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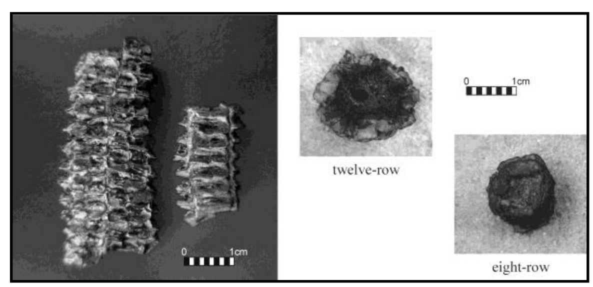

Indiana Department of Natural Resources
Division of Historic Preservation
and Archaeology (DHPA)

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INDIANA DIVISION OF
HISTORIC PRESERVATION
AND ARCHAEOLOGY

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Mission Statement: *The Division of Historic Preservation and Archaeology promotes the conservation of Indiana's cultural resources through public education efforts, financial incentives including several grant and tax credit programs, and the administration of state and federally mandated legislation.*

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Indiana Department of Natural Resources

INDIANA DIVISION OF HISTORIC PRESERVATION AND ARCHAEOLOGY

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TABLE OF CONTENTS

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This is a refereed journal. All articles are reviewed by the Editor, Guest Editor, and two professional archaeologists not with the DHPA.

INTRODUCTION

The Division of Historic Preservation and Archaeology (DHPA) is proud to present this volume of the journal *Indiana Archaeology*. Per state statute (Indiana Code 14-21-1-12), one of the duties of the DHPA is to develop a program of archaeological research and development, including the publication of information regarding archaeological resources in the state. This journal is one of the ways the DHPA continues to address that mandate. Also, Indiana Code 14-21-1-13 states that the Division may conduct a program of education in archaeology. Indiana's cultural resources management plans have also listed educating the public about Indiana's prehistoric and historic Native American cultures and identifying, and studying Native American, African-American, and other ethnic and cultural heritage resources, as ways to accomplish several preservation goals. The variety of archaeological sites in Indiana is wide-ranging and impressive. Virtually all of the cultural groups prehistorically and historically in Indiana are represented archaeologically in one way or another.

We are pleased to offer this digital document containing articles on a broad range of archaeological and anthropological topics. Archaeology is happening regularly in Indiana, and all of these articles provide the reader with various insights into many important sites, past cultures, theories, and projects. To view previous volumes of *Indiana Archaeology*, go to http://www.in.gov/dnr/historic/3676.htm.

For those who may not be familiar with some archaeological terms, a helpful glossary of some of these general terms is included in the back of this journal. To also aid the non-archaeologist reader, a general overview of prehistoric time periods may be found at the end of this volume. Additional archaeological outreach documents, including *Early Peoples of Indiana*, may be accessed at www.IN.gov/dnr/historic. For those readers who may not be familiar with the authors and editors of the volume, biographical information is provided. Feel free to access our Indiana archaeological travel itinerary (http://www.in.gov/dnr/historic/files/travelsarchaeo.pdf) if you would wish to visit an archaeological site. The DHPA also urges you to participate in the annual Indiana Archaeology Month in September. If you have an interest in providing a voluntary financial donation to contribute to archaeology in our state, please consider the Archeology Preservation Trust Fund (http://www.in.gov/dnr/historic/5897.htm).

- We thank our colleagues who contributed peer reviews for the journal.

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[*Editors' note: To be consistent, site numbers will be written, for example, as 12W245, exceptions being when county abbreviations with an "l" before the numbers, such as Allen (Al) or Clark (Cl). Counties such as the latter will be designated with a space between the 12 and the county abbreviation and a space between the county abbreviation and the site number, such as 12 Cl 127. This is done so that the reader understands that the site is from Clark County (Cl), and the number of the site is 127, rather than 1127.*]

ABOUT THE EDITORS AND AUTHORS

Editor

Johnson, Amy L.– Ms. Johnson, State Archaeologist, Archaeology Outreach Coordinator, and Team Leader for Archaeology, has worked for the DHPA since 1991. She is also Indiana’s state network coordinator for the Public Education Committee of the Society for American Archaeology. Ms. Johnson holds a B.S. and a M.A., both Anthropology, from Ball State University. Her main research interests are prehistoric archaeology (specifically the Adena and Hopewell periods), historic cemeteries, and public outreach regarding archaeological resources. She is the Editor of this volume and was responsible for the layout of the document.

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Munson, Cheryl Ann– Cheryl Ann Munson (B.A. University of Arizona, 1965; M.A., University of Illinois, 1971) is an archaeologist and Research Scientist in the Department of Anthropology, Indiana University-Bloomington. Much of her work has been concentrated on CRM projects, including investigations at Patoka Lake, a series of buried sites along the Ohio River, the Southwind site, and hundreds of smaller projects. Understanding the last prehistoric cultures to inhabit southern Indiana and the Ohio Valley has been her research focus and led to the definition of the late Mississippian Caborn-Welborn phase (A.D. 1400-1650). She directed or co-directed investigations at numerous Mississippian sites–including Hovey Lake, Caborn, Slack Farm, Murphy, Bone Bank, and Prather–as well as the archaeological study of Wyandotte Cave. Munson also teamed with other archaeologists and volunteers to present a widely recognized public education program that was held over 12 years at the Hovey Lake site, where they introduced scientific archaeology and archaeological ethics to thousands of children and adults.

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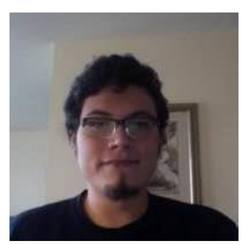

He is now working as a Cultural Resource Technician for various companies, and is currently working with TRC Environmental.

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EVIDENCE FOR FIGURINE MANUFACTURING TECHNIQUES EMPLOYED BY MANN SITE ARTISTS

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Hundreds of ceramic figurine fragments have been recovered from the Mann archaeological site of southwestern Indiana. Recently, the Indiana State Museum and Historic Sites (ISMHS) began the process of acquiring 394 of them, allowing an attribute analysis to be conducted on fragments ranging from larger portions to the smallest hand fragments. This analysis, as well as experimental work recreating figurines, provided an opportunity to find evidence of the manufacturing techniques employed by Mann site artists. The evidence indicates a breadth of variety in techniques employed, pointing towards a complex picture of innovation and artistic expression at the Mann site.

Anthropomorphic ceramic figurines and fragments seem somewhat rare, yet are found throughout most of the Hopewell world in relatively small numbers. The 27 examples from the Turner group, Hamilton County, Ohio are one of the larger known concentrations recovered through professional archaeological investigations (Willoughby 1922:72). Other smaller concentrations are known to exist. For example, Converse (1993) reports nine from a field in central Illinois and sites such as Worthington (IN), Dash Reeves (IL), Knight (IL), Carrier Mills (IL), Wenger 4 (IL), Simpson 1 (IL), and Pool (IL), to name a few, all hold less than a handful (respectively: Black 1933; Collett 1880; Fortier 2001; Griffin 1952; Jefferies 1987; Koldehoff 2006; and McGregor 1958). With this scattering of figurines throughout the Midwest, the over 400 examples from Mann alone makes the site unique in the region.

This high frequency at Mann is rendered more intriguing by the fact that none of the examples are complete, with most being highly fragmented. The high frequencies of figurine fragments at Mann have tremendous theoretical potential. For example, Swartz indicates that the concentration of fragments could indicate that the Mann site included a figurine “factory,” where the good, finished products somehow landed at other sites (Swartz 2001:255). Following theoretical threads such as this, the Mann fragments could hold an important clue toward understanding what was happening within the broader framework of “Hopewell.”

Unfortunately, there are very little hard data on which other lines of research can potentially draw. With this in mind, the current research begins at the quintessential starting line by asking the question: how were they made? This question is most appropriate, taking advantage of the hundreds of fragmented pieces with a host of tell-tale tool marks and modifications.

Background

The Mann Site

The Mann archaeological site (12Po2) is a large multi-component cultural landscape in southwestern Indiana. Although it holds substantial Archaic, Mississippian, and Caborn-Welborn deposits, the Middle Woodland component, complete with at least seventeen earthen architectural features, has understandably received the most attention. Two of the five largest Middle Woodland mounds were constructed at the Mann site, and the density of the habitation deposits recovered indicates that the size and complexity of Mann may be unique (Ruby et al. 2005:140, 142-143). Moreover, the types of materials recovered include a vast array of "exotic" materials (e.g., Knife River chalcedony from North Dakota, Tallahatta quartzite from Alabama, obsidian from the Rocky Mountains) that further identify the society at Mann as a pivotal Hopewell society. The presence of ceramic types more commonly found in the southeastern United States further indicates the deep connections and relationships that people at Mann had with other groups. For greater detail regarding the current understanding of how the Mann site fits within the broader Hopewell culture, refer to *Community Organizations in the Scioto, Mann, and Havana Hopewellian Regions* (Ruby et al. 2005).

Mann Site Figurine Fragments

Few sources provide identifications of possible manufacturing techniques for Mann site figurines. James Kellar (1979:105) indicates that limbs are affixed to the torso, with the ears and noses being modeled. B.K. Swartz, Jr. (2001:255) indicates that the figurines were created through incremental modeling. Swartz also provides an in-depth assessment of larger fragments to define characteristics including posture, sex, and clothing. His work included a catalog of detailed images of his examples, many of which had been otherwise unknown. Prior to Swartz's publication, Ruth Brinker (1984) also outlined a general description of traits such as posture, sex, and clothing. Brinker did not include notes on possible manufacturing techniques; however, because she utilized many fragments in her analyses, she also included an in-depth description of the varieties of forms (e.g., leg forms) and fragmented nature of the figurines (Brinker 1984:2-8). The most recent detailed description of the Mann figurines is from Keller and Carr (2005), who analyzed specific examples for evidence indicating gender roles. They, too, included drawings of previously unrecorded examples.

With the exception of James Kellar's work, the aforementioned studies primarily focus on the figurines recovered by a conscientious avocational archaeologist who spent over 50 years surface collecting at Mann. His work resulted in a manuscript which also outlines descriptions of the recovered figurines (Lacer 1980). The current study utilizes these figurine fragments, as well as those surface-collected by another avocational archaeologist (see King 2005 for initial descriptions of these figurines). Both collections are currently in the process of being acquired by the Indiana State Museum and Historic Sites (ISMHS). Notably, these two collections do not represent all known figurines from Mann. Seventy-seven fragments were recovered by James Kellar, Glenn A. Black Laboratory, Indiana University, during his 1966 and 1967 excavations (Kellar 1979:105; Ruby 1997:329; for descriptions of both excavations, see Ruby 1997:365-369; Ruby et al. 2005:143). There are also many in personal collections, some of which are larger, "collector-friendly" examples. Because each fragment offers new or refined information, locating and documenting more examples in personal collections will further improve this research.

The figurines assessed in this research can be confidently assigned to the Middle Woodland, Hopewell occupations. The localities in which the majority of figurines were recovered fall within an area that contains high densities of Middle Woodland material. Moreover, many came from the specific area described by Ruby and others as being the largest contiguous area of habitation debris (King, personal communication 2014; Lacer, interview by Michele Greenan, September 2010, interview L-A1 transcript; Ruby 1997:315; Ruby et al. 2005:142-143).

Furthermore, none of the ceramic figurines were recovered from mortuary contexts (King, personal communication 2014; Lacer, personal communication 2013). Rather, they were clearly recovered amidst Middle Woodland occupation/habitation-related artifact concentrations. Although some key patterns in distribution may yet emerge, a non-mortuary context is clear. In fact, more recent research (Peterson 2007) that combined remote sensing with controlled surface survey over a key portion of the site, further implicates an affiliation with habitation areas. For in-depth discussions on the currently known extent of the Mann site and the Hopewell component within, see Kellar (1979:100-101); Peterson (2007); and Ruby (1997, Parts 2 and 3).

Analysis

Three hundred ninety-four ceramic artifacts were subjected to an attribute analysis as figurine fragments, or "most likely" figurine fragments. Beginning with approximately 450 potential candidates, this final number is the result from culling all fragments of questionable design and/or origin, many of which were determined to be waste clay, daub, or possibly animal effigy or pipe fragments, all of which are also present at the Mann site. These 394 fragments are broken down into primary categories in Table 1, below.

Table 1. Figurine Fragments.

Primary Element	Count
Large Upper Body/Lower Body Portions	18
Heads	46
Hair/Head Adornment	8
Midsections/Torsos	56
Indeterminate Limbs	33
Arms/Arm Fragments	67
Legs/Leg Fragments	91
Possible Attachment Accoutrement	13
Possible Attachment Accoutrement or Hair/Head Adornment	4
Ambiguous Forms	58
Total	**394**

Shown as *Large Upper Body/Lower Body Portions* in Table 1, only 18 of the 394 analyzed artifacts are substantially large, encompassing approximately one-half of an entire figurine. The remainder are either complete single body components (e.g., arms and legs), or components and combinations thereof in various states of fragmentation. One category needing further clarification regards hair. In Table 1, the category *Hair/Head Adornment* is used, however within the text, the term is simplified as "hair," with the implication that some may have been created as something akin to an elaborate head adornment or headdress. Eight are clear examples of this with an additional four present in the category *Possible Hair/Head Adornment.* It is also highly probable that more examples are present in the category, *Possible Attachment Accoutrement*. This latter class is comprised of examples that may be accoutrement, or parts of the figurine beyond the body or clothing, for example, a staff or platform base. Another primary element category needing clarification is *Ambiguous Form*. These do not have enough attributes for specific identification. In some cases, these could be seen as possibly "preforms" or working/learning pieces (ambiguous forms are further discussed in the section below).

Utilizing breakage patterns as definitive evidence of a particular manufacturing technique is, at this time, tentative. Breaks can occur anywhere on the figurine, with a high tendency for breaks to occur in join areas or other manufacture-related weak spots such as folded-over knees or elbows. Although this has certainly taken place, it is often seen with other types of fractures.

Most figurines were likely subjected to multiple break events. They were recovered from the surface of properties that have been under heavy cultivation for well over 50 years and have been subjected to environmental factors including recurring freeze-thaw cycles. This point regarding the figurines recovery context also hinders certain theoretical aspects of interpretation. For example, conclusive evidence of a figurine being purposefully "killed" would be difficult to determine without comparisons with excavated examples. Because of the limitations imposed by the recovery context, the current study focuses more on specific tool or sculpting marks than on counts of particular breakage patterns.

Selected Attributes of the Ceramic Material

The brief discussion below on the ceramic material of the figurines is focused on providing evidence for two important theoretical threads directly related to figurine manufacture. First, most (if not all) of the figurines were created using locally sourced material consistent with that used in local pottery manufacture. Second, variations seen in the paste throughout the collection appear as different types of temper when in fact there may have been no intentionally added temper. Documenting these differences in natural inclusions provides a more robust comparative medium for other Middle Woodland figurines. Essentially, results of the analysis establish that the many varieties of figurines, regardless of the manufacture technique employed in their production, were created at the Mann site.

General paste characteristics were consistent throughout all of the fragments. The paste is fine and silty, with many examples having remnants of organic material visible within pits or around pit margins. Nearly all examples showed pits and voids of varying depths and sizes.

Color was much less uniform. Colors can be universally described through the use of Munsell color charts. Using Munsell charts, the range in color was documented for both exterior and core material. The majority of exterior colors ranged from shades of light buff to brighter orange (Munsell readings of 7.5YR6/4 - 6/6 - 6/8 and 2.5YR5/8). The minority of examples were markedly different with deep brown, red, and grey exteriors (Munsell readings 7.5YR4/3, 10R4/6, and 7.5YR5/1, respectively). Figure 1, below, illustrates the marked contrast in colors present. The grey examples display very little difference between core and exterior color and are consistent with having been fired in a reduced environment. In all cases where visible, the core is grey to dark grey.

Identifications of possible temper were also variable, shifting only between grit (more aptly described as fine grit) and grog. In conducting the analysis, values representing microscopic descriptions, assessed under 25x magnification, and values representing macroscopic descriptions, assessed during visual inspection, were taken.

Figure 1. Examples of exterior paste colors. Examples at left are substantially more prevalent. Photographs by Steve Happe, Indiana State Museum and Historic Sites (ISMHS).

Microscopic assessment allowed for the description of inclusions present in the paste. At 25x magnification, the great majority of examples had only two types of inclusions present, "clay lumps" and quartz. Only three examples included tiny rock pebbles, and no examples with limestone were identified. This conclusion was drawn after testing examples that appeared suspicious, but rendered a negative response to hydrochloric acid. Small areas of whiter clay (kaolin?) had proven misleading.

The identifications of clay and quartz inclusions were common and require further detail. The clay inclusions appear to be naturally occurring pellets or small, irregular ball-shaped (typically) clay lumps or mineralized (argillaceous) concretions. These take the same color patterning as the surrounding matrix. For example, at or near the surface they are orange to reddish orange while in the core they are grey or darker brown. Quartz was also common. Light grey to darker, smoky grey colored quartz dominated, with shades of milky white also present.

Descriptions of the paste are consistent with results from research that identified a local source used by Mann site potters in creating southeastern styled pottery. Clays from sources in and around the Mann site have been the subject of focused research. In his analysis of these sources, Bret J. Ruby (1997:135-142) characterized the local clays using multiple techniques in order to determine the potential clay source for the ceramic sherds in his sample, and to identify those sherds manufactured with non-local clays. This research was later expanded by Ruby and Shriner in 2005 (Ruby et al. 2005).

Macroscopic inspection provided the identification of what was tentatively referred to as possible temper. Key to this discussion is a brief description of the terms used. The term grit was assigned to examples where irregular, angular quartz or quartzite could easily be seen without magnification. The term grog used is not grog by strict definition, yet allows comparisons with other collections. Grog typically refers to previously fired clay, such as crushed pieces of pottery, added to the paste. The term is used here to identify those naturally occurring "clay lumps" that, macroscopically, can be virtually identical to true grog temper.

Results of the macroscopic assessment indicate that the highest percentage of samples, 43.40%, would be classified as grog tempered, and the second highest, 24.11% would be considered grog/grit (Table 2). Grit temper is also well represented with 9.39% and 8.63%. Also, the relatively high amount (14.21%) identified as "none visible" is particularly revealing.

Table 2. Results of Macroscopic Examination. Entries are written as [primary]/[secondary].

Macro/Visual ID	Count	Percentage of Sample (n=394)
Grog	171	43.40
Grog/grit	95	24.11
None visible	56	14.21
Grit (fine)	37	9.39
Grit (fine)/grog	34	8.63
Sand/grog	1	.25
Totals	**394**	**99.99%**

Under microscopic analysis, values of inclusion abundance were recorded using the inclusion abundance estimation scale from Mathews, Wood, and Oliver (outlined in Orton et al. 1993). The great majority of examples, 296, had a value of 5% or less.

In pulling the evidence together, the conclusion drawn is that the paste used to create the figurines is consistent with the paste described for locally manufactured ceramics, and that it is highly likely that all inclusions seen in Mann figurines are naturally occurring. There was probably no intentionally added "temper." For the sake of comparison with other collections, grog, grit (or fine grit), and "no temper" would all be contenders as temper types for Mann figurines. Sand might also be considered, given differences in defining grit/fine grit from sand.

Manufacturing-Related Attributes

For the purposes of addressing the primary construction techniques used in manufacturing the figurines, the focus for the current discussion lies with the construction and/or assembly of the major elements: heads, torsos, limbs, and hair. Following identification of the fragments in the collection, these elements were found in substantial numbers and appear to have been key components in terms of overall forms. Hands and feet, for example, were typically created from simple modifications to the ends of arms and legs (e.g., adding incised lines as fingers or simply squishing the end flat), rather than having been created as specific, detailed elements.

As opposed to hands and feet, hair is more appropriately addressed as a major element. Most Mann site figurines appear hairless; however, many were not meant to be bald as evidenced by the numerous examples of detached hair elements identified in the collection. Although only eight examples of clearly discernible hair were identified, an additional four were identified as probable hair, with others likely represented within the class of artifacts labeled *Possible Attachment Accoutrement* (Table 1, above). Hair, like accoutrement, is difficult to identify as unattached pieces.

Descriptions of possible manufacturing-related attributes found on the figurine elements were documented as potential evidence of the manufacturing technique employed. These descriptions were condensed into main "types" to examine the occurrences and locations of the various forms of evidence. Many fragments were too small or eroded to exhibit clearly definable evidence, and only those examples that were readily discernible as manufacturing-related marks are reported here. The types of evidence found are listed below in Table 3, with further descriptions in the following text.

Table 3. Condensed Descriptions of Manufacturing-Related Evidence on Figurine Fragments.

Characteristic/Type	Element	Count
Sculpted/Form-fitted	Arms	7
	Legs	1
	Head	9
	Hair	2
	Torso	8
	Total	**27**
In-process Separation	Hair	2
Complete Modification	Arms	0
	Legs	1
	Head	0
	Hair	0
	Torso	1
	Total	**2**
Tooled	Arms	1
	Legs	4
	Head	2
	Hair	0
	Torso	0
	Total	**7**
Smoothed	Arms/Torso	0
	Legs/Torso	1
	Head/Torso	2

	Hair/Head	0
	Total	**3**
Modeled Form	Arms/Torso	13
	Legs/Torso	27
	Head/Torso	1
	Head/Hair	1
	Total	**42**
Modeled Form-Detached	Arms	5

Evidence that an area of a fragment was pre-sculpted to fit specifically onto another element, or that an area may have begun with pre-sculpting with additional sculpting performed directly on another element ("form-fitting") is apparent on 27 examples. On arms, this takes the shape of perfectly formed grooves in the arm/shoulder articulation. On heads, the modification is in "*u*" or "*v*" shaped grooves in the bases. This sculpted area would match a common modification on torsos in which the top of the torso is built up, but is then pushed downward as a scoop (Figure 2). Between the head and torso modifications, the head would sit perfectly on the torso with no neck (only two fragments in the collection have discernible necks).

On the two examples of sculpted/form-fitted hair, much of the interior articulation surfaces are perfectly smooth, indicating incomplete adhesion of the hair element (Figure 3, left). Most heads had roughened surfaces indicating the possibility that hair was likely present. One good example of this was particularly revealing with complete removal of the exterior paste surface (Figure 3, right).

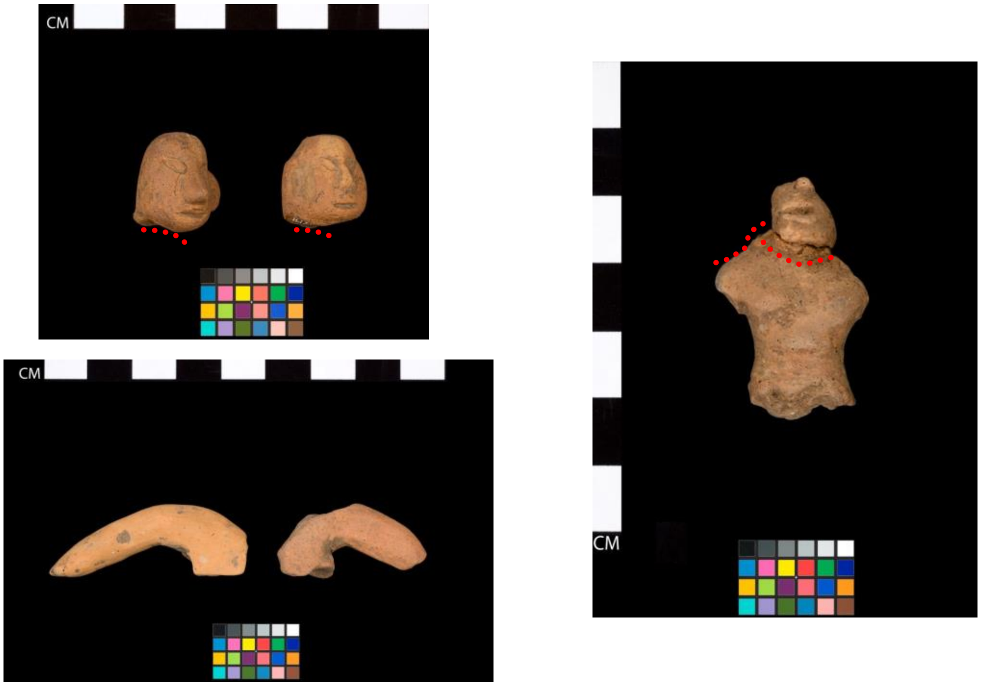

Figure 2. Examples of sculpted/form-fitted articulations. At left, top, the bases of heads are modified into "*u*" or "*v*" shaped grooves, enabling it to sit securely upon a torso. At left, bottom, the arms display shoulder articulations wherein the upper arm was sculpted over the torso, leaving a "bracket" on the upper arm. At right, the top of the torso is built-up and scooped downward. Grooves and built up areas are highlighted in red. Photographs by Steve Happe, ISMHS.

