SITES 12Or382 AND 12Or384

AND THE ARCHAEOLOGY OF WESLEY CHAPEL GULF,

ORANGE COUNTY, INDIANA

Prepared for:
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ABSTRACT

Phase II archaeological testing of sites 12Or382 and 12Or384 at Wesley Chapel Gulf in the Hoosier National Forest was conducted in June and July of 2004. The fieldwork was conducted to assess whether the sites contained significant archaeological data and were eligible for listing in the National Register of Historic Places. Research was also carried out to assess aboriginal use of the Gulf as a unique natural feature and to evaluate its role within the regional archaeological context. The research built upon data recovered during the previous archaeological surveys of the Gulf area and tested the conclusions of those investigations with excavation data from the two sites. No features were found in the sites during the test excavations and individually the sites did not appear eligible for listing on the National Register. Research into aboriginal use of caves, sinkholes and springs suggested that Wesley Chapel Gulf may have played a unique role in regional settlement systems.

ACKNOWLEDGEMENTS

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I wish to thank Beth McCord who served as a committee member and contributed helpful criticism and advice throughout the duration of this project. I am further grateful to Dr. Paul Wohlt for also serving as a committee member.

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TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

INTRODUCTION

Introduction

Wesley Chapel Gulf is a unique and extraordinary geological feature within the Hoosier National Forest region. It is a large, deep, and abrupt depression that dramatically drops from the surrounding landscape. Termed a karst gulf, Wesley Chapel Gulf is an anomalous landform to Indiana and has been proclaimed as one of the most interesting individual features in the Lost River karst system (Malott 1931). The immediate vicinity of the Gulf contains other karst elements such as caves, sinkholes, and the underground Lost River which ascends and pools within the Gulf. In 1972, 33 acres of this distinctive landscape, including the Gulf and its surrounding environ, were designated as a National Natural Landmark (Wadzinski and Reynolds 2001).

Two hundred and six acres of the Wesley Chapel Gulf area were archaeologically surveyed by shovel testing in October 1999 and again in March through April 2000 by ASC Group, Inc. (Jackson 2000, Striker 2000). The Phase I reconnaissance identified a total of 17 prehistoric sites documenting the aboriginal utilization of the area beginning in the Paleoindian period (10,000-8,500 BC) and continuing through the Late Woodland period (600 AD-1,200AD). The prehistoric sites located by Jackson (2000) and Striker (2000) consisted of artifacts including lithic tools, broken or discarded lithic tools, and waste flakes; the byproducts of tool manufacture. Based on the artifact assemblage, Striker (2000: 28) concluded: "The prehistoric sites scattered around the Gulf most likely represent short-term camps established for the purpose of resource extraction, both in terms of lithic raw materials and subsistence." Six of these sites, 12Or 382, 12Or383, 12Or384, 12Or612, 12Or614, and 12Or616, are potentially eligible for the National Register of Historic Places (NRHP) not only because of the quantity and variety of artifacts each possess, but because further work at each of these sites has the potential to provide important archaeological data on how karst features, such as gulfs, caves and sinkholes, were utilized in prehistory (Jackson 2000, Striker 2000).

The supplemental fieldwork conducted by Striker (2000) expanded the boundaries of the NRHP eligible and ineligible sites, documented eight previously unrecorded sites, and in essence, demonstrated that the sites associated with the Wesley Chapel Gulf area constitute an archaeological setting rather than an area of scattered, individual sites. It was thus proposed that the management plan for the Gulf's cultural resources regard the 17 sites as a collective whole in which the entire 206 acre tract may by eligible for the NRHP as an archaeological district (Jackson 2000, Striker 2000, Wadzinski and Reynolds 2001).

The management plan of Wesley Chapel Gulf, as outlined by Hoosier National Forest personnel (Wadzinski and Reynolds 2001), recommends archaeological excavation of the six potentially eligible sites. According to the management plan, the data recovered through excavations could aid in the interpretation of Wesley Chapel Gulf by identifying how the area was utilized in prehistory, as well as better define the settlement patterns and site types of the Hoosier National Forest region (Wadzinski and Reynolds 2001). The overarching goal of the Hoosier National Forest's heritage resource plan for the Gulf is to nominate it to the NRHP as an archaeological district within a distinctive landscape.

Objectives

Archaeological research and fieldwork carried out at Wesley Chapel Gulf was conducted under a proposal approved by the Hoosier National Forest and funded by a Challenge Grant provided by the U.S. Department of Agriculture, Forest Service, that was matched by Ball State University. The objectives of the project were akin to the research goals outlined in the Wesley Chapel Gulf management plan (Wadzinski and Reynolds 2001) and were also consistent with the goals of Angie R. Krieger, Heritage Resource Specialist for the Hoosier National Forest (personal communication, June 28, 2004). The purposes of the project were threefold:

1. To acquire a better sample of archaeological data from two sites on record for the Wesley Chapel Gulf area from which an assessment of the significance of the Gulf as an archaeological district could be made.

2. To gain sufficient data pertinent to defining the role of Wesley Chapel Gulf within the Hoosier National Forest's regional settlement pattern.

3. To gain a more thorough interpretation of the prehistoric use of a unique, natural feature.

In addition to the goals outlined above, it was hypothesized that the archaeological excavations would provide a detailed picture of the geomorphological agents (i.e. soil characteristics, water movement, topography, etc.) that may affect the reliability of geophysical prospecting (gradiometer survey) in archaeological fieldwork and the preservation and recovery of *in situ* cultural remains.

Phase II archaeological testing of the Wesley Chapel Gulf area was conducted in June and July 2004. It was anticipated that the data from test excavations in 12Or382 and 12Or384 would build upon the existing archaeological record of Wesley Chapel Gulf and assist in evaluating the conclusions of previous investigations (Jackson 2000, Striker 2000). Ecological archaeology and cognitive landscape archaeology were used as the frameworks for interpreting the significance of Wesley Chapel Gulf and its role in the archaeology of the Hoosier National Forest region.

Archaeological Perspective

Ecological archaeology is used in this report as a means to ascertain the environmental basis for the prehistoric utilization of Wesley Chapel Gulf and for the location and distribution of prehistoric sites within the Hoosier National Forest region (Steward 1955, Schermer & Tiffany 1985, King & Graham 1981, Butzer 1982). The specific environmental variables that would have been available in the Wesley Chapel Gulf area and that are considered important criteria in site selection (Schermer and Tiffany 1985) are many. Wesley Chapel Gulf is located in an ecotone at the junction of the Crawford Upland section and the Escarpment section of the Shawnee Hills/Mitchell Plateau natural region (Jackson 2000). This junction between two diverse physiographic regions would have presented aboriginal and historic inhabitants with bountiful resources included multiple sources of fresh water, a wide variety of game and edible/exploitative plants, numerous wood species, a wide variety of open habitation areas as well as more protected caves and rockshelters, and a source (or sources) of knappable chert.

In addition to correlating ecological resources with human settlement, ecological archaeology also incorporates the study of the geological transformation of archaeological sites, or geoarchaeology. Geoarchaeology is a contextual approach that seeks "to understand the natural processes of site formation" (Waters 1992: 11) and involves the analysis of the "physical, chemical, and biological factors responsible for the burial, alteration, and destruction of the systemic context at a site" (Waters 1992: 11). Given the dynamics of the geological processes that created and have continued to modify the landscape of Wesley Chapel Gulf, geoarchaeological studies are particularly relevant to the interpretation of archaeological resources in the area.

While ecological archaeology is concerned with defining human interactions with the physical landscape, a consideration of the unique landscape of the Wesley Chapel Gulf area suggests that a cognitive landscape approach can provide additional information about aboriginal use of the place. As used here, cognitive landscape archaeology is the analysis of natural places with respect to their metaphysical and social properties (Flannery and Marcus 1998, Carmichael et al. 1994, Ucko and Layton et al. 1999, Ashmore and Knapp et al 1999). Because cognitive landscape archeology examines intangible aspects of the archeological record, supporting physical evidence of cognitive landscapes may be rare. Instead, examples are drawn from ethnohistorical and modern ethnographies which identify features of the natural landscape which may be relevant to a cognitive landscape approach. In North America, prehistoric cultures considered natural features such as mountains, caves, rock outcroppings, and pools as sacred sites or as places which possessed power (Theodoratus and Lapena 1994, Pearson 2002).

The Wesley Chapel Gulf landscape includes caves, rockshelters, and an artesian spring in which the underground Lost River rises from below the ground surface. The

Gulf itself is aesthetically impressive in that it is like being in a large, cavernous chamber with the ceiling removed. The Gulf area includes specific types of natural features (i.e. caves, pools, springs, and rockshelters) that possess special qualities to Native American cosmology and religion (Theodoratus and LaPena 1994), suggesting that it could be considered a *sacred* site. The caves and the artesian spring located within Wesley Chapel Gulf may have been regarded as portals to or from the *underworld*, a cosmological and ideological concept integral to the Native American belief system (Hudson 1976, Saunders 1994, Brady and Ashmore 1999, Pearson 2002). A summary of the investigation of this hypothesis is presented in this report. An expanded investigation of the hypothesis is contained in Miller (2005).

Summary

In the following report, Wesley Chapel Gulf and its setting within the Hoosier National Forest environment is described. The archaeological background for the Hoosier National Forest is also included. The regional overview of the natural and archaeological environment serves as a base-line from which to interpret the archaeology of the Wesley Chapel Gulf area. A report detailing the methods and results of the 2004 testing project follows. Finally, the results of the project are reviewed and synthesized in order to discuss the significance of the unique natural and cultural resource that is Wesley Chapel Gulf.

LOCATION, NATURAL SETTING, ARCHAEOLOGICAL SETTING

The Wesley Chapel Gulf Study Area

Wesley Chapel Gulf is the largest of four karst gulfs present in the Lost River watershed (Malott 1931). The Gulf area is located in the township of Orangeville in Orange County, Indiana, [redacted] area lies in the [redacted] It is situated on a direct line between the sink and rise of the Lost River; the former located 5 miles east of the Gulf, the latter occurring 2 miles east in Orangeville (Orangeville Rise). The 187-acre tract of land in the Hoosier National Forest has two distinctions; in 1972, thirty-three acres of the Gulf were designated as a National Natural Landmark by the USDI National Park Service, in 2000, the USDA Forest Service selected the Gulf as a Special Management Area (Wadzinski and Reynolds 2001). The Gulf area received these designations because of its impressive geologic features, including the Gulf itself, Boiling Spring, which provides a rare glimpse of the subterranean Lost River, swallow holes, sinkholes, and caves (Wadzinski and Reynolds 2001).

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Figure 1: Portion of 2001 Indiana Transportation Map showing the location of the study area.

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Figure 2: Portion of USGS 7.5' French Lick, Indiana Topographic Quadrangle showing the study area.

Both the property around the Gulf and its alluviated floor were heavily logged in the past and had been cultivated for corn production from the early 1900s to the 1990s (Wadzinski and Reynolds 2001). The Gulf floor and the surrounding upland were also used for cattle grazing until the property was acquired by the Forest Service in 1996. A house, built in 1900, and its associated outbuildings have since been removed from the property, and besides the custodial management of the driveway, parking lot, and foot path around the Gulf and the planting of white oaks in the northwestern portion of the property, the area has been allowed to revert to an uncultivated state. Herbaceous weedy species now dominate the upland open fields and the Gulf floor, while woody species are restricted to the floor of the Gulf and its perimeter (Wadzinski and Reynolds 2001). The immediate topography surrounding the Gulf depression is rather undulating in slope and consists of ridgetops, slope benches, ridge saddles and spurs, toe and finger ridges, swales, swallow holes, and sinkholes (Jackson 2000).

The Wesley Chapel Gulf area lies in the Mitchell Plateau physiographic province, a non-glaciated and karstified surface developed on middle Mississippian limestone. The region is a rolling plane of low relief marked with numerous sinkholes, swallow holes, blind valleys, and caves (Durbin et al. 2003). Resistant upper Mississippian sandstone, limestone, and shale that once overlaid the Plateau were eroded by surface streams during the late Tertiary period exposing Middle Mississippian Blue River Group limestone strata (Gutschick 1966). During the early Pleistocene, the karst features and subterranean drainage now characteristic of the Mitchell Plateau were established. The Blue River Group consists of three limestone formations; St. Louis Limestone is the oldest formation, overlain by Ste. Genevieve Limestone, which in turn is overlain by Paoli Limestone (Shaver et al. 1970: 18). Most of the karst features of the Mitchell Plateau, however, are developed exclusively on the St. Louis and Ste. Genevieve limestones (Schneider 1966).

Karst Definition and Wesley Chapel Gulf Description

Karst is a distinctive type of landscape containing sinkholes, disrupted surface drainage, sinking streams, underground drainage networks, and caves. The term *karst* is a geologic term applied to "limestone areas which possess a topography peculiar to and dependent upon underground solution and the diversion of surface waters to underground routes" (Malott 1931: 1). Karst landscapes occur where carbonate rocks, such as limestone, underlie the surface. The solution of carboniferous limestone by rain water that has become slightly acidic by carbon dioxide in the atmosphere and by the percolation of ground water through acidic soils slowly dissolve fractures in the limestone bedrock and create the landforms associated with karst topography.

The nature of the landforms and the diversion of surface water to subterranean passages in karst environments are controlled by the structure and rock type of the area. The Mitchell Plateau is underlain by limestone rocks of the Blue River Group, which are highly susceptible to chemical dissolution, particularly the St. Louis and Ste. Genevieve limestones. In contrast, the Crawford and Norman Uplands, which flank the plateau to the west and east, are underlain predominantly by chemically resistant sandstone, shale, and siltstone of the Chester series and "do not permit complete regional underground drainage development" (Malott 1931: 3).

As defined by Malott (1931: 8) a karst gulf is "a steep-walled or abrupt circum-scribed depression which characteristically possess[es] a flat alluviated floor in which an underground stream rises and sinks." A Gulf most likely begins as a cave whose internal void can no longer support the weight of the above ground surface. As the cave collapses, several sinkholes coalesce on the above-ground surface to form a compound sink. Further development occurs as the superincumbent rock over a subterranean stream breaks down, enlarging the compound sink. The limestone breakdown is then dissolved and removed by the solution of underground stream action leaving a large depression termed a karst gulf.

In describing the origin of Wesley Chapel Gulf, Wadzinski and Reynolds (2001: 5) hypothesize:

> It probably was initiated as one or more collapsed sinkholes of rounded outline over a broad and weakened portion of the under-ground [Lost

> River] system. The collapsed rock obstructed free passage of the waters and their energies were concentrated about the collapse that in time undermined the walls about the collapse depression. Further collapse increased the perimeter of the initial collapse depression. If two or three collapse areas were formed in a row, their perimeter in time were merged to form a large and elongated depression with semicircular ends, such as Wesley Chapel Gulf possesses. Horns of rock would extend out in the depression for a time, but eventually they would melt away through enhanced weathering and solution. One such horn or rock, tumbled and broken, still extends into the floor of Wesley Chapel Gulf.

The formation of Wesley Chapel Gulf was due to the dissolution of Ste. Genevieve limestone by solution of the underground Lost River. Over time, the fallen rock was dissolved and removed by the river.   According to Malott (1931: 40): “Wesley Chapel Gulf as a surface feature represents the destruction and removal of 720,000 cubic yards of native limestone, an amount equivalent to a block of limestone 1,000 feet long, 300 feet wide, and 65 feet thick.”

Wesley Chapel Gulf measures 1,075 feet in length and averages approximately 350 feet in width. The tree-lined rim of the Gulf incorporates approximately 8.3 acres, while the alluviated floor is roughly 6.1 acres in size. The walls of the Gulf vary in height from 25 feet on the northwest side to around 95 feet on the southwest side. The north and south ends of the Gulf curve to a constricting middle resulting in a peanut shell shape. The northern, southern, and western walls of the Gulf are very steep and cliff-like, while the eastern wall, though steep, is not in the form of a cliff. Malott (1931: 12) described Wesley Chapel Gulf as “an abrupt steep-sided depression in a gently undulating soil-covered area of cultivated farm and pasture land” and considered it “one of the most interesting individual features in the Lost River karst area” (Malott 1931: 1). A 1998 aerial photograph (Figure 3) illustrates the imposing nature of this most unusual feature in view of the surrounding landscape.

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Figure 3: 1998 Aerial Photograph of study area (terraserver.com).

The floor of the Gulf is a blanket of alluvium estimated to be at least 34 feet in depth (Durbin et al. 2003). The weathering and erosion of local bedrock and loess east of the Gulf are the likely source of the alluvial sediments filling the Gulf (Durbin et al. 2003). The underground Lost River rises from a large artesian spring called Boiling Spring located at the southern end of the Gulf (Figure 4). The rise pool overlies the main subterranean passage of the Lost River and water from the conduit is constantly forced to emanate from it. According to Durbin et al. (2003: 98): "Dye tracing studies conducted along sinking streams near the gulf link subsurface flow from the Lost River eastward to the Wesley Chapel Gulf rise, and eventually to the Rise of the Lost River."

Figure 4. Photograph of Boiling Spring Rise located in the southern tip of Wesley Chapel Gulf.

During low-water periods, the Boiling Spring pool is 25-30 feet deep, perfectly calm and azure blue in color. The water flows from the pool a short distance, then disappears through the talus rock at the base of the steep south wall of the Gulf. During high water periods, water increases in volume and turbulently gushes from Boiling Spring Rise. The pool fills to overflowing and the water is discharged into two flood-water channels, each littered with swallow holes. Flood-waters reenter the underground Lost River system via the numerous swallow holes in the overflow channels, and through the fractures between talus blocks of limestone along the western wall of the Gulf. The Gulf floor may be completely inundated by as much as five feet of water during very heavy rains. This level of flooding may occur as often as five or six times a year, usually taking place in late winter or spring (Malott 1931). At such times, the waters issuing from Boiling Spring Rise "are violently turbulent and great boils of rising waters discharge from it…As much as 4,000-5,000 cubic feet per second issue from the underground course of the Lost River" (Wadzinski and Reynolds 2001: 6). When this occurs, waters may rise to enter a large cavernous opening, called Boiling Springs Cave, 25 or 30 feet directly above Boiling Spring Rise. Boiling Spring Cave (Figure 5) extends back and downward for about 100 feet over and through broken limestone slabs. It is a dry cave except during exceptionally high waters (Malott 1931). Floodwaters at this stage emanate from the rise faster that it can drain into the numerous swallow holes and are forced to drain near the north end of the Gulf "very noisily at two or three holes along the western wall" (Malott 1931: 16). Anecdotal witness accounts (James Durbin, August 30, 2004; Angie Krieger June 28, 2004) further acknowledge that, when the Rise is intense and turbulent, loud "roars" can be heard from the Gulf.

Figure 5: Photograph of Boiling Spring Rise and Boiling Spring Cave located in the southern tip of the Gulf.

An entrance to Wesley Chapel Cave and the subterranean drainage system of the Lost River is accessible through a small opening between the western wall of Wesley Chapel Gulf and the talus rock underneath (Figure 6). The opening descends downward to two main channels; the first leads northwest, parallel to the western wall of the Gulf for only several hundred feet, the other follows and zigzag course west away from the southern tip of the Gulf (Malott 1931). Two distinct levels have developed in the system; the upper level contains very little water, while the underground Lost River incessantly flows though the lower level. During periods of heavy rains and surface floods, however, the entire network is completely filled with muddy water. Mud that has been deposited by the storm waters which sometimes completely flood the cavern system coat the walls and roofs of many of the passages. Mud that has mixed with mineral matter hangs from the ceilings of these passages as mud stalactites (Malott 1931). Within a cavernous passage of the second main channel, nodules and cellular masses of an unnamed chert are exposed in the St. Louis limestone walls at just-above the water level (Malott 1931). Deep inside the second main channel, a ledge of limestone extends across an empty, broken-down space in the channel's floor. This ledge has been named "drum rock" by Malott (1931) because of the hollow, drum-like sound that is produced when the ledge is stomped upon. As mapped by Malott (1931), the total traversed length of the underground Lost River system accessible at Wesley Chapel Gulf is 5,175 feet.

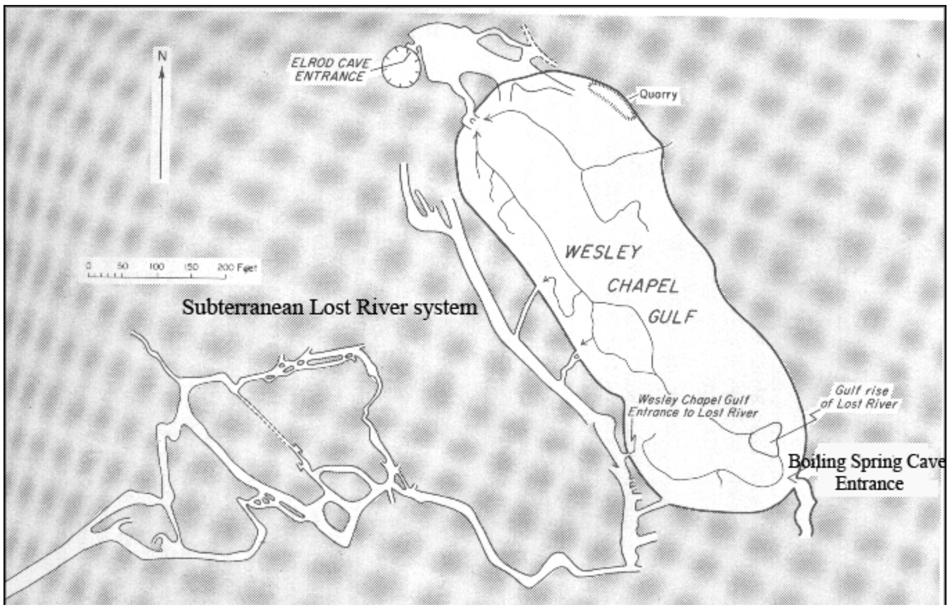

Figure 6. Map of Wesley Chapel Gulf and its underground passages; adapted from Powell 1961:97.

A round, steep-sided collapsed sinkhole approximately 90 feet in diameter lies about 125 feet northwest of the north end of Wesley Chapel Gulf (Figure 6). On the north side of this sinkhole a steep slope descends under overhanging limestone allowing entrance to a cavern known as Elrod Cave (Malott 1931). The main cavern extends 350 feet and varies in width from 40-125 feet (Wadzinski and Reynolds 2001). The cavern floor is covered in mud and clay silts which have accumulated in the cave through the repeated flooding of the subterranean Lost River system which is connected to Elrod Cave by a stream channel. The cave includes numerous and massive stalactites hanging from the ceilings and small stalagmites on the floor.

Natural shelters, in the form of ledge overhangs, occur around the inside perimeter of the Gulf. These have developed as limestone at the base of the walls has been eroded back by storm waters that periodically flood the Gulf floor (Figure 7). In the northeastern portion of the Gulf, storm waters descending into the Gulf from the upland surface have cut a V-shaped notch in the perimeter of the Gulf and produced a ledge overhang (Figure 8). Another long ledge overhang occurs at the southern tip of the Gulf (Figure 9). This overhang lies over Boiling Spring Cave and extends to the west.

Figure 7: Photograph of a ledge overhang in the western wall of the Gulf.

Figure 8: Photograph of a ledge overhang in the northeast wall of the Gulf.

Figure 9: Photograph of long ledge overhang in the south wall of the Gulf extending west over Boiling Spring Rise.

Lost River chert is known to outcrop within Wesley Chapel Gulf (Malott 1931, Shaver et al. 1970). The Lost River chert bed is an important stratigraphic marker in the Blue River Group; it is a distinctive horizon in south-central Indiana and defines the boundary between the St. Louis and Ste. Genevieve limestone beds.
Shaver et al. (1970: 97) impart: "The Lost River Chert Bed consists of one stratum or more of very fossiliferous and siliceous limestone, distributed through as much as 6 stratigraphic feet, that contains abundant bryozoans and that is an oolite in places." According to Malott (1931: 12): "The Lost River chert, near the base of the St. Genevieve, is exposed in places at or just above the level of the alluviated floor of the gulf." A lens of the chert is also exposed in the ledge overhang above Boiling Spring Cave (Figure 10). Lost River chert is a mottled and variegated light grey to light bluish-grey highly fossiliferous chert (Munson and Munson 1984, Cantin 1994). Its texture ranges from coarse-medium to medium-coarse and its luster is usually dull and opaque (Cantin 1994). Due to its high fossil content, including bryozoans and brachiopod molds, fracture is very hackly and unpredictable and its knapping characteristics are considered extremely poor (Cantin 1994). At present, Lost River chert is not considered to have been used prehistorically (Bassett and Powell 1984, Cantin 1994). However, in southern Monroe County, Indiana, north of Orange County, Lost River chert takes on different characteristics so that a stratigraphically equivalent variant is recognized: Stanford (Dupes, Dupes Folly) chert (Munson and Munson 1984). Stanford chert was utilized intensively throughout prehistory (Cantin 1994).

