.00	0.00	0	0.00	0.00
Pt	Pits	1,738.80	0.70%								0.00	0.00%															

Map Unit Symbol	Map Unit Name	Acres in County	Percent of County	Slope	Setting	Texture	Drainage	Eroded	Flooding	Ponding	Acres in Survey	Percent of Survey	SA1	SA2	SA3	SA5	SA6	SA7	SA8	SA9	SA10	Sites	Acres/Sites Density	Sites/Acre Density	Mapped Points	Acres/Point Density	Point/Acre Density
Ra	Randolph Variant silt loam	180.6	0.10%	0-2	Terraces	SiLm	Somewhat poor		Never	Never	0.60	0.11%							0.6			0	0.00	0.00	0	0.00	0.00
Ro	Ross loam	802.2	0.30%	0-2	Flood plain	Lm	Well		Occasional	Never	0.00	0.00%															
Sh	Shoals silt loam	7,900.40	3.10%	0-2	Flood plain	SiLm	Somewhat poor		Frequent	Never	0.00	0.00%															
St	Sleeth loam	898.4	0.30%	0-2	Terraces	Lm	Somewhat poor		Never	Never	7.53	1.33%							7.53			6	1.26	0.80	13	0.58	1.73
Sx	Sloan silty clay loam, sandy substratum	1,551.20	0.60%	0-2	Flood plain, depressions	SiCLm	Very poor		Frequent	Never	0.00	0.00%															
W	Water	5,594.00	2.20%								0.00	0.00%															
We	Westland silty clay loam	4,282.20	1.70%	0-2	Outwash plains, depressions	SiCLm	Poor		Never	Frequent	1.95	0.35%							1.95			0	0.00	0.00	0	0.00	0.00
Wh	Whitaker loam	1,165.20	0.50%	0-2	Stream terraces	Lm	Poor		Never	Never	0.00	0.00%															
Totals	**257,509.80**	**100.00%**									**564.76**	**100.00%**	**31.99**	**112.94**	**138.51**	**79.59**	**52.30**	**55.30**	**55.78**	**25.91**	**12.44**	**274.00**			**694**		
																						Average	**1.27**	**0.77**		**0.46**	**3.63**

Figure 6: Soil Map Units (SMUs) Classified by Landform (Soil Survey Staff et al. 2011).

Water Resources

Two reservoirs, the Geist and Morse Reservoirs, make up the two largest modern bodies of water located within Hamilton County (Davis 1992:xiv). These are followed closely by the White River, which would have dominated the prehistoric landscape (see Figure 11). The Indiana Department of Natural Resources divides the White River watershed into two hydrological basins. The first portion is the West Fork White River above the Morris Street Gage, which constitutes the majority of the county. The second portion is the West Fork White River below Morris Street Gage, located only in the furthest western portion of the county. However, the USGS (USDA-NRCS, USGS, and EPA 2010) places Hamilton County in the Wabash Hyrdological Subregion (HUC04, Figure 7; USDA-NRCS, USGS, and EPA 2010), the Patoka-White Hydrological Basin (HUC06, Figure 8; USDA-NRCS, USGS, and EPA 2010), and the Upper White Hydrological Subbasin (HUC08, Figure 9; USDA-NRCS, USGS, and EPA 2010). At a finer scale, Hamilton County is divided into eight Hydrological Watersheds (HUC10, Figure 10; USDA-NRCS, USGS, and EPA 2010).

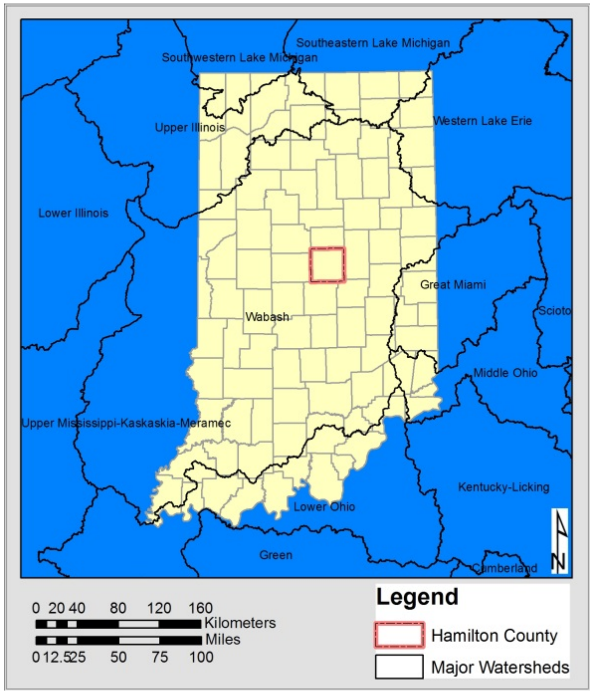

Figure 7: USGS Hydrological Subregions (HUC04) (USDA-NRCS, USGS, and EPA 2010).

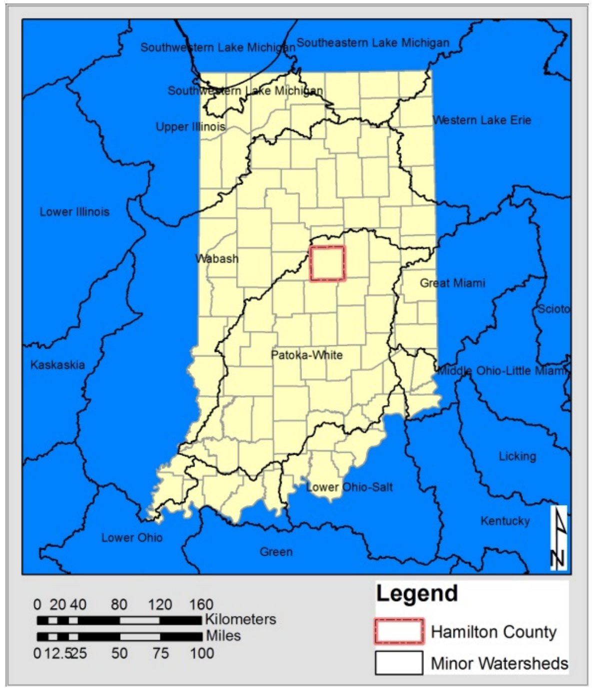

Figure 8: USGS Hydrological Basins (HUC06) (USDA-NRCS, USGS, and EPA 2010).

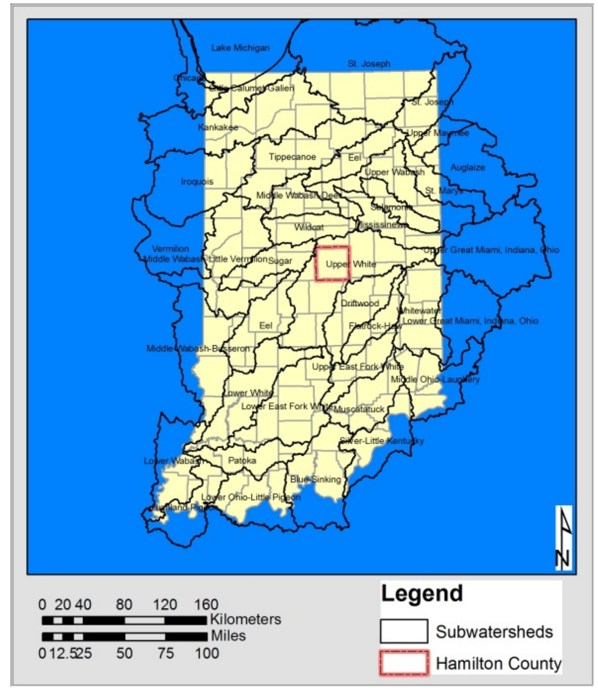

Figure 9: USGS Hydrological Subbasins (HUC08) (USDA-NRCS, USGS, and EPA 2010).

[redacted]

Figure 10: USGS Watersheds (HUC10) for Hamilton County, Indiana (USDA-NRCS, USGS, and EPA 2010).

The watershed boundaries might be expected to influence site distribution and interaction patterns. Water-borne travel easily providing access to exotic regions. Particularly, the White River and the the Wabash watershed provide direct connection to the Lower Ohio Valley and extreme southeastern Indiana and western Illinois.

Climate

Hamilton County, and Indiana in general, experience a typical temperate, continental climate with strong variations in temperature from hot summers to cold winters. Precipitation is generally adequate to support plant growth (e.g., Newman 1966). This climatic regime, while variable through time, would have provided abundant resources for prehistoric inhabitants of the study regions.

Biotic Communities

Flora

Hamilton County is located within the Beech-Maple Forest presettlement vegetation zone (Petty and Jackson 1966:280). This development occurred from the mixing of mesophytic forests as postglacial migrations occurred (Petty and Jackson 1966:282). Beech canopies predominate in this association, with sugar maple often making up a majority of the understory and a large percentage of the canopy as well (Petty and Jackson 1966:283). Other trees within the Beech-Maple association are species of sassafras, walnut, tulip poplar, and black cherry, which surely occur in the forests within Hamilton County. The understory of the association is comprised of "redbud-dogwood-blue beech or dogwood-hop hornbeam" (Petty and Jackson 1966:285). A shrub layer in this association contains spicebush, pawpaw, elderberry, greenbriar, leatherwood, maple-leaf viburnum and wahoo vibernum, or a combination of those plants. Today, the area where these forests were once located are predominately agricultural fields (Petty and Jackson 1966:285).

Also within Hamilton County, though not accounted for on large, general ecological maps, are some associated flood plain areas. Survey Area (SA) 4 of the Hamilton County Project was a floodplain. These floodplains are of the White River. These floodplain areas have seventy-one species of woody plants, and that ten tree species can account for over eight-six percent of these woody plants (Petty and Jackson 1966:276). These are "silver maple, sycamore, American elm, cottonwood, hackberry, cork elm, box-elder, black willow, white ash and red elm", with understory trees being redbud, hawthorn, hop hornbeam, flowering dogwood, and wild plum (Petty and Jackson 1966:276). The associated shrubbery of these floodplain areas are spicebush, wahoo, pawpaw, wafer-ash, swamp-privet, and elderberry (Petty and Jackson 1966:276). Lastly, vines of the floodplains include grapes, green briar, Virginia creeper, trumpet creeper, and poison-ivy (Petty and Jackson 1966:276).

Fauna

The animals living in Indiana would have changed from the end of the Pleistocene through Holocene times. Various Pleistocene-age fauna have been found in Indiana. Early twentieth century accounts list bison, giant beaver, caribou, white-tailed deer, dire wolf, wapiti, horse, mammoth, mastodon, musk-ox, peccary, sloth and perhaps moose (Lyon 1936; Moodie 1929). More recent investigations have expanded this list to include moose, caribou, black bear, giant short-face bear, giant tortoise, white-tailed deer, Canadian goose, armadillo, jaguar, sabertooth tiger and camel (Richards 1984).

The faunal arrangement greatly changed around 10,000 to 11,000 years ago with the extinction of many of the larger mammalian species. A rapidly changing climate combined with the introduction of humans resulted in a reorganization of biotic communities (Richards and Whitaker 1997:151). In 1816, an estimated 66 species of mammals were present in Indiana (Mumford 1966:475). Some of the common mammals found in Indiana include opossum, eastern cottontail, eastern chipmunk, white-tailed deer, beaver, deer mouse, white-footed mouse, meadow vole, pine vole, muskrat, southern bog lemming, Norway rat, coyote, red fox, gray fox, raccoon, long-tailed weasel, various species of squirrels, mice and shrews. Twelve species are listed as exterminated from Indiana and include bison, wapiti, porcupine, gray wolf, red wolf, black bear, fisher, eastern spotted skunk, wolverine, river otter, mountain lion and lynx (Mumford 1966:475).

Historic sources also report a large variety of other fauna in Indiana. Webster (1966:455-473) identifies 366 species of birds. A total of 177 fish have been identified in the state (Gammon and Gerking 1966:401-425). Approximately 200 species of mollusks and 400 species of crustaceans occurred in Indiana waters. Approximately 82 species of amphibians and snakes have been identified (Milton 1966:426-451). The species can be subdivided into 19 species of salamanders, two species of toads, 11 species of frogs, six types of lizards, some 30 types of snakes, and 14 turtle varieties (Milton 1966:426-451).

Summary

As the ecological and natural setting of the region changed over the last several thousand years, human settlement patterns would have also changed. Settlement and use of resources within the project area would have been influenced by potential plant and animal resources and, conversely, may have influenced changes in flora and fauna (Delcourt and Delcourt 1991:87-89). This project is at least in part beginning the investigation of the recursive nature of the human-environmental relationship over time. The impacts of anthropogenic modifications to the environment are often subtle but remarkably persistent.

The diversity of habitats that existed in Hamilton County attracted an abundance and diversity of prehistoric populations for the wide variety of natural resources available as food and raw materials in the production of tools, clothing, adornment and shelter. The geological setting serves as a crossroads of interaction from a variety of neighboring regions, most sharply illustrated by the surveys of the Strawtown Koteewi Park. That ecological and geological setting is peculiar for the county and the state; however, the hydrological, pedological, and ecological resources of Hamilton County set the stage for a highly varied and rich prehistory which, despite hundreds of investigation and over a thousand sites, we are just beginning to understand. The time to tease out this fascinating history is rapidly disappearing, and as illustrated in Figure 11, there is so much we do not know.

Archaeological and Historical Background

The area that would become Hamilton County was first settled by Euro-Americans in 1802 by William Conner who established a trading post on the east bank of the White River. The county was organized in 1823 and was divided into two townships (Davis 1992:xiv). There were at least four historic Delaware occupations [redacted] shows the William Conner settlement as of 1802, the Delaware villages of Straw's Town and Nancytown, and the Greenville to Chicago Trail.

The Upper White River Valley is in an area that experienced substantial mixing and contemporaneous geographic overlap of several archaeological traditions or cultures, especially during the Late Prehistoric period [redacted] This mixing and contemporaneity is particularly acute in Hamilton County, [redacted]. There is a strong Oliver phase presence [redacted] in the upper reaches of the White River Valley evidenced by the Oliver, Bowen, and Strawtown sites (among others). Oliver phase sites exhibit a mixing of characteristics of the Western [Lake Erie] Basin Tradition Late Woodland and the Upper Mississippian Fort Ancient Tradition [redacted]. [redacted] to the Strawtown (12-H-883) site (north of Noblesville) there are two contemporary (or nearly so) villages associated with different archaeological traditions. The Castor Farm site (12-H-3;[redacted]) is a Late Woodland settlement that (with other Castor phase sites) does not adopt any Mississippian traits and maintains an identity similar to that of more northerly and easterly groups with a possible relation to the preceding Albee phase [redacted]

Only recently was Castor detangled from Oliver as a separate cultural manifestation (see discussion of “Bowen” ceramics of the Oliver Phase in [redacted] [redacted] of Strawtown and Castor, [redacted] is the Taylor Village (12-H-25 site [[redacted] Taylor is an Oneota village, likely representing a late migration of Oneota or Oneota-related groups into the area. The assemblage from Taylor has been variously related to Oneota or Oneota-like groups such as “Orr Focus, Fisher Phase and Huber Phase ([redacted] The Oneota presence in the Strawtown locality ([redacted]) is not limited to the Taylor site. [redacted] survey detected a single Oneota related site (flood plain site 12-H-1005). There is also a minor Oneota related component within the Strawtown enclosure (12-H-883), though the relationship between the Oliver occupation and the events that introduced the Oneota pottery remain unclear ([redacted] The Oneota connection to the [redacted] has been recognized for a long time, with [redacted] suggesting a Fisher Focus influence in the Oliver Farm site and Bosson (also and Oliver phase site) ceramics. However, (and despite this being repeatedly pointed out [redacted]) the nature of this cultural confluence is still little understood and the record is being swallowed by development at an ever increasing pace (Figures 3 and 4; see also [redacted]:Appendix 3).

Previous surveys detected differences in the distribution of activity by time period, but also within the Late Prehistoric period by cultural affiliation. Albee and Castor phase groups tended to concentrate on the [redacted], while Oliver phase groups were present [redacted]. Oneota manifestations and Oliver phase are scarce in the region giving tantalizing clues about important concepts of their land use by “their relative absence” ([redacted]

Albee, Castor, Oliver, and Taylor Village Oneota groups are all variously characterized as depending on maize agriculture for subsistence; this strategy and the group’s degree of commitment to it has distinct implications for choices of settlement location [redacted]. Agriculture, and especially swidden systems, entails a peculiar pattern of landscape exploitation. Further, the presence of perhaps three contemporary groups of agriculturalists brings up the possibility of ecological competition among groups. The three groups typically are associated with different types of environments and their peaceful coexistence could be achieved by filling mutually exclusive niches, or at least geologically and ecologically distinct pockets of the same general niche. Despite proximity of their major habitation sites, it remains possible that Castor, Oliver, and Oneota populations were cultivating and gathering in fairly distinct pockets of the very productive and diverse environment provided by the Strawtown locality and the Upper White River in general.

Hamilton County has approximately 1387 previously recorded sites. As part of our records review, we were given access to a disassembled version of the SHAARD database consisting of all of the constituent tables of the database with all records for Hamilton County; however, the delivered version did not retain the relational structure of the database. We have partially reconstructed the relational structure of the DBF files delivered in Microsoft Access.

This reconstructed version of the SHAARD database forms the primary basis of our discussion of sites that follows. From the reconstructed relational database there are at least 1,392 components recorded in SHAARD, of which 1,321 have UTM coordinates.

Of the occupations with a reported cultural affiliation, the majority are unidentified prehistoric. There are 8 Paleoindian sites, 246 Archaic sites, 241 Woodland sites, 11 Mississippian-related sites, and 159 historic sites (Figure 11, Table 2). The noticeable proliferation of Late Woodland sites is due in large part to the series of intensive surveys conducted on the terraces and floodplain of the Strawtown Koteewi Prairie Park [redacted] Whether or not this temporal distribution is representative of the actual population of archaeological sites in Hamilton County is unknown, but this seems very unlikely. A quick look at Figure 11 reveals a heavy spatial bias in the reporting of sites. This is particularly troubling in Clay and Delaware Township, as Indianapolis is rapidly encroaching on this area. The bias towards the river valley favors certain time periods over others. This is further contributing to the overrepresentation of Late Woodland sites in the database. Occupations of different time periods are concentrated in different ecological and geological settings in Hamilton County and surrounding [redacted].

Table 2: Distribution of Components among Cultural Periods for Previously Identified Sites in Hamilton County

Period	Occupations	%	% Prehistoric
Unidentified Prehistoric	727	52.2%	59.0%
Paleoindian	8	0.6%	0.6%
Archaic	65	4.7%	5.3%
Early Archaic	87	6.3%	7.1%
Middle Archaic	13	0.9%	1.1%
Late Archaic	77	5.5%	6.2%
Terminal Late Archaic	4	0.3%	0.3%
Woodland	60	4.3%	4.9%
Late Archaic/Early Woodland	2	0.1%	0.2%
Early Woodland	26	1.9%	2.1%
Middle Woodland	30	2.2%	2.4%
Terminal Middle Woodland	3	0.2%	0.2%
Late Woodland	120	8.6%	9.7%
Late Woodland/Mississippian	4	0.3%	0.3%
Mississippian	7	0.5%	0.6%
Historic	159	11.4%	
Total	**1392**	**100.0%**	**100.0%**

Table 3 presents a summary of the results and distribution of previous archaeological surveys conducted in Hamilton County. Through examination of all the compliance and grant reports on file at DHPA, our own project files at AAL we identified 277 archaeological surveys or explorations that are in whole or in part within Hamilton County. To efficiently examine and present a summary of this massive body of work, investigations were tabulated by civil township. For the purposes of this review an investigation constitutes any archaeologically oriented activity that produced a report which focused within a particular township. If a report or survey encompassed parts of multiple townships, an investigation was logged for each township. Each investigation was then categorized as positive or negative. Positive investigations are those that discovered any sites. No consideration is given in this summary to quantity of material, sites, or acreage involved. Investigations include records reviews, compliance surveys, grant investigations, and reports from other general investigations of archaeological resources (e.g., Black 1931, nd). This method of counting investigations is not perfect; however, it is relatively efficient and at least grossly informative of the nature of the archaeological record for the county. Inclusion of records reviews increases the investigation/positive ratio, while inclusion of grant reports and other investigations decreases the number of investigations per positive. These two effects partially cancel each other limiting their effect on the result. We also gain comprehensiveness by this method of sorting and counting. A further peculiarity is that by not counting sites per survey, we are making the larger investigations more comparable to the small surveys. This limits the effect of the size bias for positive investigations.