Figure 3. Sculpted/form-fitted hair articulations. At left, the central image exhibits clear separation lines at the head/hair juncture while the two others have smooth articulation surfaces. At right, an example in which the hair has popped off taking with it much of the head surface is illustrated. Photographs by Steve Happe, ISMHS.

Two fragments showed evidence of more unusual, complete modifications (Figure 4). On one leg fragment, the articulation area was shaped into a peg-like form similar to the ball portion of a "ball and socket" joint. On a torso fragment, a possible corresponding type of "socket" or carved indentation was documented. Other examples provide hints of these possible "ball and socket" style modifications, but are highly fragmented.

Figure 4. Possible "ball and socket" style modifications. At left, the thigh region of a leg has been crafted into the ball fitting. At right is a torso with clean socket-like articulation areas. Modified areas are highlighted in red. Photographs by Steve Happe, ISMHS.

Tool marks that are likely associated with the manufacturing process were noted on seven examples. These tool marks were identified as clean, tooled slits that extend down into the fragment's body (Figure 5). These slits may have facilitated the joining via a tab of clay, wood or reed.

Evidence of smoothing-over areas where elements were joined during manufacture is difficult to identify. Many fragments are broken at or near articulations (see discussion below), further obliterating the view of surfaces already subjected to exfoliation. Only two good examples of smoothing were found that are likely related to manufacturing processes. Shown below in Figure 6, left, the head/neck join has been markedly smoothed to create a smooth articulation. This also has the effect of creating something of a neck, although this intension is unclear. The example in Figure 6, right, exhibits both a tool mark within the right thigh and a thin "leading edge" of smoothed clay around the upper left thigh.

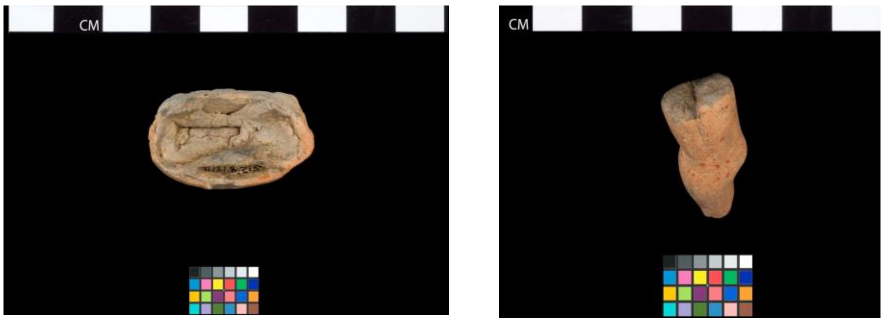

Figure 5. Examples of tool marks at articulation junctures on elements. At top, left, is a clear example of tool marking with a clean, perfect slit present going into the base of the head. At right, top, tooled punctate slits are present within the shoulders. At right, bottom, a slit has been cut down into the upper thigh. Photographs by Steve Happe, ISMHS.

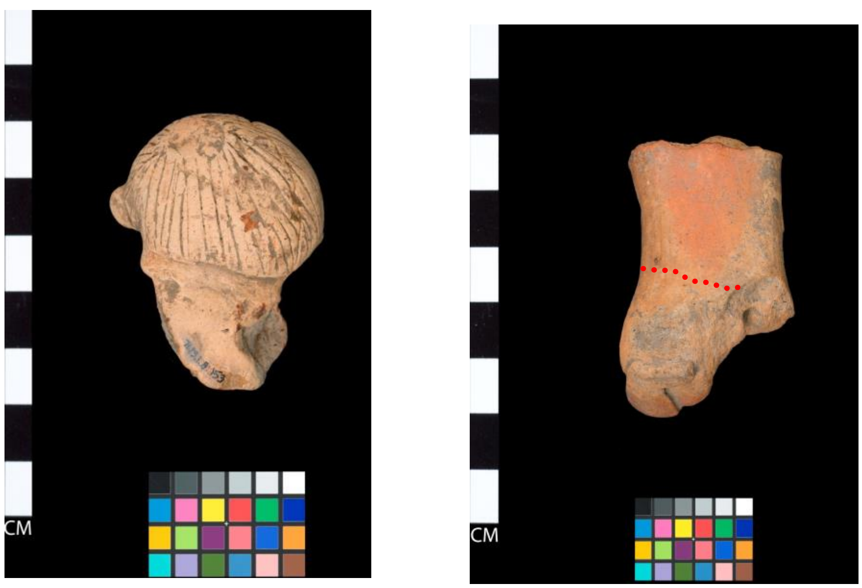

Figure 6. Examples of smoothing. At left, a thick tooled line is visible around the back of the neck (the front of this example is fragmented). At right, a leading edge of clay is seen at the thigh region (highlighted in red). This example also shows a tooled punctate into the right thigh and is a rare example of a limb carved in relief. Photographs by Steve Happe, ISMHS.

The remaining types of evidence, *Modeled Form and Modeled Form-Detached* are types reflecting an uninterrupted continuation between primary elements (Figure 7). In the latter case, there is strong evidence that the articulation had been modeled, but had broken, taking with it a portion of the torso. Combining the two, a total of 47 examples fit into this description. Only one example in which the head was a continuous, modeled form with the torso was located (Figure 8). This example has a unique, "complete Gumby" appearance.

Figure 7. Examples of arm/torso (left) and leg/torso (right) modeled articulations. Photographs by Steve Happe, ISMHS.

Figure 8. The only example of a modeled head/torso articulation. Photograph by Steve Happe, ISMHS.

Experimental Archaeology Exploring Manufacturing Techniques

The amounts of material exhibiting modeled joins between arms, legs, and torsos lead to the identification of a manufacturing technique separate from processes primarily involving adding elements together. To further explore this technique, both authors as well as laboratory staff experimented with recreating figurines with a modeled form.

<u>Construction of the body</u>. The process starts by using a single, slightly flattened coil of clay. Appendages are separated from the main clay mass using a sharp object, such as a large chert flake. The clay that will become the base of the head is folded on itself to create the necessary thickness-the "build up." Legs and arms can be sized, shaped, and positioned as required (Figure 9).

Figure 9. Carving out and manipulating the body. Although beyond the scope of this article, the image at far right illustrates the creation of the bottom of clothing (e.g., tunic) via simple modeling around the thigh. Evidence of this was common. Photographs by Michele Greenan, ISMHS.

Construction and attachment of the head. The first step in constructing the head is to form a rounded ball of clay about the size of the center of the hand palm (to create the size common in the collection)**.** From here, pinching the frontal area between the thumb and forefinger creates a slight depression for the eye sockets and raises the bridge of the nose. The eyes can then be detailed with incised lines. Mouth shapes are the result of lips having been formed from smoothing down under the nose, and upward from the chin, possibly with some clay removal. In recreating examples of the head, it became apparent that the basic features created via initial pinching served as guides in incising the fine detail. For example, the tilted almond shape of the eye follows the indent of the pinched-in clay. The nose width and corners of the mouth were typically set at or near the lowest portion of the eye (Figure 10).

Ears were often attached elements. In fact, only one example exhibited an ear drawn into the head. Similar to attached limbs discussed above, the remaining examples of ears were attached often utilizing a tooled slit or indentation. Some degree of incising was typically present that detailed basic features of the ear (see Figure 3, above). Ears, like hair, were likely given some form prior to attachment, but then further sculpted and given fine detail while attached. The level of detail, particularly on some hair pieces, would have been difficult to sculpt without the piece being set onto the head or something of a similar dimension such as a special tool/stand, or perhaps even a finger knuckle.

Figure 10. Creating the head and facial features. Pinching clay between the thumb and forefinger and the use of a thin, round implement (or rounded edged implement) created the overall head and feature shapes. A thin, sharp instrument easily incised the lines. Here, shown in the center image, a lamellar blade was used. Photographs by Michele Greenan, ISMHS.

Discussion

Typically, hand modeled clay figurines can be created using the following methods: subtractive, additive, manipulative, or a combination thereof. Each has potential advantages and drawbacks. Not surprisingly, there was little evidence for the subtractive process, which involves starting with a piece of clay large enough to contain the entire figurine in its final pose. Then, all the clay that will not be part of the final object is removed. This method is identical to that used in carving harder materials, such as stone, bone, or wood, and seems to be better suited for those materials. Experiments show that the subtractive operation is the most time consuming, often resulting in unintended errors or breaks.

The other techniques-additive and manipulative, including a newly defined combination of the two-are readily apparent in the collection. The additive technique starts with the torso area of the figurine being the planned final size and rough shape. The appendages are attached individually using additional clay to secure each to the torso. The arms and legs would begin as clay coils of the appropriate size while the head would begin as a clay ball. This process can be identified by a higher degree of breakage at the point of attachment. Frequently, these failures are caused by an incomplete or weak joining of the appendage. The resulting break has characteristics similar to those found with coil breaks in ceramic vessels (Mangold 1981).

From the high number of complete arm and leg fragments in the collection, the additive technique was used extensively. The methods of adjoining elements by sculpting one element into another, by the use of tabs or connecting implements, or by creating special join articulations (ball and socket style) represent very specific differences in technique. It is possible that individual artists were experimenting with techniques to find better ways of affixing the limbs to the torso.

Also used extensively was a combination of the manipulative technique and additive technique identified here as a form of a modified "Gumby" approach. This approach is different from a completely manipulated form that includes the head, which was seen on only one example in the collection. In the more prevalent version, the head is added separately. The occurrences of modeled forms, in addition to the fact that nearly all head and torso fragments are modified and sculpted to be added together, indicates that this "modified Gumby" technique was frequently implemented. Experimental replication of the process confirmed that it was fairly straightforward with examples created in a short amount of time.

Both the additive and manipulative techniques, as well as the variations therein, are represented in the Mann site collection. Yet, they do not explain all examples. Two examples are particularly different in basic shape and detailed features (Figure 11). One was made by squishing a ball of clay down with the thumb. The other has a squared shape with deep incised slits as facial features (possibly created by fingernails). Both appear similar to other Mann figurines in paste alone.

There are also approximately 75 examples of fragments that are, for the most part, ambiguous. Some have a definitive shape with hints of molding into larger elements such as heads or torsos. Others are simple, rolled tubes of clay similar to limbs. It seems highly likely that some of these could reflect working preforms, or perhaps manufacture fumbles, learning pieces, or simply unattached pieces. One interesting example illustrates this well with its obvious incomplete leg formation (Figure 12).

Additionally, some arms and legs could be identified, but appear as unfinished. These look more like elongated pegs or stubs than limbs. The example shown above in Figure 4 (at left) is a good example in which the final forming of the feet did not take place. Numerous other examples indicate that one common style of forming the feet entailed squishing or tapering one end as the foot. In some examples, the squished end included small incised lines as toes.

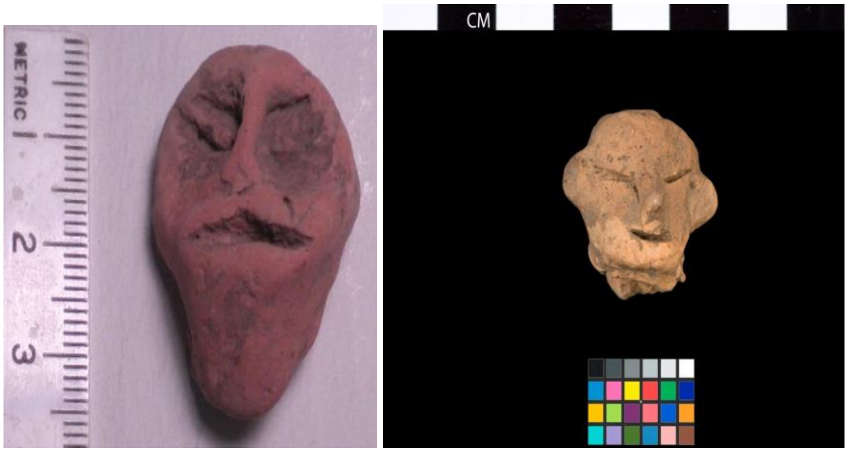

Figure 11. Atypical head shapes and feature detailing. Photograph on the left by Michele Greenan, ISMHS. Photograph on right by Steve Happe, ISMHS.

Figure 12. Possible preform or learning piece. Photograph by Steve Happe, ISMHS.

Unfortunately, manufacturing-related characteristics are extremely difficult to see on the Mann figurines with regards to surface treatment. For example, five examples show hints of possibly being carved as if a sharp prismatic bladelet was utilized to help give form and shape. The addition of paint is another real possibility for some examples, with one in the collection definitely retaining some red pigment (Figure 13). Two others are possible candidates, but severe surface sloughing hindered definitive identification.

Figure 13. Red paint on figurine hair/head adornment fragment. Photograph by Steve Happe, ISMHS.

Conclusion

Results of the analysis indicate that three different techniques were used to manufacture the figurine fragments in the collection: the additive technique, involving adding all elements together piece by piece; the complete manipulative technique, involving manipulating a piece of clay into the various elements, including the head; and the modified manipulative technique, in which the body is manipulated into shape, with the head being formed and added separately. Beyond these three techniques are further variations within the additive approach in which elements are added via sculpting, using connecting implements, or creating specialty fittings (e.g., ball and socket style). Clearly, the scope of manufacturing techniques employed goes well beyond any singular artistic school or tradition.

There are many reasons why these different techniques could all be present at the Mann site. To begin with, the Middle Woodland component of the site is estimated through Carbon 14 dating and analysis of diagnostic material (ceramics, lithics) to have existed from approximately 100 – 500 A.D. (Kellar 1979:101; Ruby 1997:303-308; Ruby et al. 2005:142-143). Within this timeframe, changing artistic expressions is likely. Additionally, outside influences at some points in time may have played a substantial role in developing these techniques or in refining those that were currently employed.

It is extremely probable that some techniques were being used at the same time. One possible scenario is that different forms, i.e., intricate postures with added elements, may have been more easily created through the additive approach. Thus, the risk of using the technique even when failures are more common during firing is warranted when producing more intricate forms. Another possibility is that certain techniques had to be employed by particular artists or on particular forms. To approach these two possibilities directly, one important next step in research is to make connections between the manufacturing type noted with particular forms (form attributes including size, gender, clothing, hair, posture). This could have tremendous potential in identifying possible patterns related to manufacturing technique.

The evidence considered together suggests that hundreds of figurines were made at the Mann site by different groups of artists. The different approaches used in manufacturing the Mann figurines suggest several communities of practice. Cultural traditions were probably passed from the experienced to the novice through hands-on teaching, such as is described in practice theory (Cordell and Habicht-Mauche 2012; Eckert 2008; Habicht-Mauche et al. 2006; Herbert 2007). Artisans within a region learn under the tutelage of an experienced elder. However, the apprentices learn as much from the other students as they do from the teacher in the process. This creates a community of artisans whose work often reflects certain traits or processes that vary from others and, with enough examples, may be able to be isolated and identified. As there is clearly a southeastern expression at the Mann site, these communities of practice may reflect regional differences or interpretations in the construction and depiction of the people modeled in the figurines. Unfortunately, the lack of complete examples to date complicates the determination of individual artisans.

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References Cited

Black, Glenn A.

1933 The Archaeology of Greene County. *Indiana History Bulletin* 10(5).

Brinker, Ruth

1984 Mann Site Figurines. Unpublished manuscript, Glenn A. Black Laboratory of Archaeology, Indiana University, Bloomington, Indiana.

Collett, John

1880 *Second Annual Report of the Bureau of Statistics and Geology*. Carlon and Hollenbeck, Indianapolis, Indiana.

Converse, Robert N.

1993 Hopewell Ceramic Figurines. *Ohio Archaeologist* 43(4):25-27.

Cordell, Linda S., and Judith A. Habicht-Mauche

2012 *Potters and Community of Practice: Glaze Paint and Polychrome Pottery of the American Southwest, A.D. 1250-1700*. University of Arizona Press, Tucson, Arizona.

Eckert, Susanne L.

2008 *Pottery and Practice: The Expression of Identity at Pottery Mound and Hummingbird Pueblo.* University of New Mexico Press, Albuquerque, New Mexico.

Fortier, Andrew

2001 *The Dash Reeves Site: A Middle Woodland Village and Lithic Production Center in the American Bottom.* Illinois Department of Transportation FAI-270 (28) University of Illinois, Urbana, Illinois.

Griffin, James B.

1952 "The Snyders Site." The Greater St. Louis Archaeological Society, p. 2. St. Louis, Missouri.

Habicht-Mauche, J., S. L. Eckert, and D. Hunter (editors)

2006 *The Social Life of Pots: Glaze Ware and Cultural Transfer in the Late Precontact Southwest.* University of Arizona Press, Tucson, Arizona.

Herbert, Joseph M.

2007 *Woodland Potters and Archaeological Ceramics of the North Carolina Coast.* University of Alabama Press, Tuscaloosa, Alabama.

Jefferies, Richard W.

1987 *The Archaeology of Carrier Mills: 10,000 years in the Saline Valley of Illinois.* Southern Illinois University Press, Center for Archeological Investigations, Carbondale, Illinois.

Kellar, James H.

1979 The Mann Site and "Hopewell" in the Lower Wabash-Ohio Valley. In *Hopewell Archaeology*, edited by David S. Brose and N'omi Greber, pp. 100-107. Kent State University Press, Kent, Ohio.

Keller, Cynthia, and Christopher Carr

2005 Gender, Role, Prestige, and Ritual Interactions across the Ohio, Mann, and Havana Hopewellian Regions, as Evidenced by Ceramic Figurines. In *Gathering Hopewell: Society, Ritual, and Ritual Interaction*, edited by Christopher Carr and D. Troy Case, pp. 428-460. Kluwer Academic/Plenum Publishers, New York.

King, John

2005 *An Oral History of the Mann Site: An Interview with Avocational Archaeologist Gerald King.* Report Submitted to the University of Southern Indiana, on file at the Indiana State Museum and Historic Sites, Indianapolis, Indiana.

Koldehoff, Brad

2006 Hopewellian Figurines from the Southern American Bottom. *Illinois Archaeology* 18:185-193.

Lacer, Charles Jr.

1980 The Mann Site. Manuscript on file, Indiana State Museum and Historic Sites, Indianapolis, Indiana.

McGregor, John C.

1958 *Pool and Irving Villages.* University of Illinois Press, Urbana, Ilinois.

Mangold, William L.

1981 *Middle Woodland Ceramics in Northwestern Indiana and Southwestern Michigan*. Unpublished Master's thesis, Department of Anthropology, Western Michigan University, Kalamazoo, Michigan.

Orton, Clive, Paul Tyers, and Alan Vince

1993 *Pottery in Archaeology*. Cambridge University Press, Cambridge, United Kingdom.

Peterson, Staffan

2007 Surface Mapping and Subsurface Imaging of the Mann Archaeological Site (12-PO-2), Posey County, Indiana HPF 21517-11. Glenn A. Black Laboratory of Archaeology, Indiana University, Bloomington, Indiana.

Ruby, Bret J.

1997 *The Mann Phase: Hopewellian Subsistence and Settlement Adaptations in the Wabash Lowlands of Southwestern Indiana*. Unpublished Ph.D. dissertation, Department of Anthropology, Indiana University, Bloomington, Indiana.

Ruby, Bret J., Christopher Carr, and Douglas K. Charles

2005 Community Organizations in the Scioto, Mann, and Havana Hopewellian Regions: A Comparative Perspective. In *Gathering Hopewell: Society, Ritual, and Ritual Interaction*, edited by Christopher Carr and D. Troy Case, pp. 119-176. Kluwer Academic/Plenum Publishers, New York.

Ruby, Bret J., and Christine M. Shriner

2005 Ceramic Vessel Compositions and Styles as Evidence of the Local and Nonlocal Social Affiliations of Ritual Participants at the Mann Site, Indiana. In *Gathering Hopewell: Society, Ritual, and Ritual Interaction*, edited by Christopher Carr and D. Troy Case, pp. 553-572. Kluwer Academic/Plenum Publishers, New York.

Swartz, B.K., Jr.

2001 Middle Woodland Figurines from the Mann Site, Southwestern Indiana. In *The New World Figurine Project, Volume* 2, edited by Terry Stocker and Cynthia L. Otis Charlton, pp. 253-270. Research Press, Bringham Young University, Provo, Utah.

Willoughby, Charles C.

1922 *The Turner Group of Earthworks Hamilton County, Ohio*. Papers of the Peabody Museum of American Archaeology and Ethnology Vol. 8, No. 3. Harvard University, Cambridge.

DISTINCTIVE FRENCH LICK PHASE ANTLER BEADS FROM THREE LOCATIONS IN INDIANA

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"Man was created for a purpose – so that he should know where he came from . . ."
Shams-i Tabrizi, the *Maqalat-i Shams-i Tabrizi*

Introduction

As a result of the publication of the investigations at 12Sp7, Spencer County, Indiana, Gary Morrison contacted the Indiana Department of Natural Resources, Division of Historic Preservation and Archaeology (DHPA), indicating that he had recovered an incised bead of similar appearance to that reported by Christopher Bergman (2011; Figure 5). This contact proved to be the impetus for this short article.

Although the authors refer to these objects as beads, a logical assumption given their morphology, we do not have any evidence that they were in fact regarded as such by the person who made them or the people that used them. The highly distinctive nature of these artifacts and their association with the French Lick Phase of southern and western Indiana is described below, focusing upon their prehistoric cultural context, design, and manufacture. Two of the beads discussed in this article were recovered by Morrison and Terry Meade as a result of casual collection, while the third example was recovered during 2010 Scientific Recovery investigations (Bergman 2011; Bergman et al. 2014). The discussion of the prehistoric context of these beads will, consequently, focus on the work at 12Sp7 in the following section.

The Prehistoric Context of 12Sp7

In fulfillment of the terms of an approved plan (#2010006) for scientific investigations granted by the DHPA, Bergman conducted fieldwork at 12Sp7, also known as the Kramer Mound (Bergman 2011; Bergman et al. 2014; Indiana University Archaeological Survey Form 1987; Kellar 1956). This investigation resulted in the recovery of eight (8) prehistoric ceramic sherds, 12,065 flaked stone artifacts, 163 groundstone and "other" artifacts, 349 specimens of worked bone and antler, 1,854 pieces of firecracked rock (FCR), 23,747 remains of terrestrial and aquatic animals, as well as the remains of at least 41 individuals.

Two AMS dates were obtained for 12Sp7 using carbonized hickory, walnut, and oak acorn nutshell fragments. Beta Sample 284033 was collected from Stratum IIb, lower Ap horizon, West 17, within a five gallon flotation sample, and yielded a calibrated radiocarbon age of 4220 B.C. (conventional radiocarbon age of 5300 $\pm$ 40 B.P.). Beta Sample 284032 was collected from Stratum III, midden horizon, South 7, within a five gallon flotation sample and yielded a calibrated radiocarbon age of 3760 B.C. (conventional radiocarbon age of 4980 $\pm$ 40 B.P.). These dates fall within the range of French Lick assemblages, which span the "Terminal" Middle Archaic into the early part of the Late Archaic.

A total of 271 Projectile Points/Knives (PPK) were collected during the scientific investigations and 43.9 percent of these could not be classified. The remaining 152 PPKs were assigned to specific clusters and types after Justice (1987) and these have date ranges between the Early Archaic and Late Woodland periods. Table 1 lists the 106 Middle and Late Archaic projectile points, which comprise 69.7 percent of the 152 PPKs that were assigned a temporal bracket at 12Sp7. Most of these specimens are represented by Brewerton Eared and Matanzas varieties (41.2 percent of the total of 106; Figure 1), as well as McWhinney Heavy Stemmed (17.0 percent of the total of 106) and other stemmed forms. These point types are characteristic of Cook (1980) and Munson's (1980) French Lick Phase, which typically includes Matanzas Side Notched, Big Sandy II, Karnak Stemmed, and straight- to expanding stemmed PPKs (referred to as the M-B-K-S grouping by Stafford and Cantin 2009:300). At 12Sp7 it was not possible to determine whether the PPKs represent functional variants within the same French Lick tool kit or whether they represent discarded tools belonging to different groups over a relatively short period of time.

Table 1. Projectile Points/Knives Typology and Temporal Affiliation at 12Sp7.