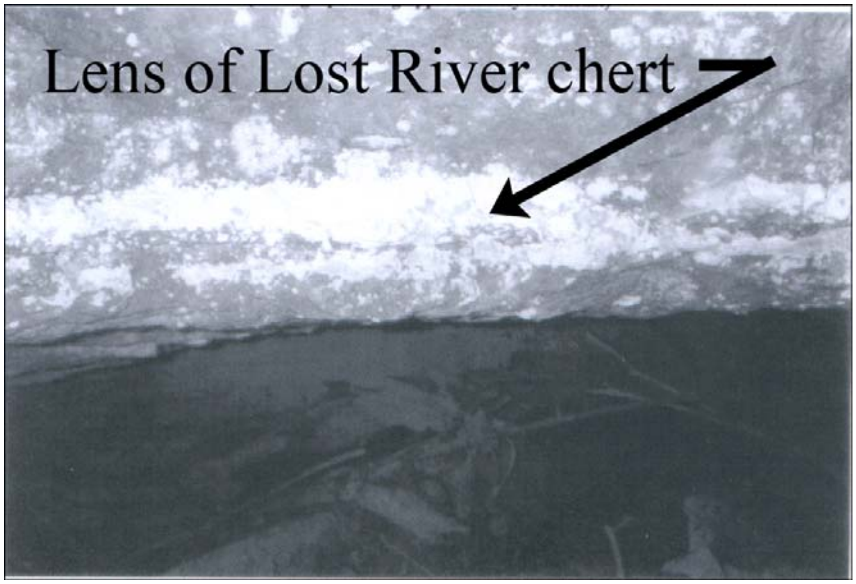

Figure 10: Photograph of Lost River chert outcrop in Wesley Chapel Gulf taken by Cameron Quimback; obtained from Curtis Tomak, 2004

Soil Morphology

The Wesley Chapel Gulf area is within the Crider-Caneyville-Frederick soil association, characterized by: "gently sloping to very steep, deep and moderately deep, well drained soils that formed in loess and in the underlying residuum of limestone" (Wingard 1984: General Soils Map). The outlying upland of the Gulf area includes Crider silt loams and Crider-Frederick-Caneyville silt loam while Haymond silt loam is restricted to the alluviated floor of the Gulf (Figure 11). The specific soil complexes of the Wesley Chapel Gulf area are described Table 1. The soils of the Wesley Chapel Gulf area have formed from limestone of the middle Mississippian Period. The limestone uplands are characterized by a rolling to gently sloping surface with moderately deep residual soils developed on them. For the most part, the soils of the Gulf area are developed on a thin veneer of loess less than two feet thick; it is silty in its upper horizon and more clayey in the lower horizons. The depth to the bedrock in each soil series is greater than 60 inches. The Crider series soils are not subject to flooding because they are well- drained and moderately permeable. Although Haymond silt loam is also a well-drained, moderately permeable soil, it is frequently flooded for brief durations from January to May (Wingard 1984) because the Gulf acts as a reservoir for the floodwaters of the underground Lost River system. The ground floor of Wesley Chapel Gulf consists of alluvial silt which has been deposited by the flooding and receding of water.

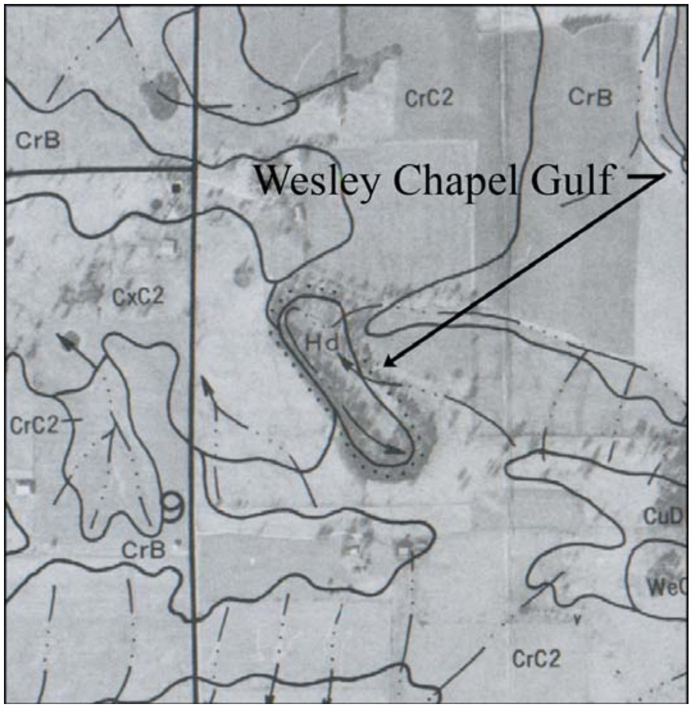

Figure 11: Soils map of the Wesley Chapel Gulf area; adapted from Wingard 1984: Sheet No. 15.

Table 1: Specific soils of the Wesley Chapel Gulf area.

Haymond silt loam (Hd), frequently flooded	A nearly level and deep well-drained soil on bottom lands; frequently flooded and consisting of alluvium; some areas are strongly or medium acidic throughout
Crider silt loam (CrB), 2-6 percent slopes	A gently sloping and deep, well-drained soil found on ridges and side-slopes; sometimes formed in alluvium at the bottom of sinkholes
Crider silt loam (CrC2), 6-12 percent slopes, eroded	A moderately sloping and deep, well-drained soil located on narrow ridges and on the side slopes of loess-covered uplands
Crider-Frederick-Caneyville silt loam (CxC2), karst, 2-12 percent slopes, eroded	These soils are well-drained, gently to moderately sloping, deep to moderately deep soils. Crider soils are found on the ridgetops between sinkholes; Frederick soils are on the upper slopes of sinkholes; and Caneyville soils are on the lower slopes of sinkholes.

Drainage Features

Orange County includes three major drainage watersheds; the Lower White River (East Fork) basin, the Minor Ohio basin, and the Patoka River basin. The county is dissected by many small streams that empty into either the Patoka River or the Lost River (Okonkwo 1985). Because the Mitchell Plateau dips westerly, the general trend of drainage is in this direction. The area of Wesley Chapel Gulf is within the Patoka and Lower White (East Fork) watersheds of the Ohio River Drainage Basin (Kingsbury 1970: 18). Large portions of Orange County and, in general, the Mitchell Plateau are drained by subterranean systems. Sinking streams, such as the Lost River, occur because "rather than downcutting their channels, the former surface streams of the Mitchell [Plateau] dissolved subterranean drainage routes as tributaries to the lower surface streams" (Powell 1966: 123).

The Lost River (Figure 12) is the best example of underground drainage occurring in south-central Indiana (Okonkwo 1985) and drains the Wesley Chapel Gulf area through underground conduits. As a surface feature, the Lost River system is very meandering, has narrow valleys and narrow floodplains. It disappears in swallow holes north of Paoli and flows through subterranean channels. The Lost River flows west to the Wesley Chapel Gulf area where it emerges to the surface at Boiling Spring Rise but quickly returns underground through swallow holes and chinks in the limestone walls of the Gulf. It reappears near Orangeville, two miles west of Wesley Chapel Gulf, as a large artesian spring called the Orangeville Rise and continues as a southerly surface stream to join Lick Creek.

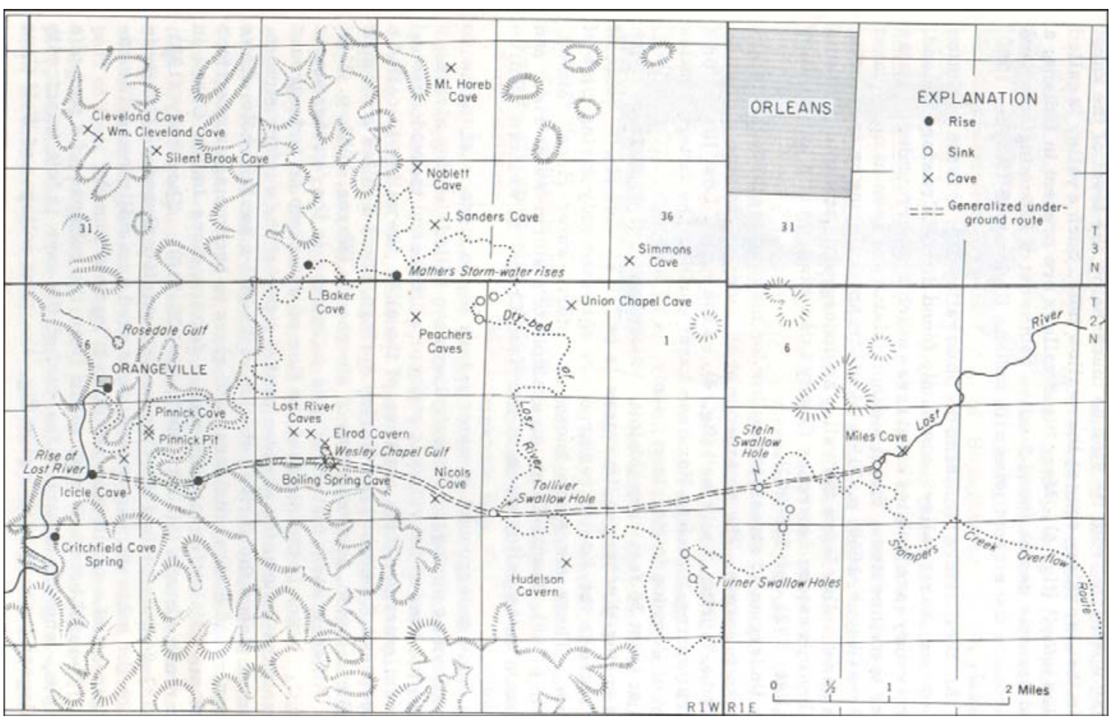

Figure 12: Map showing the surface course of the Lost River and its underground route; from Powell 1961: 16.

Local Vegetation Pattern

The presettlement vegetation of the study area was predominately Western Mesophytic forest (Petty and Jackson 1966). In this forest type, a number of species, such as oak, hickory, beech, and maple share dominance. A search of the GLO records for the area further illustrated the inclusive nature of this forest type. Noted species in the GLO plat maps for Township 2N, Range 1 West, Section 9 included ash, walnut, oak, sugar maple, hickory, beech, dogwood, elm, red bud, and poplar. It is likely, that in this mixed environment, the floodplain floor of Wesley Chapel Gulf contained water-tolerant species such as beech, tulip poplar, maple, and birch, while oaks and hickories lined the dry ridges and surrounding uplands.

The amount of understory trees and plant communities would also have differed between the floodplain floor and upland areas of the Gulf. For instance, oak-hickory forests frequently have less understory growth than floodplain environments which include elderberry, spicebush, red bud, dogwood, and wild plum. But, oak-hickory forests have more herbaceous species than their beech-maple counter-part; pussy-toes, wild licorice, wild geranium, bloodroot, blue phlox, and goldenrods are common herbs present in this forest type. Oak-hickory herbaceous species bloom in late summer and autumn, while the less prominent beech-maple herbaceous species, such as wild ginger and mayapple, bloom in the spring.

The Hoosier National Forest Region

The Hoosier National Forest is the product of land acquisitions by the U.S. Forest Service which purchased privately-owned farmland in south-central Indiana to help sustain a deteriorating Depression Era economy. As the profitable timber industry of the mid 19^{th} to early 20^{th} centuries eradicated the forests, southern farmers immigrated into the area to take advantage of the cleared lands. Unfortunately, the deforestation of the region severely eroded the area's characteristic steep hills and valleys and the repeated burning of cull trees and brush for farm plots depleted the soil of its nutrients. The unproductiveness of seasonal crop yields caused settlers to abandon their farms and homes leaving behind only tax delinquent lands. To help offset unpaid taxes and a growing unemployed population, the 73^{rd} Indiana Congress ceded parcels of land within south-central Indiana to the U.S. Forest Service for the eventual creation of a National Forest. Beginning in 1935, "Federal acquisition of land for the Hoosier National Forest combined conservation of highly eroded areas with socioeconomic measures to combat depression and unemployment" (Sieber et al. 1989: 7).

Today, the Hoosier National Forest is a conglomerate of federally owned properties interspersed with privately owned lands comprising roughly 200,000 acres in portions of Brown, Crawford, Dubois, Jackson, Lawrence, Martin, Monroe, Orange, and Perry Counties. The once barren or scrub-covered landscape has since regenerated woodlands, either through natural succession or through reforestation programs. For administrative purposes, the Hoosier National Forest is divided into two districts, the Brownstown Ranger District in the north and the Tell City Ranger District in the south (Figure 13). The two districts are further subdivided into two planning units: the Brownstown Ranger District includes the Pleasant Run and the Lost River units, and the Patoka and the Tell City units comprise the Tell City District. The Wesley Chapel Gulf Area, the focus of this study, is in the Lost River Unit of the Brownstone Ranger District.

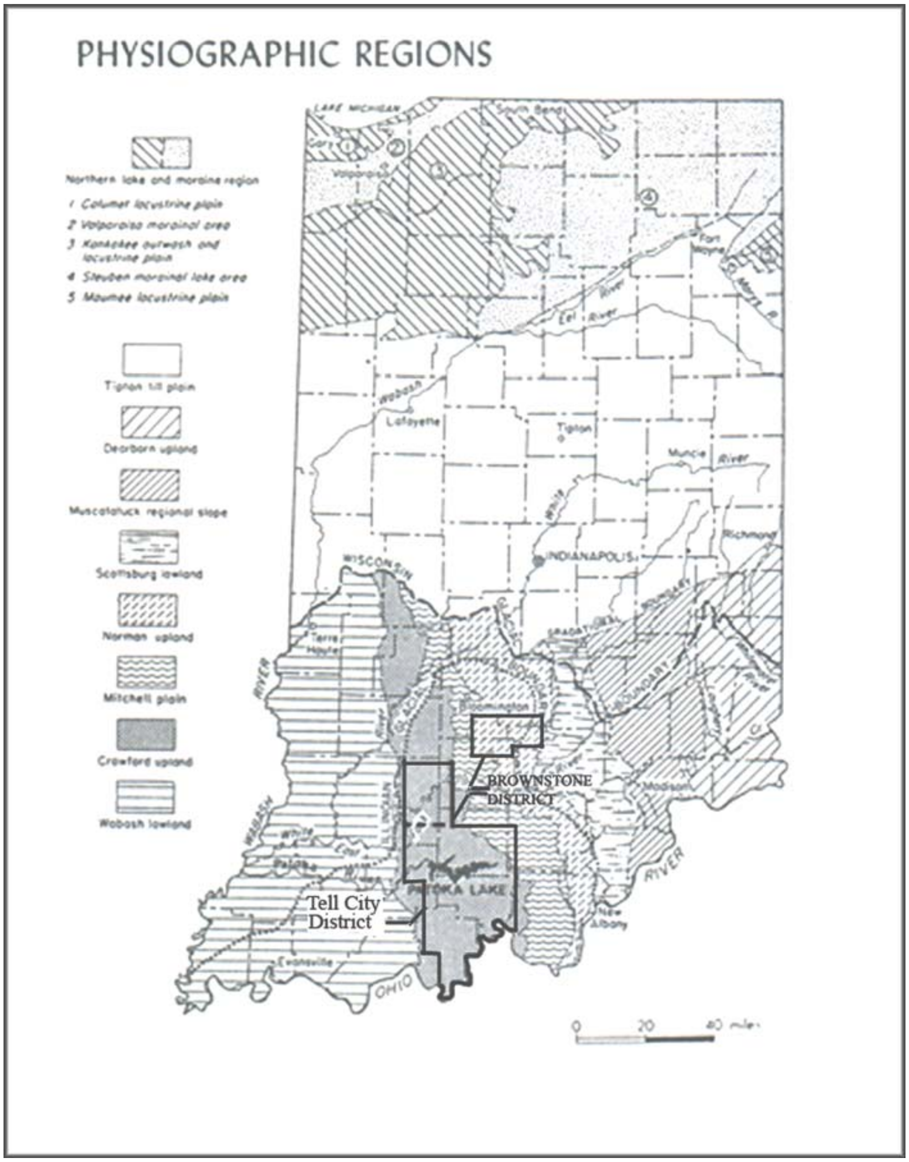

Figure 13: Map showing the boundaries of the Hoosier National Forest and the physiographic units it encompasses; modified from Schneider 1966: 41.

Three physiographic regions are recognized within the Hoosier National Forest region (Figure 14). Schneider (1966: 40) defined a physiographic unit as "an area in which several topographic and geologic conditions, such as rock type and structure are similar throughout, but in which one or more of these conditions is significantly different in adjoining units" (Figure 15). In addition, Stafford et al. (1989: 10 *in* Ellis et al. 1990:17) state, "The physiographic provinces are defined by landforms that are lithostratigraphically, more so than structurally, controlled." The Crawford Upland, the Mitchell Plateau, and the Norman Upland are distinct natural units within south-central Indiana that are differentiated from one another by their particular bedrock geology, topography, distinguishing landforms, soil characteristics, vegetation, and drainage patterns. It is important to understand the geomorphology of the Hoosier National Forest area because, as Fitting et al. (1979: 20) assert: "These three provinces have the greatest bearing on the lands and cultural resources of the Hoosier National Forest." The portions of each of the three physiographic regions situated within the Hoosier National Forest are described independently below to illustrate that the varied environments associated with the Norman Upland, the Mitchell Plateau, and the Crawford Upland influenced the varied prehistoric human usage that accompanied them.

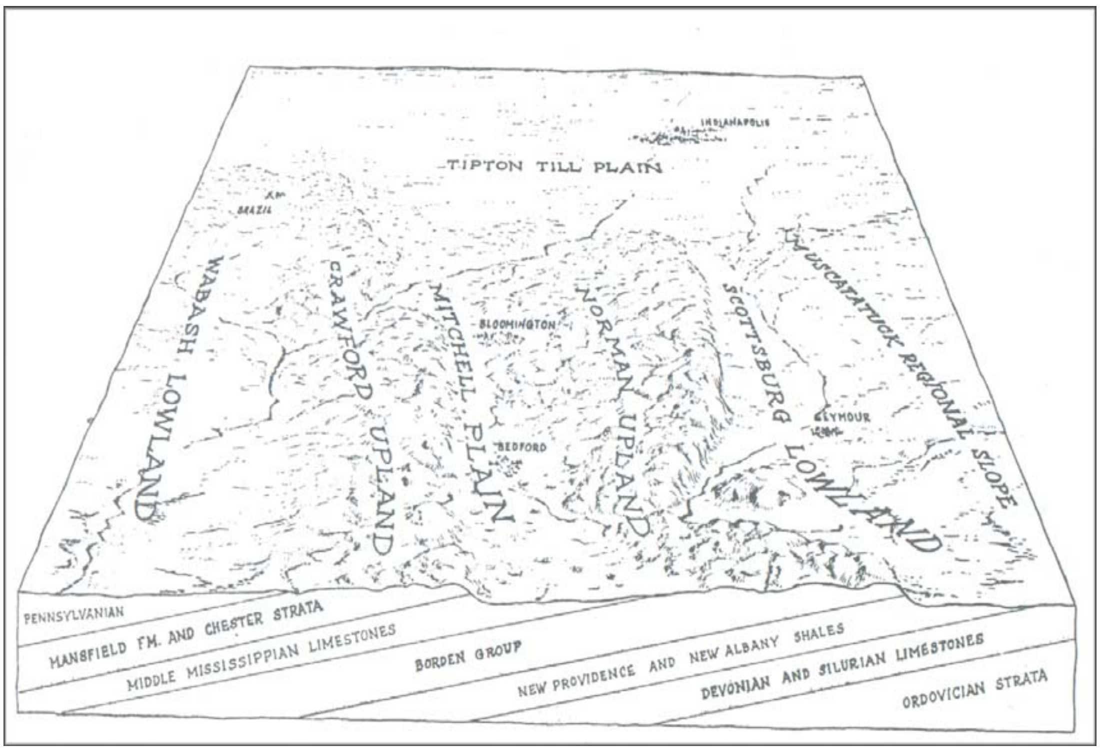

Figure 14: Diagram showing the main physiographic divisions of Indiana and the underlying bedrock geology; from Sieber et al. 1989; 12.

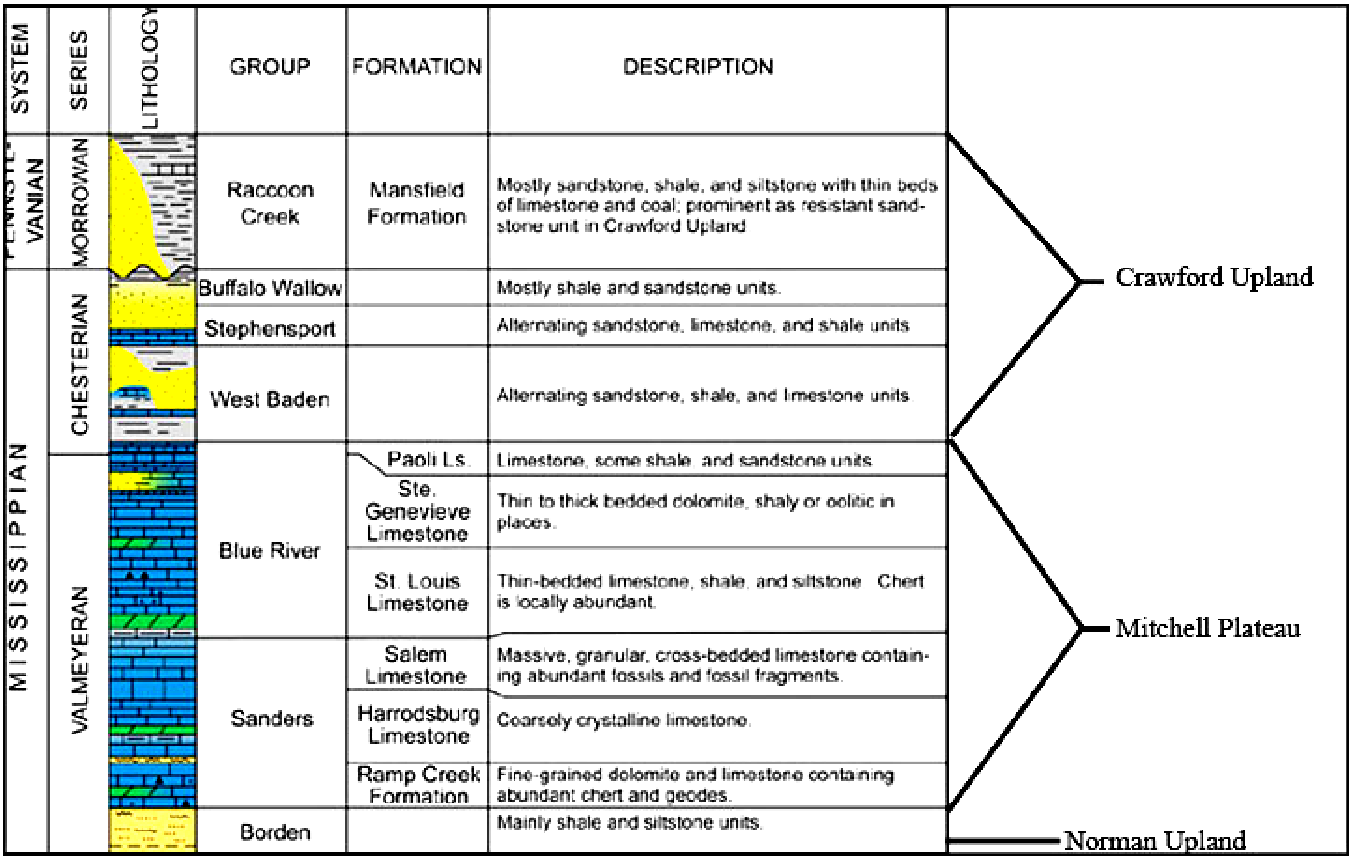

Figure 15: Diagram of the underlying bedrock and description of lithiographic strata of the three physiographic provinces included in the Hoosier National Forest; adapted from Indiana Geological Survey webpage, http://igs.indiana.edu/geology/karst/karstInIndiana/karstInIndiana03.cfm.

Regional Physiography

The three physiographic zones present in the Hoosier National Forest are unlike any of the other physiographic provinces in the state. The region's landscape is composed entirely of Paleozoic rocks because, although 80 percent of Indiana was once covered by one or more glaciations (Fitting et al. 1979), the majority of the Hoosier National Forest region remained ice free (Schneider 1966). This is due to the resistant nature of the underlying Mississippian and Pennsylvanian clastic rocks that acted as a barricade against the three Indiana glaciations. The Kansasan (350,000-400,000 B.P.) ice sheet was thwarted southwest to the Wabash Lowland and southeast to the Scottsburg Lowland, and thus avoided the region presently containing the Hoosier National Forest. The Illinoisan (125,000 B.P.) ice lobe was also diverted to the Lowlands, although the northwest portion of the Crawford Upland and the northeast portion of the Norman Upland were partly covered by ice and blanketed with glacial till deposits. The subsequent Wisconsin glacial advance (21,000 B.P.) stopped north of the Illinoisan glacial boundary (Wayne 1966) and did not cover the Uplands or the Mitchell Plateau.

While the Pleistocene glaciations did not directly shape the landscapes of the Uplands or Mitchell Plateau, the Illinoisan and Wisconsin glaciations did have an indirect affect on the present-day physiography of the Hoosier National Forest region:

> South-central Indiana escaped the most noticeable effects of glaciation- - isostatic movement of land surfaces, blankets of till, and festoons of moraines- - but the Illinoisan glaciation, and to a lesser extent the Wisconsinan glaciation, left their marks on the landscape. The more obvious glacial features in the "unglaciated" area are attributable to the meltwaters which drained through the major streams of the Hoosier National Forest region (Sieber et al. 1989:10).