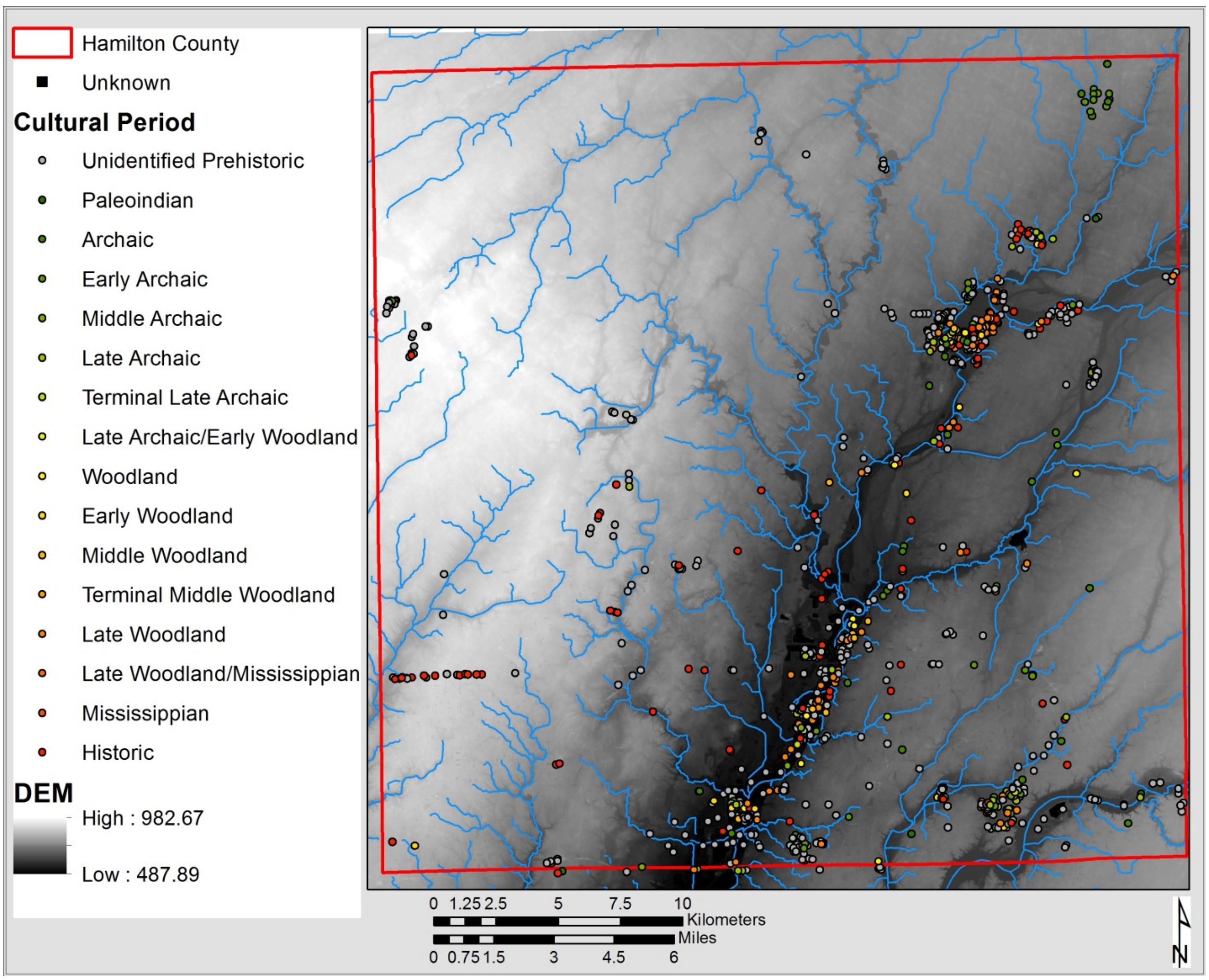

Figure 11: Locations of Previously Identified Sites in Hamilton County, Indiana.
Digital Elevation Model from 2012 Indiana Map data.

As a result of this analysis we get an average rate of positive investigations for each township and the county. This provides a relative measure of the density of archaeological remains within the county. Individual townships range from one positive for every 2.71 investigations to one every 1.26 investigations with a mean of one positive every 1.96 (Table 3). Delaware and White River Townships have the highest density. The density in White River is driven rather strongly by the number of investigations for the Strawtown Koteewi park, especially the grant reports [redacted] Clay and Noblesville have had the largest number of investigations. Clay has a positive ratio nearly perfectly mirrors the overall ratio.

To assess the positive investigation ratio in a CRM context, all the grant reports were removed from the tabulation, leaving only records reviews, compliance surveys, and miscellaneous surveys. The CRM ratio increases to 2.13, White River Township's ratio increases to 1.46, Wayne Towship's ration increases to 3.4, Fall Creek and Delaware Townships' ratios increase by ~0.1, and Noblesville and Clay Townships' ratios remain relatively unchanged.

Table 3: Summary of Previous Surveys in Hamilton County

Township	Surveys	Positive	Ratio	References
Adams	7	3	2.33	[redacted]
Jackson	18	8	2.00	[redacted]
White River	34	27	1.22	[redacted]
Washington	38	14	2.71	[redacted]
Noblesville	66	28	2.29	[redacted]
Wayne	19	7	2.71	[redacted]
Clay	68	34	1.97	[redacted]

Township	Surveys	Positive	Ratio	References
Delaware	36	26	1.42	[redacted]
Fall Creek	32	15	2.20	[redacted]
Total	**314**	**162**	**1.94**	
Average	34.89	18	1.94	

Prehistoric Agriculture and Modern Sediments

Introduction

Non-intensive agricultural systems leave little imprint on the modern landscape; their locations all but invisible to the modern archaeologist. In the absence of significant landscape modifications like terraces or ridged fields we must rely on other methods of discovery. The effects of agriculture on soils are varied, but well studied (e.g., Beach et al., 2002; Costa et al., 2013; Coultas et al., 1993; Eidt, 1977; Sandor et al., 1990). Even slight anthropogenic alterations of soil properties are remarkably persistent (e.g., Hejcman et al., 2013). A variety of studies have exploited geochemistry to analyze the nature of agricultural activities at known fields; however, these techniques are cost prohibitive for deployment in large-scale survey. A cost effective method of locating possible non-intensive agricultural plots is desirable. Once suspected gardens are identified, selective deployment of more expensive techniques can confirm or reject. If the two types of measurements are highly correlated, the higher-density measurements can be used in geostatistical modeling (i.e., co-kriging) of the more expensive measurements (Burrough and McDonnell, 1998:147-149). This project is the first attempt to deploy the first stage of this method. The successes of this initial pilot study will form the foundation of subsequent efforts to identify agricultural fields in Hamilton County and beyond. A project is currently underway to obtain full-element profiles (ICP-OES) for the series of possible fields already detected in this study.

A recent discovery along the Ohio River highlights the potential of geochemistry to document prehistorically cleared fields (Schuldenrein and Purtill 2008). Purtill and colleagues (Purtill 2008; Purtill, et al. 2006) have recently documented an artifact sparse, partially buried midden with a chemical signature consistent with a repeatedly burned, cleared field dating to the 15th-17th centuries. Geochemistry has proven effective at documenting agricultural fields and their effects on ecology in a variety of places. Most of these efforts are focused on complex, state-level societies, and/or topographically modified terraces and ridged fields. Food production and agriculture in eastern North America did not (with few exceptions) involve such intensive modifications. Ethnohistoric analogy leads to the conclusion that local food production was based on swidden systems (see Kennedy 2000). Much is known about swidden systems in the tropics (Carneiro 1956; Inoue 2000; Morisada, et al. 2000; Nye and Greenland 1965; Okimori and Matius 2000; Stromgaard 1988), but much less is known about such systems in temperate environs. Purtill et al.'s chance discovery under the auspices of a mitigation project affirms the suspected method of cultivation during the Late Prehistoric period. However, this discovery remains an isolated instance. To discover the history and distribution of this pattern of behavior requires a concerted effort to identify such features and a more expedient method of discovery. We will explore the application of a systematic soil phosphate (P) survey to detect prehistorically modified ecology.

From at least the 1990s, studies have begun tracking the location of productive activities in some regions (e.g., Lombardo, et al. 2011; Sandor, et al. 1990). These studies are mostly in places where there are visible, topographic modifications of the landscape (terraces, ridged fields, etc.). Studies of anthropogenic impacts in eastern North America are rare to absent, the region being entirely excluded from the most recent edited volume on the topic (Dean 2010). Chemical, pollen, and phytolith analysis are invaluable in deciphering intensity of use and allow reconstruction of actual landscape management strategies (e.g., Lawson, et al. 2007; McLauchlan 2003; Pilcher, et al. 1971; Verrill and Tipping 2010).

"'Because these terraces exist, we can see where prehistoric people actually farmed,' Spielmann says. 'In most parts of the Southwest, although we know people farmed, they didn't modify the landscape so we can't say for sure where. At Agua Fria, we can see exactly where they farmed and look at what transformation farming caused'" (Zrioka 2011). Uncovering environmental impacts in regions with less intensive practices has not been as readily possible (for a rare exception, see McLauchlan 2003). In regards to the Eastern Woodlands and the Ohio River Valley, food production began thousands of years ago. Inferences as to degree of disturbance of surrounding landscape are based on presence, ubiquity, and quantity of "disturbance" taxa and/or presence or absence of morphological changes in exploited plants (e.g., Smith 2009; Wymer 1996, 1997). The location of the activities, their spatial distribution, extent, and intensity remain largely invisible. We seek to modify this situation by employing soil to detect probable landscape modifications for extensive food production systems likely used in the region. We hope to make visible the invisible and reveal "exactly where people farmed." Once fields are detected, we can begin to reconstruct impacts on local ecology, degree of sustainability, and track the evolution of an indigenous food production strategy.

Prehistoric, Ethnohistoric, and Ethnographic Agricultural Fields

Few fields have been identified archaeologically in eastern North America. Similarly, ethnohistoric records of fields are rare. No examples from either source occur in Central Indiana. Ethnographic investigations of non-intensive agriculture contain few details on the nature and size of fields; however, these sources can serve to guide expectations for field location, size, and associated artifacts.

Wilk (1997:90) noted that wet season cornfields of Keckchi Maya of Belize ranged from 0.84 ha (2.08 acres) to 4.18 ha (10.33 acres), while dry season fields averaged 0.995 ha (2.46 acres) (Wilk 1998:102). Behrens (1989:84) reported that Shipibo farmers of the Peruvian Amazon who produce rice for market harvest fields averaging 0.68 ha ± 0.36 ha (1.68 ± 0.9 acres) with a range from 0.25 ha (0.62 acres) to 1.5 ha (3.71 acres), estimated to the nearest 0.25 ha (Behrens 1989:Figure 1). Behrens (1989:94) also notes that prior to market production, "most [gardens] were approximately the same size, about one-fourth to one-half ha [~0.62 acres to 1.23 acres]." Machiguenga households of the Peruvian Amazon cultivate 0.98 ha (2.42 acres) or 0.55 ha (1.35 acres) on average spread over various garden beds (Baksh and Johnson 1990:217). Hidatsa gardens ranged up to 3.14 acres (Wilson 1917), with more small and scattered plots reported.

The agricultural practices of Native Americans were regularly remarked upon by European observers; however, the nature and magnitude of the field or garden systems were rarely recorded in detail. Further, the veracity of those descriptions that do exist is suspect. That being said, the general nature and size of fields recorded ethnohistorically in North America correspond well with the estimates provided by more controlled ethnographic observations and have been found to fit with particular archaeological cases (e.g., Mrozowski 1994). Many ethnohistoric observations include reference to small plots scattered about the village (Heidenreich, 1971:187; Will and Hyde, 1917:84, 93, 97-98, 98-99, 99, 101; Wilson, 1917:108), but some are quite large and fairly distant (Will and Hyde, 1917:63, 84, 100; Wilson, 1917:108).

Dunbar (1880:276) reports Pawnee fields ranging from 1 to 3 acres (0.4 to 1.21 ha) per family. Will and Hyde (1917:65) also report that Pawnee cultivators averaged 0.5 to 1.5 acres

(0.2 to 0.61 ha) tilled. O'Shea (1989:63) notes that while the Huron used large fields, each family cultivated fields of similar size to those found in other regions concentrated together in a large cluster.

The general picture for non-intensive agricultural fields or gardens is of a variety of plots ranging from about half an acre (e.g., Behrens, 1989; Minnis, 1992) to up to 10 acres or more (Wilk, 1997; Will and Hyde, 1971:106) with most between 1 and 3 acres (Behrens, 1989; Dunbar, 1880:276; Edging, 1995:37; Gartner, 2003:207; Oswalt and Neely, 1999:300; Voegelin, 1941:518; Will and Hyde, 1917:99).

The reports discussed above and other ethnographic and ethnohistoric records accord well with the archaeological evidence from eastern North America for prehistoric fields and gardens. Buckmaster (2004) reports on a large concentration of raised-bed fields in the upper peninsula of Michigan. These occur as several discrete fields, some as small as ~0.5 acres, others much larger (for more examples see Gartner, 2003). This is consistent with the nature of ridged fields documented ethnohistorically and archaeologically in Wisconsin (Gartner 2003).

Another sort of field was discovered under a sand dune at Sandy's Point on Cape Cod (Mrozowski, 1994). The Sandy's Point field (or fields) consists of dozens of corn hills <1 m in diameter, spaced about 1 m apart encompassing approximately 0.22 acres (Mrozowski, 1994:49). These descriptions of corn hills fit ethnohistoric descriptions across many regions of North America (e.g., Heidenreich, 1971:177, Table 15; O'Shea 1989:63). Although relatively small, the Sandy's Point corn hills illustrate the diversity of precontact agricultural fields in eastern North America and provide another set of clues as to archaeological signature of native gardens. The artifact assemblage recovered during the excavations of the garden recovered an assemblage dominated by expedient flake tools and other lithics associated with preliminary processing of crops in the field (Mrozowski, 1994:52). Mrozowski (1994:51-52) cites multiple ethnohistoric sources as support for his interpretation of the assemblage as representative of in-field processing of corn (see also Will and Hyde, 1917:128, 130; Wilson, 1917:42-43).

One final example is the most proximate and most relevant. Purtill et al. (2006:152, 278; Schuldenrein and Purtill, 2008:36-37, 40) and Schuldenrein and Purtill (2008:36-37, 40) found that the buried field "midden" at 15BE485 was artifact-poor but enriched in phosphorous, calcium, magnesium, potassium, and organic matter relative to non-midden soils and that vertical changes in geochemistry within the midden profile are consistent with repeated burning and land clearance activities. This and the paucity of artifacts fit well with expectations for a prehistoric cleared field. The "midden" was traced as discontinuous patches over approximately 2.4 acres (~ 50 m x 200 m), and falls within the range of the ethnographic and ethnohistoric examples discussed above.

Effects of Swidden Agriculture on Phosphate and Magnetic Susceptibility

Heidenreich (1971:182) notes that swidden agricultural can either increase or decrease P depending on the nature and length of use and intensity of burning (see also Morisada et al., 2000). Both MS and P can be enriched through repeated heating (esp. MS) and additions of organic matter (OM) during fallow intervals. The variability and distribution of these anthropogenic soil characteristics will indicate areas of human activity. Paired geochemical and artifact distributions will reveal possible cleared fields. While most anthrosols found on archaeological sites are enriched in P, agricultural processes have the potential to *enrich or deplete* P; however, as Terry et al. (2000) point out, it is the *trends* and not the magnitude that matter. Both nutrient depleted plots (Sandor et al., 1990) and nutrient enriched plots (Eidt, 1973, 1977; Holliday and Gartner, 2007) will deviate measurably from the background. More importantly, finding either or both will increase our understanding of the effects and sustainability of prehistoric landscape management strategies.

The mechanisms for agricultural enrichment and depletion of P are well understood and will not be reviewed here; however, the effect of agricultural, particularly swidden, on MS warrants discussion. The temperatures of fires used in swidden cultivation may not rise very high. Soil temperatures achieved during forest and prairie fires vary widely dependent upon soil moisture, soil density, air circulation, and fuel abundance among other things. Soil temperatures achieved in experimental fire studies range from less than 100° C to over 300° C (Ahlgren and Ahlgren, 1960; Beadle, 1940; Heyward, 1938; Weston, 2002). Increases in MS have been observed at temperatures as low as 200° C, where hematite is converted into magnetite or maghemite (Maki et al., 2006; Tite and Mullins, 1971). Not all swidden fires are likely to reach these critical temperatures for conversion of iron oxides. Therefore, heating of the soil, even repeated heating, may not be sufficient to form magnetic particles in the sediment. However, magnetic particles contained in the soil column today, and particularly the modern plowzone, would not have necessarily formed through heating the sediment.

Plant and wood ash also contributes to the magnetic susceptibility signal of archaeological features, and has been found to have its own elevated MS signal (Maki et al., 2006:208, 224; McClean and Kean, 1993:389-390). McClean and Kean (1993:391-392) note that multiple burns increases the MS of ash and that ferromagnetic particles from ash precipitate down column creating an increase up to 22 times their soil control samples. This mechanism of MS enrichment for the soil column provides the most promise for detecting swidden fields. Even if brush were piled for burning, modern plowing would redistribute the fine magnetic particles, increasing probability of detection.

Soil Phosphate

Soil phosphate analysis saw early application in the Ohio Valley (Solecki 1951), but then, due in part to the equivocal conclusions of Skinner (1986), failed to see an increase in use. Since Skinner's study the methods of measuring and evaluating anthropogenic phosphate enrichment have improved (Terry, et al. 2000). Phosphate is added to the sediment generally through the decay of organic material. Phosphate is enriched in relative proportion of the intensity of use of an area (Marwick 2005:1359; see also Skinner 1986:51).

While phosphorous is not the only element deposited in the sediment upon organic decay, most other elements are abundant in non-anthropic soil columns and/or are rapidly leached from the soil after deposition. Phosphorous bonds rapidly with the soil in the form of phosphate compounds and these are relatively immobile (Eidt 1973:206; 1977:1328; Marwick 2005:1359; cf. Skinner 1986:52). Therefore, "[p]hosphorous is a useful indicator of human occupation because it is contained in organic matter that is deposited … [and] becomes enriched in the soil relative to carbon and nitrogen as organic matters decay" (Marwick 2005:1359). Therefore, analysis of variation in phosphate concentration across the landscape should yield information about the patterning of deposition of extra organic materials associated with human activity. Nolan (2010; Roos and Nolan 2012) successfully employed soil phosphate analysis at the Reinhardt village (ca. AD 1350) and neighboring ceremonial complex as a supplement to shovel testing, surface collection, magnetic susceptibility, and excavation (Figure 2).

Purtill et al. (2006) detected an elevated phosphate signal in the midden at site 15BE485. Purtill and Schulderein’s geochemical analysis of the 15BE485 midden included analysis of (among other elements) calcium, magnesium, potassium, and sodium in addition to phosphorous (Schuldenrein and Purtill 2008:28). The combined analyses confirm the presence of anthropogenically enriched organic content of the soil column. The results are consistent with repeated burning of the plot over a few centuries. Purtill reasons that this type of feature and the indicated formation processes are consistent with the swidden agricultural system suspected to have been employed by the Late Prehistoric occupants of the Middle Ohio River Valley. This remains the sole example of a prehistoric cleared field detected in the Middle Ohio River Valley. Purtill et al.’s project proves that these features are detectable and that soil phosphate is an effective indicator; however, a strategy for extensive detection of these features is required if we are to address the key questions about the relationship between various settlement and subsistence strategies and modification of the landscape.

Soil phosphate analysis has a particular contribution to make in understanding the nature of, especially, Late Prehistoric interaction in the Upper White River Valley. The nature of the interaction among the Late Woodland Castor phase, the Fort Ancient-like Oliver phase, and the Oneota-like Taylor Village groups has yet to be fully explored and explained (McCord and Cochran 2003:34-35, 127; McCullough et al. 2004:30, 33-34). The possibility of three contemporaneous agricultural groups in one area presents many questions about the nature of their ecological interactions with significant implications for their social and economic interactions. In order to piece together this puzzle, we need to know how each community’s activities were positioned on the landscape. Large-scale, siteless surveys (Dunnell and Dancey 1983; Ebert 1992) can address some of this issue with traditional archaeological methods. However, not all activities leave a palpable trace. In particular, prehistoric landscape modifications are unlikely to have much of an artifactual component (see Purtill et al. 2006). Unless methods like phosphate analysis are applied broadly and systematically we will never be able to detect the interactions of people with the landscape and, particularly in this case, uncover how competing groups managed a shared ecology.

ARCHAEOLOGICAL SURVEY

By Matthew R. Swihart, and Kevin C. Nolan

Introduction

Approximately 565 acres (228.65ha) of agricultural land were surveyed by pedestrian transects during this project across nine Survey Areas (SAs). A tenth SA was subjected to soil phosphate analysis only. The purpose of the pedestrian survey was to identify cultural resources in a rapidly developing county, evaluate their nature, assess their potential eligibility for state and national registers of historic places. All surveys followed DHPA guidelines for archaeological reconnaissance, and/or were conducted with a pre-approved plan for archaeological investigations. The soil survey was conducted to attempt to locate prehistoric agricultural fields or gardens. This is the first survey to deploy the proposed method to prospect for non-intensive agricultural sites.