Projectile Point/Knife Type	Total	
Middle Archaic		
Big Sandy II	10	
Eva I	1	
Total Middle Archaic	11	10.4%
Middle Archaic – Late Archaic		
Elk River Stemmed	3	
Total Middle Archaic – Late Archaic	3	2.8%
Late Archaic		
Bottleneck Stemmed	1	
Brewerton Side Notched	1	
Brewerton Corner Notched	1	
Brewerton Eared Notch	37	

Projectile Point/Knife Type	Total	
Brewerton Eared Triangle	4	
Karnak Stemmed	5	
Lamoka	4	
Ledbetter Stemmed	3	
Matanzas Side Notched	16	
McWhinney Heavy Stemmed	18	
Normanskill	1	
Table Rock Stemmed	1	
Total Late Archaic	92	86.8%
Total	106	100.0%

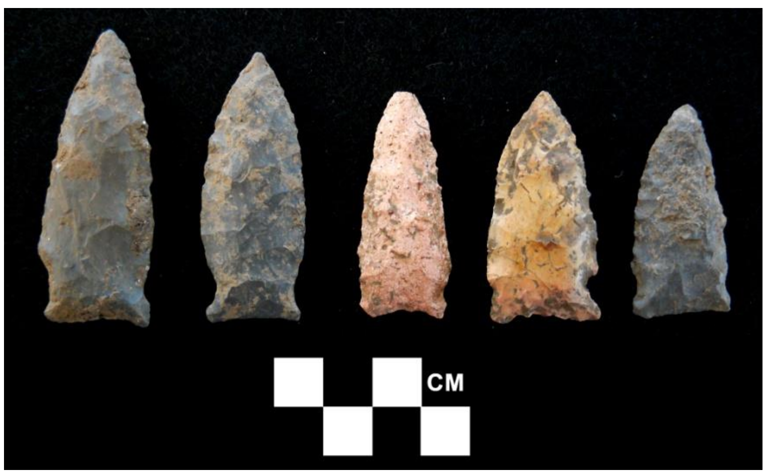

Figure 1. Matanzas Cluster projectile points from 12Sp7. Photograph by Christopher Bergman.

The prehistoric groundstone and "other artifact" assemblage is highly varied and includes axe and celt fragments, bannerstone fragments, hematite objects, fossils, collected stones and water-worn artifacts, hammerstones, pitted stones and grinding stones, as well as red ochre. The assemblage has parallels with other French Lick sites such as Bluegrass (12W162) and Late Archaic sites in Ohio (Purtill 2009:574) where groundstone tools become more common after 5950 B.P.

The presence of decorated pins suggests links with other Middle-Late Archaic sites in the region as discussed by Jefferies (1997) and Stafford and Cantin (2009). Most of the 12Sp7 sample are represented by single examples only, with the exception of four pins with fishtail-shaped heads (Bergman et al. 2014:Figure 19; Jefferies 1997:Figure 4). The fishtail-shaped head style has been reported from Crib Mound, Spencer County, Indiana, and the McCain Site in

Dubois County, Indiana (Jefferies 1997:Table 2), as well as the Koster and Black Earth sites in Illinois, indicating the presence of regional exchange networks among groups participating in similar cultural expressions. Such social interaction between prehistoric peoples involved in a shared cultural milieu is expected, but is counterbalanced by occasional violent exchanges as discussed below.

A total of 23,747 (32,396.06 g) faunal specimens from site 12Sp7 were analyzed by Tanya Lemons (Bergman et al. 2014), representing 45 different taxa, including both vertebrates and invertebrates. Mammals account for approximately 84 percent (n=17 taxa) of the total; birds 4 percent (n=6 taxa); amphibians less than 1 percent (n=1 taxon); reptiles 7 percent (n=7 taxa); bony fish less than 1 percent (n=5 taxa); gastropods less than 1 percent (n=2 taxa); and bivalves 3 percent (n=7 taxa). The 12Sp7 faunal assemblage resembles that described for Midwestern Late Archaic peoples participating in forager economies in general, and the Bluegrass Site (Stafford et al. 2000) in particular. Terrestrial mammals, especially white-tailed deer, tend to dominate these assemblages, but other components of the 12Sp7 faunal materials provide information on non-subsistence related behavior. For example, two box turtle specimens, both marginal, had perforations and may have been parts of rattles.

According to Christopher Schmidt, the Minimum Number of Individuals (MNI) indicated by human remains recovered from 12Sp7 was 41, including 24 adults and 17 subadults below the age of 18 (Bergman et al. 2014). In common with other Middle and Late Archaic mortuaries in southern Indiana along the Ohio River, there was a single individual with perimortem trauma at 12Sp7. Sites such as Bluegrass, Meyer (12Sp1082), 12Hr6, and Firehouse (12D563) have one and, in some instances, two people missing a limb and or their head or display some evidence suggestive of scalping. In general, trophy taking was more common than scalping during the Archaic Period, but the latter was present in Indiana and neighboring states at that time (Schmidt et al. 2010). The violence that produced the scalping and trophy taking was likely small-scale and perhaps infrequent, but it did persist largely unchanged for millennia. Likewise the pathology, femoral subtrochanteric flatness, sizable percentage of children in the assemblage, and heavy dental wear make 12Sp7 consistent with its contemporaries in the region.

The Prehistoric Beads

The collection of Late Archaic beads from 12Sp7 is quite varied in terms of design and manufacture (Figure 2). The sample of 11 beads are predominantly made of bone (seven specimens), while there are two drilled carnivore canines, and two beads made of deer antler. The tube beads are rather expedient in their manufacture, while the beads which are described in this paper are much more elaborate and attest to a significant degree of artisanship.

Figure 2. Examples of bead types from 12Sp7. Photograph by Christopher Bergman.

The method of bone and antler tool manufacture evidenced at 12Sp7 involved both non-controlled (direct percussion) and controlled (grooving and splitting, Bergman et al. 2014: Figures 14 and 15) production of "blanks" for various tools or decorative pieces such as pins, awls, beads, as well as spatula-like artifacts (Bergman et al. 2014:Figure 21), which appear remarkably similar to later ethnographic examples of quill working tools. Non-controlled percussive fracture was commonly used for awl manufacture, while the manufacture of pins required greater precision utilizing long splinters, removed by grooving and splitting longbone shafts. Examples of awls made on large bird bones like turkey appear to have been shaped directly by grinding one end into a sharp tip. Finally, a number of bone and antler objects were drilled, for example, carnivore canine teeth, but in some instances a hole was created by incising on both sides of an object until it was pierced.

The manufacturing sequence for the three beads undoubtedly involved some combination of the following procedures: 1) obtaining the raw material, which in all instances is antler, specifically the main beam portion; 2) preparing the antler, probably by soaking to soften the material, and then by removing parts that are superfluous to manufacture; 3) removing the bead blank by grooving the antler to the spongy inner core and snapping; 4) preparing the surface of the antler by grinding with stone of various grit; 5) overlaying and initial incision of the design; 6) enhancing the depth and width of the engraved lines; and 7) final preparation of the bead by the flattening of both ends as desired and reaming out the spongy core to create a hole. The precise order in which these steps were enacted by the prehistoric artisan undoubtedly varied.

The design is quite intricate, as is some of the engraving on Late Archaic bone pins (Bergman et al. 2014:Figure 20; Jefferies 1997:Figure 4), and consists of a double looping pattern around the circumference of an antler main beam section (Figure 3).

Figure 3. Incised pattern on the three beads. Image by Gary Morrison.

As indicated above the exact sequence of steps used in manufacture is a matter of speculation and it is not known whether the engraving was completed prior to the bead blank being removed from the main beam. Certainly working with a longer section of antler would provide a handle by which the material could be gripped and manipulated as it was finely incised. Given their size and rounded shape, engraving by holding the bead in the hand may have proved difficult if the work was conducted after the bead was fully detached. It is possible that the extraneous portions of the antler forming the pedicle/burr, as well as the fork portion that terminates in the tines, were removed first. After the design was completed, the bead would then be removed from the main beam and finished. Alternatively, the bead could have been clamped in some kind of hand-held vise or reamed out and placed tightly on a stick, thus providing the necessary support for detailed work of this kind. In the future, the authors plan to conduct some replicative experiments to explore the various options for creating the engraved designs.

The bead from 12Sp7 measures 21.4 millimeters wide x 30.5 millimeters long and it displays evidence of the manufacturing steps described previously (Figure 4). The lines are square-sided, a feature noted on all of the beads, which may suggest that after initially etching the pattern with a sharp-edged tool, it was then enhanced with a small graver/piercer or some other tool.

Figure 4. Bead from site 12Sp7, Spencer County. Photograph by Christopher Bergman.

The two beads recovered by Meade and Morrison are illustrated in Figure 5. The example collected by Meade (Figure 5, top) was recovered at a separate location in Spencer County from 12Sp7. This specimen measures 28.6 millimeters wide x 38.1 millimeters long and is the largest example of the three. In common with the bead from 12Sp7, it has three lines above/below the looping design. This artifact displays a prominent projection above and below the main design panel where the outer surface of the antler was cut to remove the bead blank.

Morrison's bead (Figure 5, bottom) was recovered from the Turpin site (12Gi275), northwestern Gibson County, and it is the smallest specimen measuring 19.1 millimeters wide x 23.8 millimeters long. Notably the bead has only two lines above/below the main design panel and, in common with the bead from 12Sp7, it has flatter surfaces at either end of the bead. This may be the result of a lower angle cut employed for the groove and snap or that these areas were ground down after the bead blank was extracted. Judging by the report illustrations (Morrison 1975:Figures a-1 to a-7), it appears that Matanzas Cluster and a variety of stemmed projectile point forms were recovered along with a variety of bone and antler tools. The latter included awls, an eyed needle, fishhooks, bone pin fragments, and two crutch top pins (Jefferies 1997: Figure 3), one of which was complete and incised with a zig-zag pattern (Jefferies 1997:Figure 4) near the head.

Figure 5. Meade's bead from Spencer County, top, and Morrison's bead from the Turpin Site (12Gi275), northwestern Gibson County, bottom. Photograph by Gary Morrison.

Conclusions

As discussed above, the beads were all made using techniques that fall within the technological repertoire of antler working by Middle and Late Archaic peoples (see Bergman et al. 2014). What makes these artifacts unique is the design and the very precise nature of the engraving. The significance of the design has been open to some speculation among the authors and opinions range from a simple decorative motif to a totemic symbol to an abstract depiction of a geographic location such as a bend in a river. The fact is we simply do not know what meaning, if any, the design is meant to convey beyond the clear aesthetic appeal.

The authors are in agreement that these beads could very well be the creation of a single individual. Their unique style and degree of artistic execution certainly suggest that this individual was a craftsperson in every sense of the word. The appearance of craft specialization becomes more common during the later part of the Archaic Period as evidenced by the proliferation of elaborately decorated objects like the bone pins described by Jefferies. In his study, Jefferies (1997:480-481) emphasizes the significance of the stylistic information they contain as it pertains to social affiliation. In the case of the bone pins, he concludes that the appearance of "more distinct, localized artifact styles [indicate] a greater degree of regional interaction among some hunter-gatherer groups. . ." (Jefferies 1997:481). We would also argue that these groups were becoming more distinct in terms of territory and cultural expression, rendering objects like the beads discussed in this paper emblematic of different groups occupying a landscape undergoing cultural diversification. An important geographic boundary was apparently the Ohio River as evidenced by the fact that the bone pins of the Green River Archaic, for example, are quite distinct from those to the north.

While the work of scholars like Jefferies (1997) and Stafford and Cantin (2009) have provided important insights into the broader cultural setting of the "Terminal" Middle Archaic and early part of the Late Archaic of the southern Midwest, in the example of our three beads we may be viewing the activity of a single individual. Resolution of behavior at this level of differentiation is always a rare opportunity in prehistory. The recovery of two of the beads in Spencer County, with the other example at least 80 kilometers (ca. 50 miles) away in Gibson County, could reflect the wanderings of this artisan or their interaction with exchange partners in neighboring localities.

References Cited

Bergman, Christopher A.

2011 Scientific Recovery Investigations at the Kramer Mound (12Sp7): Fieldwork, Stratigraphy and Dating. *Indiana Archaeology* 6(1):49-63.

Bergman, Christopher A., Tanya P. Lemons, and Christopher Schmidt

2014 Scientific Recovery Investigations at the Kramer Mound (12Sp7): Prehistoric Artifact Assemblage, Faunal and Floral Remains, and Human Osteology. *Indiana Archaeology* 9(1):13-101.

Cook, Thomas G.

1980 Typology and Description of Hafted Stone Tools. In Archaeological Salvage Excavations at Patoka Lake, Indiana: Prehistoric Occupations of the Upper Patoka River Valley, edited by Cheryl A. Munson, pp. 349-454. *Research Report* 6, Glenn A. Black Laboratory of Archaeology, Indiana University, Bloomington, Indiana.

Indiana University Archaeological Survey Form

1987 Indiana University Site No. 12Sp7, Database Enhancement 1987. Indiana Historic Sites and Structures Inventory–Archaeological Sites. Division of Historic Preservation and Archaeology, Indianapolis, Indiana.

Jefferies, Richard W.

1997 Middle Archaic Bone Pins: Evidence of Mid-Holocene Regional-Scale Social Groups in the Southern Midwest. *American Antiquity* 62(3):464-487.

Justice, Noel D.

1987 *Stone Age Spear and Arrow Points of the Midcontinental and Eastern United States*. Indiana University Press, Bloomington, Indiana.

Kellar, James H.

1956 *An Archaeological Survey of Spencer County*. Indiana Historical Bureau, Indianapolis, Indiana.

Morrison, Gary H.

1975 *Archaeological Salvage, Turpin Site: Gibson County, Indiana*. Manuscript on file, Department of Anthropology, Indiana State University, Terre Haute, Indiana.

Munson, Cheryl A.

1980 The Late Archaic French Lick Phase: A Dimensional Description. In Archaeological Salvage Excavations at Patoka Lake, Indiana: Prehistoric Occupations of the Upper Patoka River Valley, edited by Cheryl A. Munson, pp. 721-740. *Research Report* 6. Glenn A. Black Laboratory of Archaeology, Indiana University, Bloomington, Indiana.

Purtill, Matthew

2009 The Ohio Archaic: A Review. In *Archaic Societies: Diversity and Complexity Across the Midcontinent*, edited by Thomas E. Emerson, Dale L. McElrath, and Andrew C. Fortier, pp. 565-606. State University of New York Press, Albany, New York.

Schmidt, Christopher W., Rachel A. Lockhart, Christopher L. Newman, Anna Serrano, Melissa S. Zolnierz, Anne T. Bader, and Jeffrey A. Plunkett

2010 Skeletal Evidence of Cultural Variation: Mutilation Related to Warfare and Mortuary Treatment. In Human Variation in the Americas: The Integration of Archaeology and Biological Anthropology, edited by Benjamin M. Auerbach, pp. 215-237. *Occasional Paper* No. 38. Center for Archaeological Investigations, Carbondale, Illinois.

Stafford, C. Russell, R.L. Richards, and C. Michael Anslinger

2000 The Bluegrass Fauna and Changes in Middle Holocene Hunter-Gatherer Foraging in the Southern Midwest. *American Antiquity* 65(2):317-336.

Stafford, C. Russell, and Mark Cantin

2009 Archaic Period Chronology in the Hill Country of Southern Indiana. In *Archaic Societies: Diversity and Complexity Across the Midcontinent*, edited by Thomas E. Emerson, Dale L. McElrath, and Andrew C. Fortier, pp. 287-313. State University of New York Press, Albany, New York.

TOOLS OF THE TRADE: CHIPPED LITHIC ASSEMBLAGES FROM THE HOVEY LAKE (12Po10) AND RIES-HASTING (12Po590) ARCHAEOLOGICAL SITES, POSEY COUNTY, INDIANA

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Abstract

Hovey Lake and Ries-Hasting are late prehistoric Caborn-Welborn phase archaeological sites located in southwestern Indiana, along the Ohio River. Hovey Lake is a large village, and Ries-Hasting is a small hamlet. Both have been investigated with surface survey and small-scale excavations by researchers from Indiana University and other institutions. To understand Caborn-Welborn tool use and production, the lithic assemblages from these sites were systematically compared. Lithic artifacts include initial and subsequent manufacturing forms, as well as complete and fragmentary implements for cultivating, woodworking, scraping, perforating, and hunting. Characteristics of size, worked-edge shape, and presence of cortex were recorded for each manufacturing form and implement. A sample of lithic debitage from each site was observed for production stage and evidence of subsequent use as expedient tools. Chert types were also identified for manufacturing forms, implements, and debitage. Statistical analyses of artifact and chert types illustrate how chert was acquired and processed, how tools were produced and utilized at each site, and the ways in which the tool kits vary between the sites.

Introduction

This study examines the chipped stone tools and tool production by-products at two late prehistoric Mississippian archaeological sites, Hovey Lake (12Po10) and Ries-Hasting (12Po590), both located in Posey County, Indiana, in order to compare tool production and tool use at contemporary communities (Figure 1). The last Native American occupation at Hovey Lake and the only occupation at Ries-Hasting were Caborn-Welborn phase communities.

The Caborn-Welborn culture began around the confluence of the Ohio and Wabash rivers about A.D. 1400, as the earlier Mississippian chiefdom centered to the east at Angel Mounds near Evansville, Indiana (Black 1967; Monaghan et al. 2013; Peterson 2010) was declining as a political and ceremonial center (Pollack 2004; Pollack and Munson 1998, 2003). Although Caborn-Welborn people did not construct mounds, in several cases they established settlements at locations having Middle Woodland mounds that they used for cemeteries. Communities range from large villages of 500 or more people to small villages, hamlets, and still smaller farmsteads of just a house or two (Green and Munson 1978; Pollack and Munson 2003). Some of these settlements continued into the seventeenth century, based on radiocarbon dates and rare European trade goods, such as brass and copper tinklers and glass beads.

The Caborn-Welborn homeland is a roughly 1,100 km^2 area of extensive forests on bottomlands and terraces with rich soils, bordered by upland bluffs. Cypress swamps, backwater lakes, and "bayous" or sloughs along the Ohio and Wabash Rivers, though much reduced today, would have been a common feature. Historically the bottomlands had extensive stands of cane, while the terraces and bluffs on the east side of the Wabash River had occasional Pleistocene sand dunes, small pockets of prairie, and broader areas of brushy barrens (Green 1984; Homoya et al. 1984). Based on the Government Land Office survey records and Green's (1977, 1984) reconstruction of the presettlement vegetation of Posey and Gibson counties, the closest small prairie is only 12.5 km distant from the Hovey Lake site.

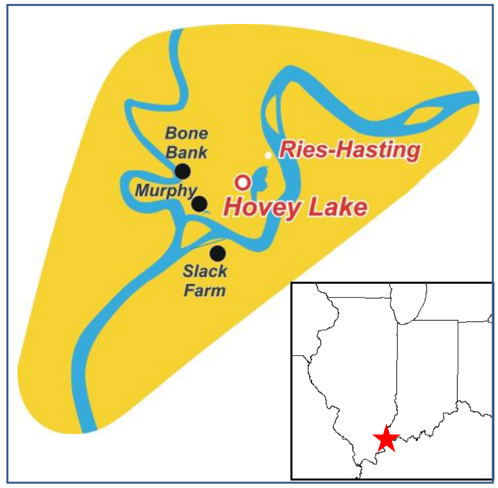

Figure 1. Location of the Hovey Lake and Ries-Hasting sites and other sites (gold) of the Caborn-Welborn phase.

The Caborn-Welborn people were maize agriculturalists who expanded the plant part of their diet by growing native cultigens, squash, sunflower, and beans, as well as by collecting a variety of nuts, wild seedy plants, and fruits (Turner and Munson 2016). Hunting included a wide variety of terrestrial and aquatic animals (Garniewicz 2000, 2001; Steven R. Kuehn, personal communication 2015; Terrance J. Martin, personal communication 2010) with assemblages dominated by deer. The proximity of settlements to backwater lakes and sloughs of the Ohio and Wabash Rivers reflects the importance of fish, turtles, and waterfowl. The presence of a few bison bone artifacts at several sites, along with the ubiquitous end-scrapers found at every Caborn-Welborn site, may indicate direct bison procurement instead of trade. Bison elements are absent in the vast analyzed faunal sample from the Angel site (Adams 1949; Kellar 1967), but are represented at the Hovey Lake site by an unmodified scapula and a possible astragalus die (game piece). At the nearby Murphy site, bison are represented by artifacts including scapula hoe blades, several astragalus dice, and a bison tooth pendant, as well as an unmodified possible bison metapodial (Munson 1998, 2001).

We review the previous research on lithic assemblages of the Caborn-Welborn culture, the setting of the Hovey Lake and Ries-Hasting sites, and the materials and methods used to analyze tool production and utilization at these sites. Discussion of the results of the study highlights the variable patterns of tool manufacture and use.

Previous Research

The sites in this study represent just two of the 29 known Caborn-Welborn archaeological sites in Indiana. Numerous other Caborn-Welborn phase sites are located at the confluence of the Ohio and Wabash Rivers in Kentucky and Illinois. In addition to the Hovey Lake and Ries-Hasting sites, research on this culture has been carried out at the nearby sites of Caborn (12Po32) (Munson et al. 1987, 1989), Murphy (12Po1) (Munson 1997, 1998, 2001), Bone Bank (12Po4) (Munson 2003), and Slack Farm (15UN28) (Pollack 2004; Pollack and Munson 1998). Ground stone tools are infrequent, but chipped stone artifacts are abundant.

Description of the chipped stone artifacts in the Bone Bank and Slack Farm assemblages show the Caborn-Welborn tool kit to be characterized by: Madison arrow points (Justice 1987:224-227); rare Nodena cluster points (Justice1987:230-232), primarily of the Banks variety; hoe blades; gouges; rare large refined bifaces, including long, bipointed Ramey-style knives (Perino 1963); occasional small hump-backed knives (Munson and Munson 1972); drills and perforators; and a variety of scrapers, including the omnipresent Caborn-Welborn end-scraper (thumbnail-size and longer). Caborn-Welborn chipped stone assemblages are dominated by manufacturing by-products and implements of locally available cherts, but non-local cherts, including Mill Creek and Kaolin from southern Illinois and Dover from western Tennessee, also occur (Munson 2003). Intersite variability in Caborn-Welborn tool kits and tool production has not previously been examined.

Although only two Caborn-Welborn lithic assemblages have been analyzed, chipped stone implements are comparable in many ways to those of the generally earlier Mississippian Angel phase, as described for the Angel site (Kellar 1967) and the Southwind site (Munson 1994). Caborn-Welborn and Angel share Madison points, Ramey-style knives, hoe blades, and drills and perforators manufactured from chert. Scraping activities such as hide processing or arrow shaft making in the Angel phase appear to be limited to side-scrapers and spokeshaves, while in Caborn-Welborn collections all three types of scrapers occur and end-scrapers are sometimes more abundant than arrow points. Caborn-Welborn arrow points include examples of Nodena styles which are absent in the described Angel phase lithic assemblages (Kellar 1967; Munson 1994; Seeman and Munson 1980).

The Sites: Large Village vs. Hamlet

Intensive archaeological surveys and test excavations, directed by Munson and carried out by researchers and students at Indiana University-Bloomington, along with University of Southern Indiana and University of Evansville, have yielded systematically collected artifacts from the Hovey Lake and Ries-Hasting sites. Support for the investigations came from Indiana University, the Glenn A. Black Laboratory of Archaeology, the Indiana Historical Society, National Park Service Historic Preservation Fund grants that were administered by the Indiana DNR Division of Historic Preservation and Archaeology, the Indiana Humanities Council, and the Indiana

Department of Transportation, Transportation Enhancement Program. The site collections were analyzed at Indiana University and are curated at the University of Southern Indiana.

Hovey Lake Site

The site is located on a glacial outwash terrace adjacent to a backwater lake. A small stream connects the lake to the Ohio River, affording the locale access to the river. The site lies on one of the highest flood-free spots in a 400 km^2 area of bottomlands and terraces. Not surprisingly, human use of the site occurred intermittently throughout all of prehistory by small groups who deposited lithic materials, including a Middle Woodland habitation with lamellar blades and other artifacts of cherts that were typically imported during this period (Wyandotte, Flint Ridge). Thus, non-diagnostic lithic artifacts from the surface collections are not useful for intersite comparisons.