Features associated with the glacial outwash of the Pleistocene can be observed along the various drainage systems of south-central Indiana. These are formations of fluvial, lacustrine, and alluvial sediments that were deposited along the "floodplains of various streams, on raised terraces above the floodplains, and on the adjoining valley walls" (Fitting et al. 1979: 23). Pleistocene sediments in south-central Indiana deposited by glacial processes are considered facies of either the Atherton or the Prospect Formations.

The Atherton Formation consists of coarse to fine-grained sediments and is recognized in the Hoosier National Forest region as one of two facies; the outwash facies, consisting of glacial outwash sands and gravels, or the lacustrine facies, composed of silts, sands, and clays of glacial lake sediments (Shaver et al. 1970). The Prospect Formation is comprised of unconsolidated sand and gravel silts and its sediments are thought to be older than those of the Atherton Formation (Shaver et al. 1970, Fitting et al. 1979). Examples of Atherton and Prospect landforms are recognized within the Hoosier National Forest as slackwater terraces above the floodplains of Salt Creek and the Upper Patoka River Valley and as a lacustrine terrace in the Little Blue River Valley (Fitting et al. 1979, Munson 1980, Sieber et al. 1989). Non-glacial deposits of Holocene origin are also represented in the Hoosier National Forest.

Because the majority of south-central Indiana was not glaciated, the landscape is much like it was prior to the Pleistocene; "a series of limestone plains, shale lowlands, and sandstone uplands that [trend] from northwest to southeast" (Wayne 1966: 27). Thus, landforms in the Hoosier National Forest region are "largely the result of normal degradational processes, such as weathering, stream erosion, and mass movement" (Schneider 1966: 42). While the Atherton and Prospect Formations account for sediment deposits of Pleistocene origin, more recent deposits of the Martinsville Formation also occur in the Hoosier National Forest. This formation includes only sediments of Holocene age (11,000 B.P. – present) and is also composed of fluvial and lacustrine sands, silts, and clays. Unlike the sediments of the Pleistocene, which are confined to areas of glacial deposition, sediments of the Martinsville Formation are relegated to the floodplains of modern streams (Fitting et al. 1979, Munson 1980).

The Pleistocene and Holocene depositions, coupled with the erosion of Paleozoic materials have resulted in a complex and diverse natural region. Within southwest Indiana, Ellis et al. (1990) have identified five types of geomorphic settings which, when slightly modified, can easily be applied to the physiographic regions of south-central Indiana. The five geomorphic settings included within the Hoosier National Forest region are:

1. Lands adjacent to broad, well developed valleys associated with a large to medium size river, such as the White and Ohio. This setting includes floodplain rises, ridges, and terraces in which the surrounding uplands are rolling and moderately dissected.

2. Medium size valleys with associated floodplain features and terraces along minor river drainages, such as the Patoka or Little Blue rivers.

3. The rugged ridge and valley topography of the Crawford and Norman Upland in which the uplands are deeply dissected while the valleys are well-defined.

4. Dissected, upland topography characterized by numerous ridge spurs which project onto poorly drained lacustrine plains of Pleistocene origin. The drainages in this setting, such as Salt Creek, are not as large as those in the previously discussed areas.

5. Upland areas with no major drainages in close proximity.

These five settings represent the total environment of the Hoosier National Forest and are worth investigating because, as Bennett and Porter (1987: 9) point out: "An examination of an area's topography and physiography is vital to a cultural resources study, since landforms provide environmental variability, and often determine the boundary between biomes." The vegetation of any given community is strongly influenced by its particular biome, principally its soil and topography. Within the five physical settings of the Hoosier National Forest region, the pre-settlement vegetation would have varied considerably, reflecting the underlying geological structure, local relief, and related soils.

Regional Vegetation Patterns

Lindsey et al. (1965) note that the dominant forest types present in south-central Indiana in pre-settlement times were beech-maple and oak-hickory (Figure 16). Two other forest communities, western mesophytic and depressional mixed, also occurred in the region but to a lesser extent. According to Lindsey et al. (1965: 160): "The forest types of unglaciated southern Indiana were strongly oriented in a north-south pattern that roughly reflects the pattern of the bedrock types furnishing the soil parent materials." The pre-settlement distribution of forest types in south-central Indiana was, and still is, dependent upon soil texture and drainage patterns (Lindsey et al. 1965). The parent materials, relief, and Pleistocene sediments of the Norman Upland, the Crawford Upland, and the Mitchell Plateau, have resulted in many different soil associations. Each soil complex is more optimal for the development of one of the main forest types.

Beech-maple forests are generally relegated to poorly drained silty soils on floodplains (Fitting et al. 1965). Species of this type are considered to be water tolerant but shade intolerant (Petty and Jackson 1966). Although the map in Figure 16 places beech-maple forests to the north of the Illinoisan glacial boundary, Fitting et al.

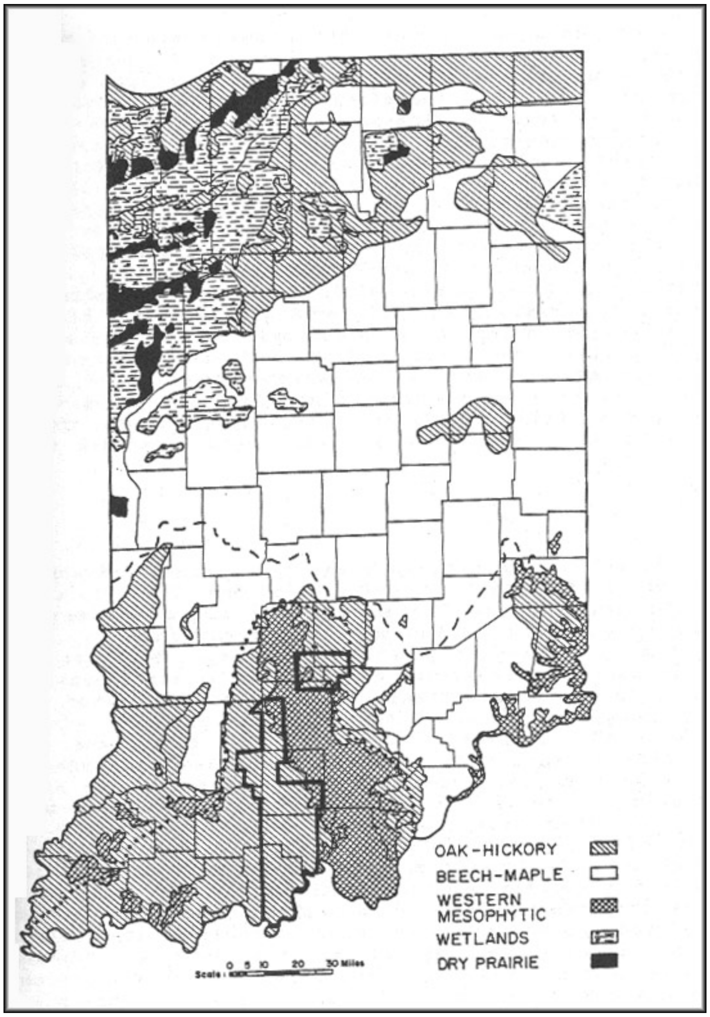

Figure 16: Map of the presettlement vegetation of Indiana; from Sieber et al. 19989.

(1979: 41) insist that "the beech-maple forests extend south of the Wisconsinan glacial sediments and cover Illinoisan deposits as well in southern Indiana." In the Hoosier National Forest, soil associations that represent floodplain beech-maple communities are Wakeland-Stendal-Haymond-Barthe silt loams of Salt Creek and the Lower Patoka River; Haymond-Nolin-Petrolia silt loams of the East Fork, White River; and the Haymond-Wakeland silt loams of the Lost River and portions of the Patoka River (Fitting et al. 1979). Petty and Jackson (1966) and Fitting et al. (1979) also include bald cypress, tulip poplar, black maple, sugar maple, silver maple, sycamore, American elm, cottonwood, hackberry, cork elm, box-elder, black willow, white ash, buckeye, hackberry, and red elm as water tolerant floodplain species. Floodplain forests, with proportions of beech too low to be included within the normal beech-maple scheme, may instead contain significant numbers of these species.

The oak-hickory forest association is generally confined to areas in which the soils are moderately deep and well-drained (Fitting et al. 1979). Figure 10 above shows that the oak-hickory forest type dominates the Crawford and Norman Upland physiographic regions. Lindsey et al. (1965) further note that the oak-hickory forests of south-central Indiana were distributed throughout the unglaciated, highly dissected sandstone and shale terrain of the Uplands. Soil associations conducive to an oak-hickory forest assemblage are the acidic silt loams of the Wellston-Zanesville-Berks complex of the Crawford Upland and the Berks-Gilpin-Weikert complex of the Norman Upland. Characteristic upland forest species include “black oak, white oak, chestnut oak, scarlet oak, post oak, pignut hickory, small-fruit hickory, shagbark hickory, and rarely, sourwood” (Homoya et al. 1985: 259).

The western mesophytic forest type is restricted to and characteristic of the Mitchell Plateau’s karst topography. This forest association occurs over limestone bedrock in which the soils, such as those included in the Crider-Frederick association, are generally well-drained silty loams derived from loess and weathered limestone bedrock. The western mesophytic forest is described as “one in which different tree associations dominate in different parts of the forest…. For example, beech-maple and oak-hickory associations may predominate but not in enough proportions to include it within either of these separate groups” (Fitting et al. 1979: 43). Typical forest species in this region include “white oak, sugar maple, shagbark hickory, pignut hickory, and white ash” (Homoya et al. 1985: 261).

The Mitchell Plateau is also interspersed with prairie-like communities referred to as limestone glades and barrens (Homoya et al. 1985). Limestone glades are natural openings in a forest where the bedrock is exposed at or near the surface; the thin soil layer coupled with direct sunlight creates a very dry and hot surface feature (Homoya and Huffman 1997). They are usually located on south-facing slopes and above cliffs (Homoya and Huffman 1997). The glades of the Mitchell Plateau exhibit many species accustomed to xeric conditions such as goat’s rue, downy milk pea, angle-pod, St. John’s-wort, adder’s tongue fern, crested coral root orchid, prairie dock, rattlesnake master, and blazing star (Homoya et al. 1985, Homoya and Huffman 1997). The barrens are a landscape devoid of large trees in which the soil tends to be dry and infertile (Homoya and Huffman 1997). Like the glades, this community is made-up of drought resistant shrubs, herbs, and trees. Species commonly found in the barrens include Indian grass, big bluestem, little bluestem, rattlesnake master, prairie willow, clasping milkweed, New Jersey tea, blackjack oak, and shining sumac (Homoya et al. 1985, Homoya and Huffman 1997).

Within the broad, macroscopic oak-hickory and beech-maple regimes smaller, isolated microenvironments exist within the landscape. In explaining microenvironments Butzer (1982: 60) states, "Terrain is important because it influences the natural moisture regime and the balance of soil formation and erosion…. Steep and sunny slopes not only are free-draining but also tend to be dry, whereas depressions and extensive flat surfaces are wet, even in uplands, and shade slopes are on the damp side." In the region of the Hoosier National Forest, slope and aspect to the sun vary within even the same setting perpetuating the occurrence of microenvironments within larger biotic communities.

An example of a microenvironment within the Forest area is presented by Fitting et al. (1979). In a few instances, the beech-maple forest is found to "extend upslope from the common floodplain location and into better drained soils" (Fitting et al. 1979: 42). It has been suggested by Lindsey et al. (1965) that this migration of beech-maple forests, from floodplains into secondary bottomlands or terraces, may be due to differential exposure to the sun. This led Fitting et al. (1979: 42) to conclude: "There may be a disproportionate number of north facing slopes in these areas providing a better environment for such moisture tolerant trees."

Within the karst landscape of the Mitchell Plateau, microenvironments exist as the glades and barrens mentioned previously and also as wetlands present in and around the numerous sinkholes and swallow holes. These are referred to as "karst wetland communities" (Homoya et al. 1985) and include southern swamp species like swamp cottonwood, swamp white oak, red maple, sweet gum, Virginia willow, beakrush, netted chain fern, and small buttercup (Homoya et al. 1985). The sandstone cliffs of the Crawford Upland present a specialized microenvironment that is the only home to three cliff-dwelling plants; French's shooting star, small-flowered alumroot, and filmy fern (Homoya and Huffman 1997).

The importance of slope and aspect to the occurrence of microenvironments is exemplified in the Norman Upland. In this region:

> Black walnut, wild cherry, and sycamore occur along streambeds. Adjacent lower slopes and sheltered north-facing slopes harbor a mesic forest dominated by a variety of mesic species and an equally rich ground layer of ferns and wildflowers. On drier ridgetops and sunny south-facing slopes, white, black, and chestnut oak and shagbark hickory dominate (Homoya and Huffman 1997: 168).

The two escarpments of south-central Indiana are indicative of a tension belt between adjoining communities. Referred to as ecotones, the escarpments are "a zone of transition between adjacent ecological systems, having a set of characteristics uniquely defined by space and time scales, and by the strength of the interactions between adjacent ecological systems" (di Castri and Hansen 1992: 6). The Knobstone and Springville Escarpments represent transitional areas between two physiographic regions in which the “spatial transition between two or more different communities” (Butzer 1982: 15) support ecotones.

In the Knobstone Escarpment, the boundary separating the Norman Upland from the Scottsburg Lowland, siltstone glades are present. These typically occur on south-facing slopes at the top of ridges (Homoya and Huffman 1997). These areas possess dry and sterile rocky soils and scattered scrub forests of blackjack and chestnut oaks. The Springville Escarpment, which divides the Crawford Upland and Mitchell Plateau regions, is substantially different. Here, plants adapted to limestone, rather than sandstone, cliffs reside. Plants, such as the wallrue fern, black-stemmed spleenwort, hairy alumroot, black seeded sedge, and spreading rockcress thrive on the calcium and alkaline environment provided by the limestone strata (Homoya and Huffman 1997). Ecotones also exist between microenvironments. For instance, within the uplands, depressional areas occur in which the soils and amount of sunlight are significantly different than in the uplands. Although an oak-hickory regime may preside in the uplands, the less well-drained bottomland may be more suitable to a beech-maple environment. Also, although oak-hickory forests are often assumed to be the dominant forest type of areas steep in slope, beech-maple types often occur on north and east facing slopes (Schneider 1965). As a transition zone between two ecological communities, the ecotone provides a rich and concentrated assortment of flora and fauna resources. Fitting et al. (1979: 55) insist, “For the prehistoric hunter and gatherer practicing a ‘diffuse’ subsistence economy, the ecotone provides an advantageous position.”

Sinkhole, Cave, and Rockshelter Formation Processes

The karst region of south-central Indiana is the result of surface erosion by stream action during Tertiary time. The Mitchell Plateau, along with portions of the Crawford Upland and the Norman Upland represent the karst belt of Indiana (Figure 17). The drainage of the ground surface removed resistant sandstones, siltstones, and shales, and carved deep valleys into the softer, underlying limestone strata. The solution of limestone bedrock near the surface resulted in the development of sinkholes, caves, and subterranean conduits; rockshelters formed at the interface of the Mitchell Plateau and Crawford Upland as the softer limestone beds eroded more rapidly than the more resistant overlying sandstone strata.

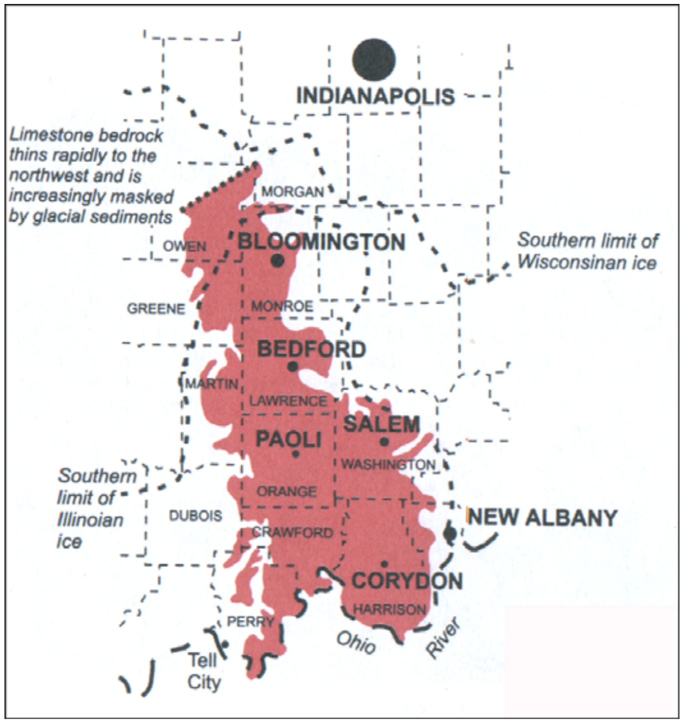

Figure 17: Map showing the karst belt of south-central Indiana; from Camp and Richardson 1999: 81.

During the Tertiary Period, surface erosion exposed soft limestones. Sinkholes formed as surface water puddled in exposed fractures and dissolved the limestone bedrock. Acidic water percolated through fissures in the surface, dissolving the subsurface bedrock. Finally, sinkholes formed as water soaked through surface fissures and eroded the bedrock.

In other instances, sinkholes formed as an underlying cavern collapsed. These are steep-sided sinkholes called “collapse sinkholes.” Most sinkholes are open and dry however, some, known as sinkhole ponds, have become plugged with rocks and sediments and hold water above the water table.

Most of Indiana’s caves and caverns have been dissolved in the Sanders and Blue River Goups of Middle Mississippian age; other caves have formed in the thin limestones of the West Baden and Stephensport Groups of late Mississippian age. Caves and caverns occur in permeable fine-grained limestone beds where the layers of rock are broken up by sets of vertical joints. The joints in one bedrock layer do not coincide with joints in adjacent layers. Acidic surface water enters the bedrock through these open joints and proceeds to the subsurface water table where it flows laterally toward a surface outlet, such as a spring or a rise. During times of floods, the velocity and volume increases to a point in which the acidic water makes contact with the walls and ceilings of subterranean passages. Caves and caverns develop as water continually erodes and widens the passages and removes dissolved rock material through subsurface conduits.

Unlike sinkholes and caves, rockshelters do not extend beyond the recesses of natural light into dark-zone subterranean passages or chambers.

In the Hoosier National Forest, rockshelters are most prevalent in the sandstone and limestone cliffs that drape the steep valley slopes and ridgetops of the Crawford Upland. According to Waters (2002: 20): "Cliff-forming sandstones in the region include the Mt. Pleasant Sandstone Member (Buffalo Wallow Group), the Tick Ridge Sandstone Member (Buffalo Wallow Group), and the Big Clifty Sandstone Member (Stephensport Group)." Though formed through the same process of solution and erosion, rockshelters are differentiated from caves; "rockshelters are shallow niches or ledges under over-hanging bedrock, while caves extend beyond their opening into subterranean passage-ways and chambers" (Waters 1992: 240).

Within the Hoosier National Forest, rockshelter formation is recognized in two situations (Martin 2000). The first occurs at the base of cliff faces where softer rock, such as limestone, has weathered more rapidly than the more resistant overlying (often sandstone) strata forming an overhang or brow. The debris from the continued erosion of the softer strata forms a talus slope that accumulates and becomes a sheltered floor. The second situation where rockshelters form is within the pilings of large, colluvial boulders that have broken off of and migrated from the cliff face.

Chert Resources in the Hoosier National Forest Region

A variety of chert types occur throughout the Hoosier National Forest region. Chert, a raw material utilized for lithic tool manufacture, is "an extremely common constituent of many limestone rock formations and is confined almost exclusively to that sedimentary rock type" (Bassett 1980: 77). Chert nodules, lenses, or tabular strata within limestone rock outcrops are exposed in a variety of settings, such as in residual soil, in dry creek beds, along the banks and terraces of rivers and streams, and in caves and rockshelters. In the Hoosier National Forest, "[b]edrock exposures are primarily of the Borden and Sanders Group (Valmeyeran Series) of the lower Mississippian System…[the Springville Escarpment], which marks the eastern boundary of the Crawford Upland, exposes rocks primarily of middle Mississippian age (Blue River and West Baden groups of the upper Valmeyeran and lower Chesterian series)" (Munson and Munson 1984: 149-152). Chert resources are readily accessible in the western margin of the Mitchell Plateau and are distributed discontinuously in exposed bedrock strata throughout the region (Figure 18).

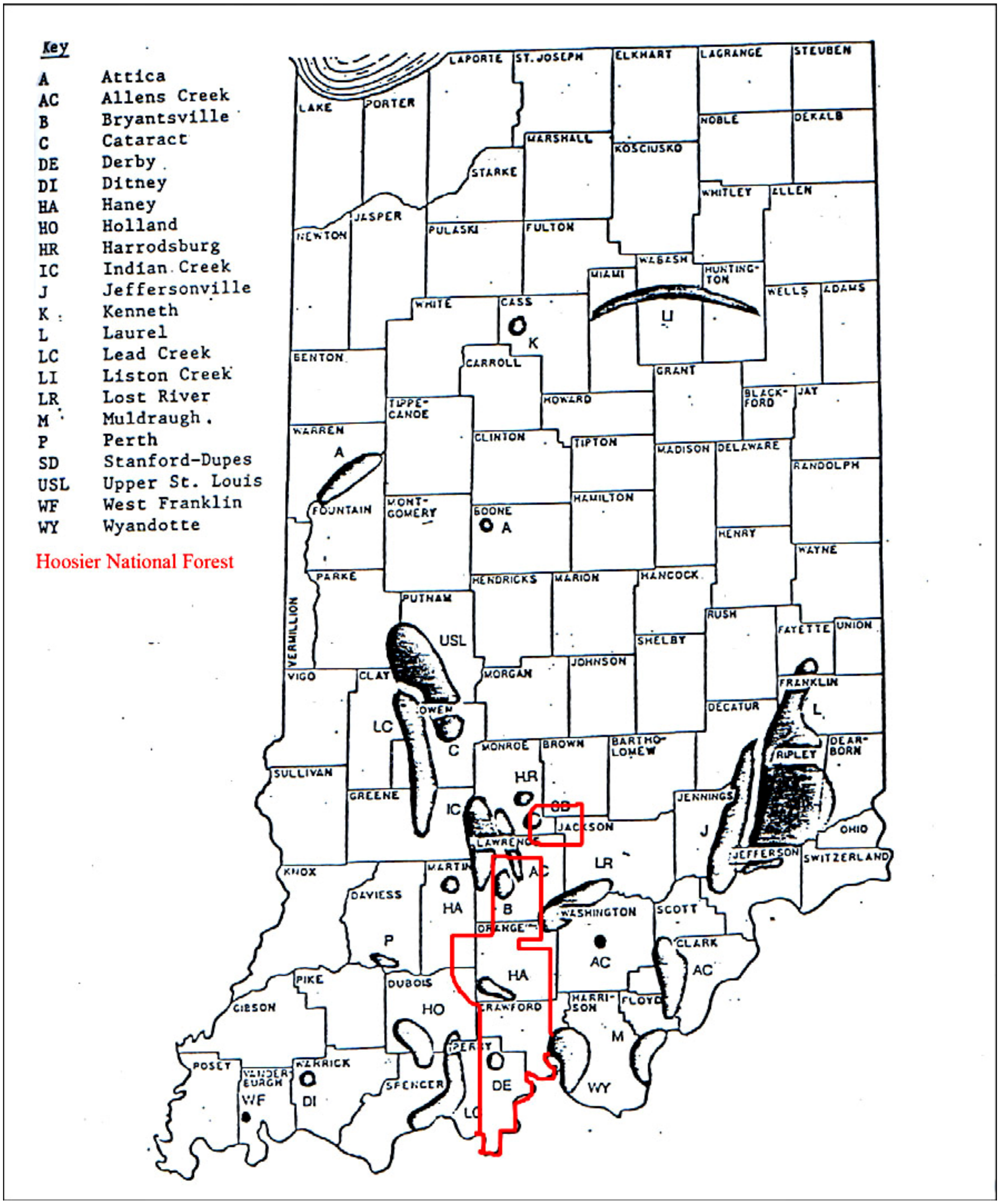

Figure 18: Distribution of Chert Types in Indiana; adapted from Cantin 1994: 19.

Knowledge of lithic raw material source locations is useful to the interpretation of prehistoric sites. Because chert availability, abundance, and quality vary throughout the

Forest region, the delineation of local and non-local (exotic) cherts in archaeological assemblages is important. Such data provides pertinent information regarding the preferential selection and use of different chert types during different cultural periods. Tankersley (*in* Ellis et al. 1990: 31) imparts "the ability to accurately identify both lithic sources and the source of lithic artifacts is thrice critical; first, to reconstruct lithic exploitation strategies; second, to monitor the movement of prehistoric peoples across the landscape; and third, to interpret prehistoric settlement patters."