Methods

Pedestrian Survey

Of the ten SAs, nine of them were surveyed using the pedestrian survey method to locate archaeological sites. (SA) 4 consisted only of soil phosphate collection survey, as the area had been previously surveyed and sites recorded by Ellis of IU-PUI (Ellis et al. 1982).

Properties were targeted for pedestrian survey based on their distance from water in meters as well as a broad soil classification (loam, silty loam, silty clay loam). The parcel numbers for the properties were then compared with state parcel numbers on the land management website known as Beacon (www.beacon.schneidercorp.com). Contact information for the owners, as well as basic numeric data on parcel size was then obtained. This information was then mailed to the property owners, along with the Hamilton County Soil Phosphate Permission form, Hamilton County Pedestrian Survey permission form, and a frequently asked questions sheet. The property owners were asked to return the signed forms in an envelope with prepaid postage to Nolan of the Applied Archaeology Laboratories after selecting time ranges that the property was available for survey and whether artifacts were to be returned to the property owner or left to be curated by the Applied Archaeology Laboratories.

Properties with at least forty acres of agricultural field predominating and within areas annexed by a municipality were selected after the previously mentioned criteria were reexamined. The properties were also judged based on the previous surveys as to maintain a sample of the county in specific research interests, namely the lower half of the county (the area undergoing most development). Property owners (and tenants, if applicable) were then contacted to schedule the date of survey, as well as answer any questions the property owner had about the survey process that would be taking place on their property.

For pedestrian survey crew members were required to wear orange vests for protection, as some of these surveys occurred during hunting season near wooded areas. The fields were examined to maintain a minimum of thirty percent surface visibility (30%). Fields falling under this visibility minimum were not surveyed. The field crew members were then spaced no more than ten meters apart and asked to walk in straight transect lines the length of the agricultural fields being surveyed. All prehistoric and historic artifacts were collected with the exception of fire-cracked rock (FCR). Fire-cracked rock was recorded in the field but not collected under most circumstances. The boundaries as well as archaeological sites were recorded on Trimble

GPS devices and uploaded to the GIS system ArcMap after returning to the Applied Archaeology Laboratories. The collected artifacts were then analyzed in the Applied Archaeology Laboratories by the author. Further discussion on recovered archaeological material is discussed in the laboratory analysis section of this report.

Soil Phosphate Survey

Soil phosphate collection surveys were conducted on three of the ten survey areas. These included survey areas one, four, and five. Survey area one was selected to undergo soil phosphate collection as a test run of the method along with the pedestrian survey. Survey area four was selected for soil phosphate collection survey because of its identification as a non-aquatic mollisol, which was stated as a good choice for identifying areas retaining evidence of prehistoric agriculture if present (G. William Monaghan, personal communication 2012; Buckmaster 2004:33, 34). The survey area had been previously systematically surveyed by Ellis and was found to contain numerous domestic sites (Ellis et al. 1982). This property would allow for comparison of soil phosphate signatures of an area containing known domestic sites with potential prehistoric agricultural fields. SA5 was selected based on the nature and abundance of pedestrian survey sites and their assemblages.

The sediment sampling employed a 25 m x 25 m grid of soil cores was collected. For each sample location in the grid, one sample was taken from the plowzone with an Oakfield soil probe. The top ~5 cm of each core was discarded and the next ~10 cm of the core was taken back to the laboratory for analysis. All artifacts and soil cores were mapped using sub-meter GPS.

This collection was taken from approximately fifteen centimeters (15 cm) from below the surface. In floodplain areas, specifically survey area four, the collection process was added to slightly. In this area, an extra collection was taken from approximately sixty centimeters (60 cm) below the surface in every other transect on every other soil core collection (~50 m x 50 m).

Laboratory

Artifact Analysis Methods

Artifact analysis for the Hamilton County Project involves every aspect of analyzing the material collected in the field. This includes spatial analysis, consisting of site delineation, as well as things as simple as cleaning procedures for the artifacts that were collected. Because of this, it could be stated that there are five major steps invoked by artifact analysis for this project. These are the cleaning process, GIS input, site delineation, site numbering conversions, and the physical analysis of the artifacts.

The analysis process begins with two simultaneously occurring steps: cleaning and GIS input. Artifacts brought back to the Applied Archaeology Laboratories are cleaned by a group of undergraduate students assigned to laboratory work for the Hamilton County Project. This consists of using water to clean the artifacts gently with toothbrushes, except on organic material collected or prehistoric pottery. Tooth brushes are also not used on the edges of lithic debitage or tools, as the tooth brush bristles could potentially affect the striations and polish that is studied in use-wear analysis (to be conducted later on materials recovered from sites that underwent the soil phosphate collection surveys).

While the cleaning is occurring, the GPS data collected in the field on the Trimble GPS units is uploaded to the GIS software program ArcMap. This program allows for spatial analysis to be conducted. The data undergoes differential correction techniques that ensure accuracy of the collection loci by up to a number of centimeters. These points are crucial when delineating sites, as distance is a major parameter when considering how to group sites.

The third step is the actual site delineation. This is based on a number of factors, the first being the firsthand knowledge of the spatial distribution of artifacts in the survey area in regards to one another. The second factor is determining the amount of distance between artifacts that is allowable to constitute two or more artifacts as a cluster or site. This number is not necessarily arbitrary, though on average is twenty meters (20 m). The third factor occurs during physical artifact analysis, by making sure that two or more artifacts together really can constitute a site based on what the artifacts are. This project is only concerned with sites that are located within or directly adjacent to the presumed prehistoric agricultural fields uncovered in the Historic Preservation Fund Grant for Hamilton County, discussed in previous sections.

The fourth step, assigning the numbering system and converting these numbers for site names, begins by exporting the GIS data by site from ArcMap to an excel document containing the provenience of the artifacts. This specific provenience is also recorded on the collection bags that contain the artifacts. This process allows for laboratory workers to group the artifacts into specific sites based on their provenience on the site delineation criteria enumerated upon previously. The artifacts are given their first site name based on survey area and site number within that survey area number. An example of this is Sa1-5, where Sa1 stands for survey area one and 5 represents the fifth site within survey area one. Once the artifacts are grouped by this site name, the site name is converted into a full field-site identification number sequence, or FSID. This sequence always begins with the accession sequence 12.62, followed by the field site number and then the number of the artifact within that specific site (ex. 12.62.1.1 represents the first artifact within the first site located in the Hamilton County Project, or the first artifact from Sa1-1). This is done to maintain continuity between other catalogs, as well for convenience as the FSID is the number sequence inscribed upon the actual artifacts. This is done to ensure that if the artifacts are ever separated from their curation bag that it can be replaced without losing its provenience. Since this process of FSID enumeration begins before the actual, in depth physical artifact analysis, some sites may become void after analysis has determined a site to contain material collected that does not actually constitute an artifact. In these instances, the site is marked as void but the number is still retained to show on the final GIS markup of each survey area which collection loci became nullified.

The fifth step, the actual analysis of the artifacts, includes defining the artifacts, recording all artifact attributes, determining FSID labeling order of the artifacts, as well as expanding upon the sources used to give chronological dates to diagnostic artifacts. Most definitions of artifacts used in the Hamilton County Project as well as this project come from Andrefsky's second edition of "Lithics: Macroscopic Approaches to Analysis" (Andrefsky 2005). For determining typology of prehistoric flaked stone artifacts, a flow chart was designed specifically for the Hamilton County Project (Figure 12).

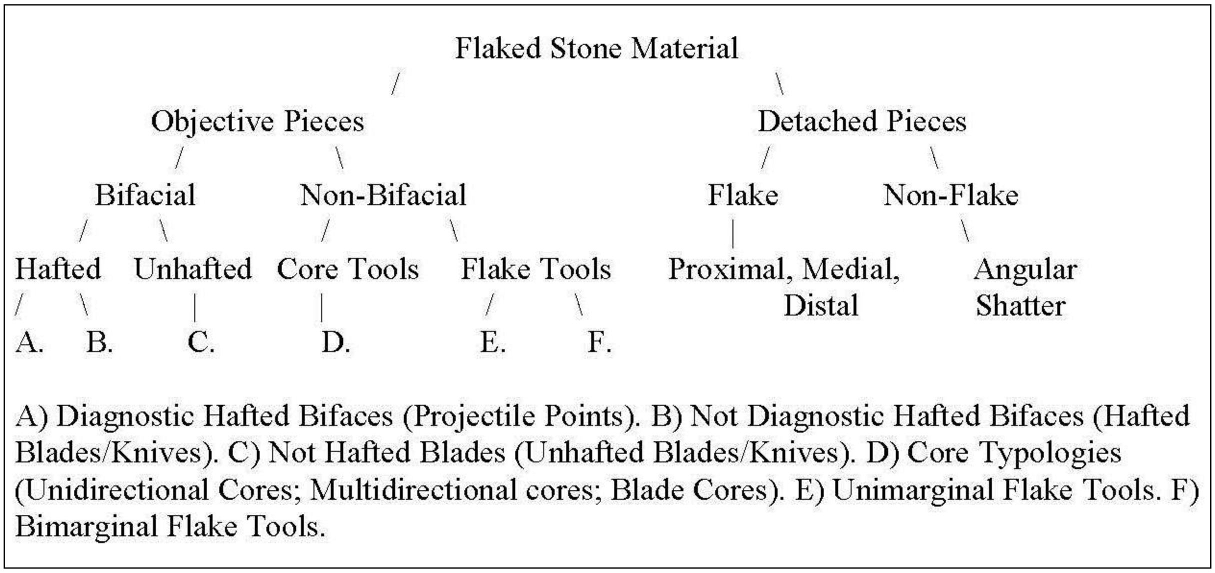

Figure 12: Flow Chart of Flaked Stone Implements.
Adapted from Andrefsky 2005:76 Figure 4.7.

Diagnostic determinations of projectile points for this project were determined by studying examples from Justice (Justice 1987). One specific type of unifacial flake tool encountered were bladelets. Multiple blade core industries exist around the world, yet it must be noted that in the Midwest this typology is considered diagnostic of the Middle Woodland period with Hopewell groups (e.g., Greber et al. 1981).

Numerous attributes of the artifacts were analyzed are recorded for this project. For all artifacts, the numerical attributes of weight (g), length (mm), width (mm), and thickness (mm) were recorded. Nominal indication by yes or no was completed to state whether length, width, and thickness were complete for each artifact. For prehistoric stone tool artifacts, nominal indication of presence by answering yes or no was used to record signs of utilization, edge modification, as well as denticulation specifically. Also for prehistoric flaked stone implements, the raw material chert type and use of heat treatment of such materials was indicated by using macroscopic and microscopic comparison to the Applied Archaeology Laboratories comparative chert collection. Presence of utilization on prehistoric flaked stone implements was also determined by examining their edges for striations, differences in luster, as well as microfractures indicative of utilization.

Soils Analysis

After Roos and Nolan (2012), analysis of P uses a molybdate colorimetric method to measure Mehlich-2 extractable phosphorus. Samples were ground and sieved through a 125 micron geological sieve (fine fraction). P was extracted using a 10 percent dilute Mehlich-2 solution and measured using a colorimetric method based on the reaction between extracted P in solution and a molybdate reagent (PhosVer3). Concentrations of P (PO_4) in mg/L are then converted to mg/kg and adjusted for dilution, and recalculated to mg/kg phosphorus based on atomic weight.

For MS analysis, soil samples were ground and large inclusions were manually removed. MS was measured using a Bartington MS3 with MS2B lab sensor. Mehlich-2 extraction and quantitative colorimetric measurement was selected from the wide variety of other extraction and measurement methods (see Holliday and Gartner 2007:309-316) as it is a simple, robust procedure performable in a variety of contexts (see Terry et al. 2000), and it is time and cost efficient (Roos and Nolan 2012:31). P concentration and MS values were mapped in the GIS through the recorded GPS coordinates and used for interpolation with ArcMap 10.1 spatial analyst extension (see Nolan 2010).

The results for P and MS were converted to attributes of a point shapefile in ArcMap 10. To analyze the distribution trends, raw values for each variable were interpolated using the ESRI kriging algorithm. Various cell sizes and search radii were employed to ensure the robustness of the spatial pattern. The maps presented below were generated with a 10 m cell size, and a variable search radius to include 12 points in modeling each location.

ARCHAEOLOGICAL SURVEY RESULTS

By Matthew R. Swihart, Kevin C. Nolan, and John P. McCarthy

Survey Area 1

Survey Area 1 is located in [redacted] as shown on the USGS 7.5' [redacted] Quadrangle map (Figure 13). Survey Area 1 was completed on Sunday, September 30, 2012. Ground surface visibility of the survey area was between 90-95 percent, with isolated areas of agricultural debris impacting surface visibility in rare instances. The entire survey area was planted in corn approximately 3m in height which at the time of survey had not yet been harvested. Spacing of the corn rows at approximately 1.5m did not impact survey visibility.

SA1 is a 32 acre (12.9 ha) plot (Figure 13) consisting of loamy soils formed in Wisconsin-age glacial till, located between two minor tributaries to the White River. SA1 is just over 3 km away from the main trunk of the river, and constitutes nearly the most elevated portion of the surrounding landscape. The soils consist of a loamy Argiaquoll (Brookston series), a loamy Hapludalf (Miami series), and a loamy Epiaqualf (Crosby series) (Soil Survey Staff 2012). The Brookston series soils are clearly identifiable in historical aerial photographs covering SA1 (Figure 14).

[redacted]

Figure 13: Location of Survey Area 1 Shown on a portion of the [redacted] 7.5’ USGS Quadrangle.

Figure 14: Historical Aerial Views
Note: Aerial photographs downloaded from the Hamilton County, Indiana Surveyor's webpage (http://www2.hamiltoncounty.in.gov/publicdocs/Aerial%20Photos/defaultlist.asp?ARG1=/Aerial%20Photos).

Landuse in SA1 has changed little as long as there is a photographic record of the property. SA1 is currently a single agricultural field; however, it has frequently been split into separate fields for different cultivation uses (Figure 14). The lot always contains a house. Only the most recent images (1994 to present) show the current horse yard that decreased the cultivation usage to 32 acres. There was a pipeline installed across the northwest corner between 1956 and 1962. Most of the history of the plot exhibits a split down the middle, though this is removed by 1985.

Two observations from the photographs are noteworthy. First, the area in the middle of the northern border is variously cultivated and the size of uncultivated area varies. This area is currently represented by a southern dip in the tree line (Figure 13). The removal of this area from cultivation periodically could affect the relative phosphate concentration retained by the soils. Second, in the 1985 image there is an apparent spill emanating from an outbuilding that pools in the center of the southern end of SA1, turning the Brookston soil locally into a bright blob. The materials dumped are unknown, but it is possible this would affect the phosphate and/or the magnetic susceptibility of the area. Aside from these, there are no features associated with modern landuse that should affect the soil characteristics; at least there are none evident that would differentially affect small portions (a few acres) of SA1. Therefore, chances are good that anomalies in Soil P and MS not explained by the observed history or topography are due to prehistoric anthropogenic influences.

Information on drainage and slope of these soils can be obtained in the previous background soils section of this report (see Table 1). Through pedestrian survey, eleven new archaeological sites, 12-H-1391-12-H-1401, were identified in this survey area. Survey Area 1 was also the first site of this project to undergo Soil Phosphate Survey and analysis as outlined in the Field and Laboratory Methods sections of this report.

Survey Area 1 Artifacts

A total number of 38 artifacts were recovered from Survey Area 1. The artifact types and associated number of each recovered in this survey area are listed in Table 4 below. Individual artifacts are listed in the site summaries located within Appendix E of Volume 2 of this report.

Two diagnostic prehistoric artifacts were recovered from Survey Area 1. These two artifacts were diagnostic projectile points from site 12-H-1391, artifact numbers 12.62.1.1 and 12.62.1.10. The first diagnostic point is from the Late Woodland Triangular Cluster, specifically a Hamilton Incurvate of Holland chert (Justice 1987:224-230). The second projectile point is a Radditz of Jeffersonville chert, diagnostic of the Middle Archaic period (Justice 1987:67-68). One diagnostic historic artifact was recovered from site 12-H-1393, a body section of a stoneware vessel.

Table 4: Artifacts from SA1

Prehistoric	No.	Historic	No.
Projectile Point	2	Stoneware	1
Flake Tool	10		
Core Tool	3		
Flake	11		
Core	3		
Angular Shatter	5		
Groundstone Tool	3		
Total	**37**		**1**

Figure 15: Diagnostic Artifacts from 12-H-1391.

Survey Area 1 Sites

Eleven archaeological sites were uncovered in Survey Area 1, 12-H-1391-12-H-1401 (Figure 17 and Figure 16). Individual site summaries are recorded in Appendix F of Volume 2 of this report. All Survey Area 1 sites contain unidentified prehistoric components, with only site 12-H-1393 containing a historic component. Sites 12-H-1392, 12-H-1395, 12-H-1396, 12-H-1398, and 12-H-1401 were isolated finds consisting of unidentified prehistoric artifacts. All other sites in Survey Area 1 were small unidentified prehistoric lithic scatters.

Eight sites were located on Miami Silt Loam (MmB2) soils (12-H-1391, 12-H-1392, 12-H-1393, 12-H-1396, 12-H-1397, 12-H-138, 12-H-1400, and 12-H-1401). Two sites were located on Brookston Silty Clay Loam (Br) soils (12-H-1394 and 12-H-1395). Only site 12-H-1399 was located on Crosby Silt Loam (CrA) soil.

Survey Area 1 had a prehistoric site density of one site per 2.92 acres (1.18 ha). As there was only one site containing a historic component, the historic site density is one site per 32.11 acres (13 ha).

Survey Area 1 Soil Phosphate and Magnetic Susceptibility Results

SA1 was sampled with 155 probes (Figure 18). The results for P and MS were converted to attributes of a point shapefile in ArcMap 10. To analyze the distribution trends, raw values for each variable were interpolated using the ESRI kriging algorithm. Various cell sizes and search radii were employed to ensure the robustness of the spatial pattern. The maps presented below were generated with a 10 m cell size, and a variable search radius to include 12 points in modeling each location.

Figure 16: Newly Defined Sites from SA1 over 2012 Aerial Photograph (USDA-FSA Aerial Photography Field Office 2012).

[redacted]

Figure 17: Location of Newly Defined Sites for SA1 over portion of [redacted] 7.5’ USGS Quadrangle.

[redacted]

Figure 18: Survey Area 1 Soil Sample and Artifact Locations.

The empirical kriging surface (Figure 19) shows several areas of depleted phosphate. One particularly depleted area adjacent to the largest artifact cluster on the surface also exhibits a relatively enriched MS signature (Figure 20). The locally most intense values for these two variables occupy a space of approximately 0.6 acres (0.24 ha). Other phosphate depleted areas did not exhibit enriched MS. In order to objectively define anomalies in both MS and P, additional geostatistical analyses were performed.

Figure 19: Interpolated (Krige) Soil Phosphate Distribution for SA1.

First, the raw values were subjected to a correlation analysis in SPSS (IBM 2012) confirming that P, MS, and elevation at each sample location were highly statistically significantly correlated ($p \leq 0.000$ for all combinations). Second, a geographically weighted regression was performed in ArcMap 10 to predict values of MS and P for each initial sample location using elevation and P, or elevation and MS, respectively, as the independent variables. The resultant predicted values were then used as input in a second kriging analysis to create a predicted surface for each variable. Finally, the predicted surface was subtracted from the observed surface revealing areas where observed P and MS deviate from the strong relationship among the variables (Figure 21).

Figure 20: Interpolated (Krige) Soil Magnetic Susceptibility Distribution for SA1.

The same area of apparent anomaly in the observed surface remains; however, the area of the MS anomaly encompasses two adjacent P anomlies (separated by a single band of 10 m x 10 m cells), measuring approximately 1.53 acres (0.62 ha). Either figure fits within the range of the examples discussed above. Further, the dual MS and P anomaly is ~50 m x ~140 m, very similar in size and shape to the possible field detected by Purtill et al. (2006) in Kentucky. The depletion of P in the possible Indiana garden vs. the enrichment of P in the Kentucky example is noteworthy and highlights the potential diversity of actual prehistoric practices. Either enrichment, or depletion of P is possible depending of Native management practices. P-depletion, for example, probably results from repeated burning and loss of organic matter (Heidenreich 1971:182) and may be indicative of swidden practices.

[redacted]

Figure 21: Magnetic Susceptibility and Soil Phosphate Anomalies.