Based on types of features, intensity of occupation, and site size, the Hovey Lake site has been classified as a large village. It has an extensive 11.8 ha area of Mississippian use, a compact residential area with an estimated 100 contemporary structures arranged around a central plaza, surrounding bastioned fortification walls, and multiple outlying cemeteries (Munson 1997, 1998, 2000, 2001, 2010). Residential area burials also occur near and within houses (Munson and Cook 2001). Ceramics, well-preserved aquatic and terrestrial faunal remains, carbonized remains of wild and cultivated plants, and lithic artifacts occur in shallow middens, house floors, filled-in house basins and storage pits, and other construction features. Radiocarbon dates range from cal A.D. 1380 to 1650 (Munson 2010).

Ries-Hasting Site

A small Caborn-Welborn population occupied a hamlet comprised of an estimated 8 to 10 houses along a linear floodplain ridge that covers only 1.7 ha (Munson 1997). The site lacks any suggestion of fortification, based on intensive surface survey and geophysical survey, but does have burials. Ries-Hasting lies only a short distance away from the large village at Hovey Lake and near the bank of the Ohio River. The geologically recent age of the floodplain here precluded earlier occupations. Sloughs extend from the lake to the occupied ridge. During high river levels, connections between the two communities would have been made only via canoe because Ries-Hasting would have been an island. During high flood stages on the river, the Ries-Hasting site and the surrounding area would have been inundated and temporarily abandoned; the Hovey Lake village would have been the nearest place of refuge for the hamlet's inhabitants.

The Ries-Hasting occupation was short compared to Hovey Lake, as the intensity of occupation debris is relatively low. The site was occupied sometime during cal A.D.1450-1640, based on a single radiocarbon date. Collections lack historic trade goods. Surveys and minimal testing (2 m^2) show typical Caborn-Welborn ceramic, faunal, and floral remains, but also an unusually high proportion of chert tool-manufacturing debris. The concentration of debitage suggested that the residents of the hamlet were involved in lithic workshop activities, as well as typical Caborn-Welborn household economic activities of farming, fishing, and hunting.

Do tool production indicators at Ries-Hasting differ from those at Hovey Lake? If so, in what ways? Are the types of tools comparable at the two sites?

Materials and Methods

The chipped stone assemblages from the two very different sites provide an opportunity to better understand the manufacture and use of lithic tools of the Caborn-Welborn phase in different types of communities. The Hovey Lake data set for tools and manufacturing by-products comes from the excavation of discarded or abandoned artifacts in samples from midden deposits, house floors, filled-in house basins, refuse-filled pits, and construction trenches for palisade walls. For Ries-Hasting, the comparable data set comes from surveys and a small test excavation that sampled a filled-in house basin and its floor. Munson has cataloged and managed a series of nine accessioned collections for the Hovey Lake site that are curated at the University of Southern Indiana (USI ACC: 139, 210, 217, 259, 276, 277, 278, 282, 283), plus three others from Ries-Hasting (USI ACC 140, 280, 281). Loans of collections curated at the Glenn A. Black Laboratory of Archaeology, Indiana University, from the initial investigations by Munson and others were obtained for this study from Hovey Lake (GBL 3305 and 6154) (Munson, notes on file, GBL-IU; Munson and Cook 2001) and Ries-Hasting (GBL 4116, 4423, 6163, 11406) (Edward E. Smith, and Cheryl Ann Munson, notes on file, GBL-IU).

Prior to this study, lithic artifacts were classified following field research according to artifact type and inferred functional categories. Computerized catalogs identified artifact morphofunctional type, raw material, segment, quantity, and weight. We identified raw materials for some of the chert debitage, if not already recorded. Excluding chert flakes, we added measurements of length, width, thickness, form of tool edge, and presence of cortex. For bifaces, we classified the production stage following Whittaker (1994). In all, we analyzed 789 tools and manufacturing by-products from Hovey Lake and 642 from Ries-Hasting. The data sets for chert flakes are a selected sample from house basins and floors from each site. Our classification of debitage addressed samples of 2,090 for Hovey Lake and 1,819 for Ries-Hasting. Debitage includes flakes and small blocky fragments. At Ries-Hasting, all chert flakes recovered from the limited test excavation represent house basin fill and floor contexts. At Hovey Lake, the excavations were more extensive and included a variety of features, so to provide comparison with the contexts from Ries-Hasting the analyzed sample was limited to the house basin fill and floor contexts in the residential area.

We classified flake type with respect to removal of cortex (primary, secondary, tertiary) and used low-level microscopic (10x hand lens) observation of edge modification suggestive of use in cutting or scraping. Prehistoric utilized flakes that may have served as expedient tools have margins with continuous alteration, as opposed to plow damage which results in intermittent edge damage.

Artifact Form and Inferred Function

Eighteen artifact types are grouped into eight inferred functional categories, based on degree of lithic reduction, refinement and shape of edges, and overall size and shape (Table 1). Microwear study has not yet been conducted to confirm the inferred functions, but they are common to other late prehistoric lithic assemblages in the Midwest. Our classifications were informed by multiple lithic analyses, particularly Boszhardt and McCarthy (1999), Brown and O'Brien (1990), Cochran (2002), Evans et al. (2014), Jeske (1992), Henning (1970), Herold et al. (1990), Lurie (1990), and Railey (1992). Additionally, one artifact type–arrow points–has multiple styles.

Initial manufacturing. Initial manurfacturing is the preliminary preparation of raw materials to produce basic tools and flakes via knapping. Amorphous cores and unifaces both represent by-products of the initial steps in raw material reduction. An amorphous core is a piece of lithic material from which a flake or flakes have been removed (Figure 2). Most cores are from river cobble chert, as indicated by their cortex. Removal of cortex may have roughly tested the cobbles for suitability for further manufacture or generated flakes of an appropriate shape and size for production of small tools. A uniface is an initial manufacturing stage made by removal of several flakes from only one face of a flake, either dorsal or ventral. Unifaces when further refined could have become bifacial tools or retouched unifacial scrapers. Both cores and unifaces occur primarily as fragments.

Table 1. Inferred functional categories and artifact types.

Category	Hovey Lake (%)	Ries-Hasting (%)	Grand Total (%)
Initial Manufacturing	13.6	24.0	18.3
Amorphous core	12.8	23.3	17.6
Uniface	0.8	0.7	0.7
Tool Manufacturing	12.7	20.4	16.2
Edged blank	3.1	5.4	4.2
Preform	9.5	14.9	12.0
Cultivating	25.8	1.8	14.9
Hoe	2.2	0.0	1.2
Hoe Flake	23.6	1.8	13.7
Woodworking	4.4	0.2	2.5
Gouge	4.4	0.2	2.5
Cutting	6.0	4.8	5.4
Biface, Refined	5.6	4.4	5.1
Hump-Backed Knife	0.4	0.3	0.4
Scraping	16.6	29.6	22.5
End-scraper	1.0	3.9	2.3
Side-scraper	0.3	0.7	0.4
Spokeshave	3.7	6.9	5.1
Denticulate	0.4	0.2	0.3
Combination Scraper	9.8	14.3	11.8
Scraper, Unclassified	1.5	3.6	2.5
Perforating	8.3	4.6	6.6
Drill	4.2	1.8	3.1

Perforator	3.8	2.6	3.3
Router	0.3	0.2	0.2
Hunting	12.6	14.8	13.6
Arrow Point	12.6	14.8	13.6
N	**733**	**609**	**1342**

Figure 2. Hovey Lake amorphous cores, top row from left to right: unidentified chert (3305/990); unidentified chert (278.246.17.1); Wyandotte chert with cortex (278.18.16.0). Ries-Hasting amorphous cores, bottom row from left to right: St. Louis chert with cortex (140.3.42.2); Dover chert (4416/51); Wyandotte chert with cortex (4416/224). Photograph by Sean O'Brien.

Tool refining. Tool refining is the further manufacture of a tool beyond the simple manipulation that occurs in initial manufacturing. Edged blank bifaces and preform bifaces are the two artifact types (Figure 3). Both are unhafted. An edged blank biface is a bifacially flaked piece of lithic material that has been roughly shaped but not thinned to the degree employed for arrow points, knives, and drills. Flakes have been detached from the edges on both sides, and most of the cortex removed. Edged blanks could have been used as a blunt or coarse tool or further refined to produce a thinner tool. A preform biface is the next stage of bifacial reduction after edged blank. A preform has no cortex and has been further thinned so that the cross section is lenticular and symmetrical. Both edged blanks and preforms occur as fragments that probably broke in manufacture. The degree of edge refinement on small fragments of bifaces, particularly on tips, could not be classified as to edged blank, preform, or refined biface, and thus were excluded from the analysis.

Cultivating. Cultivating is indicated by tools associated primarily with agricultural subsistence practices such as the planting and cultivating of crops. Hoes and hoe refurbishing flakes are the two artifact types. A hoe is a tool made for the tilling of soil for agricultural purposes (Figure 4). Mississippian chipped stone hoe blades have ovate, notched, or flared morphologies and would have been hafted on a short handle. The worked edges of hoes developed a polish as a result of the repeated working motion and the interaction between the silica in the chert and the silica in the plant material. A hoe flake is a flake that was removed from the blade of a hoe to resharpen a working edge which became dull through use. Hoe refurbishing flakes have a polished dorsal surface. They were sometimes recycled and re-worked into small tools, such as arrow points or expedient cutting and scraping implements. The recycled flakes are identified by the polish.

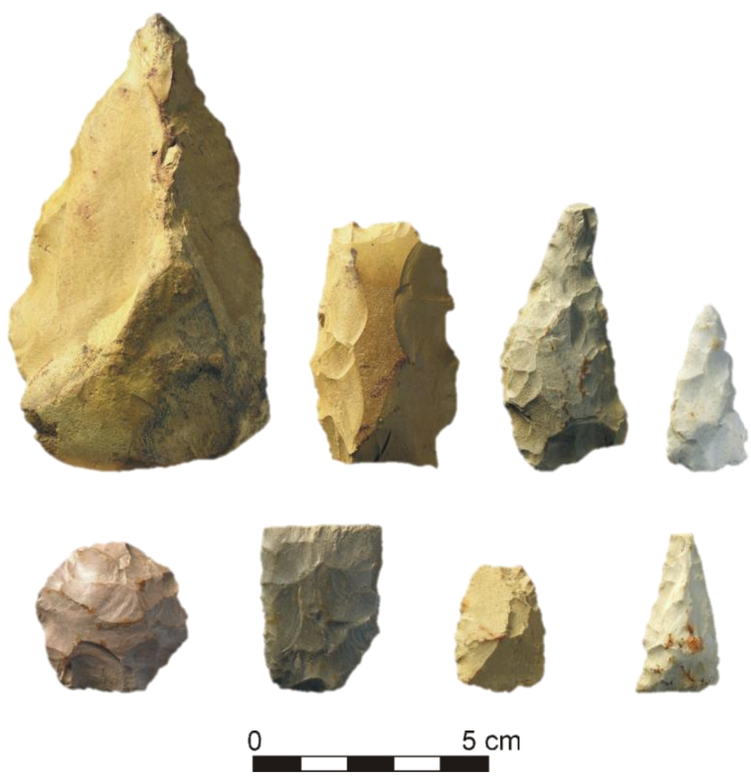

Figure 3. Hovey Lake bifaces, top row from left to right: whole, triangular edged blank biface of unidentified chert (140.8.23.1); proximal, rectangular edged blank biface of St. Louis chert (140.1.20); proximal, rectangular preform biface of Attica chert (140.3.21.2); whole, triangular preform biface of Laurel chert (140.8.23.5). Ries-Hasting bifaces, bottom row from left to right: whole, ovate preform biface of unidentified chert (280.20.1.0); proximal, rectangular refined biface of Wyandotte chert (140.8.28); proximal, triangular refined biface of unidentified chert (280.45.1.0); nearly whole hump-backed knife of West Franklin chert (Madison style) (280.3.1.0). Photograph by Sean O'Brien.

Woodworking. Woodworking tools are used in activities that require the shaping of wood. A gouge is the single chert artifact type, other woodworking tools such as celts being manufactured from various hardstones. A gouge is shaped by chipping and minimal grinding and used for shaving down, trimming, shaping or hollowing out pieces of wood to make a desired shape (Figure 5). A gouge has a perpendicular working edge, like other forms of adzes, but its cross-section is symmetrical.

Figure 4. Hovey Lake, hoe blade of Dover chert (139.136.1). Photograph by Sean O'Brien.

Figure 5. Gouges, from left to right: Ries-Hasting, distal fragment of Kaolin chert (280.44.1); Hovey Lake, distal fragment of Dover chert (3305/3597); Hovey Lake, distal fragment of Dover chert (259.20.5). Photograph by Sean O'Brien.

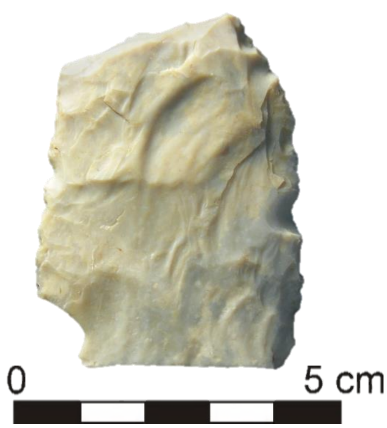

Figure 6. Hovey Lake, Ramey knife, medial fragment of unidentified chert (217.48.11). Photograph by Sean O'Brien.

Cutting. Cutting implements consist of the large or small tools designed to have sharp, acute edges in order to cut or sever material such as hide, flesh, or plant material. Refined bifaces and hump-backed knives are the two artifact types. A refined biface has had flakes removed continuously from both the center and edge of both faces (Figure 3). No cortex remains, and the Cross-section is lenticular to flat. The few complete specimens are small, generally ovate with rounded or straight bases and rounded tips. These are comparable to arrow points in size but thicker and lack pointed tips. A hump-backed knife is defined as a small, bifacially flaked tool with refined edge retouch, triangular shape, and a distinct hump on one face (Figure 3). One fragment of a large, refined biface also occurs (Figure 6). It is similar in refinement and shape to what have been categorized as Ramey-style knives, which occur in other Caborn-Welborn assemblages as lenticular or nearly bipointed knives that are smaller than "classic" Ramey knives (Munson 2001). The smaller size of Caborn-Welborn lenticular knives is perhaps due to their manufacture from cherts that do not occur as large nodules or pieces, like Mill Creek and Dover cherts that were used for "classic" Ramey knives in other Caborn-Welborn assemblages (Munson 2001).

Scraping. Scraping tools are shaped to prepare materials with a pushing or pulling motion. Wood, bone, antler, and shell can be shaped by scrapers, but more pliable materials such as hides are prepared for use by scraping away flesh, fat, and hair. Five types of scrapers are defined (Figure 7). An end-scraper has steep unifacial retouch along the distal end of a flake. A typical Caborn-Welborn end-scraper is small, generally trianguloid, and sometimes called a "thumbnail" scraper; these have a flat ventral face, a moderately to steeply domed dorsal face, and a convex working edge. Lateral margins are also retouched, but the proximal portions often show rounding or grinding as a result of use in a haft. Antler hafts have been identified at some Caborn-Welborn sites (Munson and Pollack 2012). Some end-scrapers show evidence of being resharpened after dulling. Rarely, the distal end may be snapped off, perhaps to create a new striking platform for the tool. A side-scraper has steep unifacial retouch along one or both sides of the long axis of a flake. The working edge can be straight, convex, or concave. A spokeshave has one or more small, concave working edges on a flake, with the working edges showing continuous retouch (Figure 8). Notched areas could have been used to scrape material to create a curved shape, such as a pointed bone handle or a wood arrow shaft. A denticulate has a series of small spokeshave-like notches, which forms a "toothed" edge, presumably to remove material from a wider surface than a single spokeshave (Figure 8). A combination scraper has two distinct types of scraping tools, such as a spokeshave and a side-scraper situated on different sides of the same flake. A fragmentary scraper that could not be assigned to a specific artifact type was designated as an unclassified scraper.

Figure 7. Hovey Lake scrapers, top row from left to right: whole end-scraper (thumbnail) of Wyandotte chert (3305/2520); nearly whole side-scraper of Flint Ridge chert (210.10.10.0); whole combination scraper of Wyandotte chert, which is a side-scraper/spokeshave-perforator combination (217.10.8.14.0). Ries-Hasting scrapers, bottom row from left to right: whole end-scraper (thumbnail) of unidentified chert (281.18.17.0); fragment of a side-scraper of Wyandotte chert (140.4.25); whole, subrectangular end-scraper of Wyandotte chert (140.49.1). Photograph by Sean O'Brien.

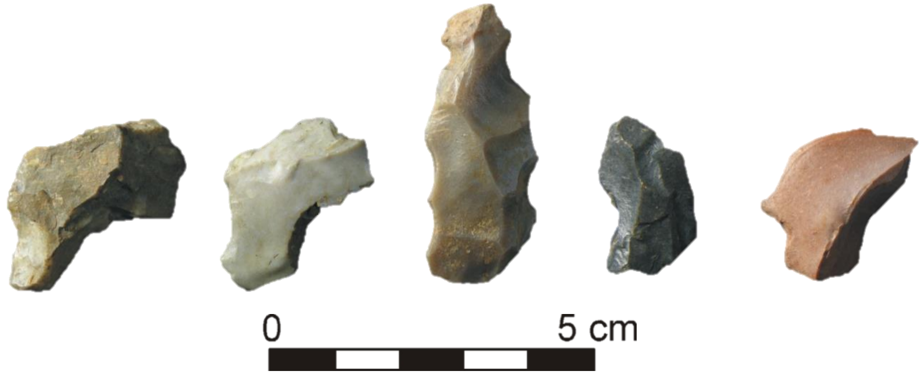

Figure 8. Spokeshaves and denticulates, whole specimens from left to right: Hovey Lake: spokeshaves, unidentified cherts (210.163.13; 3305 /2708); denticulate, Wyandotte chert (3305/1045). Ries-Hasting spokeshaves: Wyandotte chert (4416/156); unidentified chert (281.1.29.0). Photograph by Sean O'Brien.

Perforating. Perforating implements are used to create holes in a material via boring or puncturing. Three artifact types were recognized (Figure 9). A drill is a long, bifacially flaked tool with a diamond-shaped cross section that is used with a rotary motion. A perforator is a flake tool with a small, sharp-pointed feature created by unifacial or bifacial flaking. Its point was used to puncture and enlarge holes with a poking and twisting motion. A router is a large, bifacial rotary tool that presumably would have been used to create holes in thicker or more durable materials. Two of the three routers are fragmentary, so little information is available.

Figure 9. Hovey Lake drills, perforators and routers, top row from left to right: whole drill, unidentified chert, expanding sides (210.70.8); whole drill, unidentified chert, contracting sides (103.9.2); whole perforator, Wyandotte chert (217.270.7); nearly whole perforator, unidentified chert (3305/1144); whole

router, unidentified chert, contracting sides (210.23. 11); medial router fragment, Dover chert (3305/2291). Ries-Hasting drills and perforators, bottom row from left to right: whole drill, Wyandotte chert, straight sides (140.3.23); distal drill fragment, unidentified chert with constricting sides (4423/3); whole perforator, Wyandotte chert with cortical backing (4116/112); distal perforator fragment, unidentified chert (140.4.29.1); whole perforator, Wyandotte chert (140.61.3). Photograph by Sean O'Brien.

Hunting. Hunting tools are a special type of small, refined biface with a pointed distal end. All lithic hunting tools in Caborn-Welborn assemblages are arrow points. Three styles are present as defined projectile point types (Figure 10). The Madison type is trianguloid in form with straight to slightly convex sides and predominantly straight bases. Serration is absent, as is notching. Occasionally, the triangular form is achieved by minimal retouch of flake margins rather than flaking of the dorsal and ventral faces. The Nodena type occurs in two varieties. Nodena, Elliptical is willow leaf-shaped, but only one complete specimen is present. Nodena, Banks Variety is leaf-shaped with a straight base; this variety is more common. Proximal fragments of arrow points and refined bifaces could not be classified as to type and were excluded from analysis.

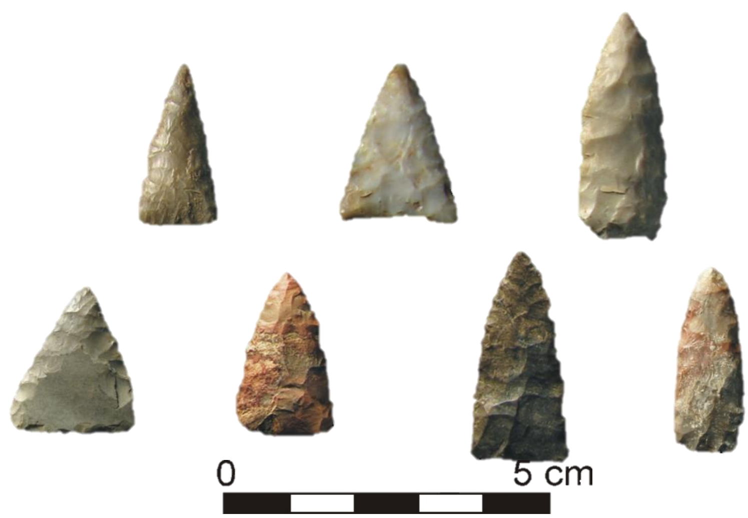

Figure 10. Hovey Lake arrow points, top row from left to right: whole Madison point of Wyandotte chert with a straight sides and base (278.131. 17); whole Madison point of unidentified chert with straight sides and concave base (283. 91. 24); whole Nodena, Banks Variety of unidentified chert with convex sides and concave base (283. 6 28.0). Ries-Hasting arrow points, bottom row from left to right: whole Madison point of unidentified chert with a straight sides and base (280.121.1); whole Madison point of Kaolin chert with convex sides and a straight base (281.3.24.2); whole Madison point of Dover chert with convex sides and a straight base (281.39.1.0); whole Nodena, Banks Variety of unidentified chert with convex sides and a straight base (281.21.19.0). Photograph by Sean O'Brien.

Lithic Raw Materials

With the exception of a single biface of slate, all chipped stone artifacts and debitage are chert. Identification of chert types in the lithic assemblages was made by Munson, Richardson, and Mark Cantin, referencing Cantin's (2008) southern Indiana chert source study. Their results showed that some chipped stone artifacts were produced from cherts that ultimately originated from distant identifiable localities; others were unidentifiable but were probably available in the immediate vicinity of the sites as river cobbles. Chert cobbles occur naturally in the Ohio River gravel bars. One bar was immediately accessible to the people living at Ries-Hasting, requiring only a 0.4 km walk. The Hovey Lake site, on the other hand, is located 4.2 km from the nearest source of river cobble cherts; these bars would have been most easily reached by canoeing down the lake and following its drain into the river. The gravel bars in Posey County contain redeposited cherts from far upstream, including high-quality Wyandotte which outcrops more than 100 km to the northeast up the Ohio River. In river cobble form, this chert has a cortex with a brown patina, remnants of which may be retained on cores or large bifaces and sometimes on smaller specimens. In contrast, the limestone cortex typical of nodules and tabular pieces collected from residuum and stream valleys in the Wyandotte chert source area (Cantin 2008), is seen in our study only in examples from Middle Woodland Mann phase contexts at Hovey Lake.

In addition to being a secondary source of local raw material in river gravels, Wyandotte chert occurs in the Middle Woodland Mann phase component at the Hovey Lake site, as well as at the Mann site (Ruby 1997). It was an additional secondary source for the Caborn-Welborn people. In Middle Woodland deposits, the small number of specimens having cortex lack cobble patina and instead show limestone cortex indicating its non-local origin. Thus, for the Middle Woodland inhabitants at Hovey Lake, Wyandotte chert was a non-local chert acquired by expedition or trade from the primary source area. But in Mississippian contexts there it was a local chert obtained from secondary sources, either from nearby gravel bars or from nearby Middle Woodland deposits. The Mississippian villagers could have found Middle Woodland lithic debitage and tools while gardening or digging a house basin or storage pit. Similarly, Middle Woodland lamellar blades of both Wyandotte and Flint Ridge cherts are present in Middle Woodland deposits at the site, but they also occur in small numbers in Caborn-Welborn contexts, including middens and house floors. Thus, the Caborn-Welborn villagers collected earlier artifacts for expedient use and for shaping into small tools (such as perforators and drills).

For the Caborn-Welborn people, then, both Wyandotte and Flint Ridge were locally available, rather than imported, raw materials. Flint Ridge material probably derived only from the secondary source in the Middle Woodland deposits, while Wyandotte was available locally from two secondary sources, the river gravels and the Middle Woodland deposits. The use of the secondary chert source at the Middle Woodland deposits by the inhabitants of the Ries-Hasting site would have required only a short canoe trip across the lake to the village, while the secondary source was immediately available to the Hovey Lake site villagers. Similarly, the inhabitants of the Hovey Lake site would have expended slightly more effort in reaching the river cobble cherts on the gravel bars than the people at Ries-Hasting, but would have had some Flint Ridge chert immediately underfoot. The minor variability between the two sites in the distances to secondary source areas for the various local cherts should not skew intersite comparison of raw material use that compares local with true non-local cherts.