Chert resources of different stratigraphic provenience are available in different levels of the region's topography. Allens Creek and Harrodsburg chert are found in sandstone and limestone outcrops of Lower Mississippian age; the Middle Mississippian limestones of the Blue River Group contain Upper St. Louis, Lost River, Stanford, Cataract, Wyandotte, Indian Creek and Bryantsville cherts,; Haney chert is found in the Upper Mississippian Haney limestone. The cherts in this limestone belt are aligned in a horizontal sequence according to stratigraphic nomenclature (Figure 19) and are exposed differentially throughout the Hoosier National Forest. The characteristics of each chert type vary by the specific lithologies of their formations, thus there are noticeable differences in the fossil content, texture, colors, and knappability of each chert type. A brief description and the prehistoric utilization of each of the chert types exposed within the Hoosier National Forest region is given in Table 1. In addition to chert resources, other minerals were accessible in the Hoosier National Forest region and were exploited by prehistoric populations. Wyandotte Cave, for example, was mined prehistorically for gypsum, aragonite, and epsomite (Munson and Munson 1990). Because most of the Forest region was not glaciated, granite, a glacial erratic and the preferred raw material for ground-stone tools, was not abundantly available.

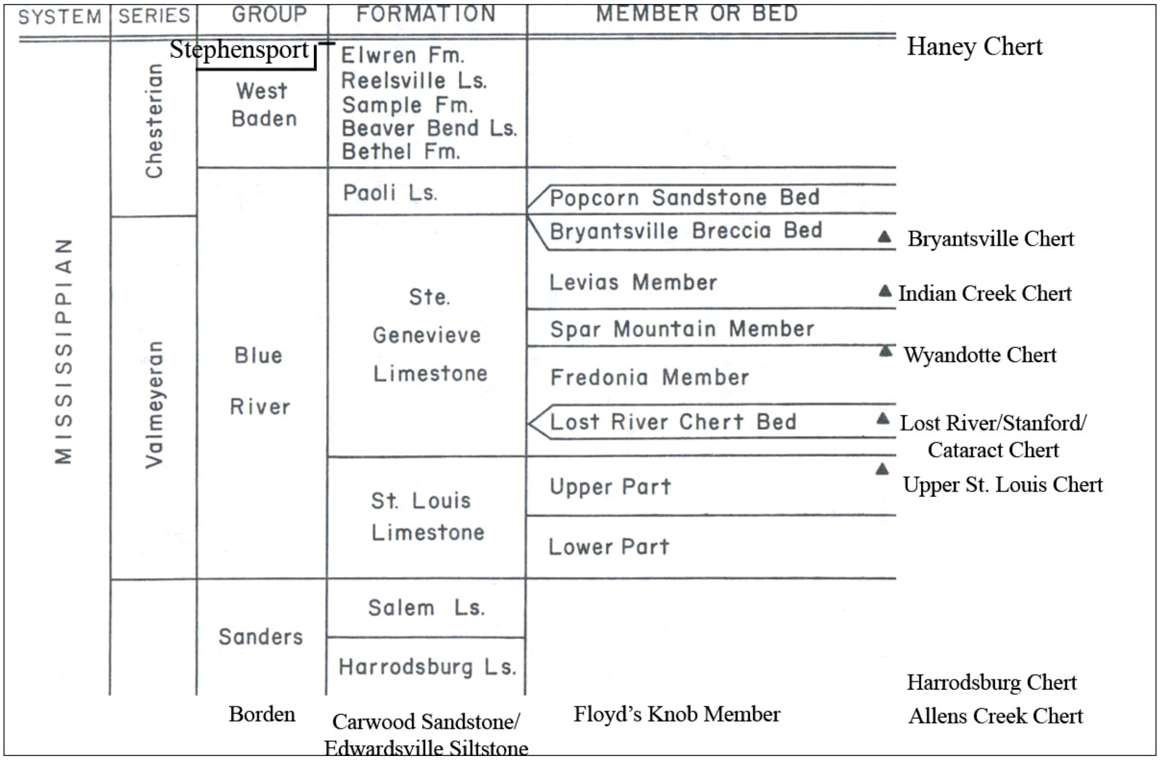

Figure 19: Stratagraphic alignment of cherts that outcrop in the Hoosier National Forest region; adapted from Bassett and Powell 1984: 241.

Table 2: Description of chert types present in the Hoosier National Forest region; adapted from Cantin 1994.

Chert Type	Description	Prehistoric Utilization
Allens Creek	Coarse-grained and fossiliferous; background silica is light grey in color; fossil speckles consisting of shades of grey, tan, brown, or transparent	Used extensively throughout south-central Indiana; particularly in Monroe County in the Late Archaic period
Bryantsville	Often multicolored with amorphous, to sub-spherical to angular splotches; texture is fine-grained to medium; quartzite vugs and replaced fossils are present in some samples	Exploited extensively by prehistoric peoples; use of the chert was confined to the Indian Creek area of Lawrence, Greene, and Monroe Counties
Cataract	Coarse-medium and some-what fossiliferous with crinoid columella, fenestrate bryzoans, and brachiopods that are white in color; opaque with bands of varying shades of blue-gray; quartz vugs are occasionally found	Utilization during the three temporal phases of the Archaic period within south-central Indiana; Late Woodland Albee cultures of the Wabash valley made some use of the chert
Derby	Dull and grainy in luster, nonfossiliferous, medium-light grey to medium dark grey in color with darker grey, silty bands	Utilized in varying degrees by most cultures in prehistory, use seems largely confined to Perry County area.
Haney	Coarse-grained and highly fossiliferous with Bryzoans, Brachiopods, and Crinoids; medium grey, tan, or blue in color	Prehistoric usage is generally confined to the region of the source areas where it is abundant; some-what limited to the Late Archaic but utilized in minor percentages in other periods
Harrodsburg	Generally light grey to white; highly fossiliferous with rectangular and circular fragments of crinoid columella and bryzoans that are darker grey than the background matrix; coarse to coarse-medium texture	Utilized minimally; though it was used to some degree near source areas during the Late Archaic period
Indian Creek	Buff, beige, brown, or tan in color; frequently mottled, variegated, and banded with shades of these colors; homogeneous and free of internal flaws	Used extensively around source areas; utilized most extensively during the Archaic Period; associated with Allison-Lamotte and Albee components
Lost River	Mottled and variegated light grey to light-bluish grey; highly fossiliferous with an abundance of bryzoans and brachiopod molds; fracture is very hackly	Not thought to have been utilized in prehistory
Stanford	Medium grey background matrix laminated with thin streaks of various shades of grey; white speckles (not fossils) are often present; good conchoidal fracture	Used intensively through-out prehistory around source areas; artifacts have been recovered up to 60 miles from source areas; usage largely confined to the Late Archaic
Upper St. Louis	Banded in shades of grey and blue-grey; remnants of the parent limestone (St. Louis Limestone) occasionally found on edges, bryzoans, fusulinids, calcite, quartz, and pyrite inclusions	Not known to have been used extensively in prehistory
Wyandotte	Medium blue-grey to medium light grey in color; frequently concentrically banded with various shades of grey or light grey; extremely cryptocrystalline; free of internal stress fractures; very homogenous; fossils are rare	Used extensively in Indiana and throughout the mid-western U.S. by all cultural periods

Overall, the physical environment of the Hoosier National Forest region provides numerous resources that would have attracted prehistoric peoples practicing a diffuse and seasonal subsistence economy. The junctions of the Crawford Upland and the Mitchell Plateau and the Mitchell Plateau and the Norman Upland, each with differentiated soils, vegetation, and topography, produce diverse ecotones in which the biotic resources of two environmental zones coexist. The numerous chert outcrops of the Forest region provided prehistoric groups the raw material required for the manufacture of chipped-stone tools. The presence of caves, rockshelters, springs, rivers, and streams in the Forest region are also important natural resources that were utilized prehistorically.

Archaeological Setting

Archaeological sites are not distributed equally across the landscape, but are instead patterned in relation to specific topographic settings and resource locations. Settlement patterns reflect the adaptive strategies practiced by prehistoric populations and are distinct for the various cultural and temporal periods. Because prehistoric groups developed a variety of adaptive practices over time in response to changing environmental conditions and the introduction of new technologies, the distribution of sites and site types within an area reflect these changes. Thus, the settlement patterns of various prehistoric hunter-gatherer and agricultural groups vary through time and across space.

The prehistoric settlement model for the Hoosier National Forest is conceived from the distribution of archaeological sites within the region. Cultural resource contracts issued by the Forest Service have resulted in the systematic survey and testing of numerous and varied tracts of, two large-scale salvage excavations (Munson 1976, Munson 1980); and two comprehensive overviews (Fitting et al. 1979, Sieber et al. 1989). In addition, given the many caves and rockshelters present in the Hoosier National Forest property, the Forest Service has supported archaeological investigations of these unique features (e.g., Martin 2000, Waters 2002). Our current understanding of the prehistoric cultural sequence and settlement patterns of the Hoosier National Forest is attributed to the results of these regional surveys and excavations.

Archaeological research conducted in the Hoosier National Forest confirms a dichotomous distribution of prehistoric sites between the bottomland and upland environmental zones (Fitting et al. 1979). The bottomlands of the region contain floodplain and terrace features while caves and rockshelters are scattered throughout the hills and hollows of upland contexts. Ecological communities and the selection of exploitable natural resources vary between the bottomlands and the uplands. The archaeological data set of the Forest region indicate that "because subsistence resources [were] not uniformly distributed, cultural differences in the distributions of settlement are likely to reflect differences in adaptive strategies" (Munson and Cook 1980: 699). Thus, as prehistoric cultures adapted to their environment, shifted subsistence strategies, and incorporated new technologies, the manner in which bottomlands and uplands were utilized also changed. Trends in the regional settlement pattern are observed by examining the locations and densities of cultural components across the landscape.

For the most part, "it appears that large, multicomponent sites tend to occur in floodplain and terrace environments while smaller, single component sites tend to occur in the uplands" (Fitting 1979: 124). Because the uplands are drained by numerous small creeks or by subterranean conduits, particularly in the Mitchell Plateau, they lack the riverbank and floodplain resources needed to support large prehistoric habitations. The general consensus is that upland sites, including rockshelters, reflect specialized hunting, nut processing, and chert working stations, while the lowland floodplains and terraces offered the riverine environment and soil conditions that would have better supported larger, sedentary base camps and the horticulture and intensive agriculture regimes of Woodland to Mississippian period villages.

The regional settlement model indicates a general paucity of prehistoric sites within the highly dissected upland areas of the Hoosier National Forest. Prehistoric sites identified during regional surveys of upland tracts have, "all been small, short-term occupations, usually temporally unidentifiable but functionally specific: most if not all can be classified as hunting camps…" (Dorwin 1986:156). Munson (1976) has found that the upland interfluves of the Forest were utilized disproportionately by groups of all prehistoric period; he has recognized extensive Archaic occupations, a small amount of utilization during the Early and Late Woodland periods, and relatively little utilization by Paleoindian, Middle Woodland, and Mississippian groups. The uncommon occurrence of Woodland pottery in the upland areas of the Forest (Sonner 1975) supports Munson's (1976) claim and suggests that the subsistence and habitation preferences of Woodland and Mississippian groups may not extend into the small and medium sized valleys of upland contexts.

The small, ephemeral nature of prehistoric sites and the apparent absence of habitation sites in the upland interfluves of the Forest region is a concern examined by Dorwin (1986: 156). In seeking to explain the near absence of sites in upland contexts, he has postulated the following two hypotheses:

1.) *The absence of sites reflects low population density within the region of the Hoosier National Forest.*

2.) *Features of the particular environment (uplands) make it less desirable for site locations.*

The first hypothesis was considered an unlikely explanation because the archaeological record from Illinois, Ohio, and Kentucky indicates relatively high populations in similar upland environments. According to Dorwin (1986:156): "It would then seem more likely that higher densities of sites may be present within [the] Hoosier National Forest but in environmental situations not yet explored."

The more credible hypothesis, according to Dorwin (1986), is the second. He supports this explanation with ethnographic evidence from the Amazon Basin in South America and with archaeological analogs from the prairie covered uplands of central Illinois and from the forested uplands in southeastern Ohio. The ethnographic data Dorwin (1986) cites demonstrated that native populations in the Amazon Basin considered upland forests to be resource poor and unsuitable for habitation; settlements were instead confined to the floodplains along larger drainage systems, which exhibited the highest density and greatest diversity of food resources. The prehistoric utilization patterns of the uplands in both Illinois and Ohio were found to be nearly identical with those encountered in the Hoosier National Forest region; ephemeral and limited in function. Dorwin (1986) reasoned that the general environmental homogeneity of the upland regions was not an optimal choice for permanent site location. Rather, habitation sites were positioned near major river systems which allowed for the greatest exploitation of ecotones. The small, limited function sites found in the uplands are thought to be tied to the larger, multi-purpose habitation sites on larger waterways, representing perhaps, only foraying episodes (Dorwin 1986).

An archaeological survey conducted by Vanden Heuvel and Dorwin (1979) examined portions of seven counties in the upland regions of south-central Indiana. The results of the reconnaissance, based on the categories of material recovered, were that the majority of the prehistoric sites recorded were temporary hunting and gathering camps. Early Archaic diagnostic points were the second most frequently point type recovered and were not restricted to any physiographic or topographic situation; sites of this period occurred in both floodplain and upland settings. Middle Archaic sites, though poorly represented, were found in areas in close proximity to water, either above a stream or on floodplain ridges. Late Archaic diagnostic points were the most numerous and widely distributed point type, ranging from Gibson to Jackson Counties. The Gibson-Orange County sites dating to this period were all upland sites with those in Orange County closely associated with the floodplains of upland streams. Other Late Archaic diagnostics were recovered from the East Fork of the White River floodplain in Washington and Jackson Counties. Artifacts recovered in association with Late Archaic components, such as drills, and pestles and nutting stones, suggest domestic activities that are carried out either at frequently visited sites or sites where occupation is of some duration. Only two diagnostic points, found within the East Fork of the White River floodplain, allude to an Early Woodland presence in the uplands of south-central Indiana. The Middle Woodland is also poorly represented in the region, with only five diagnostic Snyder projectile points being recovered in Jackson and Gibson Counties. Late Woodland and Late Prehistoric sites are also poorly represented in the upland regions.

Two Orange County sites were investigated further by archaeological testing as a result of Vanden Heuvel and Dorwin’s (1979) reconnaissance (Vanden Heuvel and Crouch 1980). Site 12Or279 is located in central Orange County on a terrace of Lick Creek. The seven test units excavated at this site failed to produce evidence of cultural activity in the B-horizon soils. Projectile points and functional tools (bifaces, 1 drill, 1 lamellar blade, 1 hammerstone) dominated the artifact assemblage suggesting that the major activity occurring at the site was hunting and butchering (Vanden Heuvel and Crouch 1980). Diagnostic artifacts indicated that all prehistoric periods, except Paleoindian, were represented. The presence of mixed cultural components at the site led to the conclusion that the site represents a series of temporary hunting camps rather than a continuously occupied habitation site (Vanden Heuvel and Crouch (1980). Indian Creek chert was the most represented raw material type recorded from 12Or279 and was believed to be outcropping in the vicinity of the site.

Site 12Or282 is located a short distance from 12Or279 and is situated in a narrow floodplain valley associated with Lick Creek. The site was archaeologically excavated by six test units and one test trench. No cultural features were observed in either the test units or in the buried soil strata exposed in the test trench. However, 3,587 pieces of lithic debris were recovered from the site. Fifty-three bifaces and biface fragments were collected from the site, as was a large quantity of unmodified chert debris, indicating that the most likely activity that occurred at the site was raw material procurement for tool manufacture (Vanden Heuvel and Crouch 1980). Like 12Or279, the majority of chert debris was Indian Creek which was thought to outcrop near the site; however few diagnostic artifacts were manufactured from this chert type. Vanden Heuvel and Crouch (1980: 36) concluded: "This lack of diagnostics of Indian Creek chert would be expected at a site where exhausted tools, manufactured elsewhere were being replaced and left behind." Temporally diagnostic artifacts from 12Or282 cluster in the Archaic period; particularly well represented are the Early and Late Archaic periods.

On a micro-scale level, a survey of the Lost River watershed by Sonners (1975) in southeastern Orange County provides a localized settlement model with which to examine the Wesley Chapel Gulf area. During the reconnaissance a Paleoindian fluted point was recorded in a private collection; the artifact was a surface find and had no contextual integrity. Early and Middle Archaic (8,000-3,000 B.C.) occupations were represented by a few projectile points in association with small amounts of occupational debris. The Late Archaic (3,000-1,000 B.C.) was better represented, particularly the Riverton Culture. Both Early and Middle Woodland (1,000 B.C.-600 A.D.) occupations were absent. The Late Prehistoric period was better represented, although this conclusion was likely the result of the survey crossing the Oliver Phase Cox's Woods site. A heavy cluster of multicomponent sites were also recorded in the vicinity of Half Moon Spring.

An archaeological survey conducted throughout portions of Orange County (Beard 1993) identified several prehistoric sites in which the collected artifacts were manufactured from Lost River chert (12Or196, 12Or197, 12Or198, 12Or548, 12Or549, 12Or550, 12Or551, 12Or552, 12Or553). Site 12Or552 is a possible prehistoric quarry and workshop site for Lost River chert (Beard 1993). The site is a rather large lithic scatter (330m wide x 4,950m long) located along a swallow hole in the dry bed of the Lost River, approximately 3 miles east of Wesley Chapel Gulf. Artifacts manufactured from Lost River chert included 112 pieces of lithic debris, 5 utilized flakes, 1 large bifacial scraper, 1 point fragment, and 1 broken Late Archaic side-notched point (Beard 1993). The recovery of artifacts made from Lost River chert in Orange County disputes the assertion that this particular raw material was not used prehistorically (Basset and Powell 1984, Cantin 1994). Furthermore, the identification of a Lost River chert quarry and workshop site suggests that outcrops of Lost River chert may have been sought after by prehistoric groups venturing into the uplands; the one diagnostic artifact from 12Or552 implies Late Archaic utilization.

Two archaeological reconnaissance surveys of the Wesley Chapel Gulf area (Jackson 2000, Striker 2000) identified 17 prehistoric sites (12Or382-384; 12Or575; 12Or612-616; 12Or624-630). Five of these sites (12Or382-384; 12Or612; 12Or614) were recommended as potentially eligible to the National Register of Historic Places because the archaeological data they contain may provide information on how karst landforms, such as gulfs, caves, and sinkholes, were utilized prehistorically (Jackson 2000). Over 2,300 prehistoric artifacts were collected from the 17 Gulf area sites and two potential cultural features were encountered; one in 12Or382, the other in12Or612. The results of the Jackson (2000) and Striker (2000) surveys indicate a very intensive occupation of the area immediately surrounding Wesley Chapel Gulf from the Late Paleoindian period to the Late Woodland Period (Striker 2000). Striker (2000) concluded that prehistoric cultures occupied the habitable landforms (i.e. slope benches and toe ridges) immediately surrounding Wesley Chapel Gulf for the purpose of resource extraction. Additional details on the two sites tested during this project, 12Or382 and 12Or384, are provided below.

12Or382

Site 12 Or 382 [redacted] The site was first documented by J.A. Mohler in 1967. This site record, however, provides no information concerning the site type, the size of the site, or what types of artifacts or cultural periods were represented (Jackson 2000).

The site was relocated by Jackson (2000) and Striker (2000) and was archaeologically surveyed by systematic shovel-probing. The artifacts recovered from the initial and supplemental surveys (n=479) include: primary flakes (n=21); secondary flakes (n=99); tertiary flakes (n=52); intermediate flakes (n=175); shatter (n=105); modified flakes (n=3); biface fragments (n=3), unifaces (n=2); scrapers (n=2); uniface fragments (n=2); a core; a worked cobble; a drill fragment; a flake scraper; a reworked Late Archaic Brewerton Side-Notched point; an unidentified projectile point fragment; an unidentified point fragment; and fragments of metal (n=8) considered incidental and not indicative of a historic occupation. Fire-cracked rock was also collected. A potential feature consisting of an intrusion of brown (10YR4/3) clay loam with charcoal flecking into the dark yellowish brown (10YR4/6) clay loam subsoil was documented, but not excavated. The temporally diagnostic surface artifacts collected from12Or382 indicate Late Archaic and Middle Woodland occupations (Striker 2000).

The raw materials utilized in prehistoric tool manufacture and recovered from the Jackson (2000) and Striker (2000) surveys include: fossiliferous (n=40); indeterminate (n=158); local chert-high quality (n=168); local chert-low quality (n=88); quartzite (n=2); Stanford (n=4); Holland (n=4); and Wyandotte (n=5). In examining the total number of debitage by stage of reduction (primary, secondary, and tertiary), Striker (2000) posited that, based on the small number of primary and tertiary flakes recovered, the initial reduction of raw materials and tool maintenance was not occurring at the site. However, based on the large number of secondary flakes recovered, Striker (2000) suggests that the manufacturing of blanks and preforms was occurring at the site. Due to the number of artifacts, the presence of a potential feature, and the location of the site, 12Or382 was considered potentially eligible for the NRHP and further work was recommended (Jackson 2000, Striker 2000).

12Or384

Site 12Or384 [redacted] the site. The site was first documented by J.A. Mohler in 1967. This site record, however, provides no information concerning the site type, the size of the site, or what types of artifacts or cultural periods were represented (Jackson 2000).

The site was relocated by Jackson (2000) and Striker (2000) and was archaeologically surveyed by systematic shovel-probing. The artifacts recovered from the initial and supplemental surveys (n=932) include: primary flakes (n=21); secondary flakes (n=150); tertiary flakes (n=151); intermediate flakes (n=360); shatter (n=217); modified flakes (n=7); biface fragments (n=9); flake scrapers (n=5); core fragments (n=2); drill fragments (n=2); a core; a worked cobble; a scraper; a Terminal Middle Woodland Lowe Flared Base point; the proximal/medial section of a Mississippian period Madison point; an indeterminate point base; and a fragment of metal, although its presence was considered incidental and not indicative of a historic occupation. One piece of fire-cracked rock was also collected. The temporally diagnostic artifacts collected from the 12Or384 reconnaissances indicate Terminal Woodland and Mississippian occupations (Striker 2000).

The raw materials utilized in prehistoric tool manufacture and recovered from the Jackson (2000) and Striker (2000) surveys include: fossiliferous (n=67); indeterminate (n=339); local chert-high quality (n=403); local chert-low quality (n=97); Holland (n=5); and Wyandotte (n=20). In examining the total number of debitage by stage of reduction (primary, secondary, and tertiary), Striker (2000) concluded that, because secondary and tertiary flakes were much more prevalent than primary flakes in the artifact assemblage, the site was used for the production of blanks, preforms, and finished artifacts rather than the initial reduction of raw materials. Due to the number of artifacts and location of the site, it was considered potentially eligible for the NRHP and further work was recommended (Jackson 2000, Striker 2000).

The archaeology of the Forest region indicates prehistoric utilization and occupation of the area from the Paleoindian period to the Mississippian period. However, because of its variable terrain and diversity of environmental zones and landforms, discrete cultural components are distributed differentially across the landscape. The identified cultural sequence of the Hoosier National Forest region illustrates that the differential distribution of sites throughout the region is the likely result of changing adaptive strategies.

Cultural Sequence

Paleoindian Period

Within the Forest region, Paleoindian (ca. 10,000 to 8,500 B.C.) projectile points have been recorded in the three physiographic zones (Crawford Upland, Mitchell Plateau, Norman Upland) encompassing south-central Indiana. The highest concentration of Paleoindian points in the region have been found on Pleistocene terraces along major river valleys, particularly the Ohio River and its principal tributaries (Sieber et al. 1989). Paleoindian utilization of upland areas is represented by smaller, less diversified sites and isolated point finds. Frequently, these sites are associated with springs, sinkholes, closed basin depressions, and outcrops of high-quality chert (e.g. Wyandotte chert in Harrison County). Several rockshelters in the Hoosier National Forest have also produced Paleoindian points (see Waters 2002; Waters 2004).

Early Archaic Period

The Archaic tradition in the Forest region is a roughly 7,000 year episode of cultural development, diversification, and adaptation to Holocene biotic systems. The subsistence-settlement strategies of Early Archaic (ca. 8,000-6,000 B.C.) groups strongly resemble those practiced by the Paleoindians. Thus, although Early Archaic sites occur on virtually all landforms, and in greater numbers than sites of the previous period, large sites tend to be restricted to the terraces, point bars, and floodplain ridges of the Ohio River and its major tributaries (Sieber et al. 1989). In addition, the uplands were heavily exploited during this period, with small upland streams, springs, and sinkholes being common open-site locations (Sieber et al. 1989; Fitting et al. 1979). The majority of documented Early Archaic sites have been interpreted as small hunting camps, with larger, more permanent base camps located nearby (Waters 2004). Evidence for the extensive use of caves and rockshelters in eastern North America is also first identified during the Early Archaic; in the Hoosier National Forest, Early Archaic diagnostics have been recovered from a number of rockshelters (Waters and Cochran 1999; Waters 2002; Nagle and Cochran 2001). The preference for high-quality cherts exhibited by Paleoindian groups continues into at least the early portion of the Early Archaic, while a tendency towards the use of lower quality lithic raw materials is noted by the end of the period (Sieber et al. 1989). Within the Forest region, short term sites of this period have been documented near chert outcrops (Waters 2004). Local Early Archaic projectile point types include Thebes, Kirk, St. Charles, and Bifurcate base clusters (Justice 1987).