The assemblage that occupies the northwest corner of the dual anomaly consists of utilized and retouched flakes, use-shaped groundstone tools, a retouched late prehistoric triangular biface, and an Early Archaic projectile point. The nature of the assemblage fits well with the assemblage recovered from the Sandy's Point field(s), being characterized by expedient flake tools associated with crop processing in the field. Further, another large phosphate anomaly (~2 acres) occurs southwest of the dual anomaly, with a nearly identical artifact inventory, and may also be a garden. The artifact inventory and the MS and P signatures are consistent with ethnographic, ethnohistoric, and archaeological examples of agricultural fields. While suggestive, additional tests are needed to definitively demonstrate the function of these areas. The proposed method has proven effective at isolating spots on the landscape where more intensive pedological and geochemical tests can be employed to tease out landscape use history. Furthermore, this was accomplished in the first 32 acres sampled. Additional tracts immediately south of prehistoric agricultural settlements, while not fully analyzed, are also showing promising signs of larger depleted phosphate anomalies (see Survey Area 4). Vogelin (1941:518) indicates that large village fields for Shawnee groups in Ohio were often located immediately south of the settlement. These preliminary results show the strong promise of the proposed method of prospecting for agricultural fields.

The potential field sizes indicated by the identified dual anomaly (Figure 21) fit within the range of the examples discussed above. Further, the dual MS and P anomaly is ~50 m x ~140 m, very similar in size and shape to the possible field detected by Purtill et al. (2006) in Kentucky. Further the distribution of phosphate anomalies in Figure 21 provides a very suggestive match to the distribution of ethnohistoric fields shown in Figure 22 (Wilson, 1917:Figures 36 and 37). The depletion of P in the possible Indiana garden vs. the enrichment of P in the Kentucky example highlights the potential diversity of actual prehistoric practices. Either enrichment or depletion of P is possible depending on Native management practices. P-depletion, for example, may results from repeated burning and loss of organic matter (Heidenreich, 1971:182) and may be indicative of swidden practices. However, it may simply indicate farming to exhaustion.

[redacted]

Survey Area 1 Site Recommendations

The low number are artifacts on sites and the site types within SA1 indicate most do not retain sufficient information potential to qualify for the Indiana Register of Historic Sites and Structures or the National Register of Historic Places (12-H-1392, 12-H-1394 – 12-H-1341). However, two sites have been deemed to possibly be eligible for listing on the Indiana Register of Historic Sites and Structures and the National Register of Historic Places. Site 12-H-1391 has yielded two diagnostic projectile points, one of the Middle Archaic and one of the Late

Woodland. Multiple prehistoric flint stone tools are present at this site besides these two diagnostic artifacts. This site can be associated with a possible prehistoric garden area that was detected through the soil phosphate and magnetic susceptibility analysis conducted under this project. As the site has the potential and integrity to yield information on Late Woodland prehistoric agricultural activities, this site is eligible for listing on the Indiana Register of Historic Sites and Structures and the National Register of Historic Places.

Site 12-H-1393 is also associated with an anomaly detected during soil phosphate and magnetic susceptibility analysis under this grant. The site contained six flaked stone tool implements that have potential to be studied in association with the soil phosphate and magnetic susceptibility results. As this site holds integrity and valuable information on Late Woodland agricultural practices, this site is eligible for listing on the Indiana Register of Historic Sites and Strucutres and the National Register of Historic Places.

Sites 12-H-1393 and, especially, 12-H-1391 warrant further investigation in the form of additional geochemical analysis, pedological analysis, and potentially limited testing. These sites, if confirmed as gardens, hold enormous information potential of a type not previously available in the region.

Survey Area 2

SA2 is located in [redacted] Township [redacted] as shown on the [redacted] USGS 7.5' Quadrangle map (Figure 23). Survey Area 2 was completed on Saturday, October 13, 2012. Ground surface visibility of the survey area was at 100 percent, as the field has recently been moldboard plowed, with no standing vegetation or agricultural debris affecting the visibility of the survey area. Further, the plowing had occurred in early September or late August allowing adequate time for weathering of broken peds. The weather conditions of the day were only slightly overcast, allowing for ideal conditions for pedestrian survey.

SA2 is approximately 112.94 acres (45.71 ha) consisting of Wisconsin glaciation aged till soils. Three different soils series are encountered in SA2, consisting of a loamy Argiaquoll (Brookston Silty Clay Loam), a loamy Epiaqualf (Crosby Silt Loam), and a silty mesic Endoaquoll (Patton Silty Clay Loam) (Table 1). Through pedestrian survey, 20 new archaeological sites (12-H-1402-12-H-1415 and 12-H-1417-12-H-1422) were identified in this survey area. SA2 was pedestrian surveyed for archaeological sites only.

Survey Area 2 Artifacts

A total number of 296 artifacts were recovered from Survey Area 2, consisting of 230 prehistoric and 66 historic artifacts. The artifact types and associated number of each recovered in this survey area are listed in below. Individual artifacts are listed in the site summaries located within Appendix F of Volume 2 of this report.

[redacted]

Figure 23: A Section of the [redacted] USGS 7.5’ Quadrangle showing the location of SA2.

Table 5: Artifacts Recovered from SA2

Prehistoric	No.	Historic	No.
Angular Shatter	50	Brick Fragment	1
Biface	9	Ceramic, Hotelware	3
Carbon Sample	2	Ceramic, Ironstone	3
Core	41	Ceramic, Redware	2
Core Tool	15	Ceramic, Stoneware	26
FCR	6	Ceramic, Whiteware	17
Flake	53	Coin	1
Flake Tool	41	Foundation Stone	1
Ground Stone Tool	5	Glass, Amber	2
Projectile Point	6	Glass, Amethyst	2
Shell Fragment	2	Glass, Aqua	2
		Glass, Clear	4
		Glass, Green	1
		Shotgun Shell	1
Total	**230**		**66**

Prehistoric Artifacts

A total of six diagnostic prehistoric artifacts were recovered from Survey Area 2, consisting of five diagnostic projectile points and one possible blade-core. Site 12-H-1402, a prehistoric habitation site with multiple components, contained four of these diagnostic artifacts. Artifact 12.62.12.1 from this site is an Early Archaic Kirk Corner Notched projectile point (Justice 1987:71) of Attica chert, shown in Figure 26. Artifact 12.62.12.2 is a Merom Expanding Stem projectile point of Attica chert, diagnostic of the Late Archaic period (Justice 1987:130), also shown in Figure 26. Artifact 12.62.12.158 is a Steuben Expanded Stem projectile point of Liston Creek chert, diagnostic of the terminal Middle Woodland through Late Woodland periods (Justice 1987:208) and is the last artifact pictured in Figure 26. The last diagnostic artifacts from this prehistoric habitation site are both blade-cores (12.62.12.13 and 12.62.12.128; Figure 27), diagnostic in the Eastern Woodlands of North America’s Middle Woodland chronological period (e.g., Greber et al. 1981; Nolan 2005; Nolan et al. 2007; Pi-Sunyer 1965). 12-H-1402 also exhibited at least four surface exposed thermal features, several with FCR and ash deposits visible on the surface. This indicates remnant integrity of sub-plowzone deposits.

In site 12-H-1404, a prehistoric camp, a Matanzas projectile point (12.62.14.1) of Attica chert was recovered and is shown in Figure 28. Matanzas projectile points are diagnostic of the Late Archaic period (Justice 1987:119). Lastly, an isolated Jack’s Reef projectile point of Liston Creek chert (12.62.32.1) was recovered from site 12-H-1418. Jack’s Reef projectile points are diagnostic of the terminal Middle Woodland through Late Woodland period (Justice 1987:217). This artifact is shown in Figure 29.

[redacted]

Figure 24: Location of SA2 Sites over 2005 Aerial.
Note: Aerial photograph accessed through the Indiana Spatial Data Portal.

Historic Artifacts

SA2 includes the land originally granted to [redacted] (Figure 30). The 1866 (Warner) *Map of Hamilton County, Indiana* illustrates a residence on an 80-acre parcel belonging to [redacted] located in approximately the center of the eastern edge of the study area (Figure 31). That map also indicates a residence belonging to [redacted] just north of the northern edge of the study area (Figure 31). The 1912 soils map (Hurst et al. 1912) indicates that both of those residences were gone by that date (Figure 32). [redacted] is shown as the owner of the former [redacted] property on the 1922 plat map (The Enterprise Printing & Publishing Co. 1922), with [redacted] owning the property to the north and [redacted] that to the west (Figure 33). The 1953 [redacted], *IN* 7.5' USGS quadrangle shows no residences in this study area (Figure 33).Seventeen temporally diagnostic historic artifacts were recovered at 12-H-1402, including aqua, amethyst, and clear container glass and sherds of Albany slip stoneware and whiteware (Figure 35 and Figure 36). Aqua container glass was manufactured between 1860 and 1910 (IMACS 1992:472). Most amethyst container glass was manufactured between 1890 and 1920 (Bottle/Glass Colors 2013). Clear container glass was manufactured between 1875 and the present (IMACS 1992:472). Stoneware dates from 1820 to the present (Feldhues 1995:6), and whiteware dates from 1820 to the present (Feldhues 1995:6). Based on the manufacturing dates of these materials, the deposit most likely dates after 1890, but could date in part as early as 1820.

[redacted]

Figure 25: Location of SA2 Sites over portion of the [redacted] 7.5’ USGS Quadrangle.

Forty-one historic artifacts were recovered at site 12-H-1406. Of these, 36 are temporaly diagnostic (Figure 37 and Figure 38). Most of this material (n= 34) was ceramic, including sherds of Hotelware manufactured 1840 to present (Majewsky and O’Brien 1987:124), ironstone dating between 1840 and the present (Brown 1982:6), whiteware with sponge decoration manufactured between 1840 and 1860 (Feldhues 1995:7), whiteware with maroon transfer-print decoration manufactured between 1830 and 1860 (Feldhues 1995:8), sponge-decorated whiteware dating between 1830 and 1871 (Brown 1982:6), hand-painted whiteware was manufactured 1830 to 1860 (Underglaze Painted Earthenwares 2012), and undecorated whiteware dates from 1820 to the present (Feldhues 1995:6). Utilitywares included redware, manufactured between 1850 and 1900 (Feldhues 1995:1), and stoneware dating from 1820 to the present (Feldhues 1995:6).

The balance of diagnostic artifacts from 12-H-1406 were glass and included an intact amber conical ink bottle marked “CARTER’S” on its base, made between 1860 and the early twentieth century. A fragment of amethyst bottle glass was likely produced 1890 to 1920 (Bottle/Glass Colors 2013), fragment of amber bottle glass made 1860 to the present (IMACS 1992:472), and a clear fragment of bottle glass produced 1875 to present (IMACS 1992:472). Finally, a fragment of aqua bottle glass, embossed "RO" was made 1875 to present (Glassmaking & Glassmakers 2013). Based on the dates of these materials the assemblage likely dates after 1890, but may in part date as early as 1820.

Artifacts from the other historic sites in SA2 were occupied during the 19th Century approximately coeval with the two sites discussed above. None of the historically indicated structure locations match the distribution of historic sites in SA2. 12-H-1406 is closest to the Crusan residence, but the artifact inventory is not a good fit for the period of occupation. The house indicated on the 2012 aerial and corresponding to 12-H-1406 is not present in 1956.

Figure 26: Diagnostic Projectile Points from Site 12-H-1402.

Figure 27: Possible Blade-core fragment from 12-H-1402.

Figure 28: Diagnostic Projectile Point from 12-H-1404.

Figure 29: Diagnostic Projectile Point from 12-H-1418.

[redacted]

Figure 30: SA2 Shown over Map of Original Land Grants in Hamilton County (http://www2.hamiltoncounty.in.gov/library/survey/images/Original_Landgrants.pdf).

[redacted]

Figure 31: 1866 *Map of Hamilton County*, *Indiana* showing SA2.

[redacted]

Figure 32: Location of SA2 over Portion of 1912 Soils Map.

[redacted]

Figure 33: Location of SA2 over portion of 1922 Plat Map (The Enterprise Printing & Publishing Co. 1922).

[redacted]

Figure 34: SA2 over Portion of the 1953 Noblesville 7.5’ USGS quadrangle.

Figure 35: Examples of Glass Artifacts Recovered from SA2.

Figure 36: Examples of Ceramics from 12-H-1402.

Figure 37: Examples of Ceramics from 12-H-1406.

Figure 38: Inkwell Recovered from 12-H-1406.

Survey Area 2 Sites

Twenty new archaeological sites were discovered in Survey Area 2. These consisted of sites 12-H-1402-12-H-1415 and 12-H-1417-12-H-1422. Ten of these sites contained prehistoric lithic scatters with a majority being culturally unidentified. Eight sites contained isolated prehistoric artifacts. Four sites contained historic scatters, with zero sites containing isolated historic artifacts. One site has been determined to be a possible prehistoric camp site, as well as one site being determined to be a possible prehistoric habitation site.

Survey Area 2 contained sites located on three different soil associations. Ten sites were located in areas consisting of soils containing Crosby Silt Loam (CrA). Eight sites were located in areas consisting of soils containing Brookston Silty Clay Loam (Br). Lastly, four sites were located in areas consisting of soils containing Patton Silty Clay Loam (Pn).

SA2 has twenty sites that contain a prehistoric component. This gives a prehistoric site density of one prehistoric site per 5.65 acres (2.29 ha). Prehistoric artifacts were encountered at a density of approximately 2 per acre. SA2 also contained four sites that had a historic component, giving a historic site density of one historic site per 28.195 acres (11.41 hectares). Historic artifacts were encountered at a rate of approximately 0.6 per acre.

Survey Area 2 Site Recommendations

Within Survey Area 2, three sites have the potential to be listed on the Indiana Register of Historic Sites and Structures and the National Register of Historic Places. Site 12-H-1402 is a very large, multi-component prehistoric habitation site, containing a very high density of artifacts and evidence of intact sub-plowzone features. However, these features are actively being destroyed by the application of moldboard plowing. The site contains diagnostic artifacts associated with the Early Archaic, Late Archaic, Middle Woodland, and Late Woodland chronological periods. The plowing does not appear to have destroyed such features. Due to the large number of artifacts and presence of multiple diagnostic time periods, as well as associated features, site 12-H-1402 retains significant information potential. While features are being plowed out, there is indication that even those features discovered on the surface in this survey retain depositional integrity. There are very few sites identified within the [redacted] Further, the sites that have been identified in the area are either historic or unidentified prehistoric. 12-H-1402 possesses the potential to fill many gaps in local prehistory. The area was a persistently important place, and we have much to learn about the nature of prehistoric use of this area. Much research concerning the Middle and Late Woodland periods in Hamilton County is still needed. As such, site 12-H-1402 is deemed potentially eligible for listing on the Indiana Register of Historic Sites and Structures and the National Register of Historic Places.

Site 12-H-1404 is a large scatter of prehistoric lithic material, including numerous flaked stone tools and one artifact diagnostic of the Late Archaic. The presence of a large amount of fire cracked rock at the site indicates prolonged activity and the presence of plow-exposed thermal features indicates remnant subsurface integrity for deposits. 12-H-1404 retains significant information potential regarding Late Archaic use of Cicero Creek drainage. 12-H-1404 is deemed potentially eligible for listing on the Indiana Register of Historic Sites and Structures and the National Register of Historic Places.

Site 12-H-1406 may correspond to the reported location of a nineteenth-century residence that no longer stood by 1912 (Hurst et al. 1912). Recovered artifacts represent domestic refuse including types dating from as early as 1820, although the assemblage in aggregate dates after 1890. The site appears to have the potential to provide important information about nineteenth-century rural life in central Indiana. Accordingly, it is potentially eligible for the NRHP and further evaluation is recommended.

All other archaeological sites identified in Survey Area 2 were either isolated prehistoric/historic artifacts or small prehistoric/historic artifact scatters that do not possess significant information potential. Therefore, no other sites within Survey Area 2 are considered potentially eligible for listing on the Indiana Register of Historic Sites and Structures or the National Register of Historic Places.

Survey Area 3

Survey Area 3 is located in [redacted] Township in Section 13, Township 18 North, Range 5 East, as shown on the USGS 7.5’ Riverwood Quadrangle below (Figure 39). The pedestrian survey of SA3 was completed on Saturday, November 4, 2012. Ground surface visibility for approximately fifteen percent of the survey area was at fifty percent, impacted by agricultural debris left over from the previous season’s harvest. The remaining eighty-five percent of the survey area had a ground surface visibility of ninety percent, impacted much less by agricultural debris and having been recently moldboard plowed. The weather conditions were sunny and favorable for archaeological fieldwork.

Survey Area 3 is an approximately 138.51 acre (56.05 ha) plot containing till soils of Wisconsin glaciation age. Soils of SA3 consisted of loamy Argiaquolls (Brookston Silty Clay Loam), silty mesic Endoaquolls (Patton Silty Clay Loam), and a loamy Epiaqualf (Crosby Silt Loam) (Soil Survey Staff 2012; Table 1). Through surface collection in pedestrian survey, thirty-eight new archaeological sites were discovered. These sites consist of 12-H-1423-12-H-1440, 12-H-1442-12-H-1460, and 12-H-1647 (Figure 40 and Figure 41).

Survey Area 3 Artifacts

A total number of 189 artifacts were collected in Survey Area 3, consisting of 79 prehistoric artifacts and 110 historic artifacts. Survey Area 3 represents the first survey area of this project in which the historic artifact assemblage is greater than the prehistoric artifact assemblage. Artifact categories and the associated number of each recovered in this survey area are listed in Table 6. Individual artifacts are listed in the artifact summaries located within Appendix E of Volume 2 of this report.

Prehistoric Artifacts

A total of five diagnostic prehistoric artifacts were recovered from Survey Area 3. Site 12-H-1428, contained a Snyders projectile point (12.62.45.1; Figure 42), diagnostic of the early Middle Woodland period (Justice 1987:201). Site 12-H-1431 contained a Kirk Corner Notched point (12.62.49.1; Figure 43), diagnostic of the Early Archaic period (Justice 1987:71-72). Site 12-H-1432 contained a point diagnostic of the Thebes Cluster (12.62.50.1; Figure 44), which is chronologically diagnostic of the Early Archaic as well (Justice 1987:54). Site 12-H-1439 contained a Raccoon Notched point (12.62.59.1; Figure 45), diagnostic of the early Late Woodland period (Justice 1987:219). Lastly, site 12-H-1448 contained a diagnostic Steuben Expanded Stem projectile point (12.62.69.1; Figure 46), diagnostic of the terminal Middle Woodland through early Late Woodland chronological periods (Justice 1987:209). Survey Area 3 also contained a number of unhafted biface tools (Figure 47).

Historic Artifacts

SA3 includes most of the land originally granted to [redacted] and a small portion of that granted to [redacted] (Figure 48). Warner's 1866 *Map of Hamilton County, Indiana* illustrates a residence on the [redacted] estate along the eastern edge of the property just north of the study area (Figure 49). That structure is shown on the 1912 soils map (Figure 50; Hurst et al. 1912). The 1922 plat map (The Enterprise Printing & Publishing Co. 1922) indicates that the property was then owned by [redacted] (Figure 51). The 1953 [redacted], *IN* 7.5' USGS quadrangle shows the residence noted on the earlier maps, just north of the eastern edge of the study area (Figure 52).

[redacted]

Figure 39: Location of SA3 over portion of the [redacted] USGS 7.5’ Quadrangles.

Twenty-eight temporally diagnostic historic artifacts were recovered from 12-H-1424 (Figure 53, Figure 54, and Figure 55). Undecorated ironstone dated from 1840 to the present (Brown 1982:6). Stoneware dated from 1820 to the present (Feldhues 1995:6), as does undecorated whiteware (Feldhues 1995:6). However, blue transfer-printed whiteware dates from1830 to 1860 (Feldhues 1995:6). Aqua container glass dates from 1860 to 1910 (IMACS 1992:472), and clear container glass dated 1875 to present (IMACS 1992:472). Based on the above dates, the assemblage dates after 1875, but could date in part as early as 1820.

Thirty-six temporally diagnostic historic artifacts were recovered 12-H-1647 (Figure 54). Porcelain electrical insulators date from ca. 1880 to the present (Porcelain insulator page 2003).

Porcelain table wares date from 1825 to the present (Brown 1982:1). Blue transfer-printed whiteware dates from 1830 to 1860 (Feldhues 1995:8). Undecorated and molded whiteware dates between 1820 and the present (Feldhues 1995:6). Stoneware dates from 1820 to the present (Feldhues 1995:6). Milkglass canning jar lid liners date between 1870 and 1960 (Lindsey 2012). Aqua container glass dates between 1860 and 1910 and clear container glass dates between 1875 and the present (IMACS 1992:472). Most amethyst container glass was manufactured between 1890 and 1920 (Bottle/Glass Colors 2013). Amber container glass has been manufactured since 1860 to the present (IMACS 1992:472). The assemblage most likely dates after 1890, but could date in part as early as 1820.

