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SUBSISTENCE STRATEGIES IN THE UPPER ILLINOIS
RIVER VALLEY: THE KUHNE SITE
CASE STUDY

Autumn M. Beyer

106 Pages

May 2015

Stuart Struever's excavation of the Kuhne site, located in the Upper Illinois River Valley occurred during the start of archaeological interest in the region. The faunal remains recovered during this excavation offer a unique opportunity to understand subsistence strategies in the area during the Middle Woodland period. Using standard zooarchaeological methods, these remains were analyzed to better understand which animal species were targeted by Middle Woodland people in this region, which season(s) the site was occupied, and how bones were modified for utilitarian and other purposes. These findings were then compared to faunal assemblages from Middle Woodland sites in the Central and Lower Illinois River Valley, the Rensch and Apple Creek sites respectively, to see how the Kuhne site's subsistence strategy relates to other sites, as well as to acquire a more comprehensive understanding of the subsistence strategy for the entire Illinois River Valley. The site comparisons are followed by a discussion of changes in methodology and Stuart Struever's contributions in archaeology and zooarchaeology, specifically the development of flotation samples.

The analysis of the Kuhne site faunal collection showed that mammals dominate the Kuhne site subsistence strategy, which also included birds, turtles, fish, and bivalves. Fish and bivalves only contribute a small portion to the total Kuhne faunal assemblage. Previous analysis completed in the 1960s indicate many more bivalve specimens in the Kuhne faunal collection, changing the subsistence economy interpretation to place more importance on riverine resources in addition to mammals. The most significant species at the Kuhne, Rensch, and Apple Creek sites was the white-tailed deer. However, when the three faunal assemblages were compared, differences were found in species used to supplement everyday diet, as well as the seasonal occupation of the sites. The Kuhne site inhabitants utilized small mammals and birds to supplement everyday diet, the Rensch site occupants with fish, and the Apple Creek inhabitant's exploited mussels. Excavation methods at the Kuhne site did not include flotation samples like the Rensch and Apple Creek site excavations, and this is likely the reason for a bias towards larger specimens in the assemblage. Subsistence along the Illinois River Valley during the Middle Woodland period appears to be similar, with each site's inhabitants exploiting local faunal resources from their surrounding environmental zones.

SUBSISTENCE STRATEGIES IN THE UPPER ILLINOIS
RIVER VALLEY: THE KUHNE SITE
CASE STUDY

AUTUMN M. BEYER

A Thesis Submitted in Partial
Fulfillment of the Requirements
for the Degree of

MASTER OF SCIENCE

Department of Sociology and Anthropology

ILLINOIS STATE UNIVERSITY

2015

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SUBSISTENCE STRATEGIES IN THE UPPER ILLINOIS
RIVER VALLEY: THE KUHNE SITE
CASE STUDY

AUTUMN M. BEYER

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CONTENTS

	Page
ACKNOWLEDGMENTS	i
CONTENTS	ii
TABLES	iv
FIGURES	v
CHAPTER	
I. INTRODUCTION	1
Research Questions	4
Theory and Methodology	6
Chapter Synopsis	7
II. THE WOODLAND PERIOD AND SITE BACKGROUNDS	8
The Early Woodland Period	8
The Middle Woodland Period	10
Middle Woodland Subsistence	14
Subsistence in the Middle-to-Late Woodland Transition	17
The Kuhne Site	18
The Rench Site	26
The Apple Creek Site	29
III. THEORETICAL FRAMEWORK AND METHODOLOGY	31
Theoretical Framework	31
Methodology	35
IV. THE KUHNE SITE FAUNAL ANALYSIS	43

Species Composition by Taxonomic Class	43
Mammals	44
Birds	45
Reptiles	48
Fish	49
Freshwater Mussels	49
Comparison of Parmalee and Beyer NISP Tabulations	50
White-tailed Deer	56
Modified Bones	59
Cultural Modifications	59
Natural Modification	69
Seasonality Indicators	70
Habitat Use	71
Kuhne Site Subsistence Strategy	72
V. SITE COMPARISONS AND CONCLUSIONS	75
Rench Site Subsistence Strategy	75
Apple Creek Site Subsistence Strategy	76
Kuhne, Rench, and Apple Creek Site Comparisons	77
Kuhne, Rench, and Apple Creek Site Conclusions	87
Environmental Zones	89
Changes in Methodology	94
Summary and Conclusion	95
REFERENCES	97

TABLES

Table	Page
1. Purdue et al 1989 White-tailed Deer Food Utility Index (FUI)	40
2. Adapted White-tailed Deer Food Utility Index (FUI)	40
3. Composition by Class of the Kuhne Faunal Assemblage	44
4. Species Composition of Animal Remains from the Kuhne Site	46
5. Comparison of Faunal Analysis: Parmalee and Beyer Tabulations	52
6. White-tailed Deer Skeletal Portions from the Kuhne Site	57
7. Food Utility Index of White-tailed Deer in Each Food Utility at the Kuhne Site	58
8. Comparison of Kuhne, Rensch, and Apple Creek Site Fauna	78

FIGURES

Figure	Page
1. Map Illustrating the Kuhne, Rensch, and Apple Creek Site Locations along the Illinois River	3
2. Sketch of the Kuhne Site Location	20
3. Aerial Photograph of the Kuhne Site Excavation	23
4. View of Crew Excavating the Kuhne Site	24
5. Ground View of Kuhne Site Excavation	24
6. Kuhne Site Archaeological Excavation 1955-1956 Profile Wall Drawing Looking South	25
7. Location of the Rensch Site in Peoria County, Illinois	27
8. Map of Kuhne Site Excavation Units	37
9. Comparison of Parmalee and Beyer NISP Percentages by Class	55
10. Photo of Cut Mark on Elk Thoracic Vertebra	60
11. Photo of Cut Marks on Trumpeter Swan Ulna	61
12. Photo of Calcined Bobcat Radius and Burned Bobcat Metacarpal	62
13. Photo of Modified White-Tailed Deer Antlers	63
14. Photo of Perforated Three-Ridge Mussel Shell [exterior]	64
15. Photo of Perforated Three-Ridge Mussel Shell [interior]	64
16. Photo of Map Turtle Modified Carapace with Vertebrates Removed	65