True non-local cherts identified in the collections are those from distant sources located downriver from the Caborn-Welborn homeland. They were acquired ultimately from southern Illinois and western Tennessee through some form of trade, used for hoe blades and gouges, and sometimes fashioned into arrow points, scrapers, and other small implements from broken hoes and other large implements.

Intersite Variability

The expectations developed during field and laboratory work were that Hovey Lake and Ries-Hasting would show similar tool kits, but Ries-Hasting, because of the abundance of flakes and cores, is a residential site that additionally served as a stone tool workshop.

Intersite comparisons of functional categories and tool types employed cross tabulations and statistical tests. Chi-square tests were used to evaluate the significance of intersite differences in artifact categories and chert sources, with the accepted probability level of 0.05. We identified an emphasis on particular artifact types or inferred functions at the sites by referencing which cells in the cross-tabulations contribute the bulk of the Chi-square score. To assess variability in artifact size, we examined several types of bifaces and arrow points using t-tests to check intersite differences in lengths and widths.

Discussion

Tool Production

Comparison of quantities of lithic manufacturing byproducts (cores, unifaces, edged blanks, and preform bifaces) and tools (in the functional categories of cultivating, woodworking, cutting, scraping, perforating, and hunting) in the assemblages (Table 2) shows a number of statistically significant differences between the sites. Table 2 lists the groups of specimens compared, sample size, results of statistical evaluation using Chi-square tests, the corresponding degrees of freedom, and probability of the statistical difference. The table also lists the particular artifact forms that occur in greater frequencies than would be statistically expected. These results show that Ries-Hasting, in comparison to Hovey Lake is indeed a settlement where lithic tool production was emphasized. However, the occurrence of house features, burials, and the full range of domestic refuse further indicates that this site is also a typical, small hamlet used for habitation. It has a significantly higher proportion than the Hovey Lake site of manufacturing by-products relative to chipped stone tools. These ratios are 1.00:0.80 and 1.00:0.36, for the Ries-Hasting and Hovey Lake samples, respectively. Thus the hamlet has more than double the proportion of manufacturing by-products to tools than the large village.

Biface Reduction

Biface comparisons (Table 2.2) also show significant differences, with a greater representation of refined bifaces (including Ramey-style knives and hump-backed knives) at Hovey Lake. The

Ries-Hasting assemblage contains a greater incidence of amorphous cores. This finding is consistent with the emphasis on lithic manufacturing at the hamlet.

Debitage, Flake Type

Comparison of chert flakes by type (Table 2.3) references the stages of removing cortex and reducing the core. Primary flakes have cortex on 50 percent or more of the dorsal surface, while secondary flakes have less than 50 percent. Tertiary flakes have none. Given the proximity of Ries-Hasting to the gravel bars on the Ohio River and the greater distance of Hovey Lake, the result was surprising. Early stage decortication flakes (primary, secondary) are less common at Ries-Hasting than at Hovey Lake.

Tools, Formal vs. Expedient

Using a subsample of the tools at each site that derive from the same contexts as the analyzed debitage at each site (Table 2.4), the comparison included formal tools of all types vs. informal implements classified as utilized flakes that presumably were employed for cutting and scraping. Hovey Lake has significantly more formal tools than Ries-Hasting.

Expedient Tools vs. Unmodified Debitage

Were the sites similar in the proportion of flakes chosen for use as informal tools? Comparison of flakes with utilized vs. unmodified edges (Table 2.5) shows that significantly more utilized flakes occur at Ries-Hasting.

Tool Functions

Comparison of inferred tool functions (Table 2.6) reveals the sharpest differences between the sites. Woodworking was not included in the statistical evaluation because of small sample size for Ries-Hasting. Examining all tools, Hovey Lake emphasized cultivating, perforating, and probably woodworking, while Ries-Hasting emphasized hunting and scraping.

Scraper Types

Examination of the types of scrapers (side-scrapers, end-scrapers, spokeshaves, combination and scrapers) at the two sites (Table 2.7) shows that the various scraping activities were essentially the same in both communities. Statistical evaluation eliminated denticulates and unclassified scrapers due to sample sizes.

Perforating Tools

Perforating tools (drills and perforators) (Table 2.8) show a pattern similar to that of scraping tools. The two sites do not differ significantly in the proportions of drills and perforators. Routers could not be included in the statistical analysis due to small sample size.

Table 2. Intersite comparison of tool production and tool types.

Comparison	Sample Size	Test Result	DF	p<	Site Emphasis
1. *Tool Production & Use* (Manufacturing By-products & Rejects vs. Finished Tools & Fragments)	1,342	X^2=46.925*	1	0.000	HL=Finished Tools RH=Manufacturing
2. *Biface Reduction Stage* (Cores, Unifaces, Edged Blanks, Preforms, Refined Bifaces [excluding Unifaces^])	521	X^2=9.204	3	0.027	HL=Refined Bifaces RH=Amorphous cores
3. *Debitage, Flake Type* (Primary, Secondary, Tertiary)	3,909	X^2=30.458	2	0.000	HL=Decortication flakes RH=Late stage flakes
4. *Tools* (Formal vs. Expedient)	2,060	X^2=264.740*	1	0.000	HL=Formal Tools RH=Expedient Tools
5. *Expedient Tools vs. Unmodified Debitage* (Utilized vs. Not Utilized Flakes)	3,909	X^2=307.213*	1	0.000	HL=Unmodified Debitage RH=Expedient Tools
6. *Tool Functions* (Cultivating, Cutting, Scraping, Perforating, Hunting [excluding Woodworking^])	846	X^2=157.081	4	0.000	HL=Cultivating, Perforating RH=Scraping and Hunting
7. *Types of Scrapers* (Combinations, Spokeshaves, Side-scrapers, End-scrapers [excluding Unclassified scrapers and Denticulates^])	292	X^2=6.397	3	0.094	No Significant Difference
8. *Types of Perforating Tools* (Drills, Perforators, [excluding Routers^])	86	X^2=0.614*	1	0.433	No Significant Difference

HL= Hovey Lake site. RH= Ries-Hasting site.
* X^2 with df=1 uses Yate's correction.
^=excluded from X^2 due to small cell size.

Chert Sources

Each of the three intersite comparisons of selected chert sources showed significant differences between the sites (Table 3).

Intersite examination of chert sources for manufacturing by-products (Table 3.1) compared the combined group of local and probably local cherts vs. the combined group of all non-local cherts (western Tennessee: Dover, and southern Illinois: Mill Creek and Kaolin), in order to collapse cells with small sizes. Local cherts predominate at both sites, but significantly more non-local cherts were used at the large village, while the hamlet, near the gravel bar, significantly more local cherts were employed.

Comparison of chert sources used for formal tools followed the same grouping of local and probably local chert, but cell sizes permitted a more specific grouping by non-local source area–western Tennessee (Dover) and southern Illinois (Mill Creek and Kaolin) (Table 3.2). The results show the same pattern but with more specificity. Hovey Lake has significantly more non-local cherts of both the western Tennessee and southern Illinois source areas than Ries-Hasting.

Another comparison addresses the debitage samples from the two sites (Table 3.3) using the same groupings in the previous comparison. The results confirm that Hovey Lake has significantly more Dover, Mill Creek, and Kaolin cherts than Ries-Hasting.

Table 3. Intersite comparison of chert sources.

Comparison	Sample Size	Test Result	DF	p<	Site Emphasis
1. Chert Sources, Manufacturing Byproducts (Local vs. Non-local)	464	X^2=11.477*	1	0.000	HL= western Tennessee / southern Illinois RH=Local/Probably Local
2. *Chert Sources*, *Tools* (Local vs. southern Illinois and western Tennessee)	877	X^2=79.442	2	0.000	HL=western Tennessee & southern Illinois RH=Local/Probably Local
3. *Chert Sources, Debitage* (Local vs. southern Illinois and western Tennessee)	3,909	$X^{2=}$85.221	2	0.000	HL=western Tennessee & southern Illinois RH=Local/Probably Local

HL= Hovey Lake site. RH= Ries-Hasting site.
* X^2 with df=1 uses Yate's correction.

Biface Size

If the Ries-Hasting residents emphasized lithic production and had only a short distance to walk to their primary source area of chert river cobbles, then were the tools made there significantly larger in size? The short answer is no. Multiple t-tests of length and width of the three biface categories–edged blank, preform, and refined biface–shows no statistically significant difference at any stage of manufacture (Table 4). However, sample sizes are small, particularly for length. Larger assemblages might produce different results.

Arrow Point Size

T-tests of length and width for the arrow point styles-Madison type and Nodena, Banks Variety–shows a statistically significant difference in the Madison type with Ries-Hasting Madison arrow points being longer and wider (Table 5). There is no statistically significant difference in length or width for the Nodena, Banks Variety; however, the Nodena, Banks Variety arrow points from Ries-Hasting are generally longer and wider than Hovey Lake. No statistical analysis could be conducted for comparison of the arrow point style Nodena, Elliptical since the assemblages include only one complete specimen.

Table 4. Intersite comparison of biface lengths and widths.

Comparison	Sample Size	Test Result	DF	p<	Site Mean
Edged Blank Length	7	t=3.182	3	0.609	HL mean = 46.28±19.37 (N=4)
					RH mean = 58.93±34.69 (N=3)
Edged Blank Width	14	t=2.201	11	0.949	HL mean = 35.21±10.55 (N=7)
					RH mean = 35.63±13.20 (N=7)
Preform Length	30	t=3.182	3	0.374	HL mean = 43.05±16.16 (N=4)
					RH mean = 34.57±4.88 (N=26)
Preform Width	65	t=2.110	17	0.696	HL mean = 24.03±8.48 (N=15)
					RH mean = 23.12±4.86 (N=50)
Refined Biface Length	5	Insufficient sample size.			HL (N=1)
					RH mean = 29.08±5.06 (N=4)
Refined Biface Width	20	t=2.228	10	0.432	HL mean = 19.91±3.39 (N=6)
					RH mean = 18.52±3.71 (N=14)

HL= Hovey Lake site. RH= Ries-Hasting site.
No significant differences in mean length or width for any type of biface.

Table 5. Intersite comparison of arrow point dimensions.

Comparison	Sample Size	Test Result	DF	p<	Site Mean
Madison Length	31	t=2.101	18	0.003	HL mean=25.54±4.70 (N=21)
					RH mean=31.62±4.57 (N=10)
Madison Width	96	t=1.988	85	0.024	HL mean=15.88±2.49 (N=52)
					RH mean=17.17±2.90 (N=44)
Nodena, Banks Variety Length	11	t=2.306	8	0.160	HL mean=27.39±5.78 (N=8)
					RH mean=30.73±1.20 (N=3)
Nodena, Banks Variety Width	28	t=2.074	22	0.071	HL mean=14.66±1.88 (N=14)
					RH mean=16.46±3.01 (N=14)
HL= Hovey Lake site. RH= Ries-Hasting site. Madison arrow points are significantly longer and wider at RH. Nodena, Banks Variety arrow points are longer and wider at RH, but are not statistically significant due to small sample size.					

Conclusions

The results of our multiple comparisons can be summarized as follows.

1. The manufacturing profile at the two sites is similar because the full range of chert cobble reduction took place at both. However, comparison of quantities shows that tool production was emphasized at the near-river hamlet. Additionally, arrow point size was significantly larger at the hamlet, suggesting a focus there on production of these implements.

2. The unexpectedly high incidence of decortication flakes at Hovey Lake warrants further explication. If cores and unifaces, plus more early stage bifaces, were emphasized over refined bifaces at Ries-Hasting, why was there more decortication occurring at Hovey Lake? One idea is that during raw material procurement on the gravel bars, the Ries-Hasting flint knappers tested chert cobbles and took the time to remove much of the cortex while at the riverside. In contrast, the Hovey Lake villagers procured local raw material in a less direct fashion, incidental to other excursions from home, and brought back chert cobbles that had been tested for knappability but not mostly decorticated. Or perhaps the Hovey Lake flint knappers tended to make strategic trips to the gravel bars, returning quickly to the protection offered by their palisaded community. The people living at Ries-Hasting, which lies close to the river and lacks fortifications based on our geophysical survey, were probably not concerned about immediate defensive strategies, as the location and setting of their community would suggest; hence, they were willing to spend time decorticating cores and roughing out bifaces in an unprotected setting. Ries-Hasting may have been occupied during a period of little threat of social conflict, while Hovey Lake was occupied throughout the Caborn-Welborn phase including times when the threat of social conflict inspired episodes of palisade construction and rebuilding as the village grew in size.

3. Similar to the manufacturing profile, the tool kits used by the residents of the Caborn-Welborn village and hamlet are comparable in terms of implement types and sizes, but again the incidence of tool use varies markedly.

    - More perforating at the large village may relate to greater production of manufactured goods in other media, such as wood, leather, bone, or shell.
    - The greater emphasis on hunting and scraping tools at the hamlet might simply reflect production of arrow points and scrapers, which fits well with the emphasis on tool production. Alternatively, this could indicate more hunting and hide-working. Use-wear studies would be informative for choosing between the alternatives of formal tool production and tool use.
    - The greater emphasis at the hamlet of expedient cutting or scraping tools in the form of utilized flakes suggests an emphasis on the use of these tools at the small community. Detailed microscopic analysis is also needed here to evaluate type of use.

4. The notable disparity between the sites in the use of non-local cherts throughout the production-to-tool sequence (cores, edged blanks, preforms, and tools) suggests that the large village served as a regional nexus for acquisition of distant raw materials.

5. The higher incidence of cultivating tools at the large village, as indicated by hoes, hoe fragments, and hoe flakes, may mean that the Hovey Lake villagers had better access to hoes of these imported cherts. In addition to the small number of fragments of chert hoe blades in the Ries-Hasting assemblage, the farmers at this site may have employed other cultivating implements of shell (mussel shell hoe blades) and bone (bison scapula hoe

blades) , which are known in small numbers for several Caborn-Welborn sites but are not represented at either site in our study.

Future Research

As comparable chipped stone tool studies have not been made for other Caborn-Welborn communities, we do not know if the observed variation between the large and small sites is a consistent pattern. However, the two sites show sufficient differences in tool production and tool use that we should at least consider their implications for the Caborn-Welborn subsistence economy. We are hampered in this regard because the faunal assemblage from Ries-Hasting is too small for meaningful analysis, although each of the major taxonomic groups found at Hovey Lake (large, medium, and small mammals; fish; reptiles; birds) was observed at the hamlet. Further, the archaeobotanical assemblage from Ries-Hasting has been only partly analyzed, although cultivated beans and both 8- and 12-row cobs are present, like at Hovey Lake (Turner and Munson 2016).

Perhaps other clues about subsistence practices can be derived from the compared sets of stone tools. Following Hall (1962), Boszhardt and McCarthy (1999) used the scraper-point ratio ([N end-scrapers/N points] x 100) to compare multiple Oneota and other later prehistoric sites in the Midwest and eastern Plains, confirming Hall's observation that the highest ratios were those in the Plains and western Midwest, and the lowest in the east, in northern and central Illinois. From this comparison they drew support for "a Plains/bison correlation for high quantities of end scrapers" (Boszhardt and McCarthy 1999:181). Additionally, their analysis of microwear on Oneota end-scrapers from sites in the La Crosse, Wisconsin locale of the Mississippi Valley was consistent with the wear found on experimental end-scrapers used for elk and bison hide-working. They interpreted their results to indicate seasonal transhumance for the La Crosse area Oneota people, in which the population migrated to the prairies to hunt bison in the winter and returned to their villages near the Mississippi River for other seasons to farm, hunt smaller animals, and work bison hides.

The view from the mouth of the Wabash is somewhat similar. Caborn-Welborn settlements are located in the forested areas south of the most extensive barrens (the Grand Barrens of Gibson County (Green 1977, 1984) and the prairies further north. The few bison elements found at Caborn-Welborn phase sites are not food remains but implements, raw materials for implements (scapula for hoe blades), ornaments (tooth pendant with copper stain), and gaming pieces (astragalus die). But bison bone is also rare in village faunal assemblages in the La Crosse area (Theler and Boszhardt 2003:198) and elsewhere at Oneota sites. Could the high incidence of end-scrapers at Caborn-Welborn sites be a comparable pattern, with villagers moving northward to the nearby prairies and returning to settlements carrying meat and hides for processing? The scraper-point ratio for Hovey Lake and Ries-Hasting is, respectively 29 and 46, similar to the ranges for Oneota sites in eastern Wisconsin (4 to 35), Fisher and Huber sites in northeastern Illinois (24-51) and northwestern Indiana (26), and the Oneota/Mississippian Norris Farm 36 site in central Illinois (20) (Boszhardt and McCarthy 1999:Table 1).

To evaluate whether Caborn-Welborn end-scrapers provide evidence of bison hide-processing would require further studies, specifically analysis of tool microwear and documentation of bison protein residues. Assessing whether bison meat partly replaced other high protein foods in the Caborn-Welborn diet would involve diachronic study of residues from cooking containers and isotopic analysis of samples of human diet (cf. Makarewicz and Sealy 2015) for early and later Mississippian populations in the southwestern Indiana region.

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References Cited

Adams, William R.

1949 Faunal Remains from the Angel Site. Unpublished Master's thesis, Indiana University, Bloomington, Indiana.

Black, Glenn A.

1967 *Angel Site: An Archaeological, Historical, and Ethnological Study.* Indiana Historical Society, Indianapolis, Indiana.

Boszhardt, Robert F., and Joelle McCarthy

1999 Oneota End Scrapers and Experiments in Hide Dressing: An Analysis from the LaCrosse Locality. *Midcontinental Journal of Archaeology* 24(2):177-199.

Brown, James A., and Patricia J. O'Brien

1990 *At the Edge of Prehistory: Huber Phase Archaeology in the Chicago Area.* Center for American Archaeology and Illinois Department of Transportation, Kampsville, Illinois.

Cantin, Mark E.

2008 Provenience, Description, and Archaeological Use of Selected Chert Types of Indiana. Indiana State University Anthropology Laboratory *Technical Report* No. 05-01, Indiana State University, Terre Haute, Indiana.

Cochran, Donald R.

2002 Analysis of Lithics from 12-H-3 and the Strawtown Enclosure. Appendix J in An Archaeological Evaluation of Late Prehistoric Village and Subsistence Patterns in North-Central and Northeastern Indiana, by Andrew A. White, Dorthea McCullough, and Robert G. McCullough, pp. 211-225. *Reports of Investigations* 216. IPFW Archeological Survey, Indiana University-Purdue University, Fort Wayne, Indiana.

Evans, Madeleine, Ian Fricker, Brenda Beck, Douglas K. Jackson, Stephanie Daniels, Jennifer Howe, and Amanda Butler

2014 Lithic Assemblage. In *The Hoxie Farm Site Fortified Village: Late Fisher Phase Occupation and Fortification in South Chicago,* edited by Douglas K. Jackson and Thomas E. Emerson, pp. 327-412. Illinois State Archaeological Survey, Prairie Research Institute, University of Illinois, Urbana-Champaign, Illinois.

Garniewicz, Rexford C.

2000 Analysis of Faunal Remains from the Murphy and Hovey Lake Sites, Posey County Indiana: Preliminary Results. In *Archaeological Survey and Testing at Protohistoric Mississippian Sites in Southwestern Indiana*, by Cheryl Ann Munson, Appendix III. Department of Anthropology, Indiana University, Bloomington, Indiana.

2001 Analysis of Vertebrate Faunal Materials from the Hovey Lake Site, Block 3, Posey County, Indiana. In *Archaeological Survey, Test Excavation and Public Education in Southwestern Indiana*, by Cheryl Ann Munson, Appendix II. Department of Anthropology, Indiana University, Bloomington, Indiana.

Green, Thomas J.
1977 *Economic Relationships Underlying Mississippian Settlement Patterns in Southwestern Indiana*. Unpublished Ph.D. dissertation, Department of Anthropology, Indiana University, Bloomington, Indiana.
1984 The Presettlement Vegetation of Posey and Gibson Counties, Southwestern Indiana. In Experiments and Observations on Aboriginal Wild Plant Food Utilization in Eastern North America, edited by Patrick J. Munson, pp. 427-458. *Prehistory Research Series* 6(2), Indiana Historical Society, Indianapolis, Indiana.

Green, Thomas J., and Cheryl Ann Munson
1978 Mississippian Settlement Patterns in Southwestern Indiana. In *Mississippian Settlement Patterns*, edited by Bruce D. Smith, pp. 293-330. Academic Press, New York.

Hall, Robert L.
1962 *The Archaeology of Carcajou Point*. University of Wisconsin Press, Madison.

Henning, Dale R.
1970 Development and Interrelationships of Oneota Culture in the Lower Missouri River Valley. *The Missouri Archaeologist* 32:1-180.

Herold, Elaine Bluhm, Patricia J. O’Brien, and David J. Wenner, Jr.
1990 Two Upper Mississippian Archaeological Sites in Cook County Illinois. In *At the Edge of Prehistory: Huber Phase Archaeology in the Chicago Area*, edited by James A. Brown and Patricia J. O’Brien, pp. 3-119. Center for American Archaeology and Illinois Department of Transportation, Kampsville, Illinois.

Homoya, Michael A., D. Brian Abrell, James R. Aldrich, and Thomas W. Post
1984 The Natural Regions of Indiana. *Proceedings of the Indiana Academy of Science* 94:245-268.

Jeske, Robert J.
1992 Energetic Efficiency and Lithic Technology: An Upper Mississippian Example. *American Antiquity* 57(3):467-481.

Justice, Noel D.
1987 *Stone Age Spear and Arrow Points of the Midcontinental and Eastern United States*. Indiana University Press, Bloomington, Indiana.

Kellar, James H.
1967 Material Remains. In *Angel Site: An Archaeological, Historical, and Ethnographical Study*, by Glenn A. Black, pp. 431-489. Indiana Historical Society, Indianapolis, Indiana.

Lurie, Rochelle
1990 Chipped-Stone Assemblage. In The Oak Forest Site: Investigations into Oneota Subsistence-Settlement in the Cal-Sag Area of Cook County, by James A. Brown, pp. 218-235. In *At the Edge of Prehistory: Huber Phase Archaeology in the Chicago Area*, edited by James A. Brown and Patricia J. O’Brien. Center for American Archaeology, Kampsville, Illinois.

Makarewicz, Cheryl A., and Judith Sealy
2015 Dietary Reconstruction, Mobility, and the Analysis of Ancient Skeletal Tissues: Expanding the Prospects of Stable Isotope Research in Archaeology. *Journal of Archaeological Science* 56:146-158.

Monaghan, George William, Timothy Schilling, Anthony Krus, and Christopher Peebles
2013 Mound Construction Chronology at Angel Mounds: Episodic Mound Construction and Ceremonial Events. *Midcontinental Journal of Archaeology* 38:155-170.

Munson, Cheryl Ann (editor)
1994 *Archaeological Investigations at the Southwind Site, A Mississippian Community in Posey County, Indiana*. Department of Anthropology, Indiana University, Bloomington, Indiana.

Munson, Cheryl Ann
1997 *Archaeological Survey and Testing of Mississippian Caborn-Welborn Phase Sites in Posey County, Indiana, 1996-1997: Investigations at the Hovey Lake and Murphy Sites and Environs.* Indiana Department of Natural Resources, Division of Historic Preservation and Archaeology, and National Park Service, U.S. Department of Interior. Department of Anthropology, Indiana University, Bloomington, Indiana.

1998 *Archaeological Investigations at Caborn-Welborn Phase Sites, 1997-1998, Posey County, Indiana*. Department of Anthropology, Indiana University, Bloomington, Indiana.

2000 *Archaeological Survey and Testing at Protohistoric Mississippian Sites in Southwestern Indiana.* Department of Anthropology, Indiana University, Bloomington, Indiana.

2001 *Archaeological Survey, Test Excavation, and Public Education in Southwestern Indiana*. Department of Anthropology, Indiana University, Bloomington, Indiana.

2003 *Bone Bank: Archaeological Rescue Investigations at a Late Mississippian Site, Posey County, Indiana*. Department of Anthropology, Indiana University, Bloomington, Indiana.

2010 Homeland Security: Fortifications of the Late Mississippian Caborn-Welborn Phase. 56th Annual Meeting of the Midwest Archaeological Conference, Program and Abstracts: 83. Bloomington, Indiana.