Table 6: Summary of Artifacts Recovered from SA3

Prehistoric	No.	Historic	No.
Angular Shatter	24	Ceramic, Ironstone	2
Core	5	Ceramic, Porcelain	7
Core Fragment	1	Ceramic, Stoneware	16
Core Tool	7	Ceramic, Whiteware	46
FCR	1	Glass, Amber	1
Flake	15	Glass, Amethyst	1
Flake Tool	18	Glass, Amethyst, Curved	1
Ground Stone	3	Glass, Aqua	12
Projectile Point	5	Glass, Aqua, Flat	3
		Glass, Clear	9
		Glass, Cobalt	2
		Glass, Milkglass	3
		Glass, Orange	1
		Metal handle	1
		Metal "Hook"	1
		Metal "Plating"	1
		Metal Spring Coil	1
		Metal, Unidentified	1
		Porcelain, Ingredient Shaker	1
Total	**79**		**110**

The remainder of the temporally indicative historic artifacts from SA3 date to primarily the 19th Century with pulses around the 1820s and the 1870s. However, many of the materials recovered continued in use up to the present time.

[redacted]

Figure 40: Location of SA3 Sites over 2012 Aerial Photograph (USDA-FSA Aerial Photography Field Office 2012).

[redacted]

Figure 41: Location of SA3 Sites over portions of [redacted] 7.5' USGS Quadrangles.

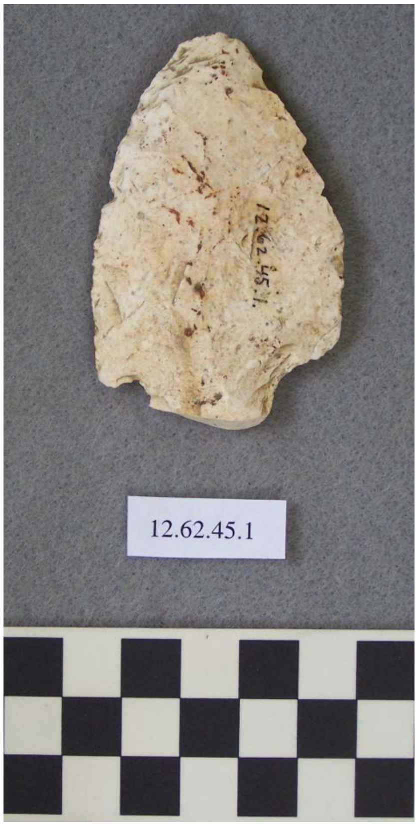

Figure 42: Snyders Point from 12-H-1428.

Figure 43: Kirk Corner Notched Point from 12-H-1431.

Figure 44: Thebes Cluster Point from 12-H-1432.

Figure 45: Raccoon Notched Point from 12-H-1439.

Figure 46: Stueben Expanding Stemmed Point from 12-H-1448.

Figure 47: Example Unhafted Bifaces from SA3.

[redacted]

Figure 48: SA3 over Map Showing Original Land Grants in Hamilton County.

[redacted]

Figure 49: Portion of the 1866 *Map of Hamilton County, Indiana*.

[redacted]

Figure 50: Portion of the 1912 Soils Map (Hurst et al. 1912) showing SA3.

[redacted]

Figure 51: Portion of the 1922 Plat Map (The Enterprise Printing & Publishing Co. 1922) Showing SA3.

[redacted] ng SA3

Figure 53: Examples of Milkglass and Orange Glass from SA3.

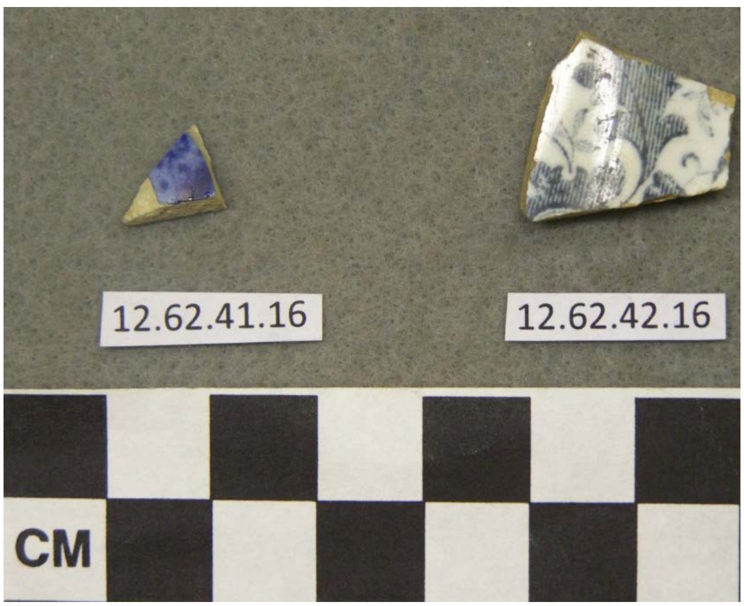

Figure 54: Examples of Ceramics Recovered from 12-H-1424 and 12-H-1647.

Figure 55: Metal Artifacts from 12-H-1424.

Survey Area 3 Site Recommendations

One site has been identified in Survey Area 3 that are potentially eligible for the Indiana Register of Historic Sites and Structures and the National Register of Historic Places. Site 12-H-1428 contains a relatively large number of flaked stone refuse, one flake tool, one groundstone tool, and a diagnostic Middle Woodland period projectile point. Also present at the site is fire cracked rock, indicative of sustained activity and possible subsurface features. Much information about the Middle Woodland period in Indiana is still sought after, and was also a focus of research for this project. The Middle Woodland period is somewhat underrepresented in Hamilton County (Table 2), there are no recorded Woodland sites in the vicinity of SA3 (Figure 11), and the location and nature of Middle Woodland habitation sites is an important and persistent question in various regions of the Midwest (Cowan 2006; Dancey and Pacheco 1997; Pacheco 1996; Wymer 1997). For these reasons, 12-H-1428 has the potential to contribute significant information of relevance in a local and regional archaeological context and is considered potentially eligible for listing on the Indiana Register of Historic Sites and Structures and the National Register of Historic Places.

No other sites within Survey Area 3 were associated with any features, nor do any other sites in Survey Area 3 appear applicable to any other archaeological research questions. As such, it has been determined that no other sites within Survey Area 3 appear eligible for listing on the Indiana Register of Historic Sites and Structures or the National Register of Historic Places.

Survey Area 4

Background

Survey Area Four was located on the [redacted] Hamilton County, Indiana (Figure 56). The property had already been previously surveyed for archaeological materials, through pedestrian survey, [redacted] Twenty-seven archaeological sites had been discovered within the [redacted] property, 18 of which are within the [redacted] (Figure 57, Table 7). After further review of the documentation, and as shown further after the discussion of the soil phosphate and magnetic susceptibility analysis, we propose that the documentation listed on the SHAARD database for archaeological site location within the [redacted] property is currently incorrect and should be revisited.

Table 7: List of Sites Located on the Horseshoe Tract at Conner Prairie

(see Figure 57)

Site Name	Type of Site	Cultural Affiliation	Significance
12-H-4	Village, Lithic Scatter	Late Archaic, Middle-Late Woodland, Historic	Potentially eligible
12-H-76	Habitation	Archaic, Late Woodland	
12-H-77	Habitation	Late Woodland, Middle Woodland	
12-H-78	Habitation	Late Woodland	
12-H-79	Habitation	Woodland	
12-H-80	Habitation	Late Archaic	
12-H-123	Light Scatter	Early Woodland	Ineligible
12-H-124	Light Prehistoric Scatter	Late Woodland	Ineligible
12-H-125	Large Scatter with Features	Late Woodland, Historic	Potentially eligible
12-H-126	Light Prehistoric Scatter	Late Woodland	Ineligible
12-H-134	Light Prehistoric Scatter	Unidentified Prehistoric	Ineligible
12-H-135	Light Prehistoric Scatter	Unidentified Prehistoric	Ineligible
12-H-136	Light Prehistoric Scatter	Unidentified Prehistoric	Ineligible
12-H-137	Light Prehistoric Scatter	Unidentified Prehistoric	Ineligible
12-H-138	Light Prehistoric Scatter	Late Woodland	Ineligible
12-H-139	Isolated Find	Unidentified Prehistoric	Ineligible
12-H-140	Isolated Find	Unidentified Prehistoric	Ineligible
12-H-142	Isolated Find	Unidentified Prehistoric	Ineligible

[redacted]

Figure 56: Location of SA4 as shown on a portion of the [redacted] 7.5' USGS Quadrangle.

Several of the previously documented sites in the [redacted] are Late Woodland and likely associated with an agricultural population. Further, the [redacted] occupies one of the largest expanses of mollisolls in Hamilton County. Mollisols are often noted as being related to ethnohistorically documented agricultural fields (see discussion in Buckmeister 2004), and Dr. G. William Monaghan (collaborating with Nolan on a similar project) believes that mollisols may be the key to locating prehistoric agricultural fields or gardens. There is also a conspicuous spot that lacks archaeological deposits in the southwestern portion of the [redacted], adjacent to multiple Late Woodland sites (Figure 58). Vogelin (1941) has noted that Shawnee population often placed their large village fields immediately south of the settlement. This open spot seemed an ideal opportunity to apply the soil phosphate survey to prospect for prehistoric gardens. It has been noted that soil phosphate signatures of anthrosols are not detectable, or reliably detectable on floodplains (Eidt 1977; Skinner 1986). Therefore, it was unknown if this survey would yield robust results.

[redacted]

Figure 57: Location of sites on the [redacted] over 2005 Aerial Photograph.
Note: Aerial photograph accessed through the Indiana Spatial Data Portal.

Survey

The southwestern portion of the [redacted] property underwent soil phosphate survey using the methodology developed for a floodplain area. The total acreage that underwent soil phosphate collection survey at the property is 44.78 acres (18.12 ha). The entire floodplain area consists of Ross Loam soils (see Table 1). Of the 18 previously identified sites, only 1 was mapped within our survey area (Figure 58). However, our results indicate that the previously mapped locations may not fully reflect the prehistoric distribution of activity.

Our soil sampling consisted of 169 plowzone samples and 68 included subsoil samples. Magnetic susceptibility samples are still being processed and will be completed with the aid of an ADVANCE grant from Ball State University.

[redacted]

Figure 58: Previously Identified Sites in Relation to SA4 Boundary.
Note: Background is 2012 aerial photograph (USDA-FSA Aerial Photography Field Office 2012)

Survey Area 4 Results

There is significant and patterned variability in the plowzone soil phosphate of SA4 (Figure 59). There are two highly enriched areas near previously mapped sites; however, neither of these matches the location of sites mapped previously. The display values in the key for mg/kg P is centered on the mean of 17.166 ±8.717 mg/kg with breaks every ½ standard deviation. It appears that the nearby habitation sites are approximately one standard deviation above the mean and higher (Figure 60). Interestingly, there is an equally depleted location along the southern edge of SA4 that is bounded approximately by 1 sd below the mean (Figure 60).

There is likewise significant variability in subsoil phosphate concentration within SA4 (Figure 61). Values are substantially less enriched, though the ranges do overlap. There is a much longer right tail to the frequency distribution for the subsoil values. The subsoil averages 4.604 ± 2.61 mg/kg phosphate. The enrichment of phosphate seems to be dominated by a depression and swale that define the eastern half of SA4. This view is much coarser than the plowzone sampling, but seems to indicate that enrichment of P in the southeast and depletion in the southwest may be driven partially by geology. It is not clear if there is any cultural contribution to these samples, and these might be best viewed as (at least partially) the background against which to evaluate the plowzone samples.

[redacted]

Figure 59: Interpolated (Krige) Soil Phosphate Concentrations from Plowzone Samples of SA4 over portion of [redacted] 7.5’ USGS Quadrangle.
See Figure 58 for key to sites.

To explore the implications of this potential relationship, the raster representing the subsoil was subtracted (map algebra) from the raster representing the plowzone (Figure 62). The resultant raster surface largely resembles Figure 59; however, there are important differences. This new surface averages 12.581 ± 8.699 mg/kg P (i.e., the Ap is on average ~12.6 mg/kg enriched relative to the B horizon). The enrichment around the Late Woodland lithic scatter (12-H-138) is the strongest deviation from background; the enrichment of the Ap here is approximately 2 standard deviations greater than average, or more (Figure 63). The site registered as a Late Woodland habitation (12-H-78) registers approximately 1 standard deviation above the mean. The depleted areas along the southern edge of SA4 exhibit the lowest enrichment of the Ap over the B, both registering approximately 1 standard deviation below the mean, or less enriched relative to the subsoil. Interestingly, some areas are even depleted relative to the subsoil (Figure 62).

[redacted]

Figure 60: Interpolated (Krige) Soil Phosphate Enrichments and Depletions from Plowzone Samples of SA4 over portion of [redacted] 7.5' USGS Quadrangle.
Note: Depleted = 1 sd below mean; Enriched = 1 sd above mean.

[redacted]

Figure 61: Interpolated (Krige) Soil Phosphate Concentrations from Plowzone Samples of SA4 over portion of [redacted] 7.5' USGS Quadrangle.
See Figure 60 for key to sites.

[redacted]

Figure 62: Phosphate Enrichment in the Ap Horizon in SA4 over portion of [redacted] 7.5’ USGS Quadrangle. See Figure 60 for key to sites.

[redacted]

Figure 63: Deviations from Background Ap Phosphate Enrichment in SA4 over portion of [redacted] 7.5’ USGS Quadrangle. See Figure 60 for key to sites.

These results are tantalizing and highly suggestive; however, they represent just the first steps towards teasing out the landuse and settlement history of the [redacted] We have demonstrated that the results of previous artifact-based surveys did not reveal the true nature of the archaeological deposits within the tract, and/or accurately report their locations. We also have two areas that exhibit anomalously depleted soil phosphate not readily explained by geology or topography. These areas, adjacent to both Late Woodland sites and multiple lithic scatters, may be gardens or fields. Alternatively, the sampled area is so small relative to the sites accidentally encountered that the background is insufficiently sampled to reach any sound conclusions about degree of relative depletion; however, the availability of samples from the B horizon serving as a proxy for geological distribution of phosphates suggests we may have detected an anthropogenic anomaly. More will be revealed by completing the MS, and obtaining full-element profiles (ADVANCE grant summer 2013). One thing is quite clear from this analysis. The method of measuring adsorbed phosphate from the fine fraction, even in floodplains is very effective at locating sites (and non-sites), and is even capable of updating results of traditional reconnaissance survey (c.f. Skinner 1986).

Survey Area 5

Survey Area 5 is located in [redacted] Township in [redacted], as shown on the USGS 7.5' [redacted] Quadrangle (Figure 60). The pedestrian survey of SA5 was completed on November 17, 2012. Ground surface visibility was at nearly 100 percent, as the field had recently been moldboard plowed, with no standing vegetation or agricultural debris affecting the visibility of the survey area. The weather conditions of the day were moderately sunny, allowing for ideal conditions for pedestrian survey. The soil phosphate survey in SA5 was completed on March 17, 2013, with the same soil visibility conditions as previously stated. During this survey, several diagnostic artifacts were collected (see Figure 61). Although slightly colder than the pedestrian survey, the weather during soil phosphate survey was relatively ideal for archaeological fieldwork.

Survey Area 5 is approximately 79.59 acres (32.21 ha). Soils (SMUs) in SA5 consisted of Brookston Silty Clay Loam (Br), Crosby Silt Loam (CrA), Patton Silty Clay Loam (Pn), and Miami Silt Loam (MmB2) (see Table 1). Through systematic surface collection during the pedestrian survey and non-systematic collection during the soil phosphate survey, forty-four new archaeological sites were identified in this survey area. These consist of sites 12-H-1461-12-H-1468, 12-H-1470-12-H-1490, 12-H-1492-12-H-1494, and 12-H-1496-1508 (Figure 61 and Figure 62).

Survey Area 5 Artifacts

A total number of 165 artifacts were recovered from Survey Area 5, consisting of 127 prehistoric artifacts and 38 historic artifacts. Artifact categories and the associated number of each recovered in this survey area are listed in Table 8. Individual artifacts are listed in the artifact summaries located within Appendix E of Volume 2 of this report.

Prehistoric Artifacts

A total of eight temporally diagnostic prehistoric artifacts were recovered from Survey Area 5, consisting of seven diagnostic projectile points and one diagnostic blade core. Site 12-H-1461 is a Late Archaic camp site. It contained artifact number 12.62.88.1 (Figure 64), a Lamoka projectile point diagnostic of the Late Archaic period (Justice 1987:129). Site 12-H-1464 is a possible terminal Late Archaic/Early Woodland lithic scatter. 12-H-1464 contained a possible Fulton Turkey-tail point (12.62.92.52; Justice 173-178; Figure 65). Site 12-H-1472 is a Late Archaic lithic scatter, containing artifact 12.62.101.1, a Matanzas Side Notched projectile point (Justice 1987:119-121). Site 12-H-1502 contained a Lamoka projectile point (12.62.138.2, Figure 63), diagnostic of the Late Archaic period (Justice 1987:127-128). Site 12-H-1503 was an

Early Woodland lithic scatter containing a diagnostic Adena Stemmed projectile point (12.62.139.1; Figure 63), diagnostic of the Early Woodland (Justice 1987:191-192). Site 12-H-1505 is an isolated Late Archaic faint side-notched Matanzas (12.62.164.1; Figure 63) projectile point (Justice 1987:120). Site 12-H-1507, an isolated projectile point from the Lowe Cluster (12.62.166.1; Figure 63), diagnostic of the terminal Middle Woodland through Late Woodland periods (Justice 1987:208). Lastly, site 12-H-1508 is an isolated Madison projectile point (12.62.167.1; Figure 63), diagnostic of the Late Woodland period (Justice 1987:224).

[redacted]

Figure 64: Location of SA5 over portion of [redacted] 7.5’ USGS Quadrangle.

[redacted]

Figure 65: Location of Sites Discovered in SA5 over 2012 Aerial Photograph (USDA-FSA Aerial Photography Field Office 2012).

[redacted]

Figure 66: Location of SA5 Sites over portion of Arcadia 7.5’ USGS Quadrangle.

Figure 67: Six Projectile Points from SA5.

Table 8: Summary of Artifacts Recovered from SA5

Prehistoric	No.	Historic	No.
Angular Shatter	16	Brick	2
Biface	2	Ceramic, Iron Stone	5
Core	38	Ceramic, Porcelain	1
Core Tool	14	Ceramic, Stoneware	10
FCR	2	Ceramic, Whiteware	7
Flake	23	Glass, Amber	1
Flake Tool	18	Glass, Amethyst	1
Groundstone Tool	6	Glass, Aqua	5
Projectile Point	8	Glass, Clear, Flat	1
		Glass, Milkglass	3
		Glass, Red	1
		Slag	1
Total	**127**		**38**

Figure 68: Lamoka point from site 12-H-1461.

Figure 69: Blade-like core from site 12-H-1465 and a possible Fulton Turkey-tail biface fragment from site 12-H-1464 of Wyandotte chert.

Historic Artifacts

A total of 62 temporally diagnostic historic artifacts was recovered from site 12-H-1464 (Figure 66, Figure 67). Undecorated whiteware dates from 1820 to the present (Feldhues 1995:6). Blue transfer-printed whiteware was manufactured between 1830 and 1860 (Feldhues 1995:8). Porcelain dates from 1825 to the present (Brown 1982:1). Stoneware dates from 1820 to the present (Feldhues 1995:6). Milkglass container glass was manufactured between 1890 and 1960 (IMACS 1992:472), while milkglass canning jar lid liners date between 1870 and 1960 (Lindsey 2012). Amber container glass has been manufactured since 1860 to the present (IMACS 2009:472), aqua container glass was manufactured between 1860 and 1910 (IMACS 1992:472), and most amethyst container glass was manufactured between 1890 and 1920 (Bottle/Glass Colors 2013). Based on the dates of these materials the deposit most likely dates after 1890, but it could in part have been deposited as early as 1820.

There are very few historic archaeological sites in SA5, and half are isolated finds and aside from 12-H-1464 none contain temporally indicative materials. The paucity of historic remains is intriguing. One possible explanation is that the neighbor who formerly owned the land and still farms the plot collects historic artifacts from his fields. He was unaware of any prehistoric sites on the property. The former owner did indicate that there was an old path that used to traverse the property right across the rise that constitutes 12-H-1464. Historic maps we examined indicate SA5 includes nearly all the land comprising [redacted]

(Figure 69). Warner's 1866 *Map of Hamilton County, Indiana* illustrates a residence on the easternmost of [redacted] (Figure 70). That structure appears on the 1912 soils map (Hurst et al. 1912) along with another at the southeast corner of the property (Figure 71). In 1922 the property was owned by [redacted] (Figure 72; The Enterprise Printing & Publishing Co. 1922). The 1961 [redacted], *IN* 7.5' USGS quadrangle shows both residences noted on the earlier maps (Figure 73). The immediate vicinity of both of these residences was excluded from the study area. The 1866 map shows the road deviating diagonally across the property, but not near 12-H-1464 as indicated by the former owner of the property.

Figure 70: An example of a historic whiteware sherd with partial maker's mark from SA5.