17.	Photo of Map Turtle Modified Carapace with Ground Interior	66
18.	Photo of Assorted Modified Turtle Species	67
19.	Photo of Assorted Modified White-Tailed Deer and Large Mammal Specimens	68
20.	Photo of Rodent Gnawing on Unidentified Large Mammal Specimens	69
21.	Photo of Carnivore Gnawing on Elk Distal Metatarsal and Phalanx 2	70
22.	Photo of Newborn White-Tailed Deer Metapodial	71
23.	MNI Percentage by Class	85
24.	Biomass Percentage by Class for Kuhne and Rench Sites	87
25.	MNI Percentage by Class, Without Fish	89
26.	Kuhne Site Vegetation Map	91
27.	Rench Site Vegetation Map	92
28.	Apple Creek Site Vegetation Map	93

CHAPTER I

INTRODUCTION

The Middle Woodland Period (200 B.C. – A.D. 400) in the Midwestern United States, best known for Hopewell mounds and extensive trade networks, has long been of interest to archaeologists. Stuart Struever played an important role in defining this period and he even coined the term “Hopewell Interaction Sphere” (Caldwell 1964; Seaman 1979; Struever 1964,). As a college student, Stuart Struever began his career as an archaeologist by directing an excavation at the Kuhne site (11PM3) in the Upper Illinois River Valley, a Middle Woodland period habitation site. This excavation was the beginning of his long-term interest in the archaeology of this region and in this time period. In this thesis I examine the faunal remains from the Kuhne site, (11PM3), excavated by Struever in 1955-1956. This research not only offers some insight into the subsistence strategies employed during this period, but it also provides a glimpse of the archaeology of Stuart Struever during his formative years.

Subsistence patterns during the Middle Woodland period in the Upper Illinois River Valley are poorly known because of the lack of faunal analysis on sites in the region. The Kuhne Site, a Middle Woodland and Weaver phase habitation site located in Putnam County, Illinois, is an excellent place to begin to understand the subsistence in this region because Struever and his team recovered a large amount of animal remains.

The analysis of these materials also permitted me to shed additional light on the subsistence strategies throughout the entire Illinois River, as I was able to compare the Kuhne assemblage to other Middle Woodland sites in the Central and Lower Illinois River Valley. Although the Kuhne site may not represent all Upper Illinois River Valley Middle Woodland, Weaver Phase sites, my analysis will provide some important baseline data for the region and also permit me to discuss how subsistence strategies in this region compare to the Rensch site (11P4) from the Central Illinois River Valley and the Apple Creek site (11GE2) from the Lower Illinois River Valley (Figure 1).

Figure 1. Map Illustrating the Kuhne, Rensch and Apple Creek Site Locations along the Illinois River

Research Questions

Four research questions guided this research project. The first question focuses on the Kuhne site subsistence strategies.

- 1.) What does an analysis of the faunal remains at the Kuhne site tell us about the subsistence strategy, seasonality, and cultural use of bone at this location?

Because the people who lived at the Kuhne site had many dietary options, it is important to first establish whether they relied more on aquatic resources, terrestrial resources, or a mix of both. The refuse disposal practices acting upon the faunal materials were also determined by observing the presence or absence of rodent and carnivore gnawing.

Understanding how these materials were disposed, whether they were buried immediately after consumption or left on the surface for an extended period of time, is important for understanding cultural practices at the Kuhne site. Seasonal indicators within the faunal collection will be studied to determine when the Kuhne site was occupied throughout the year, and if there is a preference shown towards migratory species. Examining worked/modified and cut bone also provided information on bone technology, how the Kuhne site inhabitants were processing the animals, and the symbolic importance of certain animals.

- 2.) What excavation methods were used at the Kuhne Site, and how could they affect the faunal analysis?

Archaeological recovery methods were the second focal point in my research. The lack of fine screening techniques or flotation samples can bias subsistence strategy

conclusions, as more course-grained collection methods emphasize the recovery of larger bones over smaller ones. Determining what excavation techniques were used is key to interpreting the subsistence pattern at the Kuhne site. Stuart Struever directed the excavation at the Kuhne site at the start of his archaeological career, while attending Dartmouth College. Excavation techniques implemented, even at the start of his interest in archaeology, before formal training, were well executed, yet no specific mention of the techniques used were made in the excavation notes.

- 3.) How does this Upper Illinois River Valley late Middle Woodland site's subsistence strategy relate to late Middle Woodland subsistence records for the Central Illinois River Valley and Lower Illinois River Valley?

The Kuhne site will be compared to the Rench site and the Apple Creek site, located in the Central and Lower Illinois River Valley respectively. Were similar species consumed, and if they were not, do sites from various parts of the valley reflect exploitation of similar habitats and seasonality? Other factors to consider during the comparison are differences in the excavation and recovery techniques between the three sites.

- 4.) How has the methodology and practices within archaeology and zooarchaeology changed from Struever's excavation of the Kuhne site until now?

Significant developments in methodology and practices have occurred in the disciplines over the past several decades, especially since the excavation and analysis of the Kuhne

site materials during was the 1950s to mid-1960s. I will consider how the Kuhne faunal collection was affected by these changes in the discipline of archaeology and the sub-discipline of zooarchaeology, and how this may influence the inferences that can be derived from this faunal assemblage.

Theory and Methodology

The Kuhne site collection was analyzed at the Illinois State Museum Research and Collection Center under the supervision of Dr. Terrance Martin. Faunal materials examined in the study were analyzed following standard zooarchaeological methods. The information collected for each specimen includes: taxon, element, side, portion, direction, part, completeness, cultural modification (e.g., sawed, chopped, knife-cuts, charred, burned, calcined), natural modifications (e.g. rodent-gnawed, carnivore-gnawed), specimen weight, and specimen count. In addition to these points of data, lengths of fish were also estimated for each identified fish bone in 8-cm size classes (standard length, except for gar and bowfin where size classes refer to total length).

Data collected on the Kuhne site were quantified using several analysis techniques including Minimum Number of Individuals (MNI), Number of Identified Specimens (NISP), biomass, and food utility index (for white-tailed deer). MNI for the Kuhne site could not be calculated on a feature-by-feature basis because of the lack of notes about artifact provenience. Instead, MNIs were calculated from the site as a whole.