Middle Archaic Period

Though poorly represented in the Hoosier National Forest region, general subsistence-settlement trends of Middle Archaic groups (ca. 6,000-3,000 B.C.) have been identified. Because this period coincides with the Hypsithermal Climatic Interval, an interlude of warmer than average temperatures, drier conditions, and the expansion of xeric forest taxa across much of the eastern United States (Sieber et al. 1989), changes in both material culture and site preference have been perceived. The introduction of ground and polished stone tools during this period, especially mortars, pestles, grinding slabs, and pitted nutting stones, suggests an increased reliance on vegetal foodstuffs, particularly hickory nuts (Sieber et al. 1989). This may be a behavioral response to the development of mature oak-hickory forests related to increased moisture stress brought on by the Hypsithermal. Fishing equipment such as bone hooks and net weights also appear in Middle Archaic assemblages indicating an increased reliance on aquatic resources. Large shell middens found along the major waterways of the mid-continent provide evidence for relatively intensive long-term exploitation of freshwater mussels and suggest a general increase in sedentism during the Middle Archaic. Although game animals and nuts were available in most areas of the Hoosier National Forest region, fish and shellfish were largely concentrated along the major river systems. In addition, evidence indicates that the Hypsithermal resulted in rivers with decreased gradients and biotically rich slackwater environments, such as floodplain sloughs and oxbows that are thought to have been the most productive locales for settlement by hunters and gatherers during this time (Sieber et al. 1989). The paucity of Middle Archaic sites along the small rivers and large creeks in the region, like Patoka River, Salt Creek, and Bean Blossom Creek, reflects the concentration of occupations along the Ohio River. Sieber et al. (1989: 33) add: “Upland portions of the Hoosier National Forest regions indicate very little utilization during this interval, perhaps only by occasional hunting or plant resource gathering parties whose base settlements were on the Ohio River.” This pattern implies that, for the most part, upland areas may have been largely abandoned; Middle Archaic diagnostics have been recovered from only six rockshelters in the Forest region (Waters 2004). Diagnostic projectile points from this period include Raddatz, Karnak, Godar, and Stanley (Justice 1987).

Late Archaic Period

According to Sieber et al. (1989: 35): “The Late Archaic Period affords evidence of the most intensive occupation of the Hoosier National Forest region during prehistory.” Increased sedentism and population densities continued into the Late Archaic period (3,000-1,000 B.C.) and are argued to have resulted in distinct regional stylistic boundaries, often correlating with a local drainage system. Identified Late Archaic cultures within south-central Indiana include French Lick, Bluegrass, Riverton, Shell Mound, and Harrodsburg (Munson 1976, Munson 1980, Sieber et al. 1989). The regional Late Archaic settlement model documents an expansion beyond the main river valleys and into upland areas; most likely due to increased population levels and competition amongst the growing regional cultural identities. The settlement pattern of this period indicates that “open sites associated with small upland streams and springs frequently show evidence of intensive habitation, probably as seasonal base camps” (Sieber et al.: 36).

The increased occupation of upland habitats by Late Archaic groups also facilitated the exploration and exploitation of the larger caves within the Hoosier National Forest Region (Munson and Munson 1990, Sieber et al. 1989). Evidence from Wyandotte Cave in Crawford County, Indiana (Munson and Munson 1990) indicates that Late Archaic peoples were the first to use hickory bark torches to penetrate deep into the cave to extract various cave salts and minerals; a practice that continued into the Late Woodland period. The recovery of numerous Late Archaic diagnostics from at least twenty-four rockshelter sites within the Hoosier National Forest region (Waters 2004) is evident that such upland features were also heavily exploited during this period. In addition, at least one human burial from Indian Cave (Waters and Cochran 1999) has been tentatively dated to the Late Archaic period suggesting that rockshelters may have, by this time, been regarded as ceremonial and/or mortuary locations.

The Late Archaic archaeological assemblage is basically an elaboration of that of the Middle Archaic, though characterized by an increase in the variety of lithic tool types present. Diagnostic projectile points of this period found within the Hoosier National Forest region include Matanzas, Benton, Elk River, Brewerton, Vosburg, Table Rock, Merom, Karnak, McWhinney, and other Late Archaic Stemmed varieties (Justice 1987). However, in marked contrast with earlier periods, the preference for high-quality cherts shifted to a reliance on locally available cherts of inferior quality, even at sites close to a high-quality chert source (Sieber et al. 1989). Other common Late Archaic artifacts include endscrapers, grooved axes, bi-pitted hammerstones, manos, mortars, grinding stones, nutting stones, and bone and antler tools (Waters 2004).

Early Woodland Period

The Woodland sequence of south-central Indiana represents a 2,000 year period of increasing technological and subsistence innovations. Within the sequence, economic systems shift from hunting-gathering-fishing strategies to economies that included horticulture and eventually maize agriculture. Ceramic manufacture is characteristic of Woodland cultures and become more diversified, both technologically and stylistically, through the Early, Middle, and Late temporal periods.

The Early Woodland period (1,000-200 B.C.) of south-central Indiana marks the advent of ceramic-using cultures. According to Sieber et al. (1989: 41): “Early pottery types in the Hoosier National Forest region bear resemblance to Marion Thick, Baumer, early Crab Orchard, and Fayette Thick.” Within the Forest region, diagnostic Early Woodland projectile points include Adena, Kramer, Dickson, and Motley and Gary

Contracting Stemmed (Justice 1987). Wyandotte chert dominates the lithic assemblages during this period (Sieber et al. 1989).

The settlement pattern of the Early Woodland contrasts sharply with that of the Late Archaic. During this period, the uplands and small river valleys were virtually abandoned. Instead, intensive habitation sites are found along the Ohio River and its principal tributaries, perhaps due to an increasing reliance on horticultural practices (Sieber et al. 1989). Near the major rivers, rockshelters were utilized by Early Woodland peoples and have been interpreted as short-term hunting camps (Sieber et al. 1989, Waters 2004). Overall, at least sixteen rockshelter sites within the Hoosier National Forest region include Early Woodland components (Waters 2004).

In the latter half of the Early Woodland period, the Adena culture manifests in the middle and upper Ohio River Valley. The culture is distinct from other Early Woodland groups by its elaboration of mortuary ceremonialism, including burial mounds containing log crypts. No Adena mounds have been identified within the Hoosier National Forest; however reports of looted mounds near Tell City, Indiana and in Harrison County, Indiana, and the common occurrence of Adena points near Wyandotte chert quarries, suggest that Adena peoples utilized the Forest region (Sieber et al. 1989).

Middle Woodland Period

Burial ceremonialism and the extra-regional exchange of exotic goods continue into the Middle Woodland period (200 B.C.-A.D. 600). In south-central Indiana, components of the Adena culture become fully elaborated by the Scioto Hopewell. Social hierarchy in this culture is inferred from the differential treatment of the dead, in which the burial mounds of certain individuals include exotic grave goods. Within southern Indiana, three other Middle Woodland cultural expressions are known: the late Crab Orchard Tradition, the Mann Complex, and Allison-LaMotte. Points diagnostic of the Middle Woodland period documented in the Hoosier National Forest region include Lowe Flared Base, Snyders, and points of the Copena Cluster (Justice 1987). The preference for Wyandotte chert continues and a number of Middle Woodland lithic workshops have been documented in Harrison County, Indiana (Sieber et al. 1989).

Like the cultures of the preceding period, Middle Woodland groups resided in permanent or semi-permanent villages along the major rivers and their principal tributaries (Sieber et al. 1989), most likely because the fertile floodplains allowed for experiments in maize cultivation which was widespread by the end of the Middle Woodland period. Ephemeral habitations are associated with the mounds and earthworks of the Scioto Hopewell. Diagnostic points from the Middle Woodland are scant along the large upland creeks, such as Salt Creek, Patoka River, and Bean Blossom Creek, and fewer still along their small tributary streams. The settlement model suggests that, in the hill country of south-central Indiana, only small, specialized sites occur.

The extraction of cave minerals from Wyandotte Cave appears to have been a major activity of Middle Woodland peoples (Munson and Munson 1990). Finished Middle Woodland artifacts made from Wyandotte Cave aragonite have been recovered across the Midwest (Sieber et al. 1989); fragments of a platform pipe made from this material were also recovered from Arrowhead Arch rockshelter in Crawford County, Indiana (Waters 2004). Overall, at least thirty-seven rockshelter sites within the Hoosier National Forest region have produced Middle Woodland diagnostics; Rockhouse Hollow rockshelter in Perry County, Indiana is a substantial Middle Woodland site and included late Crab Orchard ceramics, Snyders points, and numerous mica fragments (Waters 2004). Middle Woodland rockshelter occupations have been interpreted as representing "transitory, seasonal camps for the extraction and processing of upland resources" (Sieber et al. 1989).

Late Woodland Period

The Late Woodland period (600-A.D. 1,200) is marked by a decline in mortuary ceremonialism and extra-regional trade. Intensive horticulture and maize cultivation continues as does settlements situated in stream valleys. However, elaborate burial mounds constructed for the elite are replaced by smaller mounds which served as general community cemeteries lacking the indications of social stratification characteristic of the Middle Woodland period. Late Woodland settlements, thus, are argued to have "constituted economically and politically semi-autonomous units" (Sieber et al. 1989: 50) in the form of nucleated farmsteads or hamlets.

Diagnostic points of the Late Woodland period within the Hoosier National Forest region include Jack's Reef Corner-Notched, Jack's Reef Pentagonal, Raccoon Notched, and small, unnotched triangular points (Justice 1987). These latter points presumably represent true arrowheads and mark the introduction of the bow and arrow in the Forest region. The preference of Wyandotte chert declined during this period emphasizing a preference for small chert cobbles, found in alluvial deposits or in glacial till, to fashion arrow tips (Sieber et al. 1989).

Evidence for Late Woodland occupations in the Hoosier National Forest region is sparse, although Late Woodland triangular points have been recorded at open sites (Sieber et al. 1989). At least thirty-five rockshelters within the Forest region have produced Late Woodland diagnostics; these have been interpreted as transitory camps for the extraction of upland resources (Sieber et al. 1989, Waters 2004.

Late Prehistoric Period

The Late Prehistoric period (1,000-A.D. 1,650) in southern Indiana is represented by four spatially discrete but essentially contemporaneous cultures; the Oliver Phase located along the West Fork of the White River, the Angel Phase centered near the mouth of the Green River, the Caborn-Welborn Phase near the confluence of the Ohio and Wabash Rivers, and Fort Ancient in southeastern Indiana. Traits shared by these groups include planned community construction, often in sizeable towns or villages; outlying smaller hamlets and individual farmsteads; and the practice of true agriculture in which maize, beans, and squash were cultivated. The cultures of this period were socially stratified, with indications of the rise of chiefdoms in some areas (Sieber et al. 1989). Large, flat-topped truncated pyramidal mounds on top of which public or ceremonial structures stood and stockades are characteristic of the Angel Phase and Fort Ancient cultures.

Diagnostic points of the Late Prehistoric period include those in the Triangular Cluster (Justice 1987), humback knives, Ramey knives, endscrapers, side-scrapers, gravers, perforators, celts, nutting stones, and slab metates (Sieber et al. 1989). Dover and Mill Creek cherts from sources outside of Indiana were used in the manufacture of the larger agricultural implements; Wyandotte chert was only occasionally employed in the manufacture of lithic tools (Sieber et al. 1989). Late Prehistoric ceramic assemblages are far more diversified that those of the Woodland tradition and include animal and human effigies, bowls, plates, bottles, jars, and salt pans. Late Prehistoric ceramic designs and iconography are associated with the Mississippian Southeastern Ceremonial Complex.

Because the Late Prehistoric cultures of southern Indiana were agriculturalist, their communities were located along the low terraces and floodplains of the major river systems. Primary settlements also focused on natural levees which border oxbow lakes and sloughs and that have fertile sandy or light loamy soils; the Ohio River has these features from its mouth to just downstream from Tell City in southern Indiana (Sieber et al. 1989). According to Sieber et al. (1989: 60): “There is comparatively little evidence for a [Late Prehistoric] occupation of the Hoosier National Forest, apart from the occasional recovery of a Late Woodland/Mississippian triangular point or a few shell-tempered sherds from rockshelters.” Instead, it seems that “Late Woodland traditions continued to persist in these areas, with the adoption of a few [Late Prehistoric] traits, such as smaller triangular points and distinctive pottery types” (Vanden Heuvel and Dorwin 1979: 17).

A large Oliver phase occupation has been documented in Orange County, Indiana within Hoosier National Forest property. Known as the Cox’s Woods site, this village included a number of small mounds and an earth embankment (Redmond and McCullough 1996). Because the site is located in an upland area away from a major river valley, it is considered to be anomalous of the Late Woodland settlement pattern. Sieber et al. (1989) have suggested that because two salt sources are nearby (Half Moon Spring and Lick Creek) the occupants of Cox’s Woods may have been extracting the mineral. A significant Angel Phase component has been identified in the Rockhouse Hollow rockshelter in Perry County, Indiana while Arrowhead Arch rockshelter in Crawford County, Indiana includes a Fort Ancient component (Sieber et al. 1989). Elsewhere in the Hoosier National Forest region, Fort Ancient sites have been documented from the occasional recovery of serrated triangle points, again mostly from rockshelters (Sieber et al. 1989). Currently, only eight rockshelters within the Forest region have produced Late Prehistoric components (Waters 2004).

The cultural sequence outlined above correlates well with the regional settlement models proposed by Munson (1976) and Munson (1980). Archaeological surveys and excavations from the Monroe Lake and Patoka Lake areas in south-central Indiana illustrate a general paucity or diffuse patterning of Paleoindian and Early Archaic sites in the region; a strict focus on floodplain and riverine environments by Middle Archaic cultures; intensive and/or long-term Late Archaic occupations in both floodplain and upland environments; a concentration of Early-Middle Woodland sites in the major river valleys; Late Woodland utilization of small valley-upland areas; and Late Prehistoric sites confined to the major river valleys.

Summary

The information provided above describes the natural and archaeological setting of the Wesley Chapel Gulf area. The natural setting of the Hoosier National Forest region was reviewed to gain an understanding of the regional environment and geology which produced its distinct ecological niches. The prehistoric settlement pattern of the Hoosier National Forest was presented to demonstrate that discrete cultural components occur differentially throughout the Forest region and to provide a model with which to interpret the archaeology of the Gulf area.

ARCHAEOLOGICAL INVESTIGATIONS AT WESLEY CHAPEL GULF

General Field Methods

Prior to fieldwork, two sites were chosen for archaeological investigations, site 12Or382 and site 12Or384. Test excavations of these sites were conducted in order to:

1. Determine the extent, nature, and significance of prehistoric cultural deposits within the sites.
2. Test anomalies identified during the ground penetrating radar survey of 12Or382;
3. Obtain data necessary for interpreting the role of the Wesley Chapel Gulf area in the regional settlement pattern.
4. Assess the eligibility of 12Or382 and 12Or384 for nomination to the National Register of Historic Places.

Because of time and budget constraints, it was proposed that a total of 50 one-meter² test units, 25 units in each site, would be excavated. It was hypothesized that the excavation of 50 units would be sufficient in acquiring the needed data for determining the nature and extent of features across the Wesley Chapel Gulf Area and for assessing the significance of both sites. It was further conceived that enough cultural evidence would be obtained through the excavations that a determination of the prehistoric utilization of the area adjacent to Wesley Chapel Gulf and its role in the regional settlement pattern could be made.

Archaeological testing of sites 12Or382 and 12Or384 took place during 14 days between June 28 and July 16, 2004. The field crew consisted of the author, Ball State Anthropology graduate students Max Black, Tommy McAlpine, and Glacier Merchant, and Ball State Anthropology undergraduates Brad King and Casey Simpson. The crew was divided into three groups of two and the partnerships remained unchanged throughout the field session. The weather during the three week period was sunny and hot with greater than average temperatures during the days (> 86ºF) and little rainfall.

Sites 12Or382 and 12Or384 were first relocated using the site maps included in the Phase I survey reports (Jackson 2000, Striker 2000), the UTM coordinates from state site forms, and Global Position System (GPS) coordinates. Once relocated, a smaller sampling universe within each site was established with GPS using a Sokkia Axis 3 receiver with submeter accuracy. All excavation units were situated within the boundaries of the newly established sampling universes. Due to concerns of sediments washing into sinkholes and cave entrances, excavation units were placed at least 10m from such features. Other than this limitation, excavation units were distributed to ensure the sampling of all topographic features present in the two sites. Because portions of 12Or382 were surveyed with a magnetometer, a number of units were placed over subsurface anomalies to test the validity of the magnetometer results. Specific site methods will be discussed following the general excavation procedures.

A wooden stake was first placed in the southwest corner of each 1x1m^2 excavation unit and its location and ground elevation were recorded with GPS. No permanent site datum was established at either site because all units were referenced by their UTM coordinate. The stake acted as the datum for each individual unit. Thirty centimeters of the stake was left above ground surface to ensure consistent elevation readings during excavation. The opening and closing elevations, as well as level depths, were measured from the top of the stake with a string and level.

Though the area had been cultivated in the past, the plowzone in each site was difficult to identify in the stratigraphy of individual test units. The Ap horizon (Level 1) was arbitrarily defined as being 15-20cm below the ground surface (Wingard 1984). This level was removed with shovels and screened through 6.4mm wire mesh. Once the subsoil, or B horizon, was encountered, the floor of the units were cleaned and leveled with a trowel and examined for evidence of cultural features. Test units that exhibited no cultural features but continued to produce artifacts below Level 1 were excavated further by 10cm levels until sterile deposits were defined. If no features were present, and artifacts were not recovered beyond Level 1, the excavation of the unit was terminated.

Artifacts were placed into zip-lock bags and labeled according to the site, the unit number, and the level. Sequential bag numbers were also placed on the bag and recorded into a bag log for easy cross-referencing with the Unit and Level forms. Black and white photographs were taken of each excavated unit and documented with a Photo Log as were digital color images. Unit Forms were completed for each unit to document information such as its location from the datum, its opening and closing elevations, the number and thickness of levels, the black and white and digital photo numbers, and the associated bag numbers. Individual levels were also recorded using a Level Form. This form noted what kinds of artifacts were recovered from each level, each level's soil description, its associated artifact bag numbers, the photo numbers and the interpretation of the level. Fire-cracked rock was collected and placed into its own numbered bag and labeled with the site, unit, and level from which it came and recorded into the Fire-Cracked Rock List.

If cultural features were encountered at the base of the plow-zone, they were given a feature number and documented and described by a Feature Form. The feature number was also recorded into a Feature Log and referenced with the Unit and the proper Level Forms. If the feature extended beyond the original test unit, the unit was expanded until the feature was fully defined. A plan view of the feature was then mapped on the level sheet in which it first appeared and was photographed with both the black and white and digital cameras. Following documentation and plan mapping the feature was bisected into north and south halves, and the south half was excavated by trowel in 10cm levels. Artifacts recovered from the feature were placed into a numbered bag and labeled according to the site, unit, level, and feature number. The profile of the feature was then drawn on the Feature Form and photographed and the feature fill from the north half was saved to be taken to the ARMS laboratory for flotation. At the close of each unit's excavation, photographs were taken of a profile wall and, if present, the excavated feature. Archaeological data and personnel comments were noted on the Unit Form and the closing elevations were made. The units were backfilled following complete documentation.

Lab Methods

All collected cultural materials were taken to the ARMS laboratory at Ball State University for processing and analysis. Artifacts were cleaned using standard ARMS techniques. Excavated artifacts were washed and rebagged according to unit and level. The identification, labeling, and counting of materials was conducted by the author. The identification of chipped stone raw materials was made by reference to samples on file at ARMS and Cantin's (1994) manuscript. All identifications were aided by the use of a Wild M3Z binocular microscope and verified by the Principal Investigator, Don Cochran. Prehistoric chipped stone artifacts were classified according to a standardized ARMS system devised by Cochran (1985, 1991) (Appendix C).

All artifacts recovered from the 2004 investigations at Wesley Chapel Gulf will be curated by the Glenn A. Black Laboratory of Archaeology in Bloomington, Indiana under an agreement with the Hoosier National Forest.

Site Specific Archaeological Methods

12Or382

Site12Or382 is reported as covering an area of 165m north to south and 150m east to west (Striker 2000:8-10). Within this 24,750 square meter site area, an 80m x 80m portion of the northern part of the site was chosen for investigation during this project. The sample area within the site was chosen because it contained the highest artifact density within the site as well as a potential feature that was identified during the field reconnaissance (Striker 2000:8-10). A magnetometer survey of five 20m x 20m units within the 80m x 80m sample area was undertaken along with the excavation of 24 units measuring 1 x 1m and one unit measuring 3 x 1m. The 27 square meter excavation sample represented a 0.4% sample of the 80m x 80m sample area and a 0.1% sample of the total site area. The UTM coordinates of each excavation unit are shown in Appendix A and site maps are in Appendix E.

Site Locations Confidential
Not For Public Disclosure

Figure 20: Portion of USGS 7.5' French Lick, Indiana Quadrangle showing tested area of 12Or382.

Site Locations Confidential
Not For Public Disclosure

Figure 21. Unit locations at site 12Or382 and site 12Or384.

Prior to the excavation of the test units, five 20m² grids were surveyed through near-surface remote sensing (Figure 22). Ball State Anthropology Graduate Student, Max Black used a Geoscan FM 36 Fluxgate Gradiometer during this survey to aid in the identification of subsurface anomalies. The results were processed using the software package Geoplot version 3.00 for Windows. Thirty-one percent of the 80m² sampling universe were surveyed by the gradiometer. Of the area covered by the gradiometer, 12 1m² test units and one 3x1m unit representing a combined area of 15m², or approximately 7% of the gradiometer surveyed area, were tested through archaeological excavations.

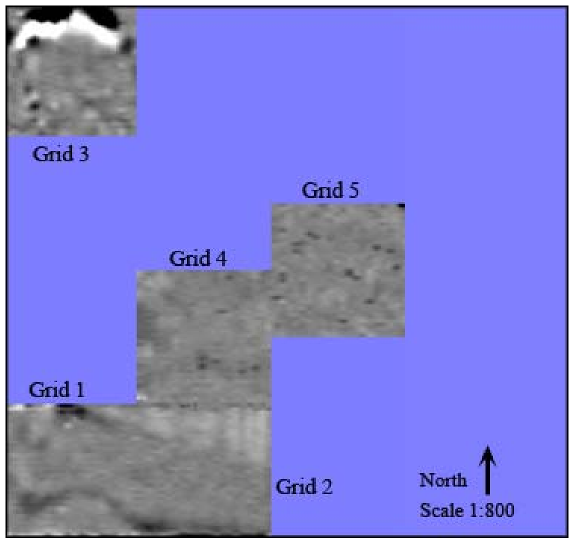

Figure 22: Project map depicting areas surveyed by near-surface remote sensing.

Eleven 1m² test units, representing a 0.2% sample of the total project area, were excavated outside of the five grids surveyed by the gradiometer. The UTM coordinates of each excavation unit and correlation of units and a gradiometer grid are shown in Appendix A. A more thorough explanation of remote sensing and the usability of gradiometer survey in archaeological contexts are provided in Appendix B.

12Or384

The size of 12Or384 was reported as 165m x 105m (Striker 2000:12-14). Testing of the site during this project focused on an area that measured 171m north to south and 134m east to west (Figures 23 and 21). The portion of the site that was the focus of investigations was chosen because it spanned a broad area situated directly over Boiling Spring Rise and Boiling Spring Cave. This upland portion of the site topography sloped down towards the Gulf as did the intermittent drainage within the site. A gradiometer survey of site 12Or384 was not conducted due to the undulating topography and dense vegetation.

Site Locations Confidential
Not For Public Disclosure

Figure 23: Portion of USGS 7.5' French Lick, Indiana Quadrangle showing the tested area of 12Or384.

During this project, 26 units measuring 1m² each, or 26 square meters, were excavated in site 12Or384. Given the total site area of 17,325 square meters, the 26 test units represented a 0.01% sample of the site. The UTM coordinates of each excavation unit are shown in Appendix A and a site map is shown in Appendix E.

Results of Gradiometer Survey and Subsurface Testing

12Or382

The processed results of the gradiometer survey indicate the presence of subsurface anomalies. These anomalies appear as amorphous blobs, small round dots and long curvilinear lines; typical signatures of natural phenomena. However, the results reveal a distinct lack of linear anomalies commonly associated with structural elements or irrigation trenches, and round, regular-edged anomalies often indicative of pits, hearths or kilns.

The amorphous anomaly observed in the northern margin of survey Grid 3 was the only feature readily identifiable in the processed image. Units 9 (3x1m) and 10 (1x1m) were placed over the anomaly to investigate its nature. The anomaly was not an *in situ* cultural deposit, but was rather the result of a fragipan; a soil feature associated with Bedford soils that often appear on the upper end of drainageways and on broad ridgetops in the area and which are included in the mapping of CrB, CrC2, and CxC2 soils (Wingard 1984). A fragipan (Figures 24 and 25) is a dense impenetrable lens of soil cemented together by silicate clays that does not allow water to percolate through it.