Munson, Cheryl Ann, and Della C. Cook
2001 Residential Mortuary Practices and Skeletal Biology at the Late Mississippian Hovey Lake Site, Posey County, Indiana. *Midcontinental Journal of Archaeology* 26(1):1-52.

Munson, Cheryl Ann, Marjorie M. Jones, and Bruce Eisterhold
1987 An Archaeological Survey of the Caborn Site (12 Po 32), Posey County, Indiana (abstract). In Current Research in Indiana Archaeology and Prehistory: 1986, Glenn A. Black Laboratory of Archaeology, Indiana University, *Research Reports* 7:8-10.

Munson, Cheryl Ann, Marjorie M. Jones, and Bret J. Ruby
1989 The 1988 Archaeological Test Excavations at the Caborn Site, a Protohistoric

Mississippian Village in Posey County, Indiana. In Current Research in Indiana Archaeology and Prehistory: 1987 and 1988, Glenn A. Black Laboratory of Archaeology, Indiana University, *Research Reports* 10:41-42.

Munson, Cheryl Ann, and David Pollack

2012 Far and Wide: Late Mississippian/Protohistoric Extraregional Interactions at the Mouth of the Wabash. *Abstracts of the Society of American Archaeology, 77th Annual Meeting*, p. 255. Memphis, TN.

Munson, Patrick J., and Cheryl Ann Munson

1972 Unfinished Triangular Projectile Points or "Hump-Back" Knives? *Pennsylvania Archaeologist* 42 (3):31-36.

Perino, Gregory

1963 Tentative Classification of Two Projectile Points and One Knife from West-Central Illinois. *Central States Archaeological Journal* 10(3):95-100.

Peterson, Staffan D.

2010 Townscape Archaeology at Angel Mounds, Indiana: Mississippian Spatiality and Community. Unpublished Ph.D. dissertation, Indiana University, Bloomington, Indiana.

Pollack, David

2004 *Caborn-Welborn: Constructing a New Society after the Angel Chiefdom Collapse.* The University of Alabama Press, Tuscaloosa, Alabama.

Pollack, David, and Cheryl Ann Munson

1998 Caborn-Welborn Ceramics: Inter-site Comparisons and Extra-regional Interaction. In *Current Archaeological Research in Kentucky, Volume 5*, edited by Charles D. Hockensmith, Kenneth Carstens, and Sara Rivers, pp. 163-202. Kentucky Heritage Council, Frankfort, Kentucky.

2003 The Angel to Caborn-Welborn Transition in Southwestern Indiana, Northwestern Kentucky, and Southeastern Illinois. In *Facing the Final Millennium: Studies in the Late Prehistory of Indiana, A.D. 700 to 1700,* edited by Brian G. Redmond and James R. Jones III, pp.255-286. Department of Natural Resources, Division of Historic Preservation and Archaeology, Indianapolis, Indiana.

Railey, Jimmy A.

1992 Chipped Stone Artifacts. In Fort Ancient Cultural Dynamics in the Middle Ohio Valley, edited by A. G. Henderson, pp.137-169. *Monographs in World Archaeology* 8. Prehistory Press, Madison, Wisconsin.

Ruby, Bret J.

1997 *The Mann Phase: Hopewellian Subsistence and Settlement Adaptations in the Wabash Lowlands of Southwestern Indiana.* Unpublished Ph.D. dissertation, Department of Anthropology, Indiana University, Bloomington, Indiana.

Seeman, Mark F., and Cheryl Ann Munson

1980 Determining the Cultural Affiliation of Terminal Late Woodland-Mississippian Hunting Stations: A Lower Ohio Valley Example. *North American Archaeologist* 2:53-65.

Theler, James L., and Robert F. Boszhardt

2003 *Twelve Millennia: Archaeology of the Upper Mississippi River Valley*. University of Iowa Press, Iowa City.

Turner, Jocelyn C., and Cheryl Ann Munson

2016 A View of Southern Indiana Fields, Forests, and Kitchens: Revealing Inter- and Intra-Cultural Variation in Plant Foodways of the Emergent through Late Mississippian Periods. In *A View from Upstream: Late Pre-Columbian Research in the Ohio Valley*, edited by Jeremy J. Wilson and Anthony Michal Krus. University Press of Florida, Gainesville. Forthcoming.

Whittaker, John C.

1994 *Flintknapping:Making and Understanding Stone Tools.* University of Texas Press, Austin.

A TALE OF TWO RIVERS: CONTRASTING PLANT USE STRATEGIES IN THE LOWER OHIO AND WHITE RIVER VALLEYS DURING LATE PREHISTORY IN INDIANA

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Introduction

The routine sampling of archaeobotanical material (charred plant remains) during the excavation of archaeological sites began more than 30 years ago (Watson 1976). Analysis of these macrobotanical collections can provide insights into plant foodways and agricultural practices of the various cultural groups that were living in Indiana during the Late Prehistoric period. With each of our primary research areas being a different major Indiana river valley, we decided to compare our existing data in order to discover any trends, similarities, or differences that might be identifiable. We were also looking for any questions that could provide direction for further research. Our two locales (Figure 1) are: the lower Ohio River Valley (especially the portion below the Green River confluence) and the White River Valley (especially Strawtown Bottom). We were able to construct food plant profiles for the Late Prehistoric agriculturists living in each of these two river valleys, with a focus on ecological influences and wider regional trends. Although significant gaps in knowledge still remain, it was possible to recognize variations and changes in plant subsistence patterns between these two geographical regions and over time.

The Lower Ohio River Valley

Our Ohio Valley data come from a succession of archaeological cultures that flourished between calendar years A.D. 700-1700 in the southwestern corner of Indiana, at and above the confluence of the Wabash and Ohio Rivers (Table 1). The Yankeetown, Angel, and Caborn-Welborn phases represent the Emergent, Middle, and Late Mississippian periods, although temporal succession in a locale, as considered here, does not necessarily imply an ancestral/descendant relationship. In addition to the cultures at the Wabash confluence, also included in this analysis are two Middle Mississippian period (Falls Mississippian) sites (Munson et al. 2006) farther up the Ohio River near the Falls of the Ohio (Table 1).

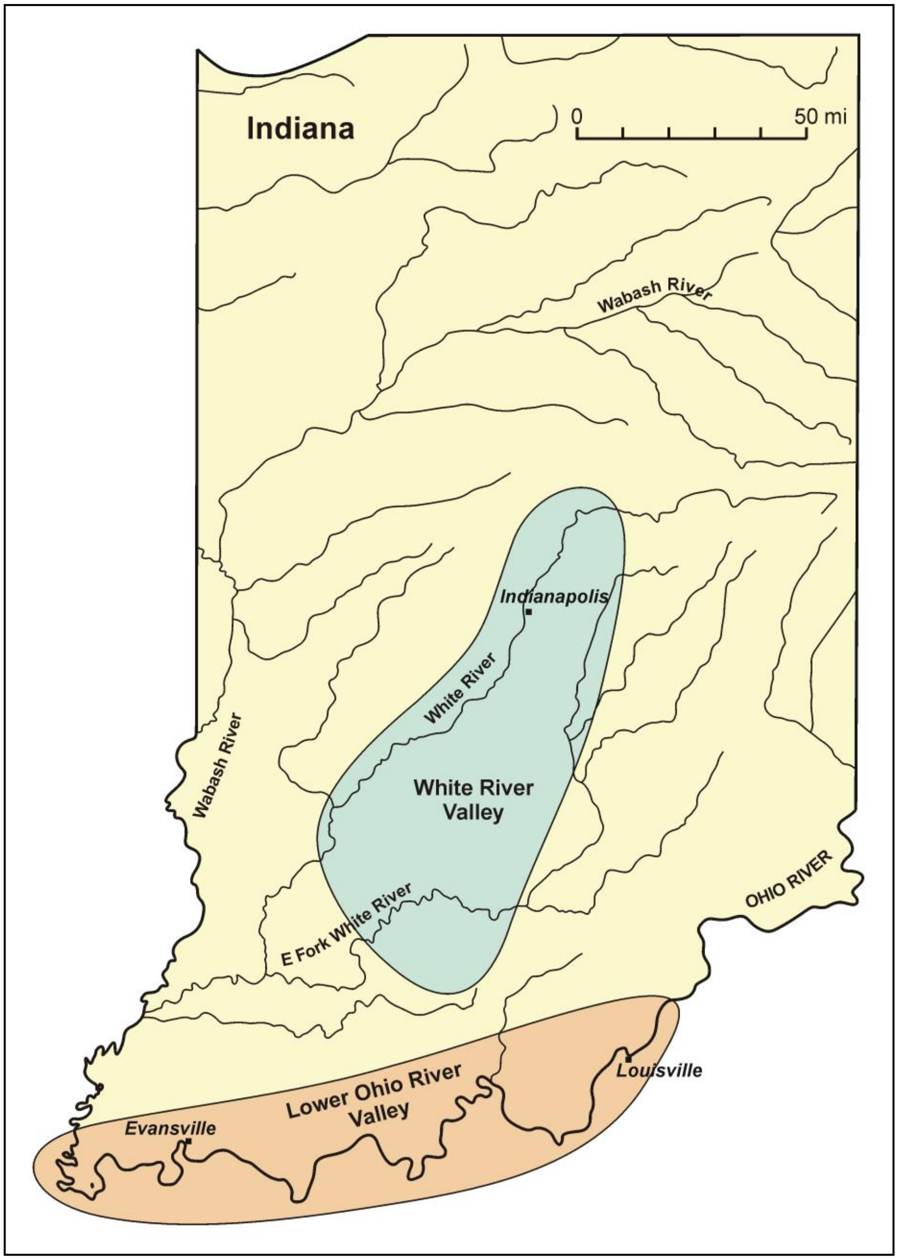

Figure 1. Location of the two river valleys included in the study.

The Yankeetown phase in the lower Ohio River Valley has generally been considered to date between A.D. 700-1100 (Alt 2010:6; Redmond 1990:12), although recent radiocarbon dates indicate the Yankeetown culture may extend to around A.D. 1200 (Greenan and Garniewicz 2010:38). The connection between the Emergent Mississippian Yankeetown phase and the later Middle Mississippian Angel phase is unclear, particularly since there are overlapping radiocarbon dates (Greenan and Garniewicz 2010:37-38). Corn was cultivated by both the Yankeetown and Angel peoples living in riverine-based settlement subsistence patterns (Redmond 1990), and Redmond also notes some similarities between Yankeetown and Angel ceramics (1990:275-277). However, other authors discuss a discontinuity in ceramic traditions (Hilgeman 2000:234-236; Monaghan and Peebles 2010:950) as well as pointing out a lack of information on Yankeetown community organization (Alt 2010). In addition, a relationship between the Yankeetown people and the Mississippian polity at the Cahokia site near St. Louis is currently under study (Alt 2010). Very little Yankeetown archaeobotanical material has been analyzed to date, and the sparse macrobotanical data considered here (Turner 2010a) are from two sites: the Yankeetown site itself (12W1) and Dead Man's Curve (12Po3).

The Middle Mississippian Angel phase is represented by material from both the Southwind (12Po265) and Angel Mounds (12Vg1) sites. The brief occupation at Southwind dates to the middle portion of the Angel phase, around A.D. 1200. While the dates at the Angel Mounds site itself range from A.D. 1000-1450 (Hilgeman 2000; Monaghan and Peebles 2010), most of the botanical data come from the village area which has been dated to the latest portion of the occupation (A.D. 1350-1420). The four Late Mississippian Caborn-Welborn sites in our dataset date from A.D. 1350-1700, but most of our botanical data are from contexts that date prior to A.D. 1500.

As is the case for the relationship between the Yankeetown and Angel phases, the connection between the Angel and Caborn-Welborn phases is also under discussion. Various researchers have noted that the radiocarbon dates for the Caborn-Welborn occupations overlap those at Angel and are not substantially later than dates for the main occupation at Angel (Green and Munson 1978; Monaghan and Peebles 2010:Figure 5; Munson 2003:159-170, Figures 81-84, Tables 24, 25, and I-1; Pollack 2004:Table 2.1). Hilgeman (2000:236-241) argues that other populations (Oneota or perhaps as-yet-unidentified populations in the Wabash Confluence) may form the larger part of Caborn-Welborn ancestors with Angel influences arriving later. Munson (2000; 2003) and Pollack (2004:11) see the Caborn-Welborn culture as the primary heir to the Angel traditions. Common aspects of material culture include continuity in ceramic trends (e.g., continued widening and thinning of vessel handles, increase in the frequency of certain vessel types such as deep rim plates) and ceramic motifs (e.g., Angel negative painted and Caborn-Welborn Decorated) (Munson 2000:85-86; Pollack 2004:28-31). In addition, there are continuities in mortuary practices (e.g. primary and secondary burials, grave goods) (Munson and Cook 2001:41-42) as well as in elements of durable material culture (e.g. triangular points, Mill Creek and Dover chert hoes) and the lower tier of settlement hierarchy (small villages, hamlets, farmsteads) (Munson 2000:3).

In this region of Mississippian cultural development, the Ohio River itself shapes the landscape, prompting ecologists to designate a separate Big Rivers Natural Region along the lower Ohio River (Homoya et al. 1985). Oak and hickory trees dominate local forests above large tracts of fertile floodplain soils available for agriculture, and the plant communities here have a noticeable southern character, with pecan (*Carya illinoinensis*), lowland hackberry (*Celtis laevigata*), southern cane (*Arundinaria gigantea*),and bald cypress (*Taxodium distichum*) found here in the most northern extent of their distribution (Green and Munson 1978:298).

Farther up the Ohio River, Indiana was home to the lesser-known Falls Mississippian culture. Near the Falls of the Ohio (modern Louisville), recent archaeological investigations into Falls Mississippian life have focused on two sites. The Middle Mississippian mound site at Prather (12 Cl 4) lies on the northeastern Mississippian frontier, just southwest of the Fort Ancient area. The nearby Newcomb site (12 Cl 2) is just southwest of Prather, but closer to the Ohio River. The Prather site dates to approximately the late 11th and early 12th centuries, and the single date from Newcomb (A.D. 1220-1280) is a century later. There is no thoroughly investi-

Table 1. Sites included in the study.

River Valley	Tradition	Local Manifestation	Sites
White	Great Lakes Late Woodland	Castor	Castor Farm (12H3)
White	Great Lakes Late Woodland	Castor	Prairie View/Moffit Farm (12H6)
White	Great Lakes Late Woodland	Castor	12H993
White	Great Lakes Late Woodland / Fort Ancient	Oliver	Bair (12Lr431)
White	Great Lakes Late Woodland / Fort Ancient	Oliver	Baker's Trails (12H837)
White	Great Lakes Late Woodland / Fort Ancient	Oliver	Bundy-Voyles (12Mg1)
White	Great Lakes Late Woodland / Fort Ancient	Oliver	Clampitt (12Lr329)
White	Great Lakes Late Woodland / Fort Ancient	Oliver	Cox's Woods (12Or1)
White	Great Lakes Late Woodland / Fort Ancient	Oliver	Heaton Farm (12Gr122)
White	Great Lakes Late Woodland / Fort Ancient	Oliver	Martinsville Plaza (12Mg195)
White	Great Lakes Late Woodland / Fort Ancient	Oliver	Noblesville (12H807)
White	Great Lakes Late Woodland / Fort Ancient	Oliver	Pottersville (12Ow431)
White	Great Lakes Late Woodland / Fort Ancient	Oliver	Strawtown (12H883, early)
White	Great Lakes Late Woodland / Fort Ancient	Oliver	Sugar Creek (12Jo289)
White	Great Lakes Late Woodland / Fort Ancient	Oliver	12Mo624
White	Oneota	Taylor Village	Strawtown (12H883, late)
White	Oneota	Taylor Village	12H1057
Ohio	Emergent Mississippian	Yankeetown	Dead Man's Curve (12Po3)
Ohio	Emergent Mississippian	Yankeetown	Yankeetown (12W1)
Ohio	Middle Mississippian	Angel	Angel (12Vg1)
Ohio	Middle Mississippian	Angel	Southwind (12Po265)
Ohio	Middle Mississippian	Falls Mississippian	Newcomb (12 Cl 2)
Ohio	Middle Mississippian	Falls Mississippian	Prather (12 Cl 4)
Ohio	Late Mississippian	Caborn-Welborn	Bone Bank (12Po4)
Ohio	Late Mississippian	Caborn-Welborn	Caborn (12Po32)
Ohio	Late Mississippian	Caborn-Welborn	Hovey Lake (12Po10)
Ohio	Late Mississippian	Caborn-Welborn	Slack Farm (15UN28)

gated Emergent through Late Mississippian sequence in the Falls area comparable to that at the mouth of the Wabash, since no Late Woodland/Emergent Mississippian or Late Mississippian populations have been identified to date (Bader 2003; Munson et al. 2006). Mississippian sites that are known only from surface manifestations and remote sensing may eventually demonstrate a more extended Mississippian presence in the area (Arnold et al. 2012).

Above the river terraces in the Falls area, the land is classified with the Muscatatuck Flats and Canyons ecological zone, which has similarities with the Bluegrass region south of the Ohio (Homoya et al. 1985). Even though it is a Mississippian mound center, the Prather site itself is west of the river in the uplands. Forests near this part of the Ohio are smaller and lack the southern composition of floodplain forests and backwater areas found near the Ohio's confluence with the Wabash River. Even the Ohio floodplain itself is not terribly wide in this area, perhaps one mile across as opposed to between four and ten miles near Angel Mounds.

The White River Valley

The primary cultural manifestation in the White River Valley during Late Prehistory is the Oliver phase, which is found along both forks of the White River from about A.D. 1200-1450, contemporary with the later Angel phase (Bush 2004:42; McCullough et al. 2004:1). As in the Ohio Valley, other groups were present in the area during this time, but much of the focus of this study is on the Strawtown Bottom area north of Indianapolis where three cultures succeed one another (Table 1). The Castor phase, whose antecedents lie in the Western Basin tradition (Maumee River area), first appears in the Strawtown Bottom around A.D. 1000 (McCullough 2005). After A.D. 1200, Fort Ancient-type ceramics co-occur with these Castor/Great Lakes ceramics, prompting archaeologists to recognize the emergence of a new culture, known as the Oliver phase, exhibiting practices derived from both ancestral groups. The Oliver component at the Strawtown site (12H883) dates to the A.D. 1300s and is succeeded by a Taylor Village Oneota occupation after A.D. 1400 (Arnold et al. 2007; Graham and McCullough 2009; McCullough 2005, 2008; McCullough et al. 2004). Data for the White River system come from three Castor, twelve Oliver, and two Taylor Village sites (Bush 1997, 2002, 2004, 2005a, 2005b, 2010). Thus, our 450-year-plus cultural sequence on the White River system begins later and is more compressed than the succession of cultures in the lower Ohio River Valley where our data span the 1000-year period of A.D. 700-1700.

The White River has two main branches: the East and West Forks. Floodplains here are generally smaller than in southwestern Indiana, especially on the East Fork, but locally they can exceed one mile in width, as at Strawtown Bottom. The northeastern portion of the White River system flows across the Tipton Till Plain, the glaciated region of Indiana (Homoya et al. 1985). Climax forests in the uplands are beech-maple, but typical tree species vary according to topography and slope aspect (Braun 1950). Thus, oaks and hickories are common on south and west facing slopes. Much of the East Fork and the central West Fork traverse the unglaciated "knobs" area of Indiana, where climax forests are oak-hickory or the very diverse western mesophytic forests (Homoya et al. 1985). Oliver macrobotanical assemblages from unglaciated areas do not appear to differ from those in glaciated areas (Bush 2004:47, 100).

Analysis and Discussion

Corn

All of the cultural groups in our Late Prehistoric dataset were agriculturalists, and one crop they all grew was corn (*Zea mays*), although the variety of corn differed. There were two primary types of corn that were grown in the Eastern Woodlands: Midwestern Twelve-row, the oldest maize described from Cahokia and the Cahokia area (Cutler and Blake 1973) and grown by Mississippian cultural groups in the Mississippi Confluence Region (Edging 2001); and Eastern Eight-row, which was dominant among both Oneota peoples to the northwest and north (Hall 1991), and Fort Ancient peoples to the northeast and east (Wagner 1987, 1994).

Prior to corn, some small starchy- and oily-seeded plants were cultivated in parts of the Eastern Woodlands. Starchy seeded cultigens included chenopod (*Chenopodium berliandieri*), erect knotweed (*Polygonum erectum*), maygrass (*Phalaris caroliniana*), and little barley (*Hordeum pusillum*), and oil-seeded cultigens consisted of sunflower (*Helianthus annuus*) and marsh elder (*Iva annua*). In many places, this tradition of "old cultigens" persisted for a time alongside corn agriculture. At the Emergent Mississippian Yankeetown sites in the Ohio River Valley, corn remains were outnumbered by old cultigens (Figure 2; Table 2). However, while many flotation samples have been collected, only a small amount of the material has been analyzed to date, and the available data from the Yankeetown site itself are from a single flotation sample. In addition, several small flotation samples from the Dead Man's Curve site were analyzed (Turner 2010a), and fragments of corn were only found in one feature, which also contained a Yankeetown bar stamped rim sherd (Alt 2010:62-64). Cutler and Blake (1973) studied 13 kernels from the 1968 excavations at the Yankeetown site, and identified 8-, 10-, and 12-rowed varieties among six of the kernels (Vickery 1970:79). During the 2008 excavations at Yankeetown by the Indiana State Museum (Greenan and Garniewicz 2010), a feature was found which contained charred corn cobs aligned around the inside edge. This cache of corn cobs, which was recovered intact and taken to the lab, is currently under analysis by Turner along with other flotation samples from the 2010 excavations at Yankeetown.

On the Middle Mississippian sites in this analysis, corn accounts for almost half of the plant food profile (Figure 2), and at the Angel phase Southwind site, corn was the primary plant food identified, with over 90% recovered from two depositional contexts: smudge pits and postholes for circular structures which were possible granaries. In the analysis done by Crites (1994), most of the charred cob fragments were found to be 8-row, with a few 10-row, and all were phenotypically comparable to the corn from Angel Mounds. Crites concluded that the small Angel phase village of Southwind had corn as a dominant plant resource, with an emphasis on processing and storage activities.

Two analyses of the corn from the Angel Mounds site have reported very similar results. Both Cutler and Blake (1973) and Wagner (1991) found at least 77% of the corn cobs to be 8- or 10-row with the remaining cobs having 12 rows or more. In Wagner's analysis of over 360 corn

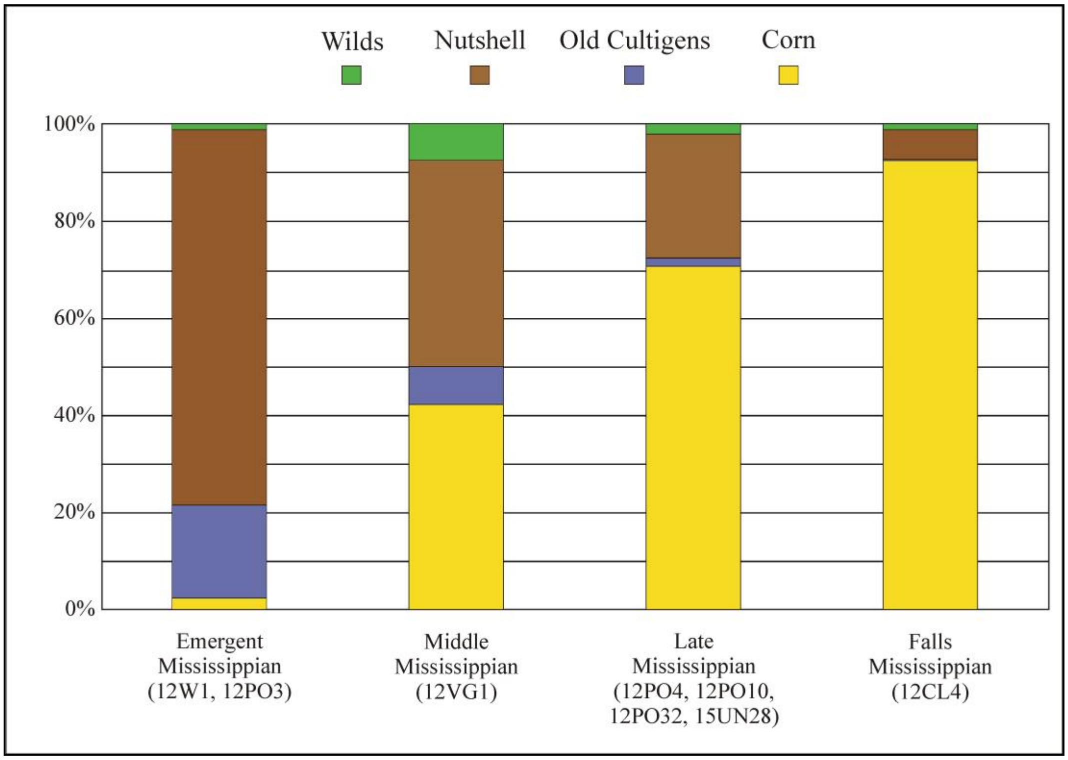

Figure 2. Percentages (by count) of plant remains on sites in the lower Ohio River Valley, A.D. 700-1700.

cobs, she compared the Angel Mounds corn with the Eastern Eight-Row corn found on Fort Ancient sites, and noted several differences including cob diameter and the ratio of kernel width to length. Specifically, she described some of the 8-row cobs that were present at Angel Mounds as "skinny," but noted that "skinny" cobs were not found on Fort Ancient sites.