The Kuhne site analysis, including MNI, NISP, and biomass was compared to the Rench and Apple Creek site. Excavation methods for each site were also compared to determine if differences existed that could cause significant discrepancies between the three sites' faunal collections. The major difference between the Kuhne site and the

Rench and Apple Creek sites is that the Kuhne site did not have flotation samples taken whereas the Rench and Apple Creeks sites did.

During this analysis, environmental archaeology is used to provide a theoretical background for the zooarchaeological analysis. Subsistence has always been a driving force in human adaptation and can be used to understand many facets of the past. Using faunal analysis, as well as other scientific analyses, I reconstructed how the Kuhne site occupants utilized their environment, and what species were selected for exploitation. Understanding how these people utilized the animal bone beyond subsistence is an additional focus.

Chapter Synopsis

Chapter 2 summarizes what is known about the Middle Woodland period in Illinois, specifically in the Illinois River Valley. It includes an introduction to the Kuhne, Rench, and Apple Creek sites. Chapter 3 focuses on the theoretical and methodological framework used in this project. Environmental archaeology and how it was used in the zooarchaeological analysis is discussed, as well as the zooarchaeological analysis techniques and quantifications used on the faunal collection. Chapter 4 focuses on the Kuhne site faunal analysis and discusses interpretations of the site's subsistence strategy. This chapter also compares this project's NISP tabulations to those in Parmalee's unpublished faunal report. Chapter 5 concludes by comparing findings from Kuhne, Rench, and Apple Creek, and discusses the changes that occurred in methodology in the subfields of archaeology and zooarchaeology, Stuart Struever's important influences and additions to the fields, and how these affected zooarchaeology in the Midwestern United States.

CHAPTER II

THE WOODLAND PERIOD AND SITE BACKGROUNDS

The Woodland Period (1000 B.C. - 900/1000 A.D.) has been divided into the Early, Middle and Late Woodland, throughout Eastern North America. In Illinois, the start of the Woodland Period is marked by the emergence and spread of gardening, formalized cemeteries, the beginnings of mound building, adoption of pottery, increased population, and distant contacts among neighboring communities (Griffin 1970, Lewis 1986, Milner 2004). With each subsequent sub-period came changes in social, economic, and settlement patterns. This chapter will summarize the culture history of the Woodland Period, and changes that took place in order to place the Kuhne site within a greater context in North American, specifically Midwestern, prehistory. A focus is placed on the Middle Woodland and Late Woodland periods in the Midwest, concentrating particularly in Illinois and the Illinois River Valley, because the Kuhne site dates to this period.

The Early Woodland Period

In the Midwest the Early Woodland period (200 B.C. – 1000 A.D.) is defined by the introduction of thick-bodied cord-marked pottery known regionally as Marion Thick Fayette Thick, and Vinette I ware, as well as the Black Sand tradition in Illinois (Fiedel 2001; Garland and Beld 1999; Griffin 1945; Ritchie and MacNeish 1949). Early Woodland period sites are often found at multi-component locations, situated in

forested areas, suggesting that similar environments were utilized for long period of time. Most sites are located in the middle Ohio River Valley, but sites have been found elsewhere throughout the Midwest. Settlement patterns established in the Archaic persisted throughout the Early Woodland and into the Middle Woodland. Lewis (1986) states that all Early Woodland sites are in localities that were forested and that none of the sites are in ecotones/environmental zones that had a native cover of tall-grass prairie. However, each Early Woodland site's location is within 3 km of forest/prairie ecotone based on early nineteenth century General Land Office maps (Lewis 1986:173). In Lewis' (1986) study he selected 17 sites from Illinois and these sites showed no bias towards any type of landform within forested areas, or any trend to be situated near larger streams. Population sized increased towards the end of the Early Woodland Period (Buikstra et al. 1986; Fortier 2001:180). The use of pottery during this period may have been part of the reason for population growth as these vessels could be used to process food in new ways (Fiedel 2001:106). As these group sizes were increasing, there is evidence that the sites represent a more sedentary lifestyle, as there are larger but fewer numerous sites than the previous periods (Fiedel 2001).

Subsistence in the Early Woodland was wide-ranging, including both terrestrial and aquatic species, supplemented with the collection of nuts and some plant domestication. Hickory, acorn, and hazelnut were the typical nut species collected. Small starchy grains are among the most common seeds recovered during archaeological investigations of this period (Fritz 1993). Plants thought to be domesticated before 900 B.C. include squash/gourd, bottle gourd, sumpweed, sunflower, and chenopod (Fritz 1993). The consumption of native crops was substantial during this period, but increased

greatly during the Middle Woodland (Fiedel 2001). Throughout the Midwest, average body size of deer significantly increased from the Terminal Archaic into the Early Woodland period (Fiedel 2001; Purdue 1989). This change did not occur because of human impacts, but from environmental changes; specifically “...cooler summer temperatures, which reduced stress on the plants that provided high quality forage for deer” (Fiedel 2001:129). Bison were also present, at least sporadically (Harn and Martin 2006).

Mounds dated to this period throughout the Midwest varied, both in how they were constructed and their size (Farnsworth and Asch 1986; Milner 2004). Construction styles ranged from simple creations of piles of soil, to ones built over the foundations of where large wooden structures formerly stood. The buildings that these mounds were built over are typically found in circular form, but occasionally in rectangular shape. The process of mound construction in the Early Woodland period most likely took place over several years, by single families or small communities. Excavations of Early Woodland mounds have revealed graves, with a variety of burial forms including log-lined tombs. During the shift from the Early to Middle Woodland, mound construction became more frequent throughout the Midwest and Southeast (Milner 2004).

The Middle Woodland Period

The Middle Woodland Period (200 B.C. – A.D. 400) in the Midwestern United States, best known for the cultural manifestation known as Hopewell, has long been of interest to archaeologists. Stuart Struever was a key player for helping us better understand this period, coining the term “Hopewell Interaction Sphere” and emphasizing the importance of habitation sites (Caldwell 1964; Seaman 1979; Struever 1964, 1968b).

In addition to Struever, Gregory Perino (e.g., Perino 2006) conducted extensive archaeological research on the Illinois Hopewell. His excavations and research on twenty major Hopewellian and Late Woodland mounds gave insight into these periods and the people who lived in the region (Farnsworth 2006).