It is a very firm and brittle silt loam and silty clay loam subsurface horizon that appears cemented and restricts root growth (Wingard 1984).

Figure 24: Digital photograph of observed fragipan in unit 9, 12Or382.

Figure 25: Digital photograph of observed fragipan in unit 10, 12Or382.

The anomalies seen in Grids 4 and 5 that appear as small, irregular dots (see Figure 22) were investigated by subsurface excavation. No cultural features were identified; however, units in these areas produced fire-cracked rock (unit 14) and iron concretions (Units 12, 13 and 14). Both fire-cracked rock and naturally occurring iron deposits possess ferromagnetic properties which may cause them to appear as magnetic anomalies.

Features

Two features were recorded during the testing of 12Or382; one in Unit 12 and the other in Unit 13. Feature 2 appeared as a circular pit revealed at the bottom of level 1 (48cm depth below datum (DBD)) in unit 12. Unit 12 was extended 50cm south to accommodate the diameter of the feature. This portion of the unit was labeled as 12-A and the recovered artifacts from its excavation were considered separate from unit 12. The feature had a Munsell color of 10YR5/6, yellowish brown, and a clay loam texture. It was easily identifiable in the surrounding 10YR4/4, dark yellowish brown, silt loam matrix (Figure 26).

Figure 26: Digital photograph of Feature 2 in unit 12, 12Or382.

Feature 2 measured 26cm north to south and 27cm east to west. The feature was excavated according to the methodologies previously stated and was found to extend 4cm into the subsoil. Three lithic flakes were recovered from Feature 2; however it is the author’s opinion that the feature was not a cultural manifestation, but rather a natural clay lens within the subsoil. Another lens of yellowish brown (10YR5/8) clay was encountered in the southeast corner of unit 14.

The color and texture of Feature 2 is similar to the potential feature encountered during the Phase I reconnaissance of 12Or382 by Striker (2000). The potential feature located by Striker (2000: 9) was described as “an intrusion of brown (10YR4/3) clay loam with charcoal flecking into the dark yellowish brown (10YR4/6) clay loam subsoil.” No artifacts were recovered from the shovel test probe that contained the potential feature and it was not excavated (Striker 2000).

Feature 3 appeared as a dark, semi-circular stain in the center of unit 13, level 2 (60cm DBD). The stain was dark brown (7.5YR3/2) in color and measured 28cm north to south and 30cm east to west (Figure 27). The feature was bisected and the southern half was excavated to subsoil (70cm DBD). The profile of Feature 3 revealed a lighter, yellowish brown (10YR5/8) discoloration in the center of the darker stain (Figure 28). A concentrated area of charcoal was documented in the southeast portion of Feature 3 at68cm DBD. No artifacts were recovered from the feature during its excavation. Feature 3 is interpreted as a tree mold.

Figure 27: Digital photograph of Feature 3 in unit 13, 12Or382.

Figure 28: Digital photograph of Feature 3 after excavation.

Artifacts

A total of 2,021 artifacts were recovered during the Phase II excavations of 12Or382 (Appendix D). The cultural material collected from subsurface testing of the site is as follows: a biface; biface fragments (n=7); bipolar artifacts (n=7); cores (n=37); endscrapers (n=2); a graver; modified flakes (n=75); a notch flake; a perforator; a perforator fragment; point fragments (n=11); and unmodified flakes (n=1,766). Selected lithic tools are shown in Figure 29. Five pieces of fire-cracked rock were also collected from four units. It should be noted that more fire-cracked rock was recorded in the field, however, after cleaning and analysis, most of these specimens were found to be limestone blocks that had not been thermally altered or cracked. The presence of these rocks is common in the subsoil, emphasizing its relationship to outcropping bedrock and the soil parent material. Historic artifacts, most likely from the old farmstead that occupied the northern portion of the Gulf area, are represented by a glass bottleneck of aqua color, a piece of whiteware, coal, and coal slag.

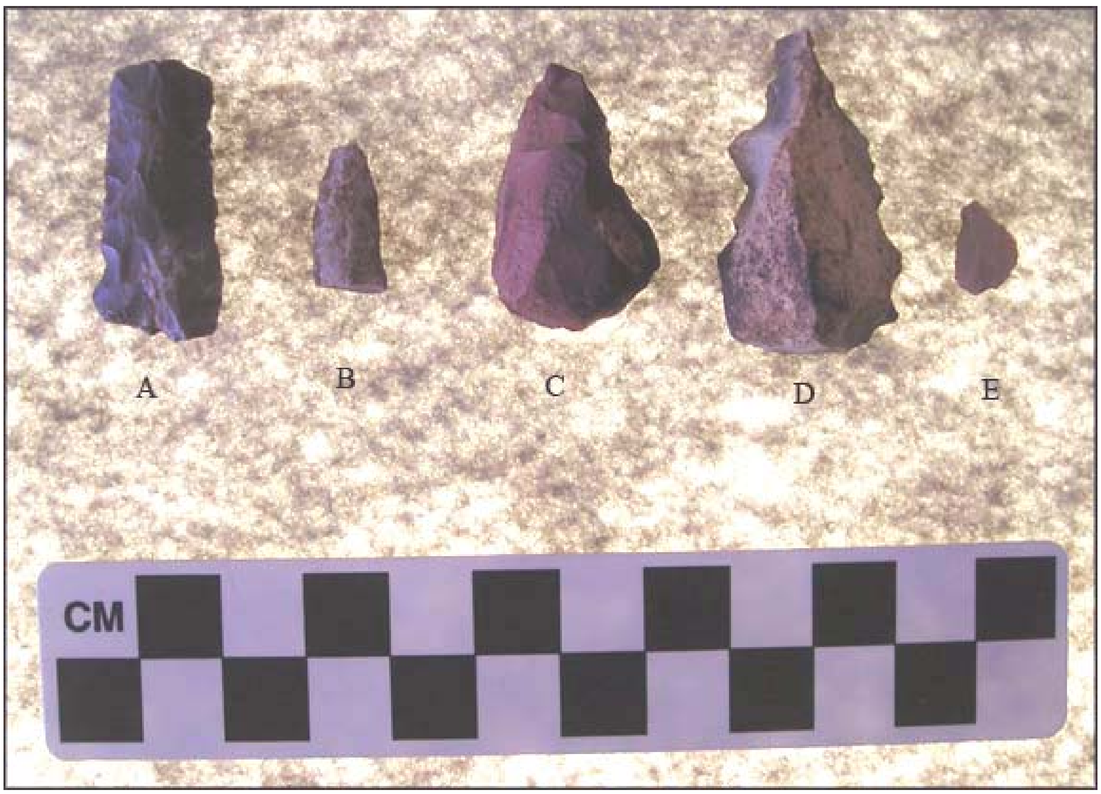

Figure 29: Selected tools from 12Or382: Perforator (A); Perforator fragment (B); Endscraper (C, D); Graver (E).

Unmodified flakes dominate the artifact assemblage of 12Or382 representing 88% of the total artifacts recovered. Block flakes account for 4.4% of the lithics collected, followed by modified flakes which represent 3.7% of the assemblage.

Diagnostic artifacts from 12Or382 (Figure 30) include a Brewerton point; a Late Archaic Stem point fragment; a Matanzas point fragment; a McWhinney Heavy Stemmed point; and a St. Charles Point. The prehistoric temporally diagnostic artifacts recovered from the subsurface excavations of 12Or382 indicate Early (St. Charles) and Late Archaic (Brewerton, Matanzas, McWhinney Heavy Stemmed, Late Archaic Stem) occupations. The inclusion of a Matanzas point fragment suggests a French Lick component (Munson and Cook 1980, Justice 1987), a Late Archaic cultural phase well represented in south-central Indiana.

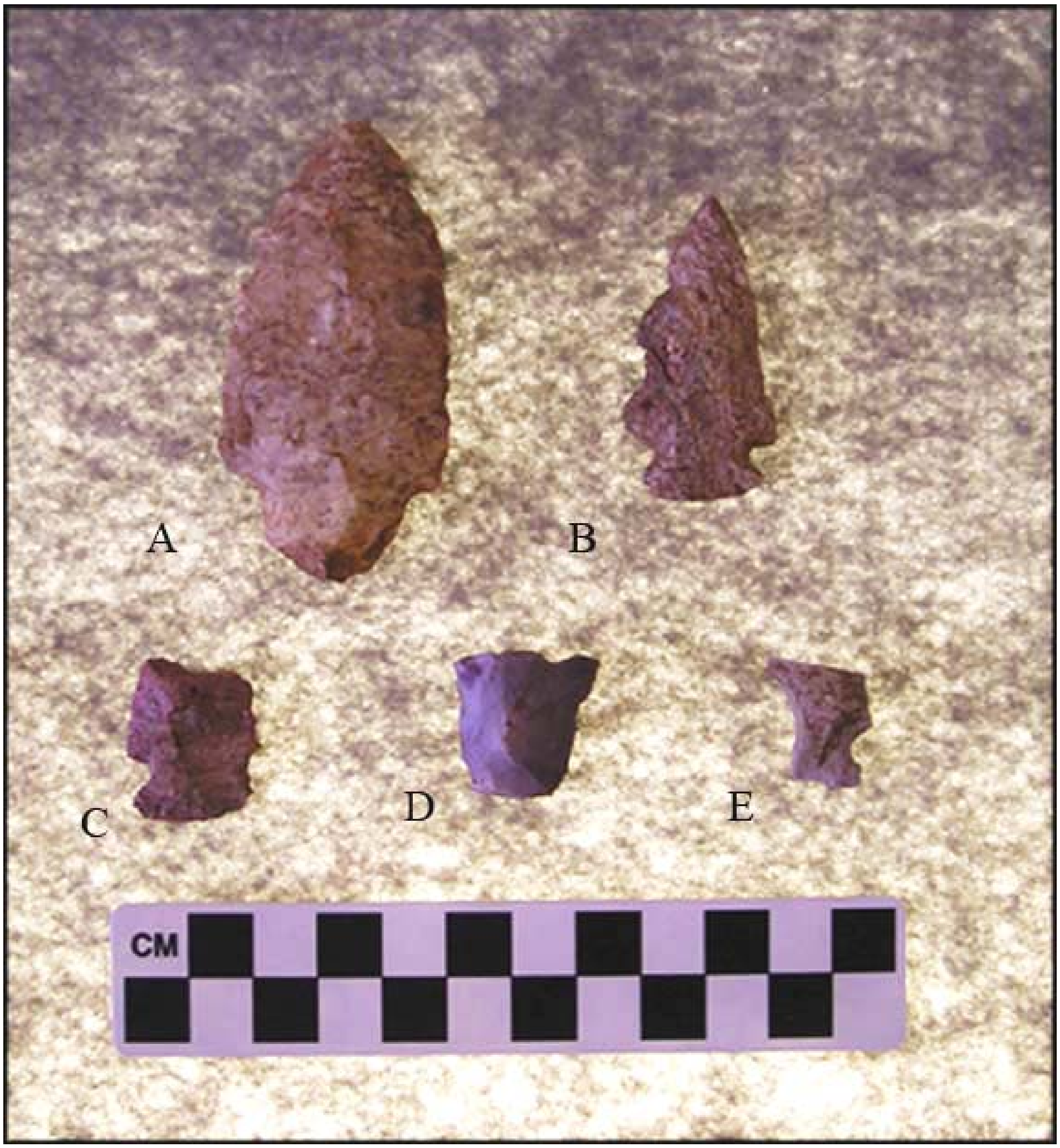

Figure 30: Diagnostic artifacts from 12Or382: McWhinney Heavy Stemmed point (A); St. Charles point (B); Brewerton point fragment (C); Late Archaic Stem point fragment (D); Matanzas point fragment (E).

The prehistoric artifacts recovered from the excavations were manufactured from the following raw materials: Allens Creek (n=241); Bryantsville (n=8); Derby (n=14); Haney (n=2); Indian Creek (n=467); Lead Creek (n=2); Stanford (n=315); Indeterminate (n=933); Upper St. Louis (n=7); and Wyandotte (n=16).

Indeterminate cherts account for the bulk (46%) of raw material included in the 12Or382 artifact assemblage. Indian Creek represents 23% of the raw material sample, followed by Stanford (16%), and Allens Creek (12%). Bryantsville, Derby, Haney, Lead Creek, Upper St. Louis, and Wyandotte chert, each account for less than 1% of the raw materials identified from the project area.

The soil profiles documented in the excavation units consisted mostly of a silt loam, dark yellowish brown (10YR4/4; 10YR4/6; 10YR3/4; 10YR3/6) A-horizon. The subsoil either exhibited darker colors of brown (7.5YR4/4; 7.5YR5/6) silt loam or red (2.5YR4/8) clay loam. The average depth of the arbitrary A-horizon was 18cm.

12Or384

Unlike 12Or382, a thin plow zone horizon (5-8cm) was discernable in the profiles of some of the units. The soil texture of the A horizon in 12Or384 consisted mainly of silt loam and silty clay loam. Soil color was predominantly dark yellowish brown (10YR4/4, 10YR4/6, 10YR3/6), though brown (10YR5/3) and dark grayish brown(10YR4/2) also occurred. The subsoil was a lighter yellowish brown (10YR5/4, 10YR5/6) with a higher clay content than the horizon above.

Artifacts

A total of 432 artifacts were recovered during the Phase II excavations of 12Or384 (Appendix D). The cultural material collected from subsurface testing of the site is as follows: biface fragments (n=4); block flakes (n-5); cores (n=5); modified flakes (n=14); point fragments (n=3); a Raddatz Side-Notched point; a Table Rock Stemmed point; and unmodified flakes (n=399). Three pieces of fire-cracked rock were collected from unit 9. It should be noted that more fire-cracked rock was recorded in the field, however, after cleaning and analysis, most of these specimens were found to be limestone blocks that had not been thermally altered or cracked.

Unmodified flakes dominate the artifact assemblage of 12Or384 representing 92% of the total artifacts recovered. Modified flakes account for 3% of the lithics collected, followed by block flakes and cores which represent approximately 1% of the assemblage.

Diagnostic artifacts from 12Or384 (Figure 31) include a Raddatz Side-Notched point and a Table Rock Stemmed point fragment. The Raddatz Side-Notched point is temporally diagnostic of the Middle Archaic period; the Table Rock Stemmed point suggests a Late Archaic occupation (Justice 1987).

Figure 31: Diagnostic artifacts from 12Or384: Raddatz Side-Notched point (A); Table Rock Stemmed point (B).

The prehistoric artifacts recovered from the excavations were manufactured from the following raw materials: Allens Creek (n=55); Bryantsville (n=1); Indian Creek (n=105); Stanford (n=35); Indeterminate (n=225); and Wyandotte (n=11).

Indeterminate cherts account for the bulk (52%) of raw material included in the 12Or384 artifact assemblage. Indian Creek represents 24% of the raw material sample, followed by Allens Creek (12%), Stanford (8%), and Wyandotte (2.5%).

Features

Just one feature was documented in 12Or384. Feature 1 was identified in the southeast corner of Unit 1 at the base of the plow zone. The southeast corner of the unit was expanded 50cm south and 50cm west to fully reveal the discoloration. The feature appeared as a circle of dark, reddish gray (5YR4/2) silt loam within the yellowish brown (10YR5/6) subsoil (Figure 32). Feature 1 measured 24cm north to south and 37cm east to west; it was excavated according to the methods previously outlined. The depth of Feature 1 was 33cm; no artifacts were recovered from the feature. In fact, only two artifacts were recovered from unit 1 in total. Feature 1 is believed to be natural, not aboriginal in origin; it is interpreted as the mold of a tree and its root system (Figure 33).

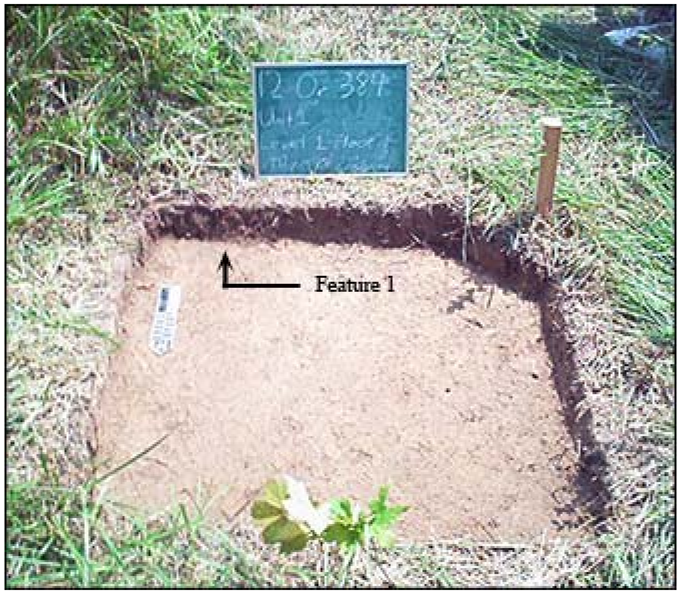

Figure 32: Digital photgraph of Feature 1 in unit 1, 12Or384.

Figure 33: Digital photograph of Feature 1 after excavation.

Results of Archaeological Investigations at 12Or382 and 12Or384

As previously stated, the goals of archaeologically testing two sites within at Wesley Chapel Gulf were as follows: 1) determine the extent, nature, and significance of prehistoric cultural deposits within the sites; 2) test subsurface anomalies identified during the gradiometer survey of 12Or382; 3) obtain data necessary for interpreting the role of the Wesley Chapel Gulf area in the regional settlement pattern; and 4) assess the eligibility of 12Or382 and 12Or384 for nomination to the National Register of Historic Places. The success of the Phase II investigations in meeting each of these goals is discussed below.

Goal One

The first goal was to determine the extent, nature, and significance of prehistoric cultural deposits within 12Or382 and 12Or384. Three features were recorded and investigated during the test excavations in the sites. The features were not aboriginal deposits, but were instead associated with natural phenomena: a clay lens (Feature 2) and the remains of trees (Features 1 and 3). It is the author's opinion that the potential feature encountered during the supplemental survey of 12Or382 by Striker (2000) was also a naturally occurring clay lens. Such lenses, or films, develop as silicate clays are leached from the upper soil horizon and accumulate in voids within the B horizon. Feature 2 was most likely a tree mold in which clay collected and formed a distinct shape of contrasting texture and color in regards to the surrounding subsoil. In Crider soils, translocated silicate clays have been known to develop clay lenses within the Bt horizon (Wingard 1984).

Though cultural features were not encountered during the Phase II investigations of 12Or382 and 384, it is not impossible that such deposits exist or have existed in the Wesley Chapel Gulf area. The soils of the upland topography surrounding the Gulf depression consist of either eroded Crider silt loams (CrC2) or eroded Crider-Frederick-Caneyville (CxC2) silt loams. These soils developed in loess and in residuum limestone bedrock; however, most of the loess in steeper areas has been washed away (Wingard 1984). The clear-cutting of forests in the late 19th and early 20th centuries, coupled with the subsequent cultivation of the area, likely accelerated the erosion of the surface loess around the Gulf.

Slopes in the area range from 2 to 12 percent and water runoff is considered medium (CrC2) to rapid (CxC2) (Wingard 1984). The slopes of the upland ridges surrounding the Gulf are contoured so that surface runoff drains into the scattered sinkholes and swallowholes, and into the Gulf itself. Sediment deposition, through alluvial and/or colluvial processes, has not occurred on the upland areas adjacent to the Gulf, and thus has not protected *in situ* cultural features. Had aboriginal deposits ever existed outside of the Gulf depression, they almost certainly have been destroyed by the removal of surface loess and the further erosion of sediments by water movement. It is therefore highly unlikely that intact archaeological deposits remain in the upland areas immediately adjacent to the Gulf.

There is the potential that *in situ* cultural horizons are buried in the frequently flooded Haymond silt loam found on the Gulf floor. The ground floor of Wesley Chapel Gulf consists of alluvial silt, estimated to be at least 34 feet thick, which has been deposited by the flooding and receding of water resurging from Boiling Spring Rise. Two sediment cores collected from the floodplain floor indicate the presence of buried A-horizons within its soil stratigraphy (Durbin et al. 2003). The buried horizons consist of poorly developed entisols (an A-horizon directly overlying a C-horizon) and inceptisols (A-Bw-C horizon sequence). The presence of inceptisols suggests that some of the buried A-horizons were exposed to the environment long enough for pedogenesis (soil development) to occur. Intact archaeological deposits containing important information on prehistoric lifeways may be present in the buried A-horizons below the ground surface of the Gulf.

The caves of the Wesley Chapel Gulf area also have the potential to produce buried archaeological deposits. Munson and Munson (1990) have shown that caves in south-central Indiana were explored and exploited by prehistoric peoples. Boiling Spring Cave, directly above the rise of the Gulf, is, for the most part, a dry cave. Blocks of limestone breakdown were observed within the cave suggesting that cultural materials may lie underneath collapsed materials. Deposition in this cave may also have occurred from colluvial sediments issuing from the mouth of the cave. Elrod Cave and the Lost River cavernous system are relatively wet and active. Sediments from within and outside these systems have been transported into the cave by fluvial processes resulting in the deposition of mud and silt within the caves. Sherwood and Goldberg (2001:148) emphasize:

> Usually the deposits in hydrologically active passages are generated by geologic process, typically fluvial in nature, and remain both wet and active. As a result, archaeological deposits in these active environments are difficult to recover, and materials are rarely found in their behavioral context. However, this condition has not diminished their archaeological significance, as the simple presence of artifacts and human remains in these environments can be informative.

Thus, the karstic cave systems of the Wesley Chapel Gulf area have an exceptional potential to produce archaeological deposits important to our understanding of prehistoric settlement and exploitative patterns.

Goal Two

The second goal was to test subsurface anomalies identified during the gradiometer survey of 12Or382 through archaeological excavation. The processed results of the gradiometer survey revealed the existence of several subsurface anomalies, particularly in Grids 3, 4, and 5. Test units placed over the magnetic anomalies defined during the gradiometer survey failed to produce archaeological features. However, several possible causes for the presence of subsurface anomalies can be identified.

Thermally altered rock (fire-cracked rock), which attains discernable remnant magnetism when heated and cooled, was collected from Unit 14. Oxidized iron reduction features in the form of concretions, concentrations, and nodules can also cause magnetic anomalies. In Orange County, the reduction and transfer of iron has occurred in most of the soil types (Wingard 1984). Units 13 and 14 produced iron concretions. Both fire-cracked rock and naturally occurring iron deposits possess ferromagnetic properties which cause them to appear as magnetic anomalies and may explain the small, irregular dots that are visible in Grids 4 and 5. The large amorphous anomaly observed in grid 3 was the result of a fragipan. Two possibilities account for why the fragipan appeared as a magnetic anomaly. First, because the fragipan is slowly permeable and restricts water movement it creates a perched water table above the fragipan. As water sits above the fragipan, the rate of iron reduction in the soil horizon increases and may show up as an anomaly of roughly the same shape of the fragipan. Second, the density of the fragipan may produce another type of magnetic feature known as viscous remnant magnetization. Though it remains unclear what exact processes caused the fragipan to appear as a magnetic anomaly, it was very discernible in Units 9 and 10 nonetheless.

In general, the gradiometer survey data appears to support the conclusions resulting from testing of the two sites. It appears that both sites have been seriously deflated and aboriginal features are unlikely to remain.

Goal Three

The third goal of this project was to obtain data necessary for interpreting the role of the Wesley Chapel Gulf area in the regional settlement pattern. Based on the presence of diagnostic artifacts, it appears that the Wesley Chapel Gulf area was utilized most frequently during the Archaic periods. The temporally diagnostic prehistoric artifacts recovered from the subsurface excavations of 12Or382 indicate Early (St. Charles) and Late Archaic (Brewerton, Matanzas, McWhinney Heavy Stemmed, Late Archaic Stem) occupations. From 12Or384, the Raddatz Side-Notched point is temporally diagnostic of the Middle Archaic occupation while the Table Rock Stemmed point suggests a Late Archaic occupation. The Late Archaic period is the most represented (71%) temporal period in the archaeological assemblage recovered during the testing of 12Or382 and 12Or384.

Overall, the predominance of Archaic diagnostics from 12Or382 and 12Or384 is not surprising. Munson (1976) has argued that the medium-sized valleys in the highly dissected uplands provide ample evidence of extensive Archaic occupations. The majority of Late Archaic diagnostic points in the assemblage are indicative of the regional settlement model proposed for the period. Sieber et al. (1989: 36) explains:

> …the Late Archaic settlement pattern indicates expansion beyond the main river valleys. Open sites associated with small upland streams and springs frequently show evidence of intensive habitation, probably as seasonal base camps. With increasing population levels, Late Archaic peoples probably found it difficult to hunt game efficiently along the favored larger rivers, and thus began to exploit the secondary drainage systems and adjoining upland intensively, at least during portions of the year.

Furthermore, during the Late Archaic period, locally available cherts of inferior quality were frequently used (Sieber et al. 1989); a notion supported by Beard's (1993) archaeological survey of Orange County. Indeterminate cherts account for the bulk (46%) of raw material included in the 12Or382 artifact assemblage, while indeterminate cherts account for much (52%) of the raw material included in the 12Or384 artifact assemblage. It is speculated that at least a portion of these specimens are the locally available Lost River chert, which outcrops within Wesley Chapel Gulf. Archaeological evidence from near the Wesley Chapel Gulf area indicates that Late Archaic quarry and workshops sites may occur in the immediate vicinity of Lost River chert outcrops (Beard 1993). The macroscopic description of this chert type, provided by Cantin (1994), is consistent with much of the indeterminate raw material. Until a sample of Lost River chert from Wesley Chapel Gulf is collected and compared to the indeterminate raw material from both site assemblages, this connection must remain speculative.