Figure 71: A historic porcelain container lid molded with a cross from SA5.

Figure 72: An example of a historic red glass sherd from SA5.

[redacted]

Figure 73: Portion of Original Land Grant Map (http://www2.hamiltoncounty.in.gov/library/survey/images/Original_Landgrants.pdf) showing SA5.

[redacted]

Figure 74: Portion of 1866 *Map of Hamilton County, Indiana* showing SA5.

[redacted]

Figure 75: Portion of 1912 Soils Map (Hurst et al. 1912) showing SA5.

[redacted]

Figure 76: Portion of 1922 Plat Map (The Enterprise Printing & Publishing Co. 1922) showing SA5.

[redacted]

Figure 77: Portion of 1961 [redacted] 7.5’ USGS Quadrangle Showing SA5.

Survey Area 5 Sites

Forty-four archaeological sites were uncovered in Survey Area 5, sites 12-H-1461-12-H-1468, 12-H-1470-12-H-1490, 12-H-1492-12-H-1494, and 12-H-1496-1508. Twenty-one of these sites were isolated unidentified prehistoric artifacts. One site was an isolated historic artifact and one prehistoric camp site was also uncovered. The remaining sites were scatters of artifacts. Eighteen sites contained prehistoric lithic scatters, for which a majority of the cultural affiliations is unknown. Three sites also contained historic scatters. The specific sites contained in these broad site type definitions are outlined in Appendix F of the second volume of this report.

Survey Area 5 contained sites located on four different soil types. Twenty-eight sites were located on Crosby Silt Loam (CrA). Nineteen sites were located on Brookston Silty Clay Loam (Br). Four sites were located on Miami Silt Loam (MmB2). Lastly, two sites were located on Patton Silty Clay Loam (Pn).

Forty prehistoric sites of different the different types listed above were discovered in SA5, giving a prehistoric site density area of 2.04 prehistoric sites per acre (one prehistoric site per 0.83 ha). Four historic sites were discovered in SA5, giving a historic site density of one historic site per 20.39 acres (one historic site per 8.25 ha).

Survey Area 5 Phosphate

Approximately 66.3 acres of SA5 were sampled for soil phosphate analysis with 298 samples from the plowzone. There is significant variability in P within SA5 (Figure 78), and the enrichment of P seems to be almost inversely correlated with both artifact distribution and elevation. The P concentration for SA5 is 37.781 ± 12.347, and is relatively normally distributed. Time constraints preclude more intensive analysis, but there does not appear to be much anthropogenic signal within the phosphate distribution in SA5. The one notable exception to the pattern is represented by the highest peak in the data near the outbuildings associated with the farm house. This cluster of enriched phosphate on a slight elevation yielded five samples with a greater concentration of phosphate than our colorimeter could read. These sample values were entered into the database at the maximum value the colorimeter can read, and the real concentrations are higher than 83 mg/kg of Mehlich-extractable P. This pattern is almost certainly not prehistoric and may relate to a former animal pen on the farm.

Further conclusions regarding the anthropogenic contribution to the P distribution in SA5 will have to await more sophisticated geostatistical analysis, and analysis of the distribution of other soil properties.

[redacted]

Figure 78: Interpolated (Krige) Soil Phosphate Distribution in SA5 over portion of [redacted] 7.5’ USGS Quadrangle.

Survey Area 5 Site Recommendations

Within Survey Area 5, two sites have been deemed as possibly eligible for listing on the Indiana Register of Historic Sites and Structures and the National Register of Historic Places. Site 12-H-1462 contains eight stone tools as well as nine core fragments. As the site also contains a decent amount of fire cracked rock, there is a chance that undisturbed features or features with a low amount of disturbance may be present. For the number of tools, artifacts overall, and possibility of intact subsurface features, it is deemed that site 12-H-1462 is possibly eligible for listing on the Indiana Register of Historic Sites and Structures as well as the National Register of Historic Places.

Site 12-H-1464 contains eighty-eight artifacts of a mixed prehistoric and historic assemblage, each representing about half of the total assemblage. The sheer number of artifacts present may indicate the sites significance. Presence of fire cracked rock also may indicate the presence of subsurface features of prehistoric age. For these reasons, it is the prehistoric component of 12-H-1464 may be eligible for listing on the Indiana Register of Historic Sites and Structures as well as the National Register of Historic Places. The historic component is not considered to possess significant information potential.

Neither site exhibits an obvious anthropogenic phosphate signature, though both are relatively elevated with respect to other topographic rises in SA5. Further analyses are required to tease out any relationship.

Although many other sites contained diagnostic artifacts of known cultural periods, no other sites contained a link to any subsurface features or integrity that can be seen at this point. Also, most diagnostic projectile points from this survey area were isolated finds. For this reason, it is deemed that no other sites from Survey Area 5 of this project are eligible for listing on the Indiana Register of Historic Sites and Structures or the National Register of Historic Places.

Survey Area 6

Survey Area 6 is located in [redacted] Township in [redacted] as shown in the USGS 7.5' [redacted] Quadrangle map (Figure 74). Survey Area 6 only underwent pedestrian survey during this project and was the first of two pedestrian surveys on the date of January 13, 2013. Ground surface visibility at SA6 ranged from 70-90 percent, visually estimated. Visibility was impacted because of agricultural debris left in the field after harvest, as well as the growth of some weeds between and across some crop rows. Although the temperature was between twenty and thirty degrees Fahrenheit, a great deal of sun provided ideal conditions for archaeological fieldwork.

Survey Area 6 is approximately 52.3 acres (21.17 ha). Soils (SMUs) in SA6 consisted of Brookston Silty Clay Loam (Br), a loamy Argiaquoll and Crosby Silt Loam (CrA), a loamy Epiaqualf (Table 1). All these soils are Wisconsin glaciation aged till soils, as shown in Figure 1. Through pedestrian survey, six new archaeological sites were discovered in SA6. These consist of sites 12-H-1509-12-H-1511 and 12-H-1513-12-H-1515 (Figure 75 and Figure 76).

Survey Area 6 Artifacts

A total number of 12 artifacts were recovered from Survey Area 6, consisting of 12 prehistoric artifacts only (Table 9). Individual artifacts are listed in the artifact summaries located within Appendix E of Volume 2 of this report.

Table 9: Summary of Artifacts Recovered from SA6

Prehistoric	No.	Historic	No.
Angular Shatter	1		
Core Tool	1		
Flake	4		
Flake Tool	1		
Groundstone Tool	5		
Total	**12**		**0**

Prehistoric Artifacts

No temporally diagnostic artifacts were recovered from Survey Area 6. For all artifacts in this survey area, the cultural affiliation is unknown prehistoric. A number of groundstone tools were recovered in this survey area, one being located in 12-H-1510, one being located in 12-H-1511, and three being located in 12-H-1514.One flake tool was recovered from 12-H-1510 and one core tool was recovered from 12-H-1513. All other artifacts recovered were flaked stone refuse.

[redacted]

Figure 79: Location of SA6 over portion of the [redacted] 7.5' USGS Quadrangles.

Survey Area 6 Sites

Six archaeological sites were uncovered in Survey Area 6, sites 12-H-1509-12-H-1511 and 12-H-1513-12-H-1515. Three of these sites were isolated prehistoric finds, with the remaining three sites being comprised of small culturally unidentified prehistoric lithic scatters. The specific sites contained in these broad site type definitions are summarized in Appendix F of the second volume of this report.

The six sites in Survey Area 6 were located on two different soil associations. Four sites were located on only Crosby Silt Loam (CrA), with two other sites being located on only

Brookston Silty Clay Loam (Br). One site, 12-H-1514, was located in both Crosby Silt Loam and Brookston Silty Clay Loam.

Survey Area 6 has a prehistoric site density of one site per 8.65 acres, or one prehistoric site per 3.50 hectares. As there are no historic artifacts or sites in Survey Area 6, the historic site density for the survey area is zero sites per acre and zero sites per hectare.

Survey Area 6 Site Recommendations

Due to the nature and very low frequency of artifacts per site, as well as the absence of any culturally identifiable materials, no sites from Survey Area 6 are considered eligible for the Indiana Register of Historic Sites and Structures or the National Register of Historic Places.

[redacted]

Figure 80: Location of SA6 Sites over 2012 Aerial Photograph (USDA-FSA Aerial Photography Field Office 2012).

[redacted]

Figure 81: Location of SA6 Sites over portions of the [redacted] 7.5’ USGS Quadrangles.

Survey Area 7

Survey Area 7 is located in [redacted] Township in [redacted] as shown on the USGS 7.5’ [redacted] Quadrangle (Figure 77). The pedestrian survey of SA7 was completed on January 13, 2013 and was the second pedestrian survey of the day. Ground surface visibility was between 40-80 percent, visually estimated. This was impacted by agricultural debris as well as very small areas of standing water approximately two inches in depth caused by the melting of snow and ice from the week before. This standing water only occurred in one small section of the survey area in random spots, only being about fifty centimeters wide by thirty centimeters long. The weather was fairly sunny in the afternoon, which made conditions for archaeological survey favorable.

[redacted]

Figure 82: Location of SA7 over portions of the [redacted] 7.5’ USGS Quadrangles.

Survey Area 7 is an approximately 55.3 acre (22.38 ha) plot on Wisconsin glaciation aged till soils. Three soil associations are present in SA7. One is that of a loamy Epiaqualf, Crosby Silt Loam (CrA), with the other two being a loamy Hapludalf (Miami series) and a loamy Argiaquoll (Brookston series) (Soil Survey Staff 2012). Information on drainage and slope of these soils can be obtained in the previous background soils section of this report. Through

[redacted]

Figure 83: Location of SA7 Sites over 2012 Aerial Photograph (USDA-FSA Aerial Photography Field Office 2012).

[redacted]

Figure 84: Location of SA7 Sites over portions of the [redacted] 7.5’ USGS Quadrangles.

surface collection in pedestrian survey, sixteen new archaeological sites were discovered in this survey area. These sites are that of 12-H-1516-12-H-1531 (Figure 78 and Figure 79).

Table 10: Summary of Artifacts Recovered from SA7

Prehistoric	No.	Historic	No.
Angular Shatter	1	Battery Core	1
Biface	1	Ceramic, Stoneware	3
Groundstone, Celt	1	Ceramic, Whiteware	2
Core	3	Glass, Amber	1
Core Tool	3	Glass, Aqua	3
Flake	3	Glass, Clear	9
Flake Tool	8	Glass, Milkglass	1
Groundstone Tool	1		
Total	**21**		**20**

Survey Area 7 Artifacts

A total number of 41 artifacts were recovered from Survey Area 7, consisting of 21 prehistoric artifacts and 20 historic artifacts (Table 10). Individual artifacts are listed in the artifact summaries located within Appendix E of Volume 2 of this report.

Prehistoric Artifacts

No diagnostic prehistoric artifacts were collected from SA7. However, one site in particular, 12-H-1516, contained a complete groundstone celt tool as well as a fragment of a biface tool (Figure 80). Thirteen of the twenty one prehistoric artifacts collected in SA7 were used as tools in some fashion, representing approximately 62 percent of the overall prehistoric artifact assemblage from the survey area.

Figure 85: Groundstone celt and biface tool fragment from site 12-H-1516.

Historic Artifacts

SA7 includes nearly all the land comprising the [redacted] and approximately the western half of [redacted] (Figure 81). The 1866 *Map of Hamilton County, Indiana* (Warner 1866) shows no building in the study area with the northern portion being part of the [redacted] A residence is shown to the west of the southern arm of the study area (Figure 82). The 1912 soils map (Hurst et al. 1912) shows a residence along the eastern edge of the northern portion of the study area. A residence is also shown south of that, to the east of the southern arm of the study area (Figure 83). The 1922 plat map shows that the northernmost portion of the study area was part of a property owned by [redacted] (The Enterprise Printing & Publishing Co. 1922). The portion of the study area with the residence was owned by [redacted], while the southern arm was part of the [redacted] property (Figure 84). The study area lies partially on the [redacted], *IN* 7.5'USGS (1953) quadrangle (Figure 85). The residences shown on the earlier maps, however, are on the [redacted], *IN* 7.5' USGS (1952) quadrangle (Figure 86). At that time, 1952, the complex included a ruin, presumable of a major outbuilding such as a barn. The residence south and east of the study area is shown on the 1952 map as a cluster of three ruins. The residence in the study area appeared to have been relatively recently demolished at the time fieldwork took place.

[redacted]

Figure 86: Portion of Original Land Grant Map (http://www2.hamiltoncounty.in.gov/library/survey/images/Original_Landgrants.pdf) showing SA7.

[redacted]

Figure 87: Portion of 1866 *Map of Hamilton County, Indiana* showing SA7.

[redacted]

Figure 88: Portion of 1912 Soils Map (Hurst et al. 1912) showing SA7.

[redacted]

Figure 89: Portion of 1922 Plat Map (The Enterprise Printing & Publishing Co. 1922) Showing SA7.

[redacted]

Figure 90: Portion of SA7 over the 1953 [redacted] 7.5’ USGS Quadrangle.

[redacted]

Figure 91: Portion of SA7 over the 1953 [redacted] 7.5' USGS Quadrangle.

All historic artifacts come from a single cluster, 12-H-1531. Nineteen of the 20 the historic artifacts recovered at this site are temporally diagnostic (Figure 87). Whiteware dates from 1820 to the present, and stoneware also dates from 1820 to the present (Feldhues 1995:6). Blue transfer-printed whiteware was manufactured between 1830 and 1860 (Feldhues 1995:8). Milkglass container glass was manufactured between 1890 and 1960 (IMACS 1992:472). Amber container glass has been manufactured since 1860 to the present (IMACS 2009:472), aqua container glass was manufactured between 1860 and 1910 (IMACS 1992:472), and clear container glass was manufactured between 1875 and the present (IMACS 1992:472). Based on these dates it is most likely that the deposit dates after 1890, but may in part date as early as 1820.

Survey Area 7 Sites

Sixteen archaeological sites were uncovered in Survey Area 7, sites 12-H-1516-12-H-1531. Nine of these sites were isolated culturally unidentifiable prehistoric artifacts. Six of these sites are culturally unidentifiable prehistoric lithic scatters. The last remaining site, 12-H-1531, is the only historic site in SA7. It is the largest site within SA7, consisting of a relatively large historic scatter.

One site is located on a loamy Argiaquoll (Brookston Silty Clay Loam), 12-H-1517. One site is located on a loamy Hapludalf (Miami Silt Loam), 12-H-1519. All remaining sites are located on loamy Epiaqualf soils (Crosby Silt Loam).

Fifteen of the sixteen sites in SA7 are prehistoric sites of either lithic scatters or isolated artifacts, both of which are culturally unidentifiable. This presents a prehistoric site density in SA7 of one prehistoric site per 3.7 acres, or one prehistoric site per 1.50 hectares. As there is only one historic site in SA7, the historic site density is one site per 55.3 acres (22.38 hectares).

Figure 92: Examples of historic artifacts collected in SA7.

Survey Area 7 Site Recommendations

No sites within SA7 are considered potentially eligible for the Indiana Register of Historic Sites and Structures or the National Register of Historic Places. The sites are either isolated finds, small lithic scatters, or secondary historical refuse deposits retaining both little information potential and little integrity.

Survey Area 8

Survey Area 8 is located in [redacted] Township in [redacted] as shown on the USGS 7.5' [redacted] Quadrangle (Figure 88). The pedestrian survey of SA8 was completed on February 16, 2013. Ground surface visibility was between 70-90 percent, impacted in limited locations by agricultural debris left over from the previous harvesting season. The weather conditions were slightly overcast with short periods of rain towards the very end of the last two acres of the survey. Conditions were ideal for archaeological fieldwork.

Survey Area 8 is approximately 55.78 acres (22.57 ha) located on three different tracts of Wisconsin-aged glacial till soils. Soil associations are mixed between six different soils associations, making this the most diverse survey area surveyed during this project. There are four loamy Hapludalfs (Ockley series, Fox series, Miami series, and Milton series) and two loamy Endoaqualfs (Sleeth series and Randolph series), with Fox series, Milton series, and Randolph series all being slightly mixed (Soil Survey Staff 2012; Table 1). Through surface collection during pedestrian survey, sixty-one new archaeological sites were identified in SA8. These sites consist of 12-H-1532-12-H-1543, 12-H-1545-12-H-1555, 12-H-1558-12-H-1560, 12-H-1562-12-H-1580, 12-H-1582-12-H-1591, and 12-H-1594-12-H-1599 (Figure 90, Figure 91).

Survey Area 8 Artifacts

A total number of 542 artifacts were recovered from Survey Area 8, consisting of 408 prehistoric artifacts and 134 historic artifacts (Table 11). Individual artifacts are listed in the artifact summaries located within Appendix E of Volume 2 of this report.

Prehistoric Artifacts

One diagnostic prehistoric artifact was recovered from Survey Area 8 (12.62.214.1). This is a blade-core diagnostic of the Middle Woodland period (Greber et al. 1981, Nolan et al. 2007). This artifact was located within site 12-H-1578, a Middle Woodland lithic scatter. 12-H-578 occurs in a cluster of sites along the southeastern portion of SA8 that yielded a variety of exotic and heat treated materials, including Ohio Flint Ridge. The nature of the use of this area adjacent to the creek is unknown, but 12-H-578 is likely largely destroyed by E 166th Street.

Although not culturally diagnostic, within site 12-H-1570 a heavily denticulated core tool was recovered. This artifact (12.62.206.1) represents the only heavily denticulated artifact recovered in this project. Denticulation is a word representing artifacts that are "serrated or toothed edged" (Andrefsky 2005:255). Both of these artifacts are pictured in Figure 89. Lastly, a total number of 118 prehistoric tools were used as tools. This represents roughly 29 percent of the total prehistoric artifact assemblage recovered from SA8.

Table 11: Summary of Artifacts Recovered from SA8

Prehistoric	No.	Historic	No.
Angular Shatter	56	Battery Core	1
Biface	5	Ceramic, Ironstone	1
Core	72	Ceramic, Porcelain	5
Core Tool	33	Ceramic, Stoneware	14
Flake	162	Ceramic, Whiteware	49
Flake Tool	77	Glass, Amber	3
Groundstone Tool	3	Glass, Amethyst	5
		Glass, Aqua	11
		Glass, Bright Green	1
		Glass, Clear	32
		Glass, Cobalt	2
		Glass, Green	1
		Glass, Milkglass	7
		Glass, Vile (Complete)	1
		Spark Plug	1
Total	**408**		**134**

[redacted]

Figure 93: Location of SA8 over portion of the [redacted] 7.5’ USGS Quadrangle.

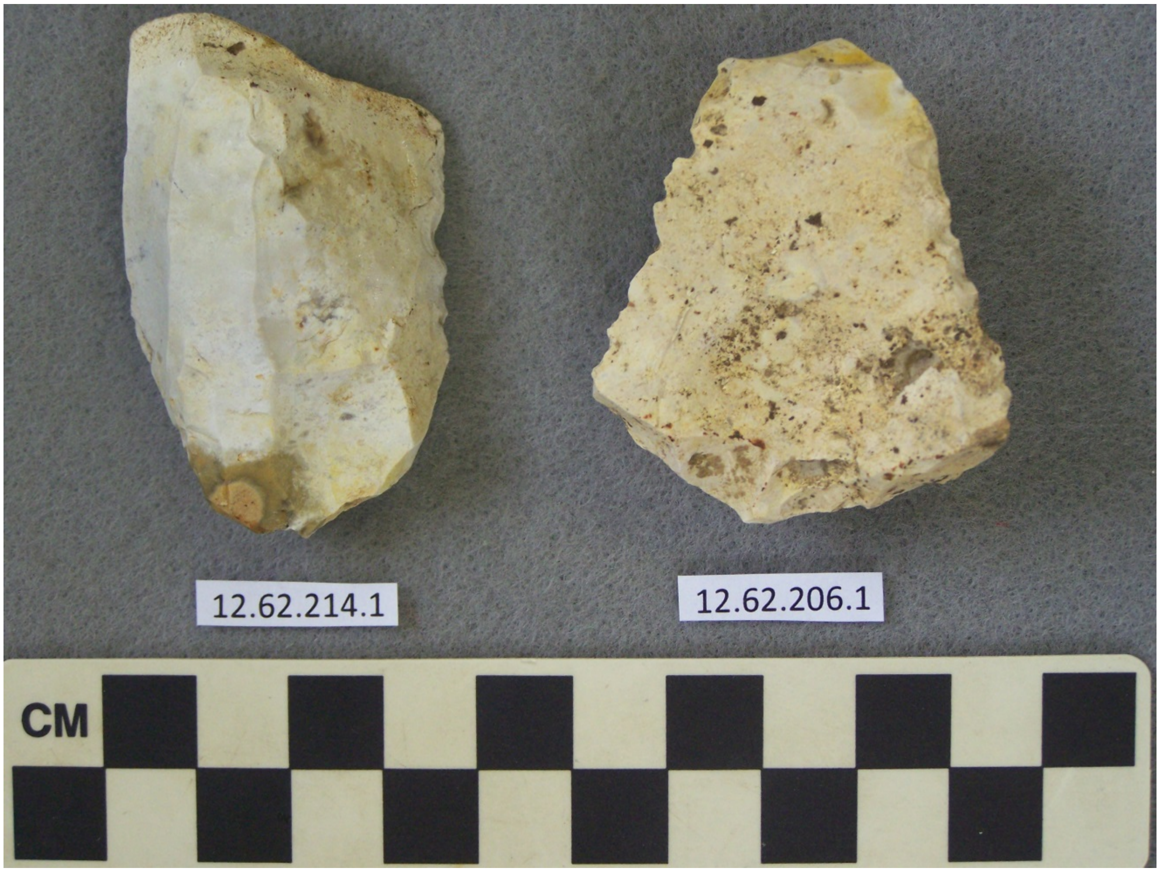

Figure 94: Blade-core from site 12-H-1578 and a denticulated core tool from site 12-H-1570.