Participants in the Hopewellian network, or the “Hopewell Interaction Sphere,” exchanged exotic raw materials, including copper, obsidian, marine shells, mica, and finished products made out of these materials such as copper ear spools and breast plates, containers made out of marine shells, effigy pipes, clay figurines, and small ceramic vessels (Struever 1965). This network began around 150 B.C. and ended between A.D. 250 and 400. The Hopewellian network ranged from southeastern Canada to the southeastern United States (Caldwell 1964; Griffin 1959; Loy 1968; Seaman 1979; Struever 1964; Struever 1968a). The exotic materials were brought to manufacturing areas where they were converted into finished products, and Native Americans exported those products through regional and local exchange networks. An increase in population also occurred during the Middle Woodland period, along with increased settlement size (Milner 2004; Struever 1968a).

Archaeologists have found extensive earthworks and mounds from this period throughout the Midwest, and these features appear in the greatest concentrations along the Ohio and Illinois River Valleys. Differences between these concentrations exist in several forms. The Ohio Valley Hopewell culture created larger and more elaborate earthworks than the Illinois Valley Hopewell (Milner 2004; Struever 1968a). The general structure of Hopewell mounds was circular or oval piles of earth, only a few meters in height. Flat-topped rectangular and circular mounds were also built during this

period, and have been interpreted as ceremonial platforms. Mounds are mostly found along bluff crests; however, there are a few that are located on the floodplain of the Illinois River (Buikstra 1986). Wooden walls were also used at some Middle Woodland sites to visually enhance the earthen structures. Excavations of Middle Woodland sites in western Illinois showed that the contents vary from site to site. However, most have a central tomb that was surrounded by simple graves, and log-lined tombs were still being constructed (Milner 2004).

The technique of mound construction during this period has been determined through careful excavation. Before mound building began, the top layer of earth, the dark soil horizon, was occasionally removed, followed by the building up of soil with separate basket loads. In addition to the basket loads of earth, blocks of sod were also stacked to form the mound, generally with the grassy side facing down. Soil caps had been interpreted in the past to be intentionally placed to finish the mounds, but they are usually found to be naturally formed soil horizons that accumulated over the centuries after the mounds construction (Milner 2004). Habitation sites have been studied extensively to learn about the people who created these elaborate earth constructions. Soil stains reveal that house structures were in circular to oval shape with a large variety of sizes. Hearths and shallow pits were also uncovered, with the shallow pits used for storage purposes or as earth ovens (Milner 2004).

In addition to earthworks and habitation sites, mortuary patterns and stylistic variations on ceramics were distinctive (Struever 1965). Most Middle Woodland sites within Illinois are located within the Illinois River Valley, with sites recorded along bluff

edges and secondary streams that border the valley. Occasionally some sites were located in the floodplains as well (Holt 2000; Milner 2004). Unfortunately, most of the research for the Middle Woodland Period has focused on Hopewell burial customs and earthworks, which limits the amount of information known about this period.

Overall, the Middle Woodland period was a period of relative harmony. Milner (2004) argues based upon an analysis of skeletal trauma from sites throughout the Midwest, that the Middle Woodland period skeletal populations show few signs of injuries that occur from fighting. The lessening of these types of injuries has been interpreted to be consistent with “more permeable social boundaries that allowed some people to travel unscathed across long distances with ritually significant and highly unusual objects” (Milner 2004:85).

The beginning of the Middle Woodland period aligns with the movement of populations into major river valleys, along with an increase in population density (Charles 1992). Populations’ movements and exchanges of material culture can be seen through the spread of Havana characteristics throughout the Middle Woodland period. The Havana tradition is “the cultural horizon in Illinois that contributed the parent stock in the formation of the Hopewell complex of traits. It stemmed from Early Woodland on the fringe of the Illinois prairies and contributed the Havana pottery wares to the Hopewell Complex” (Perino 2006:137). Havana wares are most often grit tempered; types include Havana Plain, Havana Cordmarked, and Havana zones. These ceramic types include a variety of decorative techniques, typically incised zones filled with stamped punctates, dentates, or cord-wrapped-stick impressions (Perino 2006). Stretton

(2013) compiled radiocarbon dates from Havana and Havana related sites in the Illinois River Valley, Kankekee River Valley, Northwest Indiana, and Southwest Michigan. A pattern emerged showing that the spread of people, and their cultural material, began in the Central Illinois Valley, and spread north and south to the other regions included in his study (Stretton 2013).

Asch (1976) estimated the size and density of Middle Woodland populations in the Lower Illinois River Valley by analyzing the number of years that sites were occupied and the length of the Middle Woodland period. He estimated that the population levels during this period were similar to those from the early historic period in eastern North America, approximately “less than one person per square mile” (Asch 1976:68). However, as stated previously, a concentration of people and their settlements during this period occurred along the river valleys. This concentration was a result of the close proximity to food resources along these rivers (Fie 2008:7). The distribution of sites during this period shows social groups maintained territorial boundaries (Fie 2008:28). These boundaries also included and confined the exploitation of local raw materials such as clay sources (Fie 2008).

Middle Woodland Subsistence

The subsistence base during the Middle Woodland in general consisted of hunting and gathering with the additional use of cultigens through gardening (Cook 1979, Fritz 1993; Milner 2004). The crops grown in the gardening systems were stored in increasing quantity throughout the period, showing an increased dependence on horticultural products (Fritz 1993). Corn was one of the starchy seeds cultivated, however, it is not clear how important the plant was during the Middle Woodland period (Fritz 1993;

Yerkes 1988). Fritz (1993) states that corn itself may have just been another starchy seed, among many others, but that there is also a possibility that it might “have been a special plant from the beginning, perhaps introduced and dispersed via the Hopewellian exchange network, carrying ritual or social status connotations” (Fritz 1993:53). Scarry (1993) supports this idea that corn was an important plant since the beginning of its domestication. Archaeobotanical research completed by VanDerwarker, Wilson, and Bardolph on maize adoption and intensification in the Central Illinois River Valley also substantiates corn’s importance during this period (VanDerwarker et al. 2013). However, there is no evidence for extensive corn consumption until after the Middle Woodland period.