It is also during the Late Archaic period that the caves of south-central Indiana were first explored (Munson and Munson 1990). High-quality Wyandotte chert and other minerals were extracted from Wyandotte Cave in Crawford County by prehistoric peoples from the Late Archaic period to the Late Woodland period, though the readily accessible sources of chert were exhausted by Late Archaic and Early Woodland miners (Munson and Munson 1990). Interestingly, many of the artifacts fashioned from this material by Late Archaic and Early Woodland groups "seem to have had some ritual or ceremonial connotations (e.g., Turkey Tail "points")" (Munson and Munson 1990: 63). According to Munson and Munson (1990: 63):

> Although it cannot be demonstrated that any of the chert used for the artifacts actually came from the cave (there are numerous and abundant sources of identical material on the surface), it remains an intriguing possibility that Wyandotte Cave was the source of at least some of the chert used for these 'sacred' objects, a possibility suggested by the strong ethnographic correlation in eastern North America among various supernatural beings, caves, and cave minerals.

The presence of three caves within the Wesley Chapel Gulf area may have been a draw to Late Archaic explorers; leading to another possible cause for the increased presence of diagnostics from this period.

Goal Four

The fourth goal of this study was to assess the eligibility of 12Or382 and 12 Or384 for nomination to the National Register of Historic Places. Because no *in situ* cultural deposits were recorded by either remote-sensing or test excavations, and because of the extensive erosion that was documented at both sites, it appeared unlikely that undisturbed archaeological deposits remained at the sites. In addition, the sample of artifacts recovered during testing of the sites duplicates the site data recovered during the surface surveys conducted by ASC (Jackson 2000, Striker 2000). It would appear that data redundancy has been demonstrated and further work at the sites appears unlikely to reveal additional information. These two factors, the lack of *in situ* deposits and data redundancy, indicate that the two sites are not individually eligible for listing on the National Register of Historic Places based upon the present state of archaeological knowledge.

Although, 12Or382 and 12Or384 do not, by themselves, appear eligible for listing on the National Register of Historic Places, it seems reasonable to consider the sites documented around the Wesley Chapel Gulf as an archaeological whole, rather than as discrete entities. Seventeen prehistoric sites have been recorded in the immediate vicinity of Wesley Chapel Gulf, restricted for the most part to an area less than 200 meters wide around the Gulf. Since these archaeological resources are associated with the unique natural setting of Wesley Chapel Gulf, they could be considered as an archaeological district.

One avenue for establishing significance for the archaeological resources associated with Wesley Chapel Gulf is through a cognitive approach to past use of the unique features of the Gulf. As mentioned previously, the ethnographic and archaeological evidence indicates that anomalous geological formations, such as Wesley Chapel Gulf and its associated caves and sinkholes, played a special role in the world-view of prehistoric cultures. The evidence for Wesley Chapel Gulf as such a place is reviewed in the following section.

The Sacred Nature of the Wesley Chapel Gulf Area

The physical environment of a particular place or landscape feature may invoke a sense of spirituality. Matsubayashi (1991: 334) states: “Certain landscapes stir a sense of awe and admiration in people by their sheer presence.” Wesley Chapel Gulf is such a place. For example, in describing his Wesley Chapel Gulf visits and explorations, Malott (as cited in Wadzinski and Reynolds 2001) wrote:

> This miserable little stretch of the underground river route gives us but a tantalizing glimpse of a mighty cavern, whose main channel length cannot be less than eight miles. Inadequate as it is, it is a sample of a big cavern in the making…coursed by a dangerous river. It presents a forbidding,

> mysterious, fearful picture to the senses and it is impressive only when conceived as the underground conduit of a large stream more than eight miles in length and 60 to 150 feet beneath the upland surface which feed water to it through…nondescript inlets.

Further acknowledgement of the significance of Wesley Chapel Gulf stems from its state and national titles. The Gulf was designated as a National Natural Landmark in 1972 because of its impressive geologic features (Wadzinski and Reynolds 2001). In 1991, it was designated as a Special Area by the Hoosier National Forest (Wadzinski and Reynolds 2001). Special Areas are defined as "unique or unusual ecological, botanical, zoological geological, scenic, historic, prehistoric, and other areas which merit special recognition and management" (Wadzinki and Reynolds 2001: 3).

The Wesley Chapel Gulf area meets three of the four criteria established by Tacon (1999: 37) pertaining to sacred landscape features. The three criteria that the area expresses are: 1.) it is a place where the results of great acts of natural transformation can be best seen; 2.) because the area includes both upland and wetland elements and is near the interface of the Crawford Upland and Mitchell Plateau, it is a point of change between geology, hydrology, and vegetation; 3.) it is an unusual landscape feature.

The Wesley Chapel Gulf area includes three caves; Elrod Cave, Boiling Spring Cave, and the access cave to the subterranean Lost River cavernous route. Many sinkholes also dot the landscape surrounding the Gulf. The ethnographical and archaeological record substantiates the cosmological and ideological conceptualization of caves and sinkholes as portals to the underworld. Anecdotal accounts attest that after heavy rains and as floodwaters rush out of Boiling Spring Rise, a very loud "roar" is heard from the Gulf. The author has heard the underground Lost River flowing from outside of the limestone walls. According to Theodoratus and LaPena (1994: 23), "the spirit often makes its presence known through an audible buzzing." It could be surmised that the roaring floodwaters and hidden water sounds of the Gulf were associated with spirits of the underworld.

The archaeological record demonstrates that Late Archaic peoples were the first to enter caves for both resource extraction and ceremonial purposes. 3rd Unnamed Cave produced a Late Archaic Matanzas point in association with chert mining activities and cave art. The majority of diagnostic projectile points in the archaeological assemblage are representative of the Late Archaic period; a period when locally available cherts of inferior quality were heavily utilized. Lost River chert outcrops within Wesley Chapel Gulf and, is believed by the author to make-up a portion of the raw material collected during the 2004 archaeological fieldwork.

Wesley Chapel Gulf is an intriguing location because it was repeatedly visited by Native American groups over a long period of time and it is a regional archaeological anomaly in comparison with other upland areas away from major and minor river valleys, is quite intriguing. This phenomenon is best understood if one views the Wesley Chapel Gulf area as a sacred landscape. As Crumley (1999: 271) explains:

> In the study of sacred landscapes, the importance of memory and culture cannot be overstated. Culture acts like a "carrier wave", transmitting information across time and space. Even when the connection between memory and meaning is severed (as when ritual is retained but its meaning is lost), information can still be delivered to future generations. The most effective carriers of social memory are landscape elements that have both practical utility and cosmic meaning, such as caves, springs, or gardens.

The continued visitations to Wesley Chapel Gulf, represented by approximately 11,000 years of cultural history, and its uniqueness in terms of the regional landscape certainly suggests the timelessness and mnemonic character of the Gulf as a sacred landmark.

However, we are currently not able to materially demonstrate the role of Wesley Chapel Gulf in the cognitive landscapes of the indigenous people who inhabited the area. At this time, it is pertinent to point out the potential for this avenue of investigation and to suggest that further studies be undertaken to test hypotheses associated with this theme.

SUMMARY AND CONCLUSIONS

Wesley Chapel Gulf is a unique and significant geological feature located within the Hoosier National Forest in Orange County, Indiana. The Gulf most likely began as a cave, whose internal void could not support the ground surface. As the ground began to fall in, a number of sinkholes appeared on the surface. The dissolution of the underlain Ste. Genevieve limestone by the movement of the underground Lost River caused the sinkholes to collapse, forming Wesley Chapel Gulf. Over time, the fallen rock was dissolved and removed by the Lost River leaving an open and spacious floor. Because of its size, roughly 8.3 acres, it is an anomalous natural feature to Indiana and is one of the most interesting natural features in the Hoosier National Forest. Because of its location on the margin of two distinctive physiographic zones, Wesley Chapel Gulf, and the diverse ecotone associated with it, provides a wealth of natural resources advantageous to human subsistence.

Phase II archaeological testing of the Wesley Chapel Gulf area was conducted in June and July 2004 by six Ball State Anthropology students, including the author. The purpose of subsurface testing was threefold:

1. To acquire a better sample of archaeological data from two sites on record for the Wesley Chapel Gulf area from which an assessment of the significance of the Gulf as an archaeological district could be made.

2. To gain sufficient data pertinent to defining the role of Wesley Chapel Gulf within the Hoosier National Forest's regional settlement pattern.

3. To gain a more thorough interpretation of the prehistoric use of a unique, natural feature.

The data collected in 2004 from the test excavations of two Gulf sites; 12Or382 and 12Or384 are meant to build upon the existing archaeological record of the Wesley Chapel Gulf area.

A gradiometer survey was conducted in portions of 12Or382. Eight percent of the site was surveyed by the gradiometer. The processed results indicated the presence of subsurface anomalies. The anomalies appeared as amorphous blobs, small round dots, and long curvilinear lines; typical signatures of natural phenomena. Excavation units placed in areas surveyed by the gradiometer and exhibiting subsurface anomalies identified no cultural features. The anomalies detected by the gradiometer were determined to be fire-cracked rock, naturally occurring iron deposits, and a fragipan.

Three potential archaeological features were recorded during the excavations of 12Or382 and 12Or384. Feature 1 was identified in unit 1 of 12Or384. Feature 2 was identified in unit 12 of 12Or382; Feature 3 was identified in unit 13 of 12Or382. The potential features were excavated and documented according to the archaeological procedures developed for the project. The three potential features were found to be natural in origin with no cultural significance.

A total of 2,453 artifacts were recovered from the subsurface excavations of 12Or382 and 12Or384. Five temporally diagnostic projectile points were collected from 12Or382; an Early Archaic component is represented by a St. Charles point, a Late Archaic component is represented by a Brewerton, a Late Archaic Stem, a McWhinney Heavy Stem, and a Matanzas. Two temporally diagnostic projectile points were collected from 12Or383; a Middle Archaic Raddatz side-notched point, and a Late Archaic Table Rock point.

The Late Archaic period is the most represented temporal period in the archaeological assemblage. Several factors account for this occurrence. First, because of increasing population levels along the region's major river systems, Late Archaic peoples expanded beyond the main river valleys and inhabited upland areas near streams and springs. Boiling Spring Rise, located within Wesley Chapel Gulf would have provided a constant source of fresh water. Second, as populations moved into the uplands, locally available cherts of inferior quality became the preferred raw material for stone-tool production. Lost River chert, considered to be of inferior quality, outcrops within Wesley Chapel Gulf and is presumed to account for a portion of the indeterminate raw material identified in the 12Or382 and 12Or384 archaeological assemblage indicating that the chert was indeed utilized to some extent. Third, it is during the Late Archaic period that the caves of the Eastern Woodlands and south-central Indiana were first explored and exploited. The Wesley Chapel Gulf area includes three caves that are accessible to humans. Lastly, the phenomenon of shamanism and the ritual use of caves are documented to have their origins in the Late Archaic. Cave and rock art, which often depict images representative of a three-tiered cosmological world-view and often attributed to shamanism, also commence in the Late Archaic. The caves and the rise of the Lost River within the Gulf correspond to aboriginal ideologies of liminal and sacred places, in that it is an area where this (the middle world) and the underworld intersect.

The high artifact density and multicomponent context of the Wesley Chapel Gulf area is unlike other documented upland sites in the Hoosier National Forest region. According to the regional prehistoric settlement pattern, large, multicomponent sites tend to occur in floodplain and terrace environments, while smaller, single component sites tend to occur in the uplands. The settlement model indicates a general paucity of prehistoric sites within the upland areas of the Hoosier National Forest and those that exist have been described as temporally unidentifiable hunting-camps. To date, over 4,700 prehistoric artifacts have been recovered from the Wesley Chapel Gulf area. Cultural components dating from the Paleoindian period to the Late Prehistoric period have been recognized.

The available data clearly identifies the Wesley Chapel Gulf area as an archaeological anomaly. Though the highly visible Late Archaic component is in itself not surprising; as a large, multicomponent site in an upland area and in no proximity to a major river, the archaeology of the Gulf is inconsistent with the regional settlement model. It is plausible to assume that the Gulf area was initially explored by Paleoindian and Early Archaic groups; isolated Paleoindian points have been found in association with springs and sinkholes, while Early Archaic open-site hunting camps have been identified near upland streams, springs, and sinkholes. Originating in the Late Archaic period and continuing to the Late Prehistoric period, Wesley Chapel Gulf and its associated caves and sinkholes may have been viewed as a liminal place where the underworld and middle world intersect. As a unique geological feature with ideological and cosmological connotations attached to it, Wesley Chapel Gulf may have served as a sacred landmark for ritual and ceremonial activities.

The archaeological excavations at sites 12Or382 and 12Or384 did not produce the kinds of cultural material commonly associated with sacred sites or ritual activity (i.e. rock or cave art, platform or effigy pipes, human burials, and Late Prehistoric ceramics imprinted with iconographic designs). The artifact assemblage from the Wesley Chapel Gulf sites and the data collected during the test excavations of two Gulf sites does not provide the necessary evidence to categorically state that Wesley Chapel Gulf was a component of a prehistoric sacred landscape.

The archaeological fieldwork and background research for this project provides some data with which to assess the potential significance of the Wesley Chapel Gulf area as an archaeological district. An archaeological district is a grouping of archaeological sites related primarily by their common components and restricted to a definable geographic area. Seventeen prehistoric sites have been recorded in the immediate vicinity of Wesley Chapel Gulf. The boundaries between the sites are so vague, however, that it is more appropriate to consider the archaeological setting as one, discrete entity. For the most part, the site perimeter is restricted to an area less than 200 meters around Wesley Chapel Gulf.

The information provided by the archaeology of Wesley Chapel Gulf is considered important because it has significant bearing on regional research questions. For instance, the current data shows that the archaeological potential of the Gulf area is greater than the potential of other upland sites not in proximity to a major river system. Ethnographical and archaeological analogs for unique natural areas suggest that evidence relating to prehistoric cosmologies and ideologies may in fact be restricted to the two dry caves of the Gulf area (Elrod Cave and Boiling Spring Cave) in the form of cave art and/or to the sinkholes surrounding the Gulf which may have served as repositories for ceremonial offerings or ritual mortuary pits. It is therefore recommended that an archaeological survey of Elrod Cave and Boiling Spring Cave be conducted to search for and document the presence of prehistoric cave art. Archaeological testing of a sample of the Gulf area’s sinkholes is also recommended to investigate whether they were used for domestic or ritual activities (i.e. Mayan cenotes). The alluviated floor of the Gulf also has the potential to contain buried archaeological deposits which would be of great importance not only in understanding how the Gulf was utilized in prehistory, but also in furthering the understanding of its role in the regional settlement model and is recommended for deep testing.

In addition, to be eligible under Criterion D, a property must be associated with human activity and be critical for understanding a site's prehistoric or historic environment. A property can be related to human activity through such cultural systems as settlement, migration, processes, ideals, beliefs, and lifeways. The archaeology of the Wesley Chapel Gulf area has demonstrated that the area was an important landmark in prehistory, whether for short or long term occupation remains unknown. Archaeological and ethnographical analogy has allowed for a broader, cognitive interpretation of the cosmological and ideological aspects inherent to the Gulf's geology that cross-culturally served a vital role to the belief systems of prehistoric groups.

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APPENDIX A

UTM COORDINATES OF TEST UNITS

Site Locations Confidential
Not For Public Disclosure

APPENDIX B

GRADIOMETER SURVEY OF 12Or382

Discussion of the Gradiometer Survey of 12OR382
Max Black

On June 28th and 29th 2004, site 12OR382 was surveyed by remote sensing using a FM 36, Geoscan Fluxgate Gradiometer. The Gradiometer survey was employed in order to help identify archaeological features and structures within an 80 by 80 meter portion of site 12 Or 382 (Figure B1). This portion of the site will be referred to as the project area. Within the project area, 2,000 square meters were the subject of a magnetic survey which consisted of five 400 square meter sections. Each $400m^2$ section consisted of a square grid with 20 meter sides. The five grids were placed within the project area using an opportunistic sampling pattern. Due to the presence of multiple sinkholes, the Elrod Cave entrance, Wesley Chapel Gulf itself and a vehicle path, the potential locations for the survey grids were somewhat limited. Despite these limitations, an appropriate sample of 12OR382 was investigated by remote sensing.

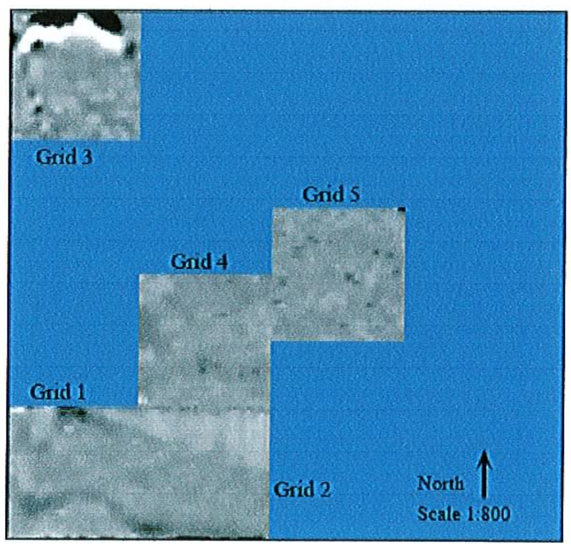

Figure B1. Gradiometer survey of 12Or382.

Test units were not placed within 30 feet of the Gulf, Elrod Cave, or the sinkholes, which means that any potential magnetic anomalies in these areas could not be tested. Placement of the survey grids was decided in the field as the conditions dictated. Figure B1 shows the locations of the survey grids within the project area. In general, the survey grids were laid out so as to include representations of all the topographic features present within the project area.

The survey areas were partitioned into grids with 20m sides. The survey grids were in turn subdivided into a mesh of smaller squares using tapes on the north and south ends of the grid and another movable tape pulled between the end tapes to mark transects. The gradiometer was used to record measurements of the geomagnetic field strength at 0.1 Nanotesla (nT) resolution along each transect at half meter intervals. The magnetic intensity was digitally recorded for each 1m x 0.5m square, in the gradiometer's solid state memory bank. At a later date the stored readings were processed and analyzed. The survey technique used provides detailed systematic coverage of the survey area at a resolution capable of locating features of at least one meter or more in size. The method used at 12Or382 amounts to 20 transects of 40 readings each, or 800 readings per grid.

Statistical imaging software uses the readings from a survey grid to produce several types of visual representations of the survey results. Dot-density, trace plot (a type of wire frame) and shade plots are the primary methods used to view survey data processed with Geoplot 3, the software package accompanying the Geoscan FM 36.

The processing software used in this study provides more than a means of viewing data. Geoplot 3 contains many tools designed to apply statistical corrections to the entire data set that will help reduce environmental background magnetization, eliminate iron spikes and in general help clean up the image. By filtering out background magnetism, manmade features that were once present at the site become easier to identify. Regular and sometimes amorphous shapes seen in the processed imagery of the survey area can reveal the location of subsurface phenomena and in some cases its nature.

Even with the degree of technology applied to magnetic gradient survey, there remains a high level of interpretation involved when determining the nature of magnetic anomalies. The only way to become proficient at interpreting survey results is to have firsthand experience with the data collection and the tools used to process that data. However, several general rules should be kept in mind when looking at a map of a magnetic survey. Linear anomalies at right angles to each other often indicate structural or building elements or irrigation trenches. While commonly associated with natural phenomena, round anomalies with regular edges are indicative of pits, hearths or kilns. Furthermore, it is assumed, based on the results of this survey and others conducted by the author, that amorphous irregularly shaped anomalies are typical signatures of natural phenomena. These types of anomalies may appear as long curvilinear stripes or amoeba like blobs.

As seen in Figure B1, the magnetic survey of site 12Or382 resulted in a range of anomalies. Amorphous blobs, small round dots and long curvilinear lines are present, but there is a distinct lack of linear anomalies or anything resembling a structure.

To test the possibility that any of these shapes might represent archaeological features, one by one meter test units were placed over a variety of the anomalous shapes. Four units were placed in Grid 1; one unit was placed in Grid 2; three units were placed in Grid 3; three units were placed in Grid 4; and four units were placed in Grid 5.

A 1x3m test unit (Unit 9) and a $1m^2$ (Unit 10) test unit were place over the large amorphous shape seen in the north central part of Grid 3 (Figure B1). None of the excavation units testing the gradiometer survey data produced archaeological features and in many cases a definite cause for the observed anomaly could not be determined. Upon further research of the geomagnetic technique and based on other remote sensing surveys conducted by the author, several possible causes for the unidentified magnetic anomalies are possible.

Thermally altered rock, better known as fire-cracked rock (FCR), has been shown to possess discernable remnant magnetism. As with any heated, baked or fired object containing ferrous minerals, rocks attain a slight magnetism upon cooling from the Currie temperature (640°C). FCR was found in many of the units excavated within the survey grids and may account for the presence of the magnetic anomalies. Another possibility is oxidized iron reduction features which can cause magnetic anomalies. Iron redox occurs in soils with fluctuating high water tables.

Iron reduction in the form of concretions, concentrations and nodules become highly ferromagnetic as they oxidize in an aerobic environment. Iron reduction was noted in many of the test units in the survey areas and when concentrated may produce magnetic anomalies.

The amorphous anomaly observed in survey Grid 3 was the only feature readily identifiable in the excavation units. This anomaly was the result of a fragipan, a soil phenomenon commonly found in areas along the shoulder slopes of ridges overlooking sinkholes in the region. A fragipan is a dense impenetrable lens of soil cemented together by silicate clays that does not allow water to percolate through it (Figures B2 and B3). In effect this feature creates what is known as a perched water table above the fragipan. Several aspects of the fragipan may account for its appearance as a magnetic anomaly. First, the water table above the fragipan increases the rate of iron reduction above it, which will show up as an anomaly of roughly the same shape of the feature. Second, the density of the fragipan may produce another type of magnetic feature known as viscous remnant magnetization. This type of magnetism is less intense than others but could be picked up by the gradiometer if the environmental background magnetism is slight; which is the case at site 12Or382.

Figure B2: Digital photograph of observed fragipan in unit 9, 12Or382.

Figure B3: Digital photograph of observed fragipan in unit 10, 12Or382.

Based on the fact that none of the excavations at 12Or382 produced buried archaeological features or structures, it is assumed that there were no human induced magnetic elements at the site or that their presence has been erased through erosion. Of the entire project area 31% was covered by the gradiometer survey. Of the surveyed area 13% was tested by excavation. Furthermore, eleven units were placed outside of the survey areas all together.

It was found that of the units included within the gradiometer grids, seven units (3, 9, 10, 11, 12, 13, and 14) contained induced magnetic elements in the form of iron accretions (Appendix D). Unit 3 was in Grid 1; Units 9, 10, and 11 were in Grid 3; Units 12, 13, and 14 were in Grid 5. Grids 3 and 5 showed the most magnetic anomalies recorded by the gradiometer

(Figure B1) and test units in these grids produced iron accretions. The small dots and amorphous blobs seen in Grid 5 (Figure B1) most likely represent natural iron deposits in the soil.

APPENDIX B

GRADIOMETER SURVEY OF 12Or382

Discussion of the Gradiometer Survey of 12OR382
Max Black

On June 28th and 29th 2004, site 12OR382 was surveyed by remote sensing using a FM 36, Geoscan Fluxgate Gradiometer. The Gradiometer survey was employed in order to help identify archaeological features and structures within an 80 by 80 meter portion of site 12 Or 382 (Figure B1). This portion of the site will be referred to as the project area. Within the project area, 2,000 square meters were the subject of a magnetic survey which consisted of five 400 square meter sections. Each $400m^2$ section consisted of a square grid with 20 meter sides. The five grids were placed within the project area using an opportunistic sampling pattern. Due to the presence of multiple sinkholes, the Elrod Cave entrance, Wesley Chapel Gulf itself and a vehicle path, the potential locations for the survey grids were somewhat limited. Despite these limitations, an appropriate sample of 12OR382 was investigated by remote sensing.

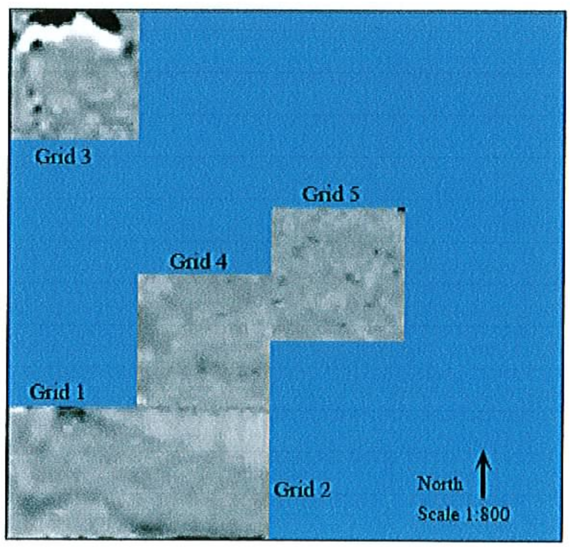

Figure B1. Gradiometer survey of 12Or382.