[redacted]

Figure 95: Location of SA8 Sites over 2012 Aerial Photograph (USDA-FSA Aerial Photography Field Office 2012).

[redacted]

Figure 96: Location of SA8 Sites over portion of the [redacted] 7.5’ USGS Quadrangle.

Historic Artifacts

This study area is discontinuous with a farmhouse ruin separating the parcels that make-up the study area. The land comprising most of the southern half of the [redacted] and approximately the northwest potion of the [redacted] (Figure 92). Warner's 1866 *Map of Hamilton County, Indiana* illustrates that both parcels were included in the property of [redacted] A residence is illustrated where the ruined farmhouse now stands, while a second residence was located at approximately the center of the southern parcel (Figure 93). While there are several sites in the general vicinity of the house shown, none contain historic artifacts indicating a house site. That map also illustrates a cemetery to the east of the southern portion of the study area. There was no sign of this cemetery in the field, though it appears to be within a wooded area outside of SA8 and uncultivated (see Figure 90). The farmhouse ruin appears on the 1912 soils map (Hurst et al. 1912). However, the residence in the southern parcel is not show (Figure 94). In 1922 the property was in the estate of [redacted] (Figure 95; The Enterprise Printing & Publishing Co. 1922). The 1953 [redacted], *IN* 7.5' USGS quadrangle shows the now ruined farmhouse and an adjacent ruin, likely a barn (Figure 96).

[redacted]

Figure 97: SA8 over portion of Original Land Grant Map (http://www2.hamiltoncounty.in.gov/library/survey/images/Original_Landgrants.pdf).

[redacted]

Figure 98: Portion of 1866 *Map of Hamilton County*, *Indiana* showing SA8.

[redacted]

Figure 99: Location of SA8 over portion of 1912 Soils Map (Hurst et al. 1912)

[redacted]

Figure 100: Portion of 1922 Plat Map (The Enterprise Printing & Publishing Co. 1922) showing SA8.

[redacted]

Figure 101: Portion of the 1953 [redacted] 7.5' USGS Quadrangle showing SA8.

As with the other survey areas, most of the artifacts recovered date to the 19th Century, with many types continuing to be manufactured and used up until the present. 124 temporally diagnostic historic artifacts were recovered from 12-H-1552. Nine datable varieties of ceramics were found (Figure 99). A marked sherd was also found. Stoneware dates from 1820 to the present (Feldhues 1995:6). Porcelain tablewares date from 1825 to the present (Brown 1982:1). Undecorated whiteware dated from 1820 to the present (Feldhues 1995:6). Decal-decorated porcelain and whiteware date from 1890 to 1960 (Decal Decorated Wares 2012). Hand-painted, transfer-printed, dipped, and sponge-decorated whiteware date from 1830 to 1860 (Brown 1982:6). Homer Laughlin whiteware has been produced since 1874 and continues to be made (Welch ND).

Seven types of dateable glass were found (Figure 97 and Figure 98). Bright green container glass was introduced in 1900 and continues to be made (Bottle/Glass Colors 2013). Aqua container glass dates from 1860 to 1910 (IMACS 1992:472). Clear container glass dates from 1875 to the present (IMACS 1992:472). Amber container glass dates from 1860 to the present (IMACS 1992:472). Most amethyst container glass was manufactured between 1890 and 1920 (Bottle/Glass Colors 2013). Milk glass jar lid liners were produced from 1870 to 1960 (Lindsey 2012), while milk glass was used for containers from 1890 to 1960 (IMACS 1992:472). Based on these dates, the site most likely dates after 1900, but the assemblage could date in part as early as 1820.

Figure 102: Examples of Historic Glass Artifacts from 12-H-1552.

Figure 103: Additional Examples of Historic Glass from 12-H-1552.

Figure 104: Example Ceramics from 12-H-1552.

Survey Area 8 Sites

Sixty-one archaeological sites were uncovered in Survey Area 8, sites 12-H-1532-12-H-1543, 12-H-1545-12-H-1555, 12-H-1558-12-H-1560, 12-H-1562-12-H-1580, 12-H-1582-12-H-1591, and 12-H-1594-12-H-1599. Thirty-two of these sites are prehistoric lithic scatters, with all but 12-H-1578 being culturally unidentifiable. Twenty-five of the sites in SA8 are isolated prehistoric artifacts, compared to two sites being isolated historic artifacts. Two sites are identified as culturally unidentified prehistoric camps. Lastly, three sites contain historic scatters. The specific sites contained in these broad site type definitions are outlined in Appendix F of the second volume of this report.

Survey Area 8 contained sites located within five of the six soil series within the survey area, representing six specific soil types. Thirty of the SA8 sites are within Ockley Silt Loam (OcA). Seventeen of the sites are on the higher sloped, eroded form of Ockley Silt Loam (OcB2). Five of the sites fall within the bounds of Sleeth Loam (St). Thirteen sites are on Fox Loam soils (FnB2). Lastly, two sites are within Miami Silt Loam (MmB2), and two sites contain Milton Silt Loam (MxA).

Of the sixty-one sites discovered within SA8, fifty-nine of these sites contained some type of prehistoric component described previously. This leads to a prehistoric site density at one prehistoric site per 0.97 acres (0.39 hectares). The historic site density with five sites of the sixty-one total containing a historic component is one historic site per 11.41 acres (4.62 hectares).

Survey Area 8 Site Recommendations

Three sites were identified in Survey Area 8 that are potentially eligible for listing on the Indiana Register of Historic Sites and Structures. Site 12-H-1534 contains 41 prehistoric artifacts, consisting of 10 stone tools and a large quantity of debitage. Due to the size of the site, it is deemed that the 12-H-1534 may be eligible for listing on the Indiana Register of Historic Sites and Structures as well as the National Register of Historic Places.

Site 12-H-1582 contains 7 stone tools in an assemblage of 47 prehistoric artifacts. Due to the diversity of artifact types and the intensity of use indicated, it is deemed that 12-H-1582 may be eligible for listing on the Indiana Register of Historic Sites and Structures and the National Register of Historic Places.

Lastly within Survey Area 8, site 12-H-1587 contains 20 flaked stone tool implements in an assemblage of 78 artifacts, leading for this site to be labeled a culturally unidentified prehistoric camp site. Due to the size of the site and the large number of tools present, it is deemed that 12-H-1587 may be eligible for listing on the Indiana Register of Historic Sites and Structures as well as the National Register of Historic Places.

Survey Area 9

Survey Area 9 is located in Fall Creek Township in Section 24, Township 18 North, Range 5 East, as shown in the USGS 7.5’ McCordsville and Riverwood Quadrangle maps (Figure 100). The pedestrian survey of SA9 was completed on February 24, 2013. Ground surface visibility was between 40-60 percent, with a moderate and relatively evenly spaced amount of agricultural debris throughout the entire survey area. A small section of the survey area was also experiencing ponding approximately twenty inches in depth in an area of close to ten by ten meters. As such, this ponded area was not included in the pedestrian survey. Weather conditions were sunny at approximately thirty-eight degrees Fahrenheit. Conditions were ideal for archaeological fieldwork.

Survey Area 9 is approximately 25.91 acres (10.49 ha) of loamy Epiaqualf (Crosby Silt Loam), loamy Argiaquoll (Brookston Silty Clay Loam), and loamy Hapludalf (Miami Silt Loam) till soils of Wisconsin glaciation age (Soil Survey Staff 2012; Table 1). Through surface collection in pedestrian survey, nineteen new archaeological sites were discovered. These sites are 12-H-1600-12-H-1603, 12-H-1605-12-H-1608, 12-H-1611-12-H-1618, 12-H-1620, 12-H-1622, and 12-H-1625 (Figure 101 and Figure 102).

Survey Area 9 Artifacts

A total number of 126 artifacts were recovered from Survey Area 9, with 28 of these artifacts being prehistoric (22.2%) and 98 being historic (77.8%). The artifact categories and the associated number of each recovered in this survey area are listed below in Table 12. Survey Area 9 represents the second survey area in this project where the historic assemblage is larger than the prehistoric assemblage. Individual artifacts are listed in the artifact summaries located within Appendix E of Volume 2 of this report.

Prehistoric Artifacts

No diagnostic prehistoric artifacts were recovered from Survey Area 9. Of the 28 prehistoric artifacts, 10 of them were used as tools. This represents 35.71 percent of the total prehistoric artifact assemblage. The rest of the assemblage is represented by core fragments, flaked stone debitage, and fire cracked rock.

Historic Artifacts

SA9 includes nearly all the land comprising [redacted] (Figure 103). A residence stood on the property at the time of the survey, and it and its access were excluded from the study area. Warner's 1866 *Map of Hamilton County, Indiana* indicated that the study area was part of the holdings of [redacted], but no residences are indicated (Figure 104). The 1912 soils map (Hurst et al. 1912) shows a structure at the location where one stood at the time of the survey (Figure 105). In 1922 the property was owned by [redacted] (Figure 106; The Enterprise Printing & Publishing Co. 1922). The 1952 [redacted] IN 7.5' USGS quadrangle also shows the residence standing on the property at the time of the survey (Figure 107).

The majority of the historic artifacts come from a single site: 12-H-1600. Fifty-six temporally diagnostic historic artifacts were recovered at this site. Six datable varieties of ceramics were found. Stoneware was produced from 1820 to the present (Feldhues 1995:6). Undecorated whiteware was produced from 1820 to the present (Feldhues 1995:6), while hand-painted white ware was produced from 1830 to 1860 (Feldhues 1995:6) and decal-decorated whiteware was produced from 1890 to 1960 (Decal Decorated Wares 2012). Porcelain was produced from 1825 to the present (Brown 1982:1). Four dateable varieties of glassware were found, including milkglass produced from 1890 to 1960, aqua glass was produced 1860 to 1910, and clear glass was produced 1875 to the present (IMACS 1992:472). Amethyst glass was produced mostly from 1890 to 1920 (Bottle/Glass Colors 2013). Based on these dates, the assemblage likely dates after 1890, but could date in part as early as 1820.

Six temporally diagnostic historic artifacts were recovered 12-H-1602. A sherd of undecorated porcelain dates from 1825 to the present (Brown 1982:1). Transfer-printed whiteware dates from 1830 to 1860 (Feldhues 1995:6). Embossed aqua container glass dates between1875 to 1910 (IMACS 1992:472, Glassmaking & Glassmakers 2013), while other fragments of aqua glass date from 1860 to 1910 (IMACS 1992:472). Based on these dates, the assemblage likely dates after 1875. However, it may in part date as early as 1825.

Table 12: Summary of Artifacts Recovered from SA9

Prehistoric	No.	Historic	No.
Core	8	Brick	29
Core Tool	6	Ceramic, Porcelain	3
FCR	6	Ceramic, Stoneware	10
Flake	4	Ceramic, Whiteware	20
Flake Tool	2	Ceramic, Yelloware	1
Groundstone Tool	2	Foot Stirrup	1
		Glass, Amethyst	4
		Glass, Aqua	20
		Glass, Clear	9
		Glass, Milkglass	1
Total	**28**		**98**

[redacted]

Figure 105: Location of SA9 over portions of the [redacted] 7.5’ USGS Quadrangles.

Survey Area 9 Sites

Nineteen new archaeological sites were uncovered in Survey Area 9, sites 12-H-1600-12-H-1603, 12-H-1605-12-H-1608, 12-H-1611-12-H-1618, 12-H-1620, 12-H-1622, and 12-H-1625. Of these sites, thirteen were isolated culturally unidentifiable prehistoric artifacts. One site was an isolated historic artifact. Five sites contained culturally unidentifiable prehistoric lithic scatters and two sites contained historic scatters. These specific sites and their broad associated site type definitions are out summarized in Appendix F of the second volume of this report.

Survey Area 9 contained three different soil associations in which sites were located. Ten sites were located on Crosby Silt Loam (CrA). Two sites were located on Brookston Silty Clay Loam (Br). Lastly, ten sites were located on Miami Silt Loam (MmB2).

Eighteen sites within Survey Area 9 contained prehistoric components, giving a prehistoric site distribution of one prehistoric site per 2.07 acres (0.84 hectares). Three sites contained a historic component, giving a historic site density for SA9 of one historic site per 12.4 acres (5.02 hectares).

[redacted]

Figure 106: Location of SA9 Sites over 2012 Aerial Photograph (USDA-FSA Aerial Photography Field Office 2012).

Survey Area 9 Site Recommendations

No site in SA9 are considered potentially eligible for the Indiana Register of Historic Sites and Structures or the National Register of Historic Places. The sites are isolated finds, small lithic scatters, or secondary historic debris. It should be noted that the farmer of the tract reported to us that he had recovered a possible breast plate from the property, but never allowed us to examine his collection. It is possible that significant sites exist, or formerly existed here, but have been hunted to exhaustion.

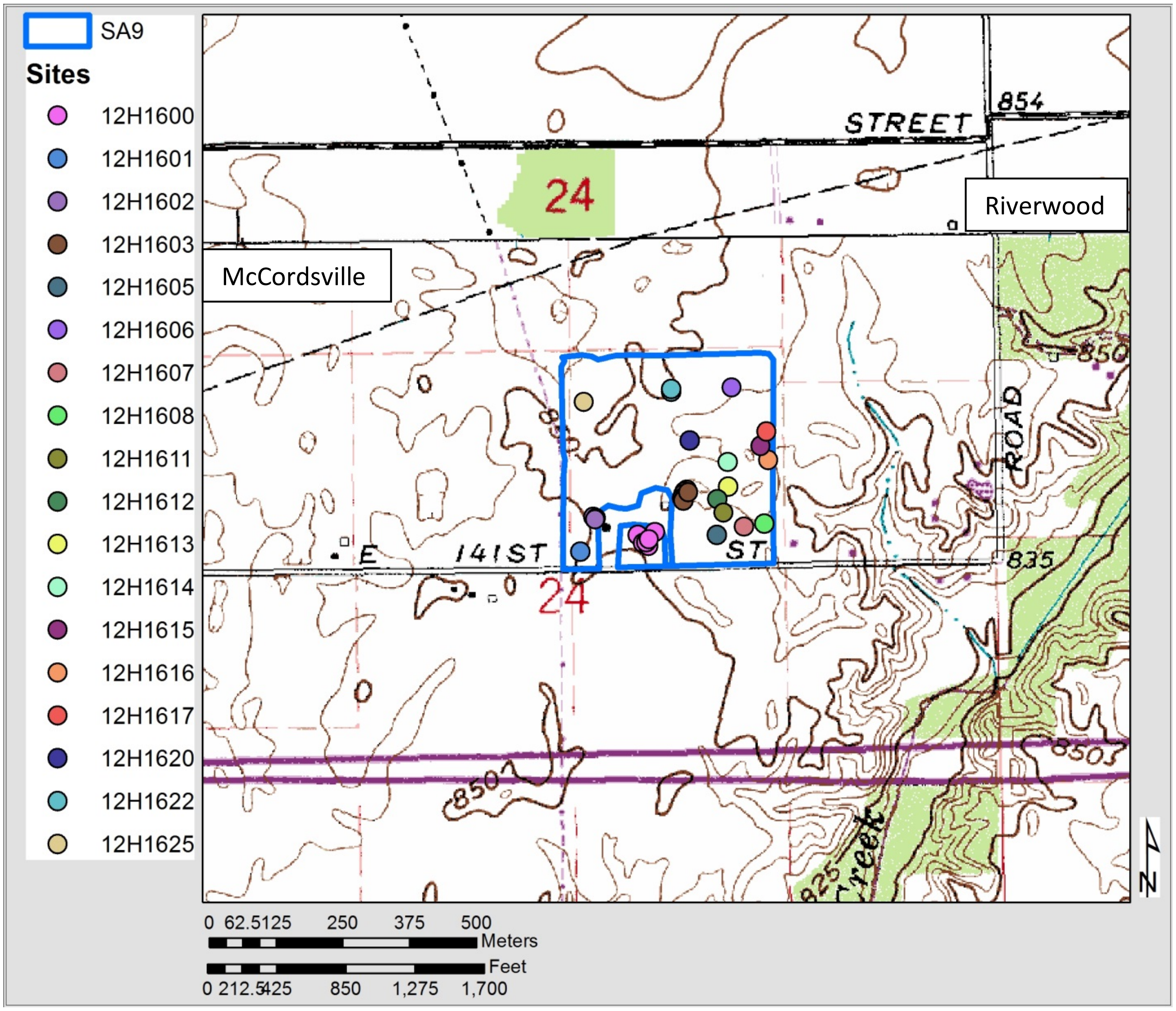

Figure 107: Location of SA9 Sites over portion of the [redacted] 7.5' Minute USGS Quadrangles.

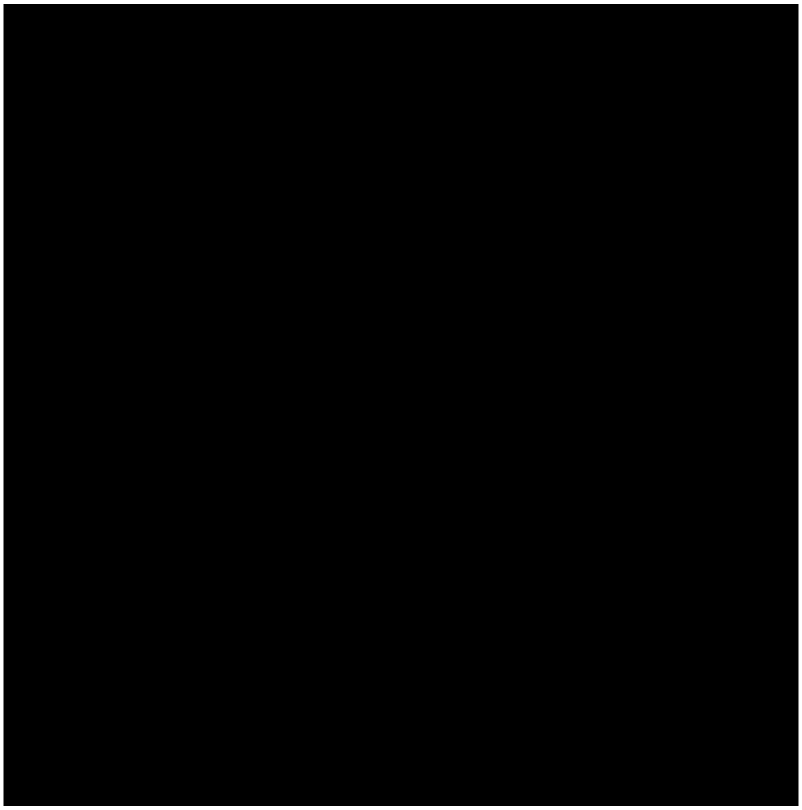

Figure 108: SA9 over portion of the Original Land Grant Map
(http://www2.hamiltoncounty.in.gov/library/survey/images/Original_Landgrants.pdf).

Figure 109: Portion of the 1866 *Map of Hamilton County, Indiana* showing SA9.

[redacted]

Figure 110: Portion of 1912 Soils Map (Hurst et al. 1912) showing SA9.

[redacted]

Figure 111: Portion of 1922 Plat Map (The Enterprise Printing & Publishing Co. 1922) showing SA9.

[redacted]

Figure 112: Portion of the 1952 [redacted] 7.5’ USGS Quadrangle showing SA9.

Figure 113: Stirrup Recovered from 12-H-1600.