The fact that domesticated native plants were a part of the subsistence economy utilized by Middle Woodland peoples, alongside the consumption of plants and animals obtained through hunting and gathering, initially caused uncertainty over whether these people were sedentary or seasonally mobile (Yerkes 1988). Domestication of native plants does not guarantee that the people were sedentary, just as the use of a hunting-gathering economy does not prove a mobile lifestyle (Yerkes 1988).

Animals that were consumed include many species of mammals, especially white-tailed deer, along with fish, turtles, and mussels. In addition to white-tailed deer faunal remains, muskrat, raccoon, striped skunk, eastern cottontail, elk, duck, prairie chicken, wild turkey, Canada goose, trumpeter swan, snapping turtle, and two species of box turtles, among hundreds of other diverse species are found in Middle Woodland faunal collections. Aquatic species were exploited extensively because the locations of sites during this period were close to rivers, backwater lakes, and swamps (Holt 2005; Milner

2004; Munson et al. 1971). Bowfin, gar, bullhead, catfish, and freshwater drum, were local fish species exploited during the Middle Woodland period.

The Central and Lower Illinois River Valley's Middle Woodland subsistence strategies are better known than most areas because there has been a significant amount of research in the area. Holt's (2005) work in the lower Illinois River Valley reviews the faunal evidence for the transition from the Middle to Late Woodland Periods. She noted that there was a shift in consumption, specifically pertaining to the amount of fish utilized for subsistence. Many researchers have stated (e.g., Binford and Binford 1968) that subsistence strategies typically only change during times of extreme stress, otherwise they are fairly stable and consistent (Milner 2004). The increase in fish consumption that is represented throughout the region during the shift from the Middle to Late Woodland could represent a solution to the stresses caused by an increasingly sedentary lifestyle (Buikstra 1986; Styles 1981, 1996). Research in the Central and Lower Illinois River Valley by Holt (2000) shows that the focus on fish may also indicate an emphasis on local animal resources to increase self-sufficiency, which in turn implies a decrease in social integration among these Woodland sites. Holt (2000:378) also states that the shifts seen in faunal exploitation from the Middle Woodland to the Late Woodland "might also indicate shifts in social organization within settlements." The elderly and children within Middle/Late Woodland societies are able to collect more fish than larger and faster mammalian species, which would allow "prime-aged" adults to focus on hunting the more mobile species, such as white-tailed deer (Holt 2000:378).

Subsistence in the Middle-to-Late Woodland Transition

There is a significant change in subsistence during the transition from the Middle Woodland to the Late Woodland Period. This transition included an emphasis on increased cultivation of plants, specifically maize agriculture (Buikstra 1986; Simon 2000; Styles 2000). In addition to more plant cultivation, subsistence strategies shifted from the broad-based practice to a more localized resource exploitation. Settlements in the Late Woodland expanded throughout the uplands and a higher reliance was placed on cultivated plants for nourishment (Colburn 1994).

The Lower Illinois River Valley has been the main focus for research on this transition in the Illinois region. Research has been extensively conducted focusing on all aspects of Middle Woodland people's lives. The changes in subsistence strategies could be from stress-producing environmental changes, biophysical environmental changes, sociocultural environmental changes, or a combination of these (Styles 1981). Sites from the Late Woodland are found to have a vast amount of fish remains, and this shows that these people were exploiting local renewable resources in addition to their agricultural products (Styles 2000). Geographic variation greatly affects resource selection among Late Woodland peoples and explains why there is such variety in archaeofaunal remains (Styles 2000). The length of occupation, along with seasonality, greatly affect the type and number of species exploited. Short-term encampments, typically during the cooler seasons generally have distinctive faunal signatures compared to longer term, warmer season habitation sites. In addition to the differences in the animal species recovered, there is a geographic difference in the location of these sites based on the particular species that are targeted, with the warm-season occupations located closer to aquatic

resources, while the cold-season sites are found further from the rivers, streams, and lakes (Styles 2000).

The Kuhne Site

The Kuhne Site (11PM3) is a Middle Woodland (Havana-Hopewell) and Weaver phase habitation site (186 B.C – 150 A.D.), located in Putnam County, Illinois, along the base of the eastern bluff of the Illinois River Valley between Swan Lake and Clear Creek (Farnsworth 2009). Frank and Adolph Kuhne were the property owners during the site's investigation in 1955-1956, and they collected artifacts from the creek bank for several years after heavy rains. Stuart Struever was invited to visit the Kuhne farm to see their collection, which included a 20 pound grooved axe and a polished chunky stone. They also toured the farm and discussed the mounds that were plowed flat for farming purposes, and the artifacts recovered from them. Classic Hopewell artifacts were found including mica sheets, obsidian projectile points, and drilled basalt pendants (Struever n.d. [b]). Although Stuart Struever had no formal archaeological training at this time, he directed an excavation of a habitation area over two seasons, from June 1 through August 20, 1955, and June 14 to July 21, 1956. The first season's archaeological crew consisted of ten high school students and two Dartmouth college students; Struever reported that these students were selected on the basis of interest and maturity (Struever n.d. [a]:8). The following season's field crew consisted of one college student and two of the previous year's high school students. The estimated total period of excavation at the Kuhne site was sixteen weeks. A sketch map created by Struever (Figure 2) illustrates the location and extent of the excavation. Archaeological Research, Inc., a non-profit, tax-exempt corporation that was established in 1953 by Stuart Struever, funded the

excavations. Struever's formal archaeological training did not occur until 1958 when he submitted his application to continue his education in graduate studies focusing in archaeology at Northwestern University (Wiant 2014).

The Weaver phase in Illinois dates to A.D. 250-500, however Struever's ceramic analysis of the Kuhne site materials revealed that the pottery assemblage at the Kuhne site resembled a Weaver pottery style throughout the sites occupation (Struever n.d. [c]). This phase is characterized by the presence and distribution of Weaver ware. Weaver phase pottery "is usually thinner than the preceding Middle Woodland Havana Ware types" with cord-wrapped-stick stamping, bosses or nodes, and diagonally incised rims as typical decorative traits (McConaughy 1993:353). The excavation and ceramic analysis indicated a long period of occupation, perhaps several hundred years, based on the cultural debris that had accumulated to six feet in depth (Struever n.d. [a]:1). During the excavation, the site's size was determined to be approximately 120 ft. by 350 ft., with natural boundaries on all four sides, with a refuse pit that is 5 ft. deep in places. A hill surrounds the site to the north and west, and a creek on the south and east. During the excavation, 180 5 ft. squares were excavated, which is approximately 40% of the site. Struever determined that the site functioned as a village and was associated with the Hopewellian culture. Clear Creek is the closest water supply, which drains into the Illinois River. Soil at the site consists of dark loam overlying yellow sandy-clay and the ground cover was pasture at the time of excavation. The site is relatively level, but is surrounded on two sides by steep knolls along a small tributary (Struever n.d. [a]; Figure 2).