The picture is also not yet clear for the Caborn-Welborn phase. Rossen's 1996 analysis of cob fragments from the Caborn, Hovey Lake, and Slack Farm sites describes the majority of the cobs as being morphologically Midwestern Twelve-row, with 8-rowed cobs also present. Bone Bank site has yielded no cobs at all, and analysis by Turner (2010c) of more recently excavated Hovey Lake macrobotanicals has yielded only two cobs. These cobs are not the "skinny" 8-row cobs described by Wagner (1991) for some of the Angel Mounds corn. However, among the Hovey Lake corn kernels there is a wide range of width to length ratios, with 90% greater than 1.0, which is a trait also described for Angel (Wagner 1991). A more complete analysis–which would include kernel and cupule measurements and characteristics and relate the recovered material to context and chronology–is needed to provide a better idea of which varieties of corn were in use at these sites.

Of the four Caborn-Welborn sites discussed here, only Slack Farm has features indicative of large-scale storage of corn, although this may simply be due to the areas of each site that have been excavated. The fact that the corn from several features at Slack Farm showed evidence of spoiled or sprouted kernels might be a reflection of a diversity of storage systems. Both large, deep underground pits and above-ground storage structures were found (Rossen 1996).

Table 2. Old and new crops on Late Prehistoric sites in the lower Ohio River Valley.

Phases		Sites	Old Cultigens							Corn (*Zea mays*)			
			chenopod (*Chenopodium* sp.)	erect knotweed (*Polygonum erectum*)	maygrass (*Phalaris caroliniana*)	little barley (*Hordeum pusillum*)	marshelder (*Iva annua*)	sunflower (*Helianthus annuus*)	cultivated beans (*Phaseolus vulgaris*)	kernels		cupules	
										Ct.	Wt. (g)	Ct.	Wt. (g)
Emergent Mississippian		Yankeetown (12W1)	221	221	5					33	0.29	23	0.12
Emergent Mississippian		Dead Man's Curve (12Po3)	44							3	0.006		
Middle Mississippian	Angel	Southwind (12Po265)	5								153.55		653.08
Middle Mississippian	Angel	Angel Mounds (12Vg1)	205	19	2	23				645	6.96	578	4.12
Middle Mississippian	Falls	Prather (12 Cl 4)	5							827	2.61	477	2.79
Late Mississippian	Caborn-Welborn	Bone Bank (12Po4)	61	3	11	1	1		5	913	6.50	872	4.59
Late Mississippian	Caborn-Welborn	Hovey Lake (12Po10)	395						15	7,576	37.77	1,207	6.74
Late Mississippian	Caborn-Welborn	Caborn (12Po32)	3				1		20	1,255	11.80	616	5.80
Late Mississippian	Caborn-Welborn	Slack Farm (15UN28)	31	2	45		1	3	5	5,481	55.00	6,359	70.90

Data are still preliminary for the Falls Mississippian sites. At Prather, no corn cobs have been recovered, and although both kernels and cupules have been identified (Table 2), only a few are whole. At the nearby Newcomb site, flotation samples have yet to be analyzed, but two cob segments were recovered during survey (Turner 2010b). Of note is the fact that one is 12-row, and one is an 8-row cob (Figure 3).

In the White River system, we have very little data about the types of corn grown. Four cobs, one each from Baker's Trails (12H837), Strawtown (12H883), Bowen (12Ma4), and Clampitt (12Lr329), have eight rows. Baker's Trails and Strawtown also yielded one 10-rowed cob each (Bush 2005b). The mean row number for Oliver corn is thus 8.7. The 10-rowed specimen from Baker's Trails represents the butt end of a cob, so the mean row number may be

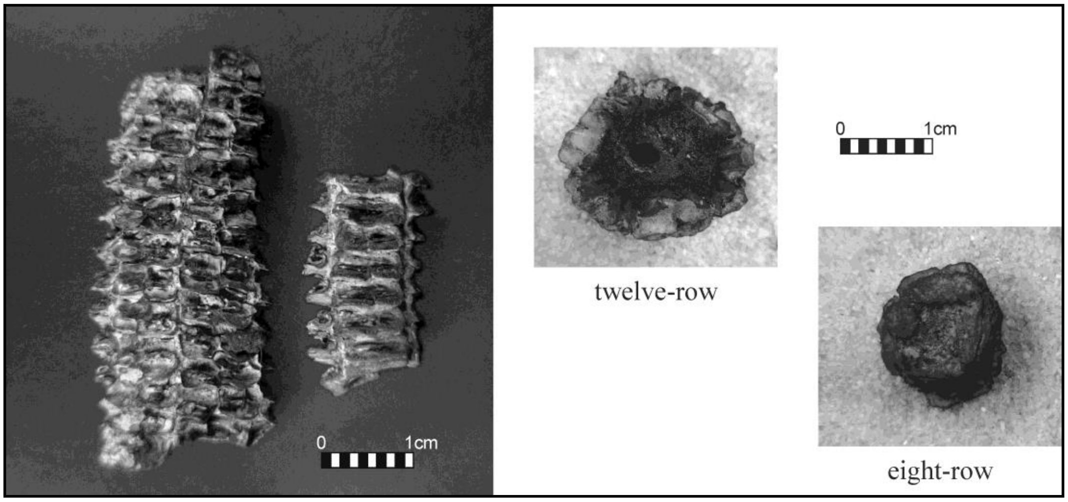

Figure 3. Two corn cob fragments (1852.189.9) recovered from the Newcomb site (12 Cl 2) during survey. Image created by Jocelyn C. Turner.

slightly overstated. Determining the types of corn in use in each of the two river valleys is difficult since, other than the studies of the Angel Mounds corn, data sets are small or variable in content. In general, though, corn in the White River Valley tends toward lower row numbers (mean = 8.7 on Oliver sites), while their contemporaries on the Ohio have slightly higher row numbers (mean = 9.7 at Angel Mounds and 9.6 at Southwind). While there is some indication that row numbers may increase by Late Mississippian times, these data are still incomplete.

One intriguing result of our analysis, however, is that a comparison of the use of corn relative to other food plants in the two river valleys shows distinctly different trends (Figures 2, 4; Tables 2, 3). In the Ohio Valley, there is a trend toward increasing use of corn over time. However, in the White River system a very different trend is apparent. Corn decreases from 52.2% of non-wood plant remains by count during the Castor phase to 29.9% during the Oliver phase and remains low at 32.8% on Taylor Village sites. These numbers may not reflect the entire White River Valley, however, since our data for Castor and Taylor Village are all from the Strawtown Bottom area north of Indianapolis. In addition, it should be noted that numbers from three sites in the White River Valley data set have been adjusted in Figure 4 for large concentrations of plants in single features that would otherwise skew the data (see Powell 2000). The concentrations are: 188,000 corn kernels from Feature 7A in the Oliver component at Strawtown (12H883), 473 blackberry seeds (*Rubus* sp.) from Feature 5 at Prairie View (12H6/46), and 21,406 chenopod seeds (*Chenopodium* sp.) from Feature 13 at Bundy-Voyles (12Mg1).

When only sites in the Strawtown Bottom are considered, corn reaches peak visibility during the Castor phase and early Oliver phase, making up about seventy percent of the plant remains at 12H993 and the Oliver (early) component at Strawtown. Two trends in the wood charcoal composition at Strawtown Bottom sites indicate that the increase in corn is an actual increase in corn production rather than a change in processing methods that resulted in less carbonized corn being deposited. First, the percentage of oak in the wood charcoal assemblage in

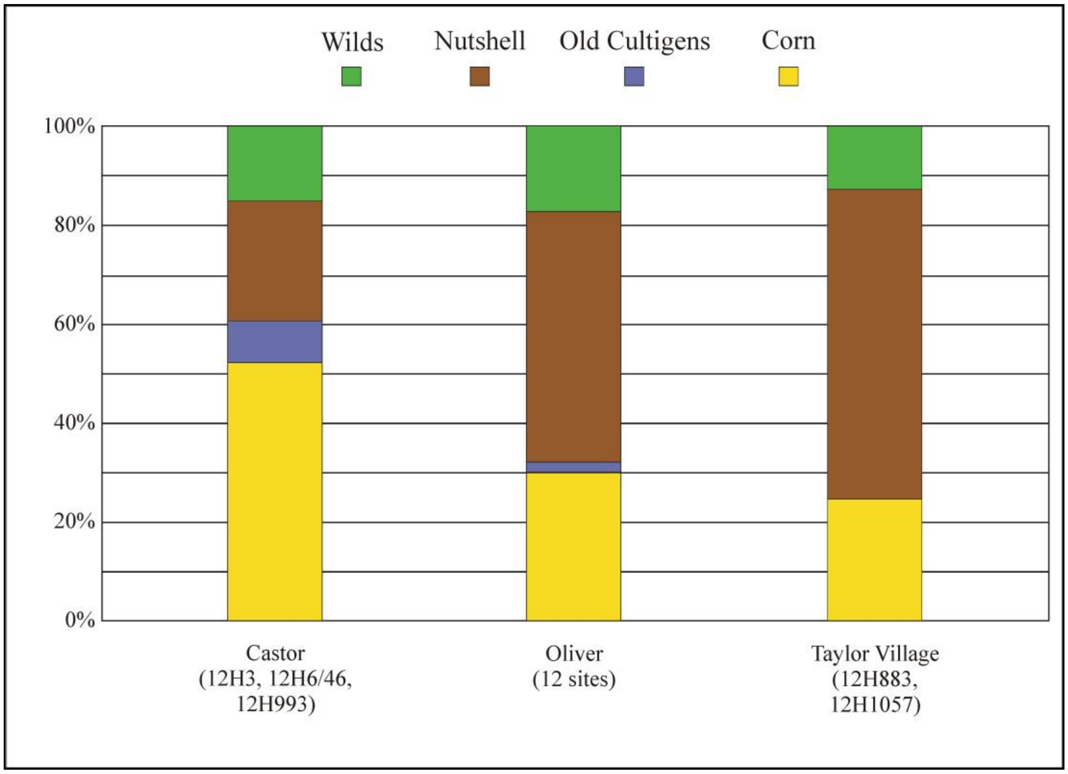

Figure 4. Percentages (by count) of plant remains on sites in the White River Valley, A.D. 1000-1450.

the Strawtown Bottom generally increases through time. Oak makes up 30-50% of wood charcoal at Castor and Oliver sites in the Strawtown Bottom but 58-61% of wood charcoal on Taylor Village sites. In this part of the state, the more common oaks are species of the uplands or transitional forests and not floodplains. Upland oaks include white oak (*Quercus alba*), red oak (*Q. rubra*), chinkapin oak (*Q. muhlenbergii*), and black oak (*Q. velutina*), while pinoak (*Q. palustris*), swamp white oak (*Q. bicolor*) and bur oak (*Q. macrocarpa*) are floodplain oaks (Deam1940; Jackson 2003). The increase in oak wood on archaeological sites in the Strawtown Bottom may reflect depletion of floodplain wood resources by Late Prehistoric agriculturalists, pushing the search for firewood into the terraces, transitional forests, and upland forests. The increasing rank of sumac among wild seeds in botanical assemblages supports this suggestion. Sumac is the seventh most common plant at Castor Farm and the fifth most common at the Castor phase Site 12H993. Its rank increases to second in the Oliver component at Strawtown. It is also the second most common small wild seed at 12H1057, a Taylor Village site. Sumac is a small tree or shrub that colonizes old fields and forest edges, suggesting increased acreage had been opened for agriculture at least through Oliver times.

As shown in Figure 4, Oliver flotation samples have less corn as a percentage of total plants than do Castor samples. Ubiquity data show a similar trend, with 89 of 104 Oliver samples containing corn for a total ubiquity of 86%, Of the 36 Castor samples, 32 (89%) yielded corn. McCullough (2000) has demonstrated that Oliver populations were shifting southward through time. For example, some of the earliest Oliver sites are in the northern suburbs of Indianapolis,

Table 3. Old and new crops on Late Prehistoric sites in the White River Valley, A.D. 1000-1450.

Tradition	Local Manifestation	Sites	Old Cultigens						cultivated beans (*Phaseolus vulgaris*)	Corn (*Zea mays*)			
			chenopod (*Chenopodium* sp.)	erect knotweed (*Polygonum erectum*)	maygrass (*Phalaris caroliniana*)	little barley (*Hordeum pusillum*)	marshelder (*Iva annua*)	sunflower (*Helianthus annuus*)		kernels		cupules	
										Ct.	Wt. (g)	Ct.	Wt. (g)
Great Lakes Late Woodland	Castor	Prairie View/ Moffit Farm (12H6)								151	3.2	137	0.7
		Castor Farm (12H3)		9		190				91	.96	516	4.45
		12H993	1		2					100	1.24	192	1.07
Great Lakes Late Woodland/Fort Ancient	Oliver	Noblesville (12H807)	18				1			56	0.4	22	0.1
		Baker's Trails (12H837)	4						7	1657	23.91	160	3.62
		Strawtown (12H883, early)	3		1	9		1	2	1621	35.05	569	2.57
		Sugar Creek (12Jo289)							1	74	0.9	4	<0.1
		Martinsville Plaza (12Mg195)			1					5	0.03	0	
		12Mo624								3	0.04	1	<0.01
		Clampitt (12Lr329)	2		1	1			2	149	1.49	289	1.47
		Bair (12Lr431)								4	<0.01	3	<0.01
		Bundy-Voyles (12Mg1)	21,406							104	0.7	146	0.6
		Pottersville (12Ow431)								1	<0.01	33	0.17
		Cox's Woods (12Or1)	2		74	51				182	1.8	206	1.3
		Heaton Farm (12Gr122) (Mississippianized)	93	12	1			1		199	1.89	678	3.82
Oneota	Taylor Village	Strawtown (12H883, late)							1	57	0.50	29	0.22
		12H1057								23	0.16	6	0.03

while the latest sites are near Martinsville, Bloomfield, and Paoli. It is possible that ecological factors constrained Oliver corn production outside the Strawtown Bottom as they moved into the West Fork of the White River. However, ecological constraints seem unlikely to account for the entire trend since Taylor Village inhabitants, who remained in the wide floodplain of the Strawtown Bottom, also continued the trend toward more nutshell and less corn. In addition, floodplain width eventually increases downstream on the West Fork of the White River. Thus the ecological possibility for greater corn production on later Oliver sites runs counter to the archaeological actuality of fewer corn remains. Therefore, we regard decreasing corn production to be constrained primarily by cultural, not ecological, factors during the Oliver phase.

McCullough also found qualitative evidence of increased social risk toward the end of the Oliver sequence (McCullough 2000). Decreased corn production (or less corn processing) could be a reflection of that increasing social risk. Another possibility is that farmers on the White River were differentially affected by climactic deterioration associated with the Little Ice Age. In either case, the later inhabitants of the Strawtown Bottom (Taylor Village) seem to have been responding to different influences (or responding differently to the same influences) than the Mississippian farmers in southwestern Indiana.

Beans

The earliest cultivated beans (*Phaseolus vulgaris*) identified in Indiana are more or less contemporary and come from four different Late Prehistoric cultures, consistent with the current model of bean cultivation spreading rapidly over the area from Illinois to New England during the 13th and 14th centuries (Hart et al. 2002). An Oliver bean from Feature 11 at Baker’s Trails yielded a date of A.D. 1409 while a Caborn-Welborn bean from Murphy was dated to A.D. 1347 (Hart et al. 2002). A bean from site 12De772 in the southeastern corner of Indiana is contemporary or perhaps slightly earlier (A.D. 1330), but no diagnostic ceramics were recovered from the site, confounding assignment to Falls Mississippian, Fort Ancient, or any Late Prehistoric group (Baltz 2010/2011:60, Beta-261447). In the Ohio Valley, beans are absent from Emergent and some Middle Mississippian sites (including the Falls Mississippian Prather site), but they are present at Angel[1] and all four of the Late Mississippian Caborn-Welborn sites (Bone Bank, Caborn, Hovey Lake, and Slack Farm) included in this analysis (Table 2). In the White River Valley (Table 3), cultivated beans are absent from Castor sites, which date prior to the advent of beans northeast of the Ohio River, but beans are present at four Oliver sites (Baker’s Trails, Sugar Creek, Clampitt, and the early component at Strawtown), and one of the two Taylor Village components (late Strawtown).

Old Cultigens

Quantities and types of small, starchy-seeded cultigens vary among the sites in the dataset. At the Emergent Mississippian Yankeetown sites in the lower Ohio Valley, starchy-seeded annuals

[1] The fifteen common beans identified to date from the Angel site are from *in situ* samples taken during the WPA-era investigations and 2011 Indiana University field school excavations (Bush 2011). Because they are not from flotation samples, they are excluded from Table 2.

outnumber corn remains, with chenopodium (*Chenopodium* sp.) and erect knotweed (*Polygonum erectum*) being the predominant species identified (Table 2). Maygrass (*Phalaris caroliniana*) is also present at Yankeetown, and these three cultigens plus little barley (*Hordeum pusillum*) comprise the starchy taxa present at the Middle Mississippian Angel Mounds site. An even larger number of cultigen taxa has been recovered from the later Mississippian Caborn-Welborn sites (Table 2), but the greater variety of species is probably due to the larger macrobotanical assemblage available for analysis, rather than being a true reflection of the importance of starchy-seeded annual crops in local foodways. In fact, starchy seeds decline as a percentage of archaeological non-wood plant remains, both in the Ohio and White River Valleys (Figures 2, 4).

In the White River system, chenopodium is the most common of the starchy-seeded crops, appearing at two of three Castor phase sites, seven of twelve Oliver sites and one of two Taylor Village sites (Table 3). It is likely, however, that these are not all domesticated forms of chenopodium. While testa thickness has not been systematically measured for chenopodium specimens in any of our samples, other characteristics can be useful indicators of how intensively human selective pressures operated on the plant populations (Gremillion 1993). Many of the chenopodium seeds in the Mississippian and Oliver samples lack seed coats, a common occurrence with domesticated chenopodium varieties.

Margaret Scarry indicated that the Yankeetown chenopodium seeds were a mixture of wild and domesticated types (Redmond 1990:192), and measurements of two specimens from the Caborn-Welborn Bone Bank site (Munson 2003:Figure II.3) suggested a cultivar. It seems likely, therefore, that both wild and cultivated varieties of chenopodium were present in the Ohio Valley from Emergent Mississippian through later Mississippian times.

In the White River Valley, margin morphology indicates a mixed population at the site with the largest chenopodium sample. More than 21,000 chenopodium seeds or fruits were recovered from Bundy-Voyles, a late Oliver occupation near modern Martinsville (Bush 1997). Of the 88 specimens examined for margin morphology, 40 had the truncate margins associated with domestication, 20 were indeterminate, and 28 were rounded. Wild forms of chenopodium (thick testa) were noted at Castor Farm and Taylor Village, the earliest and latest sites in our White River Valley data set. The data, though sparse, indicate that selection pressures toward domestication were less in the White River Valley than in the Ohio Valley.

In general, old cultigens decline in importance in both geographic areas over time. Of these starchy-seeded crops, chenopodium persists the longest, and it was identified at the latest sites in our sample (Slack Farm and Caborn), both Late Mississippian Caborn-Welborn sites in the lower Ohio River Valley.

Wild Foods

Nutshell varies inversely with corn as a percentage of non-wood plants in both locations (Figures 2, 4), but wild plants other than nuts remain fairly consistent over time in both the Ohio and White River Valleys. These include edible fruits such as blackberry, grape, cherry, plum, persimmon, pawpaw, strawberry, hawthorn, and sumac; edible greens (pokeweed, purslane); and burs (bedstraw). There is a trend toward higher visibility of wild plants in the White River Valley as compared to the Ohio Valley, however. Wild plants comprise roughly ten to twenty percent of food plant assemblages by count in the White River Valley and only two to ten percent in the Ohio River Valley.

One aspect of the wild plant data set can be traced directly to the larger floodplains of the Ohio Valley: aquatic resources are conspicuous in these assemblages but absent or nearly absent from White River assemblages. Cane (*Arundinaria gigantea*) is especially ubiquitous in samples from the Ohio Valley; and rush or bulrush (*Juncus* or *Scirpus*) stems have been recovered from non-flotation contexts in Mound A at Angel Mounds, as have stems that are probably reeds (*Phragmites australis*) (Monaghan and Peebles 2010). Smartweed (lenticular *Polygonum* spp.) is often present as well, and these species typically prefer damp ground. A fertile shoot that is probably horsetail (*Equisetum* sp) was recovered at Bone Bank, and American lotus (*Nelumbo lutea*) has been identified at Bone Bank as well. American lotus is a water plant that can be used as a food in a variety of ways, and is available over several seasons. Since the layers of the shell have aspects in common with both acorn and hazelnut, careful comparison with known material is important. The exterior of the lotus seed tends toward a smooth or slightly dimpled texture rather than the striate or fishnet-stocking texture of acorn shells. In cross section, both lotus seed coats and acorn shells typically have two layers, but the exterior layer is more dense in lotus whereas the interior layer is more dense in acorn.

True wetlands species are rare in the White River system, although smartweed is present at six of twelve Oliver sites, and wood charcoal assemblages frequently include riparian species such as sycamore (*Platanus occidentalis*). The only aquatic plants we are aware of from a Late Prehistoric site in the White River system are ten grains of wild rice that were recovered from a large storage pit (Feature 2) at the Crouch Site (Bush 1997). Crouch is part of the Smith Valley Complex, an unusual occupation of Great Lakes Late Woodland people in a small locale south of Indianapolis in the 14^{th} and early 15^{th} centuries. It is contemporary with Oliver but clearly not part of the same ceramic, architectural, or settlement traditions. The site is located near a wetland more than six kilometers from the White River.

Future Directions

Two river valleys in Indiana, both populated by Late Prehistoric agriculturists, appear to have noticeably different plant utilization patterns. In the lower Ohio River Valley, current data reveal that crops of both native starchy-seeded plants and corn are important, but indicate that corn increases in importance over time and older cultigens decrease until only chenopodium persists, possibly as late as the 16th century at Slack Farm and Caborn. In the White River system, our data show corn and old cultigens becoming progressively less visible in the archaeological record even as Oliver farmers populate increasingly wide floodplains. There are also apparent differences in the varieties of corn that were grown in the two river valleys. Data are sparse, but Oliver corn appears to have lower average row numbers than contemporary Middle and Late Mississippian corn.

When considering the reasons behind these differences, it is always necessary to take into account the quantity and quality of data available, and one result of this current appraisal has been a better understanding of where the gaps in the data are, and what questions need to be addressed in future research. To date, in the Ohio River Valley, only modest amounts of Yankeetown macrobotanical material have been analyzed, and botanical data from sites in the Falls of the Ohio area are minimal. In the White River Valley, the only macrobotanical data for the Castor and Taylor Village phases come from sites in the Strawtown Bottom, in contrast to Oliver phase data which was gathered from sites throughout the river valley.

Another obvious factor that can lead to differences is the physical environment, which includes landforms, natural vegetation, soils, and–in this case in particular–the extent of the floodplains. Harder to factor in are cultural variables. Cultural traditions of cropping indigenous small-seeded grain plants may have been a key factor in determining how long these crops persisted through time. The Mississippians in our study are heirs to the Late Woodland agricultural traditions of Sissel Johannessen's central area while the Western Basin contributors to the Oliver phase are from Johannessen's northern area, where old cultigen traditions were never as strong (Johannessen 1993).