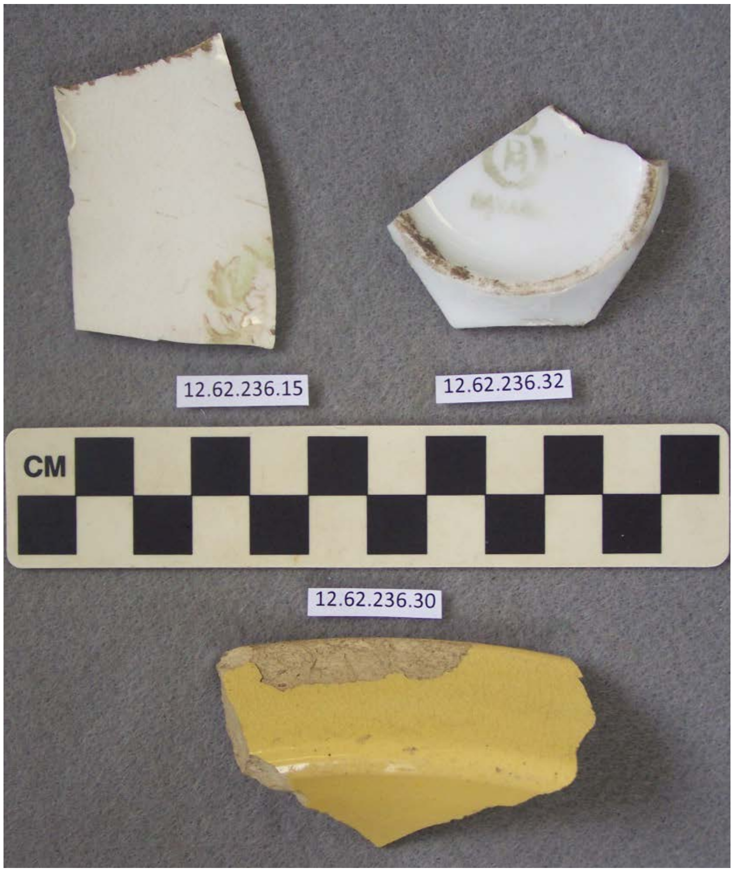

Figure 114: Examples of Ceramics Recovered from 12-H-1600.

Figure 115: Examples of Glass Artifacts Recovered from 12-H-1600.

Survey Area 10

Survey Area 10 is located in [redacted] Township in [redacted] as shown on the USGS 7.5' [redacted] Quadrangle map below (Figure 113). The pedestrian survey of SA10 was completed on March 16, 2013. Ground surface visibility ranged from 70 to 90 percent, visually estimated. The visibility was impacted by agricultural debris left from the previous season's harvest. Overall, the day was only slightly overcast with conditions ideal for archaeological fieldwork.

Survey Area 10 is approximately 12.44 acres (5.03 ha) of till soils of Wisconsin glaciation age. Two main soil subgroups are located in SA10, representing a total of three different soil series. Two are Hapludalf soils (Miami Silt Loam and Miami Clay Loam) and one is a loamy Epiaqualf (Crosby Silt Loam) (Soil Survey Staff 2012; Table 1). Through surface collection in pedestrian survey, nineteen new archaeological sites were discovered in SA10. These sites are 12-H-1627-12-H-1641 and 12-H-1643-12-H-1646 (Figure 114 and Figure 115).

Survey Area 10 Artifacts

A total number of 216 artifacts were recovered from Survey Area 10, with 212 of these artifacts being prehistoric and only 4 historic artifacts. Artifact categories and the associated number of each recovered in this survey area are listed in Table 13. Individual artifacts are listed in the artifact summaries located within Appendix E of Volume 2 of this report.

Prehistoric Artifacts

A total of four diagnostic prehistoric artifacts were recovered from Survey Area 10, consisting entirely of diagnostic projectile points. Site 12-H-1636 contained two of these diagnostic projectile points: a Brewerton Cluster (Vossburg?) point (12.62.272.1; Figure 111) (Justice 1987:116) and a Brewerton Corner Notched point (12.62.272.2) both diagnostic of the Late Archaic period (Justice 1987:116-117). Site 12-H-1628 contained a Jack's Reef point (12.62.264.1; Figure 111) diagnostic of the terminal Middle Woodland through Late Woodland chronological periods (Justice 1987:217). Lastly, a Kirk Corner Notched point (12.62.282.1; Figure 111) was found in site 12-H-1646. One non-diagnostic artifact of interest recovered in this survey area is a large biface tool (12.62.268.1) recovered from site 12-H-1630 (Figure 112). This biface represents the largest flaked stone tool found in this project.

Figure 116: Diagnostic Projectile Points Discovered in SA10.

Figure 117: Large Chipped Stone Biface from 12-H-1630.

[redacted]

Figure 118: Location of SA10 over portions of the [redacted] 7.5' USGS Quadrangles.

Historic Artifacts

Historic sites encountered are very sparse and recent deposits. It is entirely possible that all sites are less than 50 years in age. Two artifacts of interest were recovered. 12-H-1628 yielded a single horseshoe (Figure 116), and 12-H-1636 yielded a single decal-decorated whiteware sherd (Figure 117). The decal-decoration dates between 1890 and 1960 (Decal Decorated Wares 2012).

Table 13: Summary of Artifacts Recovered from SA10

Prehistoric	No.	Historic	No.
Angular Shatter	47	Ceramic, Whiteware	1
Biface	3	Glass, Clear	2
Core	79	Horseshoe	1
Core Tool	11		
FCR	4		
Flake	44		
Flake Tool	17		
Groundstone Tool	3		
Projectile Point	4		
Total	**212**		**4**

[redacted]

Figure 119: Location of SA10 Sites over 2012 Aerial Photograph (USDA-FSA Aerial Photography Field Office 2012).

[redacted]

Figure 120: Location of SA10 Sites over portions of [redacted] 7.5’ Quadrangles.

Figure 121: Horseshoe Recovered from 12-H-1628.

Survey Area 10 Sites

Nineteen new archaeological sites were uncovered in Survey Area 10, sites 12-H-1627-12-H-1641 and 12-H-1643-12-H-1646. Seven of these sites contained isolated prehistoric artifacts, with all but diagnostic projectile points being culturally unidentifiable. Nine sites contained prehistoric lithic scatters. Three of these sites were determined to be possible prehistoric camps. Lastly, one site contained an isolated historic artifact and one site contained a historic scatter.

Survey Area 10 contained sites located on three different soil associations (Table 1). Nine sites were located on Crosby Silt Loam (CrA). Eight sites were located in areas containing soils of Miami Silt Loam (MmB2). Lastly, six sites were located in areas containing soils of Miami Clay Loam (MoC3).

Nine sites contained a prehistoric component in SA10. This gives a prehistoric site density of one prehistoric site per 0.72 acres (0.29 ha). SA10 yielded a prehistoric artifact density of 17.04 artifacts per acre (42.15/ha), the densest concentration of artifacts encountered in the entire project. With two sites containing a historic component, SA10 has a historic site density of one historic site per 6.22 acres (2.52 ha). Survey Area 10 represents the survey area with the most densely concentrated prehistoric site density.

Survey Area 10 Site Recommendations

Within Survey Area 10, two sites have been identified as being potentially eligible for listing on the Indiana Register of Historic Sites and Structures and the National Register of Historic Places. Site 12-H-1628 is a prehistoric camp site with diagnostic artifacts from the Middle Woodland period and Late Woodland period. As fire cracked rock is present, the potential for undisturbed sub surface features is present. A total of 75 artifacts were recovered from this site, demonstrating its size. Research on the Middle Woodland in Hamilton County and Indiana is needed, as well as many questions about land use in the Late Woodland period. For these research objects, as well as the sheer size and number of artifacts present at this dateable site, it is deemed that site 12-H-1628 is potentially eligible for listing on the Indiana Register of Historic Sites and Structures as well as the National Register of Historic Places.

Site 12-H-1636 contains diagnostic artifacts of the Late Archaic period, with 9 stone tools total in an assemblage of 38 total artifacts. This site has been labeled a potential Late Archaic camp site. As the site contains diagnostic artifacts and a large number of stone tools, it is deemed that 12-H-1636 likely retains significant information potential. No evidence of erosion or other significant impact to site integrity was noted. 12-H-1636 may be eligible for listing on the Indiana Register of Historic Sites and Structures as well as the National Register of Historic Places.

More research is warranted in this setting in general given the unexpected density and diversity of material encountered on such a small plot.

Site 12-H-1630 deserves special comment. This site contains one very large biface tool (Figure 112), 7 other flaked stone tools, as well as fire cracked rock. In total, 49 artifacts were recovered from the site. The assemblage seems to warrant further investigation; however, due to the eroded nature of the slope above (containing 12-H-1633) there is likely no integrity present at 12-H-1630. The long, narrow nature of the site is a function of topography, field boundaries and gravity. 12-H-1630 is not potentially eligible for listing on the Indiana Register of Historic Sites and Structures as well as the National Register of Historic Places.

With all other sites being small historic/prehistoric scatters or isolated finds with no foreseeable integrity, it is deemed that no other sites within Survey Area 10 are eligible for listing on the Indiana Register of Historic Sites and Structures or the National Register of Historic Places.

Figure 122: Decal-decorated Sherd from 12-H-1636.

SUMMARY AND CONCLUSION

By Kevin C. Nolan

A total of 230 new archaeological sites were discovered during this project over nine survey areas encompassing 564.76 acres (228.55 ha). On average we discovered one site every 2.46 acres (0.996 ha), and one artifact every 0.35 acres (0.14 ha). Prehistoric artifacts were substantially more dense (1 every 0.49 acres) and frequent (N = 1154) than historic artifact (1 every 1.2 acres, N = 471; Table 14). We recovered artifacts ranging from the Early Archaic through Late Woodland, and 19th Century through modern period. Most sites are small lithic scatters/historic scatters or isolates and not considered eligible for the NRHP. Thirteen sites are considered to possess significant information potential for important regional research.

Table 14: Summary of Distribution and Density of Sites and Artifacts for all Survey Areas.

	SA1	SA2	SA3	SA5	SA6	SA7	SA8	SA9	SA10	Total	N/acre	acres/N
Sites	11	21	37	43	6	16	59	18	19	230	0.41	2.46
Artifacts	38	296	189	165	12	41	542	126	216	1625	2.88	0.35
Historic	1	66	110	38		20	134	98	4	471	0.83	1.20
Prehistoric	37	230	79	127	12	21	408	28	212	1154	2.04	0.49
Acres	31.99	112.94	138.51	79.59	52.30	55.30	55.78	25.91	12.44			
Historic/acre	0.03	0.58	0.79	0.48	0.00	0.36	2.40	3.78	0.32			
Prehistoric/acre	1.16	2.04	0.57	1.60	0.23	0.38	7.31	1.08	17.04			

There are several interesting distributional patterns that emerge from this large survey project. While we surveyed a very small proportion (~0.22%) of Hamilton County, Table 15 shows that our sampling of soils and environmental zones produced a fairly good representation of the variability present in the county (see also Table 1, Figure 5, and Figure 6). Floodplains, clay loam soils, and moderately well drained soils are underrepresented. As Floodplains are over-represented in the current sample of known sites within the county, this omission is tolerable. Inclusion of floodplain soils would likely increase our overall site density, but not significantly. Given the distribution of our sample across environmental variables, it seems that our density of approximately one site every 2.4 acres is probably fairly representative of the region. However, for a variety of reasons, site density is not the most pertinent variable in a distributional analysis.

Our sample (coincidentally) cuts a southeast to northwest cross-section across Hamilton County (see Figure 5), sampling most of the subbasins in the county (Figure 10). Fall Creek and Cicero Creek are more heavily sampled (though Cicero is the largest in the county). Cicero Creek has the highest average (per SA) prehistoric artifact density at 4.41 artifacts per acre; however, this is heavily influenced by SA10 (17.04/acre) (Table 14). On a per acre average, Cicero Creek subbasin weighs in with a 2.51 artifact/acre density. The Stoney Creek/White River Subbasin is represented by SA8 and exhibits a density of 7.31 prehistoric artifacts/acre, 2.41 historic artifacts/acre, and 9.72 artifacts/acre. The Fall Creek drainage weighs in with the lowest densities with 1.6 artifacts/acre (Table 14). However, subbasins explain very little of the variability in artifact density.

Table 15: Proportional Representation of Various Geological Variables

Landform	% County	% Survey	Texture	% County	% Survey	Drainage	% County	% Survey
Till Plains	79	85	**Mk**	0.2	0	**Very Poor**	0.8	0
Terraces	5.2	5.64	**CLm**	2.1	0.62	**Poor**	31.7	41.18
Floodplain	5.4	0	**SiCLm**	31.8	41.18	**Somewhat Poor**	38.6	42.49
Outwash	2.3	2.71	**SiLm**	59.7	55.91	**Moderately Well**	18.3	8.43
Lake Plains	5	5.63	**Lm**	3.1	2.3	**Well**	7.8	7.9
Spoil/Fill	0	0						

Figure 123: Location of Survey Areas over a Digital Elevation Model (DEM) of Hamilton County.

The SAs encompass a wide range of elevation, and nearly the full range in the county (Figure 118). SA6 occupies the highest elevation (~954.32 ft, 290.88 m) sampled and nearly the highest elevation in the county and yielded the lowest artifact densities. The SA with the next highest elevation is SA10 (~908.08 ft, 276.78 m) which exhibited by far the highest artifact density, ~10/acre more than any other and nearly 10 times the average (Table 14). Survey Areas 2, 3, 5, and 9 (~850 ft, 260 m) occupy approximately the same elevations and vary from 0.57 (SA3) to 2.62 (SA2) artifacts/acre. Survey Areas 1 and 7 occupy the next lowest elevation range (~825 ft, 252 m) and they exhibit relatively divergent artifact densities of 1.19/acre and 0.74/acre, respectively. SA8 occupies the lowest elevation sampled and exhibits the second highest artifact density, ~5 artifacts more per acre than the third most dense, SA9 (also ~5 more prehistoric artifacts than the third most dense prehistoric concentration, SA2).

From this point forward, only prehistoric artifact densities will be discussed, as a few small, but dense historic sites throw off artifact densities for some SAs.

Figure 124: Survey Areas over 500 m Buffers of Distance From Streams.
Note: Greater than 2000 m is displayed as the same as the background.

Figure 119 shows that the vast majority of the county is within 500 m of some form of stream. Survey Areas 6 and 3 occupy the furthest distances from any form of stream and have two of the lower densities. Figure 5 illustrates that the vast majority of the county is poorly drained and Figure 4 shows the majority of the county and sampled area constituted of uplands. Site and artifact densities do not appear to be patterned completely by these variables, though SA8 is immediately adjacent to water on lowland soil associations.

The one survey area that stands out in all this discussion is SA10. This tract is set in the uplands and occupies nearly the highest spot in the immediate setting. There is no major water source, though there is a small intermittent drainage that is cut into the hills and defines the northwest boundary of the area surveyed. SA10 yielded one Archaic period diagnostic projectile point for every 4.2 acres (Figure 111) and a single terminal Middle Woodland/Late Woodland diagnostic (1/12.44 acres). This is a very dense concentration of temporally diagnostic material. Further, several of the sites are considered to be short-term camps based on the presence of FCR.

At first glance this is a highly improbably place for such an intense concentration of occupation debris. The soils are moderately well drained clay loams (8.22 acres), somewhat poorly drained silt loam (3.9 acres), and poorly drained silty clay loam (0.32 acres). The abundance of moderately well drained soils likely accounts for some of the realized artifact density. This factor gains special importance when the larger region is taken into account. As shown in Figure 5, SA10 occupies the southern edge of an island of moderately well-drained soils in a sea of poorly drained uplands approximately 10 km from the White River. This island creates a variety of ecotonal opportunities. The uniqueness of the local setting is further illustrated by examination of the landform classification in Figure 6. The well-drained till-plain soils of SA10 are immediately adjacent to one of the larger outwash plains deposits and several areas of poorly drained floodplain. This ecological diversity, combined with the favorable drainage create an ideal place for repeated forays into the uplands and perhaps a favorable location for seasonal base camps. This setting and these sites deserve more investigation to determine if our small sample of this island yields and accurate picture of the prehistoric utilization of the area. The periods of primary occupation are recognized as times of relatively high residential mobility. The Jacks Reef Horizon is a regional (beyond Indiana) poorly understood period of time with increase residential mobility postulated for many areas. Further, the absence of Early and Middle Woodland and the later Late Woodland is interesting, if a potentially biased view.

A total of 27 prehistoric components can be assigned to a temporal period (Table 16). These occupations represent the entire scope of prehistory except the Paleoindian and Early Woodland periods. The Late Archaic and Middle Woodland are overrepresented in our sample relative to previously identified occupation frequency, and the terminal Middle Woodland/early Late Woodland is heavily overrepresented. Late Woodland is underrepresented in our sample. Perhaps the reason for the difference is that Jacks Reef and Lowe Cluster Points have been included in Late Woodland by other investigators. Another possible reason is that we sampled a larger portion of the uplands than the previous surveys. If the post-Hopewellian and pre-maize agricultural populations employed distinctive settlement patterns as they did in other regions (e.g., Pollack and Henderson 2000; Seeman and Dancey 2000), the latter explanation would be more plausible.

Our survey is the first in the region to apply large-area phosphate survey for the purpose of archeological prospection. This technique has shown promise in other regions and around the world as a supplement to traditional archaeological survey. The particular aim in this project was to test a proposed method for prospecting for prehistoric gardens. In this respect our efforts have been surprisingly successful. Possible gardens were discovered in the first 32 acres surveyed (SA1). Additional possible gardens were identified in an area of heavy Late Woodland activity (SA4). Further, the validity of this method of mapping the distribution of adsorbed phosphates in the fine-fraction of the sediment in floodplain settings was demonstrated. This directly contradicts conclusions of an earlier study in a nearby and geologically similar setting

(Skinner 1986). Our results clearly demonstrate that geochemical prospection, and soil phosphate in particular, can yield valuable information about the location and nature of archaeological deposits. In SA4, we were able to reveal errors in mapping and sampling from previous investigations. More fine-grained sampling would be required to tease out more detail about activity patterning within previously documented sites (Nolan 2010; Roos and Nolan 2012), but it is clear that the reported locations for these sites was in error, and the nature of the occupations recorded may be errant as well. Soil phosphate analysis is an effective and cost efficient method to supplement, enhance, and correct interpretations of the archaeological record, and our results coupled with the myriad successes in both research and compliance contexts around the world argue for increased application of this investigative technique. Perhaps the most benefit can be gained from application in compliance settings where consultants are forced to make definitive assessments about the nature of the archaeological record based on inevitably incomplete or biased, one-time surveys (see Banning 2002).

It must be noted that the potential gardens detected cannot be argued to be such definitively based on the evidence collected in this study. This method is only intended to identify locations on the landscape to subject to more intensive geochemical and archaeological analyses. This process is currently under way for the candidate gardens identified during this pilot project. If substantiated, these will constitute the first such features in the Midwest identified by geochemical prospection and open up an avenue to investigate an aspect of prehistory formerly entirely beyond the reach of Midwestern prehistorians. The impact of the ability to directly map and analyze the anthropogenic creation of subsistence landscapes cannot be overestimated.

Table 16: Temporal Distribution of Newly Discovered Occupations

Period	Occupations	%	% Prehistoric	%ID'd	Found	% Found
Unidentified Prehistoric	727	52.20%	59.00%		0	
Paleoindian	8	0.60%	0.60%	1.58%	0	0%
Archaic	65	4.70%	5.30%	12.85%	0	0%
Early Archaic	87	6.30%	7.10%	17.19%	4	15%
Middle Archaic	13	0.90%	1.10%	2.57%	1	4%
Late Archaic	77	5.50%	6.20%	15.22%	8	31%
Terminal Late Archaic	4	0.30%	0.30%	0.79%	1	4%
Woodland	60	4.30%	4.90%	11.86%	0	0%
Late Archaic/Early Woodland	2	0.10%	0.20%	0.40%	0	0%
Early Woodland	26	1.90%	2.10%	5.14%	1	4%
Middle Woodland	30	2.20%	2.40%	5.93%	4	15%
Terminal Middle Woodland	3	0.20%	0.20%	0.59%	6	23%
Late Woodland	120	8.60%	9.70%	23.72%	2	8%
Late Woodland/Mississippian	4	0.30%	0.30%	0.79%	0	0%
Mississippian	7	0.50%	0.60%	1.38%	0	0%
Historic	159	11.40%				
Total	**1392**	**100.00%**	**100.00%**		**27**	

A review of previous archaeological research and the results of our survey of 0.22 percent of the county shows that the sheer number of sites recorded in Hamilton County belies a gaping hole in our knowledge of the distribution of prehistoric activity on the landscape within the county. The distribution of previously identified sites within the county (see Figure 11) is far from representative of the nature and distribution of prehistoric activity. This amounts to a massive oversampling of the floodplains and stream terraces. As a result we have captured only a small portion of the cultural systems we hope to study. Even with an oversampling of the uplands, our survey yielded are very high site density (1/2.4 acres, 1/ ha) and even higher artifact density. Hamilton County was intensively utilized prehistorically, and not just along the course of the White River. Our window of opportunity to document this diversity is ever more rapidly eroding as the city of Indianapolis and its suburbs eat away at the open land that remains within the county. It has already been observed by many archaeologists the volume of information that has been lost within Marion County. It is not yet too late to fill in the gaps in Hamilton County's history.

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