Figure 2. Sketch of Kuhne Site Location (Struever n.d. [b])

In Stuart Struever's unpublished manuscript (n.d. [a]) on the Kuhne site he discusses what he describes as a perplexing lack of deep refuse pits. According to Struever, they expected to find deep refuse pits because of the large amounts of refuse recovered. However, they only uncovered a few shallow depressions in the homogeneous yellow-brown clay, and tightly packed concentrations of refuse in the black loam layers with no soil distinction between the pits and the surrounding soil. Household structures were difficult to determine at the site because of recent farming practices. A vineyard was planted over the site, and left a "maze of black circles and squares to riddle

the yellow-brown clay substratum. This made identification of Hopewell structures exceedingly difficult” (Struever n.d. (a), (b)).

Many kinds of artifacts were discovered where the structures were presumably located. These include mussel shell hoes and spoons; bone needles; chipped stone spears; arrowheads, knives and scrapers; copper awls and fishhooks; a modified bear canine ornament; and ground stone axes, mauls, hammers, and celts (Struever n.d. [a]). However, the main focus of research at the Kuhne site consisted of ceramic analysis that was most important for putting the site into the correct culture historical context. According to Struever the ceramics were sorted as to Morton Ware, Havana Ware, Dry Creek Ware, Hopewell Ware, and Corbin Ware. He suggested that there are at least thirty distinct decorative designs represented among the sherds. Most of the pottery found and analyzed consists of sherds. Struever proposed that the Kuhne site was occupied intermittently from the “late pre-Hopewellian period” through the Late Woodland period, with two major occupations (Farnsworth 2009; Struever n.d. [c]:1). The first occupation was Hopewellian, which was continuous from the middle to late phase of the Middle Woodland, and the second was a Maples Mills component. The major occupation at the Kuhne site occurred during the middle and late phases of the Illinois Valley Hopewell.

The burial mound at the Kuhne site was another research focus by Struever and his team. Several bundle burials were uncovered, which typically contained the cranium and several long bones. An interesting feature of these burials was that each cranium was collapsed, most likely from the amount of soil packed over the grave. Struever and other

researchers believe that the individuals contained in the bundle burials were most likely buried in the general cemetery and then ritually removed at a later time and buried in the mound. Struever (n.d. [b]) argues that the mound has individuals of significant importance such as one flexed burial that had three small ½ inch round holes, which appear to have been drilled in the skull. Two pieces of human arm-bone were carved and hollowed and were placed on the neck, while two projectile points were found close to the individuals skull.

Paul Parmalee's (n.d.) report briefly discusses the past environment of the region during the Kuhne site occupation based on the species identified. He concluded that the marshlands and river bottoms were hunted extensively, with white-tailed deer being the species that was the most important meat staple. Upland area species were found to be much less important, implying that that type of region was seldom hunted.

No notes or documentation have been found to explain how these numbers are related to the excavation units, and Stuart Struever himself does not recall the system (Stuart Struever, personal communication 2014). Images of the excavation pattern can be seen in Figures 3-5, from both aerial and ground viewpoints. One of the few drawings of the Kuhne site, Figure 6, illustrated soil stratigraphy of the Kuhne site excavation looking south. The lack of known provenience information made separating the site into different features or activity areas impossible. More will be said about this issue and the faunal collection in Chapter 3.

Figure 3. Aerial Photograph of Kuhne Site Excavation (Image from Center of American Archaeology)

Figure 4. View of Crew Excavating the Kuhne Site (Image from Center for American Archaeology)

Figure 5. Ground View of Kuhne Site Excavation (Image from Center for American Archaeology)

KUHNE SITE
ARCHAEOLOGICAL EXCAVATIONS
1955 - 1956

LOOKING SOUTH

Figure 6. Kuhne Site Archaeological Excavation 1955-1956 Profile Wall Drawing Looking South (Struever n.d. [b])

The Rench Site

The Rench site (11P4) in the Central Illinois River Valley (Figure 1) is a multi-component site containing a stratified sequence including Middle Archaic, Late Archaic, Middle Woodland, early Late Woodland (Weaver phase), Late Woodland/Mississippian, and Historic components (McConaughy 1993). It is located on the western side of the Illinois River Valley just north of where Dickson Run enters the Illinois River Valley, approximately 32 km north of Peoria, Illinois (Figure 7). The faunal collection of interest is from the Weaver Phase (A.D. 400-600) component, because the Kuhne site also contains Weaver components. The Weaver Phase faunal material from Rench can be used to compare to the Kuhne site to reveal any differences in Middle Woodland subsistence along the Illinois River Valley. The faunal assemblage that was used in this comparison was analyzed at the Illinois State Museum (ISM) (Martin and Masulis 1993).

Figure 7. Location of the Rench Site in Peoria County, Illinois (McConaughy 1993:1)

The archaeological investigation at the Rench site began in 1977 as a part of a highway mitigation project, beginning with a Phase I pedestrian survey and Phase II investigation. Phase III excavations took place in the proposed construction zone from June to October 1981 and uncovered over 200 pit features, four Weaver Phase dwellings, human burials, late Late Woodland/Mississippian occupation, and a buried Late Archaic component (McConaughy 1993).

Excavation began with the removal of the plow zone by shovel skimming in a single level. The rest of the cultural material was excavated following natural

stratigraphy with trowels and/or shovels. When cultural deposits were considered sufficiently thick, they were divided and excavated in 10 cm arbitrary levels. All removed soil was screened through 6.4 mm (1/4 in.) mesh. Excluding the plow zone, flotation samples were taken from every excavation level, stratum, and feature. The minimum volume of flotation samples was 15 liters.