There are also regional influences and interactions. For example, ceramic and architectural traditions indicate a connection between Yankeetown, Cahokia, and Angel, and more complete food plant profiles could strengthen this association. Similarly, utilizing more thoroughly defined plant subsistence patterns could help describe the less well understood interaction between the Fort Ancient people and the Falls Mississippians.

Our comparison of the botanical lifeways of people living in two different river valleys has revealed some apparent differences as well as some overall similarities. While both river valleys supported an agricultural lifestyle, various factors appear to have resulted in different patterns of plant utilization. Clearly, analyzing macrobotanical material can broaden our knowledge of cultural similarities and differences within and among regional areas as well as through time.

References Cited

Alt, Susan M.

2010 *Investigation of Two Yankeetown Sites in Posey County*. Department of Anthropology, Indiana University, Bloomington.

Arnold, Craig R., Colin Graham, Scott Hipskind, Dorothea McCullough, Robert G. McCullough, and Mariah Yager

2007 Archaeology in a Public Venue at the Strawtown Enclosure (12-H-883):2006. *Reports of Investigations* 701. Indiana University-Purdue University at Fort Wayne, Fort Wayne, Indiana.

Arnold, Craig R., Robert G. McCullough, Colin D. Graham, and Leslie (Nocton) Arnold

2012 Recent Archaeological Investigations of the Falls Mississippian Complex 14 Ellingsworth and Smith-Sutton Sites. *Indiana Archaeology* 7(1):14-34.

Bader, Anne T.

2003 Late Prehistoric Occupation at the Falls of the Ohio River: Somewhat More Than Speculation, Somewhat Less Than Conviction. *Currents of Change, Journal of the Falls of the Ohio Archaeological Society* 1(1):3-42.

Baltz, Christopher J., with contributions from Beth McCord and Leslie Bush

2010/2011 Site 12De772: An Oliver Phase Occupation in the Upper East Fork White River Drainage. *Indiana Archaeology* 5(2):50-73.

Braun, E. Lucy

1950 *Deciduous Forests of Eastern North America*. Hafner Publishing Company, New York, New York.

Bush, Leslie L.

1997 Floral Analysis. In An Archaeological Investigation of Late Prehistoric Subsistence-settlement Diversity in Central Indiana, edited by Robert G. McCullough and Timothy M. Wright, pp. 223-282. *Research Reports* No. 18. Glenn A. Black Laboratory of Archaeology, Indiana University, Bloomington.

2002 Macrobotanical Remains from the Pottersville Site. In Investigations at Pottersville (12Ow431): A Small Oliver Phase Habitation Site in Owen County, Indiana, by Michael Strezewski. *Research Reports* No. 20. Glenn A. Black Laboratory of Archaeology, Indiana University, Bloomington.

2004 *Boundary Conditions: Botanical Remains of the Oliver Phase, Central Indiana, A.D. 1200-1450.* The University of Alabama Press, Tuscaloosa.

2005a Macrobotanical Remains (12-H-993). In Investigations in the Upper White River Drainage: The Albee Phase and Late Woodland/Prehistoric Settlement, by Beth K. McCord, pp. 180-195. *Reports of Investigation* 65. Archaeological Resources Management Service, Ball State University, Muncie, Indiana.

2005b Strawtown Bottoms Macroflora: 2005 Update. In Late Prehistoric Archaeology of a Frontier, by Robert G. McCullough, pp. 205-226. IPFW Archaeological Survey *Reports of Investigations* 502. Indiana University-Purdue University at Fort Wayne, Fort Wayne, Indiana.

2010 *Two Additional Flotation Samples from the Oneota Component at Strawtown (12H883): Features 54 and 62*. Report submitted by Macrobotanical Analysis, Manchaca, Texas to IPFW Archaeological Survey, Indiana University-Purdue University at Fort Wayne, Fort Wayne, Indiana.

2011 *Plant Remains from the Angel Site (12Vg1) and White River Valley Cores, Indiana*. Report submitted by Macrobotanical Analysis, Manchaca, Texas to Glenn A. Black Laboratory of Archaeology, Indiana University, Bloomington.

Crites, Gary D.

1994 Plant Remains from the Southwind Site. In *Archaeological Investigations at the Southwind Site, A Mississippian Community in Posey County Indiana*, edited by Cheryl Ann Munson, Chapter 13, pp. 1-16. Department of Anthropology, Indiana University, Bloomington.

Cutler, Hugh C., and Leonard W. Blake

1973 Corn from Cahokia Sites. In Explorations into Cahokia Archaeology, edited by M. L. Fowler, pp. 123-136. Revised ed. *Bulletin* 7. Illinois Archaeological Survey, Inc., University of Illinois, Urbana.

Deam, Charles C.

1940 *Flora of Indiana*. Department of Conservation, Division of Forestry. Reprinted 2002 by The Blackburn Press, Indianapolis, Indiana.

Edging, Richard B.

2001 Archaeobotany at the Confluence. In *Excavations at Wickliffe Mounds*, edited by Kit W. Wesler, Chapter 16, on accompanying CD-ROM. The University of Alabama Press, Tuscaloosa.

Graham, Colin D., and Robert G. McCullough

2009 Archaeology in a Public Venue at the Strawtown Enclosure (12-H-883): 2008. *Reports of Investigations* 902. Indiana University-Purdue University at Fort Wayne, Fort Wayne, Indiana.

Green, Thomas J., and Cheryl A. Munson

1978 Mississippian Settlement Patterns in Southwestern Indiana. In *Mississippian Settlement Patterns*, edited by Bruce D. Smith, pp. 293-330. Academic Press, Inc., New York, New York.

Greenan, Michele, and Rexford Garniewicz

2010 Investigations at the Yankeetown Site (12W1). *Indiana Archaeology* 5(1):28-48.

Gremillion, Kristen J.

1993 Crop and Weed in Prehistoric Eastern North America: The Chenopodium Example. *American Antiquity* 58(3):496-509.

Hall, Robert L.

1991 Cahokia Identity and Interaction Models of Cahokia Mississippian. In *Cahokia and the Hinterlands: Middle Mississippian Cultures of the Midwest*, edited by Thomas E. Emerson and R. Barry Lewis, pp. 3-34. University of Illinois Press, Urbana.

Hart, John P., David L. Asch, C. Margaret Scarry, and Gary W. Crawford

2002 The Age of the Common Bean (*Phaseolus vulgaris* L.) in the Northern Eastern Woodlands of North America. *Antiquity* 76:377-85.

Hilgeman, Sherri L.

2000 *Pottery and Chronology at Angel*. The University of Alabama Press, Tuscaloosa, Alabama.

Homoya, Michael A., D. Brian Abrell, James R. Aldrich, and Thomas W. Post

1985 The Natural Regions of Indiana. *Proceedings of the Indiana Academy of Science* 94:245-268.

Jackson, Marion T.
2003 *101 Trees of Indiana: A Field Guide*. With illustrations by Katherine Harrington and photographs by Ron Rathfon. Indiana University Press, Bloomington and Indianapolis.

Johannessen, Sissel
1993 Farmers of the Late Woodland. In *Foraging and Farming in the Eastern Woodlands*, edited by C. M. Scarry, pp. 57-77. University Press of Florida, Gainesville.

McCullough, Robert G.
2000 The Oliver Phase of Central Indiana: A Study of Settlement Variability as a Response to Social Risk. Unpublished Ph.D. dissertation, Department of Anthropology, Southern Illinois University, Carbondale.
2005 Late Prehistoric Archaeology of a Frontier. *Reports of Investigations* 502. Indiana University-Purdue University at Fort Wayne, Fort Wayne, Indiana.
2008 Archaeology in a Public Venue at the Strawtown Enclosure (12-H-883). *Reports of Investigations* 803. Indiana University-Purdue University at Fort Wayne, Fort Wayne, Indiana.

McCullough, Robert G., Andrew A. White, Michael R. Strezewski, and Dorothea McCullough
2004 Frontier Interaction During the Late Prehistoric Period: A Case Study from Central Indiana. *Reports of Investigations* 401. Indiana University-Purdue University at Fort Wayne, Fort Wayne, Indiana.

Monaghan, G. William, and Christopher S. Peebles
2010 The Construction, Use, and Abandonment of Angel Site Mound A: Tracing the History of a Middle Mississippian Town through its Earthworks. *American Antiquity* 75(4):935-953.

Munson, Cheryl Ann
2000 *Archaeological Survey and Testing at Protohistoric Mississippian Sites in Southwestern Indiana*. Department of Anthropology, Indiana University, Bloomington, Indiana.
2003 *Bone Bank: Archaeological Rescue Investigations at a Late Mississippian Site, Posey County, Indiana*. Department of Anthropology, Indiana University, Bloomington.

Munson, Cheryl Ann, and Della Collins Cook
2001 Residential Mortuary Practices and Skeletal Biology at the Late Mississippian Hovey Lake Site, Posey County, Indiana. *Midcontinental Journal of Archaeology* 26(1):1-52.

Munson, Cheryl Ann, Michael Strezewski, and C. Russell Stafford
2006 *Archaeological Investigations at the Prather Site, Clark County, Indiana: The 2005 Survey and Excavations*. IPFW Archaeological Survey, Indiana University-Purdue University at Fort Wayne, Fort Wayne, Indiana.

Pollack, David
2004 *Caborn-Welborn: Constructing a New Society after the Angel Chiefdom Collapse.* University of Alabama Press, Tuscaloosa.

Powell, Gina S.
2000 Charred, Non-Maize Seed Concentrations in the American Bottom Area: Examples from the Westpark Site (11-MO-96), Monroe County, Illinois. *Midcontinental Journal of Archaeology* 25(1):27-48.

Redmond, Brian G.
1990 The Yankeetown Phase: Emergent Mississippian Cultural Adaptation in the Lower Ohio River Valley. Unpublished Ph.D. dissertation, Department of Anthropology, Indiana University, Bloomington.

Rossen, Jack
1996 *The Archaeobotanical Record of the Late Mississippian Caborn-Welborn Culture: The Slack Farm, Caborn, and Hovey Lake Sites*. Manuscript on file, Department of Anthropology, Indiana University, Bloomington.

Turner, Jocelyn C.
2010a Analysis of the Macrobotanical Remains from Site 12PO03 in Posey County, Indiana (Indiana University Field School, 2009). In *Investigation of Two Yankeetown Sites in Posey Count*y, by Susan M. Alt, pp. 88-106. Department of Anthropology, Indiana University, Bloomington.
2010b Analysis of the Macrobotanical Remains from Sites 12CL2, 12CL890-U, and 12CL935 in Clark County, Indiana. In *Phase I Archaeological Survey of the Lewis and Clark Trail, Town of Clarksville, Indiana (INDOT Des. No. 0200120),* by Cheryl Ann Munson, pp. II.1-5. Department of Anthropology, Indiana University, Bloomington.
2010c *Archaeobotanical Analysis of the Hovey Lake Site (12PO10) in Posey County, Indiana.* Analysis in progress. Department of Anthropology, Indiana University, Bloomington.

Vickery, Kent D.
1970 *Excavation of the Yankeetown Site, 1968 Season.* Unpublished report submitted to the National Park Service. Indiana University, Bloomington.

Wagner, Gail E.
1987 Uses of Plants by the Fort Ancient Indians. Unpublished Ph.D. dissertation, Department of Anthropology, Washington University, St. Louis.
1991 Corn from the Angel Site, Indiana. Paper presented at the 14th Ethnobiology Conference, March 14-15, 1991, St. Louis, Missouri. Manuscript on file, Glenn A. Black Laboratory of Archaeology, Indiana University, Bloomington.

Watson, Patty Jo
1976 In Pursuit of Prehistoric Subsistence: A Comparative Account of Some Contemporary Flotation Techniques. *Midcontinental Journal of Archaeology* 1: 77-100.

GLOSSARY OF ARCHAEOLOGICAL TERMS

A-horizon soil
The upper layer of soil, nearest the surface.

Anthropology
The study of humankind, with particular emphasis on its cultural and biological adaptations.

Archaeology
The anthropological study of past lifeways, cultures, and cultural processes through the investigation of material remains left behind by humans.

Artifact
Any portable object made, used, and/or modified by humans. Or, more generally, any evidence of human behavior. Common prehistoric artifacts found archaeologically include spear points, arrowheads, knives, chipped or broken stone debris, ground stone axes, grinding stones, mortars and pestles, awls, adzes, gouges, pottery, clothing and ornamental pins, decorative items and ornaments, scraping tools, hammerstones, bone fishhooks, stone perforators, and beads.

Associations
The relationships of artifacts and features at a site, based on provenience and context.

Atlatl
A spearthrower.

Avocational archaeologist
A person who participates in archaeology but does not practice it as a profession. Avocational archaeologists may volunteer to work with qualified professional archaeologists, and many take courses and gain substantial experience in archaeological methods and techniques. Others may be involved in archaeology as a hobby. Generally, avocational archaeologists subscribe to a preservation ethic to protect archaeological resources and to responsibly and legally preserve and study information from sites.

B.P.
Before present. By professional agreement present was established to be A.D. 1950 based on radiocarbon dating. For example, 1000 B.P. means 1000 years before A.D. 1950, or A.D. 950.

Celt
An ungrooved axe. Celts may be made of pecked and ground stone, or hammered copper. It is thought that celts appeared in Late Archaic times, and they continue to occur through later prehistory.

Ceramics
Pottery vessels or potsherds.

Chert
Stone of microscopic or small quartz particles used for the making of stone tools. Some types of chert include flint, agate, and jasper.

Chiefdom
A non-egalitarian hierarchial social organization with a fixed and permanent role for a chief/leader.

Collared
A thickened area present below the rim and above the neck on a clay pottery vessel.

Complicated stamped
Decorations of curvilinear or rectilinear design paddle stamped into a clay vessel.

Context
The position of an artifact or feature in its soil matrix, horizontal, and vertical location, and its relationship with other artifacts and features, related to the behavioral activities which placed it there.

Cord-impressed
Impression into a clay vessel surface before firing by a stick wrapped with cord, or cord on the edge of a paddle.

Cordmarked
Cordage impressions on a pottery vessel as a result of stamping with a cord-wrapped paddle.

Core
A stone which exhibits one or more flake scars, showing that it has been used as a raw material for flintknapping.

CRM
Cultural resource management. The protection, preservation, and recovery of information from archaeological sites, under federal and state laws. Universities and private archaeological companies often are hired to conduct CRM archaeology mandated under federal or state statutes.

Culture
A system of shared, learned, symbolic human behavior for adaptation to our natural and social environment. Culture may be thought of as a system composed of interrelated parts or subsystems, where a change in one part affects or influences the other parts. Subsystems interrelated with culture include technology, communication (and language), biological and physical characteristics, psychology, economics, social and political organization, beliefs and values, subsistence, settlement, environment, etc.

Excavation
The systematic recovery of archaeological deposits through the removal and screening of soil. These can be either test excavations (termed Phase II in CRM investigations) or large-scale excavations (termed Phase III in CRM investigations).

Fabric-impressed
Impressions of woven fabric in the surface of a pottery vessel.

Feature
Non-portable evidence of past human behavior, activity, and technology found on or in the ground. Prehistoric features commonly include fire pits and hearths, burned earth and clay, trash and garbage pits, post molds, evidence of house floors or basins, storage pits, clusters of artifacts (e.g., chipped and broken stones, caches of projectile points, ceramics or pottery sherds), human and animal burials, clusters of animal bone, earthworks (such as mounds and circular enclosures), petroglyphs and pictographs, and middens.

Flake
A by-product of flintknapping, toolmaking, use, or other human activities, resulting in a fragment of stone detached from a parent stone. Often, a flake has evidence of purposeful removal, including a bulb of percussion, ripple marks, a striking platform, etc.

Gorget
Decorative object worn on the chest.

Grog-tempered
Ceramics tempered with fragments of crushed pottery.

Lithics
Stones used or modified for human activities such as the manufacture of prehistoric tools, cooking, hunting, etc.

Microtools
Small tools, predominately of stone, manufactured and used to perform certain tasks.

Midden
Cultural refuse or deposits built up at a site.

Multicomponent
An archaeological site with occupations from more than one culture or time period.

Petroglyphs
Naturalistic or symbolic representations or depictions carved into stone.

Pictographs
Pictures or drawings painted on rocks, cave walls, stone outcrops, or rockshelters.

Prehistory
Human activities, events, and occupations before written records. In North America, this primarily includes Native American prehistoric cultures, but does not imply that these cultures did not have long, rich, and varied cultural and oral histories and traditions.

Protohistory
Protohistoric cultures can be defined as those prehistoric groups developing or continuing directly into early recorded history, some associated with early historic artifacts.

Provenience
The horizontal and vertical location of an artifact at a site.

Red Ochre
Late Archaic-Early Woodland culture with burial practices, usually in mounds, involving the use or placement of red ochre (a red hematite pigment).

Shell-tempered
Ceramics (pottery) tempered with fragments of crushed shell.

Site
The presence or occurrence of one or more artifacts or features indicates an archaeological site. An archaeological site is an instance of past human behavior or activity, where humans conducted some activity and left evidence of it behind, on or in the ground. Some common prehistoric site types include artifact caches, villages and camps, cemeteries, burials, workshops (e.g., stone debris from flintknapping activities), quarries, and earthworks (mounds, embankments, enclosures, fortifications, etc.).

Stratigraphy
Horizons, strata, or layers of soil deposited at a location, where the deepest strata were deposited the earliest, and the more recent layers deposited higher in the stratigraphic sequence.

Survey
The systematic discovery, recovery, and recording of archaeological information such as site locations, artifacts, and features by visually inspecting the surface of the ground if the soil is visible. Or, the use of shovel probes, cores, and/or augers near the surface, if surface visibility is restricted or poor. Termed Phase I in CRM investigations.

Test excavation
Systematic excavation of a representative portion or percentage of a site to evaluate and determine its nature and extent, what information is present, whether there are intact or in situ deposits present, and the degree of disturbance to the site, often to determine whether it is eligible for the National Register of Historic Places. Termed Phase II in CRM.

Wyandotte
A type of dark blue-gray chert found in southern Indiana.

For those with access to the Internet, the following sites also provide opportunities to access definitions and additional information regarding archaeological terms and concepts:

http://www.archaeological.org/education/glossary
http://archaeology.about.com/od/rterms/g/radiocarbon.htm

PREHISTORIC INDIANS OF INDIANA

Note- The word prehistory is a technical term used by archaeologists to indicate information about cultures before written records were kept—in North America at first by Europeans and people of Old World descent—in that area. It does not imply by any means the cultures described did not have long, rich, and varied cultural and oral histories and traditions. All of the cultures certainly did.

Paleoindians:

Paleoindians are the first known people who lived in the Americas, including Indiana. They lived here during the last stages of the last glacial advance, or ice age, and the early part of a changing environment and climate as the glaciers retreated. These people occupied the area now known as Indiana some 12,000 years ago, and lasted until about 10,000 years ago.

These early peoples probably lived in small groups of related individuals who moved around a lot, hunting large game animals, including some now extinct, such as the Mastodon, a large elephant-like creature. They also relied upon the gathering of wild plants to eat for their survival. Their population was very low.

The Paleoindians had very well-made stone tools, made out of a type of stone archaeologists call chert, which is a fine-grained rock that breaks a little like glass when hit by hard materials like another rock or a piece of deer antler. The tools they made by chipping, flintknapping, and flaking included long spearpoints, cutting and scraping implements, and engraving items. Some of their spear and piercing tools are called Clovis, Gainey, Barnes, Cumberland, Holcombe, Quad, Plainview, Hi-Lo, and Agate Basin points.

Evidence of these peoples is often found in Indiana on land near water sources like major rivers and springs, and where chert is found. Little is known about the Paleoindians since they moved around a lot and did not occupy any one place for a very long time. Therefore, they did not leave behind much evidence of their lives in any one place.

Archaic Indians:

American Indians known as the Archaic peoples lived here for a long time: some 6-7,000 years. Although these people did change over time, increasing in population and using new tool types and food preparation techniques, they did share certain general characteristics. These included new types of spear points and knives, with various types of notches and stems for hafting to wooden handles and shafts. Some of the projectile point types of the Archaic Period are called Kirk, Thebes, MacCorkle, LeCroy, Faulkner, Godar, Karnak, Matanzas, Brewerton, Riverton, and Terminal Archaic Barbed points.

They also used ground stone tools such as stone axes, woodworking tools, and grinding stones. The grinding stones were used to pound, crush, and grind wild nuts, berries, seeds, and other plant foods. They were hunters and gatherers of wild plants and animals, and moved around in their natural environments by season, often scheduling their movements to coincide with the appearance of foods like nuts, fish, deer, and wild seeds. Over time, they became very selective in what kind of resource they were pursuing.

During the Archaic Period, the spearthrower was used. This consisted of a shaft with a handle, weighted for balance with a ground and smoothed stone, and a hook on the end. A spear was fitted onto the hook, and was thrown with the spearthrower shaft.

Towards the end of the Archaic, more evidence of mortuary activities is found, including human burials with a red pigment coloring remains or grave goods. Burial mounds appear. During the Archaic, the cultures became more different from one another, and more types of artifacts were used. Their settlements became more permanent. One type of settlement was along large rivers, where they discarded large amounts of mussel shells. These sites are called shell middens or "mounds," although they are not really constructed, burial mounds. The general Archaic period ended at about 1,500 B.C., although some Terminal Archaic peoples lived until 700 B.C.

Woodland Peoples:

During the Woodland Period, a number of new cultural characteristics appear. A notable event was the appearance and use of ceramics and pottery vessels. Another significant occurrence was the use and increase of horticulture. A remarkable feature of some Woodland sites is earthen mounds and earthworks, such as embankments. The Woodland peoples persisted for over 1,500 years in Indiana.

During the early portion of the Woodland Period, the pottery was thick and heavy. One early Woodland culture called the Adena people had elaborate mortuary rituals, including log tombs beneath earthen mounds. Projectile points during this time included Adena, Kramer, Dickson, and Gary Contracting Stemmed types.

A little later in time, in the Middle Woodland, there were also elaborate burial rituals, but also long-range trade of exotic goods like mica, marine shells, copper, obsidian, copper axes, drilled wolf and bear teeth, and other goods from region to region throughout the Eastern Woodlands area of North America. Some of these groups were called Hopewell peoples. Their ceramics had all kinds of incised and stamped decorations. During this time, the Woodland Indians were likely organized into groups we might recognize as what we today call tribes. Projectile points from the Middle Woodland include Snyders, Lowe Flared Base, Steuben, Chesser, and Baker's Creek.

The latter part of the Woodland Period is called Late Woodland. In Late Woodland, two important events occur. One is the first appearance of agriculture; that is, intensive cultivation and modification of crops such as corn and squash. Another important occurrence is the appearance of the bow and arrow. Prior to this time, most of the chipped stone tools were either spearheads, knives, engraving tools, or scrapers. In Late Woodland, however, small, triangular points occur which are true arrowheads. One type of these arrowheads is called Madison. Other point types are termed Jack's Reef Pentagonal and Raccoon Notched. Settlement during the Late Woodland time changed from the earlier more permanent and nucleated villages to a pattern of smaller sites dispersed more over the landscape. In some regions of the state, Woodland groups may have persisted almost until historic times, although in general, the Woodland Period ends at A.D. 1,000.

Mississippian Period:

The Mississippian peoples In Indiana lived in some cases almost until contact with Early European explorers, missionaries, soldiers, and traders. They lived from about A.D. 1,000 until possibly as late as A.D. 1650. A noticeable change during this period is the nucleation of some peoples into large settlements akin to "towns," such as at the Angel Mounds site near Evansville, Indiana. These towns had large public areas such as plazas and platform mounds—like truncated or flat-topped pyramids—where influential or important public individuals lived or conducted rituals. Thus, there was social stratification and ranking of individuals in Mississippian societies. There were probably chiefs and religious leaders. The towns were supported by the harvesting of large agricultural fields growing corn, beans, and squash. People living in sites such as these are termed Middle Mississippian.

Notable artifacts indicating Mississippian settlements include large, chipped stone hoes, and pottery bowls and jars tempered with crushed shell. Straps, loops, and handles for these containers characterize this time period as well. Stone tools include point types known as Madison, Nodena, and Cahokia, and other implements such as mortars, pestles, pendants, beads, anvils, abraders, and other items.

Another less elaborate type of Mississippian society called Upper Mississippian was present in the state, with people living in hamlets and villages. Many of these people lived in northern and southeastern Indiana. They also grew and harvested maize, beans, and squash. One group to the southeast was called Fort Ancient, and lots of shell-tempered vessels with straps are found at these sites. In northern Indiana, incised shell-tempered pottery fragments are found on Upper Mississippian sites that are often located near the beds or former beds of lakes.