Test units were not placed within 30 feet of the Gulf, Elrod Cave, or the sinkholes, which means that any potential magnetic anomalies in these areas could not be tested. Placement of the survey grids was decided in the field as the conditions dictated. Figure B1 shows the locations of the survey grids within the project area. In general, the survey grids were laid out so as to include representations of all the topographic features present within the project area.

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Figure B3: Digital photograph of observed fragipan in unit 10, 12Or382.

Of the 80m x 80m project area, 31% was covered by the gradiometer survey. Of this area 0.4% was tested by excavation. Furthermore, eleven units were placed outside of the survey areas all together. Based on the fact that none of the magnetic anomalies tested at 12Or382 revealed buried archaeological features or structures, it appears likely that either there were no humanly induced magnetic elements at the site or that their presence was erased through erosion.

Of the units included within the gradiometer grids, seven (3, 9, 10, 11, 12, 13, and 14) contained induced magnetic elements in the form of iron accretions (Appendix D). Unit 3 was in Grid 1; Units 9, 10, and 11 were in Grid 3; Units 12, 13, and 14 were in Grid 5. Grids 3 and 5 showed the most magnetic anomalies recorded by the gradiometer

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APPENDIX C

CHIPPED STONE ARTIFACT CLASSIFICATION

ARMS
Chipped Stone Artifact Classification

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

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

Stage 2 Bifaces. A stage 2 biface is defined as "that stage during which the core blank or spall is given an edge . . . or, where the edge is too sharp and low-angled,. . it is thickened so that roughly centered, circumferential edge-angles of between 55 degrees to 75 degrees result. Flake scars may cover less than half of the width of the biface, producing a hexagonal, irregular to thick lenticular cross-section" (Callahan 1979:36).

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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APPENDIX D

ARTIFACT INVENTORIES

Artifact Inventory of 12Or382.

Unit	Level	Artifact	Raw Material	Untreated	Heat Treated	Heat Damaged	Total	FCR (ct.)	Iron Accretions Present (Y/N)	Gradometer Grid No.
1	1							0	N	1
		Biface Fragment, Stage 4	Unknown	1	0	0	1			
		Point Fragment	Unknown	0	1	0	1			
		Unmodified Flake	Allens Creek	1	0	0	1			
		Unmodified Flake	Indian Creek	0	2	0	2			
		Unmodified Flake	Stanford	1	0	0	1			
		Unmodified Flake	Unknown	6	1	0	7			
2	1							0	N	1
		Block Flake	Indian Creek	1	0	0	1			
		Unmodified Flake	Indian Creek	1	0	0	1			
		Unmodified Flake	Stanford	6	0	0	6			
		Unmodified Flake	Unknown	6	0	0	6			
3	1							0	N	1
		Modified Flake	Indian Creek	0	1	0	1			
		Unmodified Flake	Allens Creek	3	0	0	3			
		Unmodified Flake	Indian Creek	3	0	0	3			
		Unmodified Flake	Stanford	1	0	0	1			
		Unmodified Flake	Unknown	4	0	0	4			
3	2							0	Y	
		Core	Unknown	1	0	0	1			
		Unmodified Flake	Allens Creek	1	0	0	1			
		Unmodified Flake	Indian Creek	2	0	0	2			
		Unmodified Flake	Stanford	2	0	0	2			
		Unmodified Flake	Unknown	5	0	0	5			

4	1							0	N	1
		Core	Unknown	1	0	0	1			
		Unmodified Flake	Allens Creek	2	1	0	3			
		Unmodified Flake	Indian Creek	2	2	0	4			
		Unmodified Flake	Stanford	12	0	0	12			
		Unmodified Flake	Unknown	2	0	0	2			
5	1							0	Y	N/A
		Core	Unknown	1	0	0	1			
		Modified Flake	Stanford	2	0	0	2			
		Modified Flake	Unknown	1	0	0	1			
		Modified Flake	Stanford	1	0	0	1			
		Unmodified Flake	Allens Creek	3	0	0	3			
		Unmodified Flake	Indian Creek	7	8	0	15			
		Unmodified Flake	Stanford	12	0	0	12			
		Unmodified Flake	Unknown	19	0	0	19			
5	2							0	N	
		Point, McWhinney Heavy Stemmed	Allens Creek	1	0	0	1			
		Modified Flake	Stanford	1	0	0	1			
		Unmodified Flake	Bryantsville	1	0	0	1			
		Unmodified Flake	Indian Creek	2	5	0	7			
		Unmodified Flake	Stanford	1	0	0	1			
		Unmodified Flake	Unknown	3	0	0	3			
6	1							0	Y	N/A
		Core	Allens Creek	1	0	0	1			
		Core	Unknown	1	0	0	1			
		Unmodified Flake	Allens Creek	0	1	0	1			
		Unmodified Flake	Indian Creek	0	1	0	1			
		Unmodified Flake	Stanford	5	0	0	5			
		Unmodified Flake	Unknown	2	0	0	2			

		Unmodified Flake	Wyandotte	1	0	0	1			
6	2							0	N	N/A
		Block Flake	Unknown	2	0	0	2			
7	1							0	N	N/A
		Block Flake	Allens Creek	1	0	0	1			
		Block Flake	Stanford	2	0	0	2			
		Block Flake	Unknown	5	0	0	5			
		Core	Indian Creek	2	0	0	2			
		Core	Unknown	1	0	0	1			
		Modified Flake	Indian Creek	1	1	0	2			
		Modified Flake	Stanford	4	0	0	4			
		Modified Flake	Unknown	3	0	0	3			
		Unmodified Flake	Allens Creek	8	0	0	8			
		Unmodified Flake	Haney	1	0	0	1			
		Unmodified Flake	Indian Creek	8	8	0	16			
		Unmodified Flake	Stanford	6	0	0	6			
		Unmodified Flake	Unknown	44	0	0	44			
8	1							0	Y	N/A
		Bipolar	Unknown	1	0	0	1			
		Historic Ceramic	Whiteware				1			
		Unmodified Flake	Stanford	1	0	0	1			
		Unmodified Flake	Unknown	2	0	0	2			
9	1							0	N	3
		Block Flake	Indian Creek	3	0	0	3			
		Block Flake	Stanford	4	0	0	4			
		Core	Unknown	1	0	0	1			
		Modified Flake	Allens Creek	0	1	0	1			
		Modified Flake	Unknown	2	0	0	2			

		Point, St. Charles	Allens Creek	1	0	0	1			
		Point Fragment	Allens Creek	0	1	0	1			
		Unmodified Flake	Allens Creek	6	2	0	8			
		Unmodified Flake	Derby	9	0	0	9			
		Unmodified Flake	Indian Creek	33	5	0	38			
		Unmodified Flake	Stanford	10	0	0	10			
9	2							0	Y	
		Block Flake	Allens Creek	0	1	0	1			
		Core	Indian Creek	1	0	0	1			
		Modified Flake	Stanford	1	0	0	1			
		Point Fragment	Unknown	0	1	0	1			
		Unmodified Flake	Allens Creek	12	4	0	16			
		Unmodified Flake	Indian Creek	10	8	0	18			
		Unmodified Flake	Stanford	10	0	0	10			
		Unmodified Flake	Unknown	38	0	0	38			
9	3							0	N	
		Unmodified Flake	Allens Creek	1	0	0	1			
		Unmodified Flake	Unknown	6	0	0	6			
10	1							0	Y	3
		Bipolar	Unknown	1	0	0	1			
		Block Flake	Allens Creek	0	1	0	1			
		Block Flake	Unknown	6	0	0	6			
		Modified Flake	Indian Creek	1	0	0	1			
		Modified Flake	Unknown	1	0	0	1			
		Point Fragment	Unknown	0	0	1	1			
		Unmodified Flake	Allens Creek	1	2	0	3			
		Unmodified Flake	Bryantsville	1	0	0	1			
		Unmodified Flake	Indian Creek	7	2	0	9			
		Unmodified Flake	Stanford	8	0	0	8			
		Unmodified Flake	Unknown	28	0	0	28			

11	1							0	Y	3
		Block Flake	Lead Creek	1	0	0	1			
		Block Flake	Unknown	0	0	1	1			
		Coal		0	0	0	1			
		Modified Flake	Unknown	1	0	0	1			
		Modified Flake	Wyandotte	1	0	0	1			
		Perforator	Wyandotte	1	0	0	1			
		Unmodified Flake	Allens Creek	3	0	0	3			
		Unmodified Flake	Indian Creek	0	2	0	2			
		Unmodified Flake	Stanford	5	0	0	5			
		Unmodified Flake	Unknown	15	0	0	15			
11	2							0	Y	
		Block Flake	Allens Creek	2	0	0	2			
		Unmodified Flake	Allens Creek	4	0	0	4			
		Unmodified Flake	Bryantsville	1	0	0	1			
		Unmodified Flake	Indian Creek	1	7	0	8			
		Unmodified Flake	Stanford	4	0	0	4			
		Unmodified Flake	Unknown	21	0	0	21			
11	3							0	N	
		Biface	Unknown	1	0	0	1			
		Unmodified Flake	Indian Creek	1	0	0	1			
		Unmodified Flake	Unknown	1	0	0	1			
12	1							0	Y	5
		Block Flake	Allens Creek	1	0	0	1			
		Block Flake	Indian Creek	2	0	0	2			
		Block Flake	Stanford	1	0	0	1			
		Block Flake	Unknown	9	0	0	9			
		Bottle Neck, Automatic Bottle Machine,								
		Cork Enclosure	Glass, Aqua				1			

		Core	Unknown	1	0	0	1			
		Endscraper	Indian Creek	0	1	0	1			
		Endscraper	Wyandotte	1	0	0	1			
		Modified Flake	Stanford	1	0	0	1			
		Point Fragment	Unknown	0	1	0	1			
		Unmodified Flake	Allens Creek	9	1	0	10			
		Unmodified Flake	Indian Creek	12	4	0	16			
		Unmodified Flake	Stanford	15	0	0	15			
		Unmodified Flake	Unknown	43	0	0	43			
12-A	1							0	N	N/A
		Block Flake	Unknown	6	1	0	7			
		Core	Indian Creek	1	0	0	1			
		Core	Unknown	1	0	0	1			
		Modified Flake	Indian Creek	1	0	0	1			
		Unmodified Flake	Allens Creek	0	2	0	2			
		Unmodified Flake	Bryantsville	1	0	0	1			
		Unmodified Flake	Indian Creek	7	2	0	9			
		Unmodified Flake	Unknown	10	0	0	10			
13	1							0	Y	5
		Biface Fragment	Derby	1	0	0	1			
		Biface Fragment	Unknown	1	0	0	1			
		Bipolar	Wyandotte	1	0	0	1			
		Block Flake	Unknown	7	0	0	7			
		Core	Unknown	1	0	0	1			
		Modified Flake	Indian Creek	3	1	0	4			
		Modified Flake	Stanford	1	0	0	1			
		Modified Flake	Unknown	2	0	0	2			
		Point Fragment, Brewerton	Allens Creek	0	1	0	1			
		Unmodified Flake	Allens Creek	10	9	0	19			
		Unmodified Flake	Derby	1	0	0	1			

		Unmodified Flake	Indian Creek	33	18	0	51			
		Unmodified Flake	Stanford	18	0	0	18			
		Unmodified Flake	Unknown	112	0	0	112			
13	2							0	N	
		Core	Unknown	1	0	0	1			
		Unmodified Flake	Unknown	1	0	0	1			
14	1							0	Y	5
		Core	Unknown	2	0	0	2			
		Modified Flake	Bryantsville	1	0	0	1			
		Modified Flake	Stanford	1	0	0	1			
		Modified Flake	Unknown	2	0	0	2			
		Unmodified Flake	Allens Creek	10	2	0	12			
		Unmodified Flake	Indian Creek	7	5	0	12			
		Unmodified Flake	Stanford	13	0	0	13			
		Unmodified Flake	Unknown	30	0	0	30			
14	2							2	Y	
		Biface Fragment	Allens Creek	0	1	0	1			
		Block Flake	Unknown	7	0	0	7			
		Core	Indian Creek	0	1	0	1			
		Core	Stanford	1	0	0	1			
		Core	Unknown	4	0	0	4			
		Modified Flake	Wyandotte	1	0	0	1			
		Unmodified Flake	Allens Creek	10	4	0	14			
		Unmodified Flake	Indian Creek	4	15	0	19			
		Unmodified Flake	Stanford	10	0	0	10			
		Unmodified Flake	Unknown	47	5	0	52			
		Unmodified Flake	Wyandotte	6	0	0	6			
15	1							1	Y	N/A
		Coal					11			

		Core	Unknown	1	0	0	1			
		Modified Flake	Allens Creek	1	0	0	1			
		Modified Flake	Indian Creek	1	0	0	1			
		Modified Flake	Stanford	2	0	0	2			
		Unmodified Flake	Allens Creek	10	0	0	10			
		Unmodified Flake	Indian Creek	9	0	0	9			
		Unmodified Flake	Stanford	9	0	0	9			
		Unmodified Flake	Unknown	31	0	0	31			
16	1									
								0	N	4
		Biface Fragment	Allens Creek	0	1	0	1			
		Modified Flake	Derby	1	0	0	1			
		Modified Flake	Indian Creek	4	0	0	4			
		Modified Flake	Lead Creek	1	0	0	1			
		Modified Flake	Unknown	1	0	0	1			
		Unmodified Flake	Allens Creek	11	0	0	11			
		Unmodified Flake	Indian Creek	21	7	0	28			
		Unmodified Flake	Stanford	26	0	0	26			
		Unmodified Flake	Unknown	35	0	0	35			
17	1									
								1	N	N/A
		Bipolar	Indian Creek	1	0	0	1			
		Coal Slag					1			
		Core	Allens Creek	0	1	0	1			
		Modified Flake	Allens Creek	3	1	0	4			
		Modified Flake	Indian Creek	1	1	0	2			
		Modified Flake	Stanford	2	0	0	2			
		Modified Flake	Unknown	3	0	0	3			
		Modified Flake	Upper St. Louis	1	0	0	1			
		Notch Flake	Indian Creek	1	0	0	1			
		Point Fragment	Allens Creek	1	0	0	1			

		Point Fragment	Indian Creek	1	0	0	1			
		Point Fragment	Stanford	0	0	1	1			
		Unmodified Flake	Allens Creek	11	3	0	14			
		Unmodified Flake	Haney	1	0	0	1			
		Unmodified Flake	Indian Creek	11	2	0	13			
		Unmodified Flake	Stanford	14	0	0	14			
		Unmodified Flake	Unknown	41	0	0	41			
		Unmodified Flake	Upper St. Louis	6	0	0	6			
18	1									
		Block Flake	Unknown	6	0	0	6	0	Y	N/A
		Core	Indian Creek	1	0	0	1			
		Core	Unknown	2	0	0	2			
		Modified Flake	Allens Creek	4	0	0	4			
		Modified Flake	Stanford	1	0	0	1			
		Modified Flake	Unknown	1	0	0	1			
		Point Fragment	Allens Creek	0	1	0	1			
		Unmodified Flake	Allens Creek	10	0	0	10			
		Unmodified Flake	Bryantsville	2	0	0	2			
		Unmodified Flake	Indian Creek	18	6	0	24			
		Unmodified Flake	Stanford	7	0	0	7			
		Unmodified Flake	Unknown	61	0	0	61			
19	1									
		Unmodified Flake	Allens Creek	0	1	0	1	0	N	N/A
		Unmodified Flake	Indian Creek	2	5	0	7			
		Unmodified Flake	Unknown	4	0	0	4			
20	1									
		Biface Fragment	Allens Creek	1	0	0	1	0	N	4
		Bipolar	Unknown	2	0	0	2			

		Core	Derby	1	0	0	1			
		Core	Unknown	1	0	0	1			
		Unmodified Flake	Allens Creek	3	3	0	6			
		Unmodified Flake	Indian Creek	15	9	0	24			
		Unmodified Flake	Stanford	12	0	0	12			
		Unmodified Flake	Unknown	46	0	0	46			
21	1							1	Y	N/A
		Block Flake	Stanford	2	0	0	2			
		Block Flake	Unknown	3	0	0	3			
		Core	Unknown	2	0	0	2			
		Modified Flake	Unknown	1	0	0	1			
		Perforator Fragment	Allens Creek	1	0	0	1			
		Unmodified Flake	Allens Creek	3	2	0	5			
		Unmodified Flake	Indian Creek	14	7	0	21			
		Unmodified Flake	Stanford	6	0	0	6			
		Unmodified Flake	Unknown	38	0	0	38			
22	1							0	N	4
		Coal		0	0	0	1			
		Core	Stanford	1	0	0	1			
		Unmodified Flake	Allens Creek	3	1	0	4			
		Unmodified Flake	Indian Creek	2	3	0	5			
		Unmodified Flake	Stanford	6	0	0	6			
		Unmodified Flake	Unknown	18	0	0	18			
		Unmodified Flake	Wyandotte	1	0	0	1			
23	1							0	N	5
		Block Flake	Stanford	8	0	0	8			
		Block Flake	Unknown	6	0	0	6			
		Core	Unknown	1	0	0	1			

		Graver	Unknown	1	0	0	1			
		Modified Flake	Stanford	1	0	0	1			
		Point Fragment	Unknown	1	0	0	1			
		Point Fragment, Late Archaic Stem	Wyandotte	1	0	0	1			
		Unmodified Flake	Allens Creek	21	0	0	21			
		Unmodified Flake	Bryantsville	1	0	0	1			
		Unmodified Flake	Indian Creek	29	9	0	38			
		Unmodified Flake	Stanford	6	0	0	6			
		Unmodified Flake	Unknown	49	0	0	49			
		Unmodified Flake	Wyandotte	1	0	0	1			
24	1							0	N	2
		Biface Fragment	Stanford	1	0	0	1			
		Biface Fragment	Unknown	1	0	0	1			
		Bipolar	Unknown	1	0	0	1			
		Core	Indian Creek	1	2	0	3			
		Modified Flake	Stanford	1	0	0	1			
		Modified Flake	Unknown	3	1	0	4			
		Modified Flake	Wyandotte	1	0	0	1			
		Point Fragment	Unknown	0	1	0	1			
		Point Fragment, Matanzas	Stanford	1	0	0	1			
		Unmodified Flake	Allens Creek	12	7	0	19			
		Unmodified Flake	Indian Creek	18	10	0	28			
		Unmodified Flake	Stanford	47	0	0	47			
		Unmodified Flake	Unknown	30	1	0	31			
25	1							0	N	N/A
		Modified Flake	Stanford	1	0	0	1			
		Unmodified Flake	Derby	1	0	0	1			
		Unmodified Flake	Indian Creek	0	1	0	1			
		Unmodified Flake	Unknown	8	0	0	8			

					Total Artifacts		2,021			

Artifact Inventory for 12Or384.

Unit	Level	Artifact	Raw Material	Untreated	Heat Treated (HT)	Heat Damaged (HD)	Total	Fire-Cracked Rock (ct.)
1	1							0
		Unmodified Flake	Allens Creek	2	0	0	2	
		Unmodified Flake	Indian Creek	1	0	0	1	
		Unmodified Flake	Stanford	1	0	0	1	
2	1							0
		Unmodified Flake	Allens Creek	0	1	0	1	
		Unmodified Flake	Unknown	1	0	0	1	
3	1							0
				0	0	0	0	
4	1							0
		Unmodified Flake	Indian Creek	1	0	0	1	
5	1							0
		Core	Indian Creek	1	0	0	1	
		Modified Flake	Indian Creek	1	0	0	1	
		Modified Flake	Stanford	1	0	0	1	
		Point, Raddatz Side Notched	Allens Creek	0	1	0	1	
		Unmodified Flake	Allens Creek	0	2	0	2	
		Unmodified Flake	Indian Creek	6	0	0	6	
		Unmodified Flake	Stanford	2	0	0	2	
6	1							0
		Modified Flake	Allens Creek	1	0	0	1	
		Modified Flake	Indian Creek	2	0	0	2	
		Modified Flake	Unknown	1	0	0	1	

		Point, Table Rock	Allens Creek	1	0	0	1	
		Point Fragment	Indian Creek	1	0	0	1	
		Point Fragment	Wyandotte	1	0	0	1	
		Unmodified Flake	Allens Creek	6	0	0	6	
		Unmodified Flake	Indian Creek	4	0	0	4	
		Unmodified Flake	Unknown	25	0	0	25	
		Unmodified Flake	Wyandotte	1	0	0	1	
7	1							0
		Unmodified Flake	Unknown	5	0	0	5	
8	1							0
		Core	Allens Creek	1	0	0	1	
		Point Fragment	Unknown	1	0	0	1	
		Unmodified Flake	Allens Creek	3	0	0	3	
		Unmodified Flake	Indian Creek	2	0	0	2	
		Unmodified Flake	Stanford	1	0	0	1	
		Unmodified Flake	Unknown	8	0	0	8	
		Unmodified Flake	Wyandotte	2	0	0	2	
9	1							3
		Unmodified Flake	Allens Creek	3	0	0	3	
		Unmodified Flake	Indian Creek	3	0	0	3	
		Unmodified Flake	Unknown	9	0	0	9	
10	1							0
		Unmodified Flake	Indian Creek	2	1	0	3	
		Unmodified Flake	Stanford	2	0	0	2	
		Unmodified Flake	Unknown	5	0	0	5	
11	1							0

		Core	Indian Creek	0	1	0	1	
		Unmodified Flake	Bryantsville	1	0	0	1	
		Umnmodified Flake	Indian Creek	1	0	0	1	
		Unmodified Flake	Stanford	1	0	0	1	
		Unmodified Flake	Unknown	2	0	0	2	
12	1							0
		Unmodified Flake	Allens Creek	0	2	0	2	
13	1							0
		Unmodified Flake	Unknown	3	0	0	3	
14	1							0
		Unmodified Flake	Stanford	1	0	0	1	
		Unmodified Flake	Unknown	2	0	0	2	
15	1							0
				0	0	0	0	
16	1							0
		Unmodified Flake	Indian Creek	1	0	0	1	
		Unmodified Flake	Unknown	5	0	0	5	
17	1							0
		Unmodified Flake	Indian Creek	0	3	0	3	
		Unmodified Flake	Unknown	5	0	0	5	
18	1							0
		Core	Unknown	1	0	0	1	

		Unmodified Flake	Allens Creek	0	1	0	1	
		Unmodified Flake	Indian Creek	1	1	0	2	
19	1							0
		Unmodified Flake	Allens Creek	1	1	0	2	
		Unmodified Flake	Indian Creek	3	0	0	3	
20								
	1							0
				0	0	0	0	
21	1							0
		Unmodified Flake	Allens Creek	0	1	0	1	
		Unmodified Flake	Indian Creek	0	3	0	3	
		Unmodified Flake	Unknown	2	0	0	2	
22	1							0
		Unmodified Flake	Allens Creek	1	1	0	2	
		Unmodified Flake	Indian Creek	6	0	0	6	
23	1							0
		Biface Fragment	Indian Creek	1	0	0	1	
		Biface Fragment	Wyandotte	1	0	0	1	
		Block Flake	Stanford	2	0	0	2	
		Block Flake	Unknown	1	0	0	1	
		Core	Unknown	1	0	0	1	
		Modified Flake	Allens Creek	0	1	0	1	
		Modified Flake	Indian Creek	2	0	0	2	
		Modified Flake	Unknown	1	0	0	1	
		Unmodified Flake	Allens Creek	4	6	0	10	

		Unmodified Flake	Indian Creek	8	12	0	20	
		Unmodified Flake	Stanford	8	0	0	8	
		Unmodified Flake	Unknown	56	0	0	56	
		Unmodified Flake	Wyandotte	1	0	0	1	
24	1							0
		Biface Fragment	Unknown	1	0	0	1	
		Modified Flake	Allens Creek	0	1	0	1	
		Modified Flake	Unknown	1	0	0	1	
		Modified Flake	Wyandotte	1	0	0	1	
		Unmodified Flake	Allens Creek	1	1	0	2	
		Unmodified Flake	Indian Creek	5	8	0	13	
		Unmodified Flake	Stanford	3	0	0	3	
		Unmodified Flake	Unknown	31	0	0	31	
		Unmodified Flake	Wyandotte	4	0	0	4	
25	1							0
		Biface Fragment	Unknown	1	0	0	1	
		Modified Flake	Stanford	1	0	0	1	
		Unmodified Flake	Allens Creek	1	4	0	5	
		Unmodified Flake	Indian Creek	20	1	0	21	
		Unmodified Flake	Stanford	4	0	0	4	
		Unmodified Flake	Unknown	38	0	0	38	
26	1							0
		Block Flake	Unknown	2	0	0	2	
		Unmodified Flake	Allens Creek	7	0	0	7	
		Unmodified Flake	Indian Creek	3	0	0	3	
		Unmodified Flake	Stanford	8	0	0	8	
		Unmodified Flake	Unknown	17	0	0	17	

			Total Artifacts				432	

APPENDIX E

SITE MAPS

Site Locations Confidential
Not For Public Disclosure