The Rench site's past environment was reconstructed using geological, stratigraphic, faunal, and floral analyses. It was determined that during the Weaver phase occupation the environment was warm and dry, similar to modern conditions. Inhabitants of the Rench site had access to a larger variety of natural resources. Within 3 km were prairies, sand prairies, and swamps, which gave the inhabitants access to a wide variety of natural resources in close proximity. The site's location near the Illinois River and Dickson Run allowed for easy access to aquatic, as well as woodland resources (Vento et al. 1993).

Terrance Martin and Mary Carol Masulis analyzed more than 20,700 faunal remains from 44 Weaver refuse deposits and 19 of the 44 flotation samples from the deposits. The sample selected contained 15 features, and 29 randomly selected features that were excavated in 1983. The faunal materials were identified, and analyzed using NISP, MNI, biomass, usable meat, and percentage of features containing a given taxon (Martin and Masulis 1993).

The Apple Creek Site

The Apple Creek Site (see Figure 1) located four miles north of Eldred in Green County, in the Lower Illinois River Valley, is a Middle Woodland village that was occupied from 200 B.C. to A.D. 450. The site encompasses 3.8 acres along the north bank of Apple Creek. Stuart Struever, now a professional archaeologist, excavated this site for ten weeks during the summers of 1962, and for eleven weeks in 1963. The purpose of this excavation was to examine the late Middle Woodland settlement and subsistence patterns in the Lower Illinois River Valley. The Illinois River is approximately 6.4 km to the west, and Grassy Lake is about 3.4 km to the northwest, while smaller backwaters once were located near the site. Approximately 18,500 square feet of ground was excavated in 191 five and ten-foot squares (Parmalee et al. 1972). However, because of the extensive and long occupation of the site by multiple groups, many structures were superimposed on each other. Typically, the soil was removed in three-inch levels, but was adapted to conform to features. A one-half-inch wire mesh screen was used to process all the soil; in addition to dry screening, flotation samples were passed through a fine mesh screen to recover small cultural debris (Parmalee et al. 1972). Stuart Struever conducted a ceramic analysis for the site. The components were divided into seven categories based on Struever's analysis: Havana-Hopewell, Pike-Hopewell, Middle Woodland, White Hall, Middle Woodland – White Hall, Middle Woodland – White Hall – Jersey Bluff, and Indeterminate (mixed cultural unites) (Parmalee et al. 1972).

Approximately 130,400 bones were recovered, and approximately one-third of them were identified to the family or species level. The faunal remains used in this

comparison are from the Middle Woodland period of the collection, including Initial Havana, Havana-Hopewell, and Pike-Hopewell. The Middle Woodland period component of the Apple Creek site was chosen because it overlaps with some of the occupations at the Kuhne site, as well as the similar Havana-Hopewell component. Paul Parmalee, Andreas Paloumpis, and Nancy Wilson analyzed the faunal remains from the site. The materials were identified and quantified using NISP, MNI, and estimated percentage of meat for each species (Parmalee et al. 1972, Styles 1981).

CHAPTER III

THEORETICAL FRAMEWORK AND METHODOLOGY

Theoretical Framework

Zooarchaeology as an academic field is relatively young compared to other research focus areas within anthropology. Generally, the goal of zooarchaeology is to understand the ecology and biology of animals throughout time and space, as well as how past humans used these resources (Reitz and Wing 2008). Environmental archaeology provides the general theoretical background for zooarchaeological analysis.

Environmental archaeology has been defined in a number of ways. Shackley (1985:14) states that it “is concerned both with the reconstruction of these past environments, and with elucidating the role and significance of human communities within them.” He goes on to state that zooarchaeology seeks “to understand the nature of the relationship between man and the land in the past, together with the intrinsic bias imparted by the fragmentary nature of archaeological record and the process of change, both natural and human in origin, which the record may reflect.” A more recent definition by Wilkinson and Stevens (2003:15) states that environmental archaeology is “the study of the landscapes that were inhabited by past human populations and the economies they constructed, on the basis of preserved biological remains and geological

phenomena.” According to Reitz and Shackley (2012) environmental archaeologists follow biological, physical, chemical and social science theories and practices to understand the relationship between the environment and people throughout time. In general, environmental archaeology focuses on the relationship between humans and their environment throughout history, with the understanding that both the environment and humans shape each other in many ways.

The theory behind reconstructing past diets and environment can be considered a landscape approach. One focus of the landscape approach centers on how people in the past lived off the environment and surrounding resources (Turner 2001; Winterhalder 1994). Changing habitats influence both flora and fauna, causing them to react individually by taxon (Stahl 1996). These shifts are both caused by humans themselves and also affect humans, such as global warming today. Studying subsistence strategies enables archaeologists to reconstruct past environments through faunal and floral remains, and determine how the environment, its resources, and humans responded to one another.

There are numerous ways that subsistence strategies can be analyzed. Early on in zooarchaeology, optimization models were the most common method to approach subsistence studies and these continue to play a significant role in foraging strategy research. These models have both positives and negatives attributes. The main limitation is that they only consider resource selection from an economic point of view. They are well adapted to detailing why specific animals were chosen for exploitation, but are not as well adapted to explaining why other species were not (Holt 1996).

As part of the optimization model methodology, site catchment analysis became a standard framework for subsistence interpretation in zooarchaeological reports throughout the Midwest (Cook 1979; Holt 1996; Kelly and Cross 1988; Munson et al. 1971; Styles 1981). A site catchment is the area surrounding a site that is continually exploited by a human group (Styles 1981). Catchment analyses are “traditionally used to infer site function and subsistence pursuits based on surrounding land characteristics and/or resource potential” (Styles 1981:22). Results from site catchment studies throughout the American Bottom show that there is some slight variation between upland and floodplain sites in terms of animals exploited. Holt (1996) considered resource optimization from a broader perspective than previous research. She used five criteria to look at the advantages and disadvantages of animal exploitation: ease of procurement, abundance of the resource, caloric value, protein and fat content, and ease of processing (Holt 1996). When these criteria are analyzed, Holt (1996) argues that it is possible to explain why “every exploited species was chosen for exploitation.” However, the use of these five categories being considered is both the strength and weakness of this analytic approach. Under this umbrella of analysis, every species would be a valuable resource, and why certain animals are rarely exploited cannot be explained. Economic models, such as these, should be used in conjunction with other avenues of research because they cannot fully explain why certain species are not chosen for exploitation.

Holt (1996) offers two alternative ways of looking at animal exploitation, ethnohistoric analogy and a structural approach. The structural approach “allows the analyst to hypothesize a native taxonomy, how people themselves categorized animals, in

the absence of historic records or ethnohistoric analogy” (Holt 1996:105). These approaches allow us to understand the roles that animals played in a society beyond their economic impact. Symbolic and ritual roles can be analyzed through ethnohistoric analogy, and a structural approach can be used to provide alternative perspectives on human-animal relationships in the past, such as how various animal species influence symbolism. Direct historical, ethnohistoric, and ethnographic analogies can be useful if they can be related back to prehistory, and correlated to zooarchaeological remains (Holt 1996). This is not always possible, however, and taking a structural approach to understand animal’s influences on prehistoric societies through analysis of their artistic archaeological record may allow for a deeper understanding of these people.

These two alternative approaches to zooarchaeological analysis can lead to a broader comprehension of the past, but it is not possible to complete both approaches in this research venture. An ethnographic analogy cannot be used as a part of the Kuhne site analysis, because too little information is known about this region. However, it is possible to understand why the Kuhne site inhabitants selected certain species for exploitation through the structural approach, and it will be the main focus of research on the faunal collection.

Subsistence is a driving force in human adaptation, and can be used to understand how change occurred throughout history. Through zooarchaeology, and other scientific analyses, it is possible to reconstruct how humans utilized their environment and how the environment reacted to the presence of humans and changes caused by them (Peres 2014:1). I used this approach to establish the past environmental setting at the Kuhne

site, and how the occupants utilized their surroundings. In addition to determining the subsistence strategy of the Kuhne site inhabitants, I look into how these people utilized and modified animal bones for purposes other than subsistence, such as the use of bone marrow in hide processing and the modification of turtle bone.

Methodology

To understand the subsistence strategy at the Kuhne site, I analyzed the faunal materials recovered by Stuart Struever during his investigations in 1955-1956. The Illinois State Museum (ISM) acquired the artifact collection in three installments and the faunal collections that I analyzed in two installments. All of the cultural material transferred to the ISM is from the 1955-56 Struever excavation. The first collection (ISM Accession No. 1959-38) came to the ISM from Stuart Struever when Struever asked Dr. Paul Parmalee to analyze the Kuhne site faunal assemblage. The second transfer (ISM Accession No. 2010-267) consisted of eight boxes of prehistoric ceramic sherds from the Center for American Archaeology in Kampsville. The third installment was from Sharon Clausen and Sidney Whitaker, who were representing the Putnam County Historical Society in 2012. This collection included two and a half boxes of animal remains along with several ceramic sherds and lithics that were mixed in with the faunal material. This third accession of Kuhne materials was salvaged from a farm building on the Kuhne farm and then added to the 2010-267 collection because it was from the same excavation project, as the previously possessed bags were labeled with the same kind of "K" prefixes. It is known that the family had housed and displayed some of the material from the Kuhne site in the outbuilding that was destroyed in 2012. Unlike the animal remains

from the first collection, there were no indications that Dr. Parmalee had ever seen or analyzed the animal remains in the third collection.

Although there is an eight-page draft report by Struever (n.d. [a]) there are no field notes available for the Kuhne site and its excavation. No information has been found that describes how the Kuhne site was excavated, or provenience for individual specimens. Struever excavated units in a checkerboard pattern, each labeled with the letter “K” and a number. The units were numbered as excavated. However, the “K” series of numbers on each of the artifact bags do not correspond with the “K” unit numbers. The unit identification numbers all appear to be whole numbers ending in a zero (for example, K-550), while the artifact bags do not end with a zero (for example K-553). Details about the Kuhne site including screen size, level depths, or number of features is not known. How the unit numbers and the artifact bag numbers are related is also unknown. A site map, Figure 8 (below) exists that shows where the units of excavation occurred, but the numbers on this map do not match the numbers on the artifact bags. Struever does not recall details on how the Kuhne site was excavated nor the numbering strategy for the artifact bags (Stuart Struever, personal communication 2014). For the analysis of the Kuhne site’s faunal collection, each unit/bag was analytically combined into one single feature, because of the scarcity of information available. Although K-numbers were maintained for the faunal database, analytically lumping of all units is the only way to examine the subsistence remains from the Kuhne site so that we will at least have a broad understanding of the subsistence strategies.

The faunal materials were analyzed following standard zooarchaeological methods (Parmalee 1985; Reitz and Wing 2008). The animal remains that were previously identified by Paul Parmalee were confirmed using the osteological reference collection at the Illinois State Museum's Research and Collection Center (ISM RCC). The remainder of the faunal collection was identified and inventoried using the same reference collection. The analysis that I carried out occurred at the ISM RCC under the supervision of Dr. Terrance Martin. Information collected about each specimen included: taxon, element, side, portion, direction, part, completeness, cultural modifications (e.g. sawed, chopped, knife-cuts, charred, burned, calcined), natural modifications (e.g. rodent gnawed, carnivore gnawed), specimen weight, and specimen count. Lengths of fish were estimated for each identified fish bone by referring to bones from modern fish of known size in the reference collection (Reitz and Wing 2008; Styles 1981).

The Minimum Number of Individuals (MNI) and the Number of Individual Specimens (NISP) was calculated, along with biomass (estimated by allometric scaling [Reitz and Scarry 1985:15]), and a food utility index, to determine what species were consumed and in what relative proportions. NISP was calculated as the total number of elements identified to species. Lyman (1982:359) defined MNI as "the minimum number of (complete) individual animals necessary to account for (to have contributed) the specimens observed." This quantification is biased in this research because the MNI for the Kuhne site was not calculated on a feature-by-feature basis because that information is not available. As stated previously, the Kuhne site's faunal collection was treated as a single unit. To account for this bias, the biomass calculation will assist in the

interpretation of species importance within the subsistence strategies for the site. The recovery techniques used at the Kuhne site needed to be factored in to determine if the faunal collection was biased towards larger species, because they are more likely to survive, and be recovered.

A methodological problem was encountered during the estimation of the food utility indices (FUIs) calculation: how to handle white-tailed deer metapodials. Metacarpals and metatarsals are broken into many fragments during the marrow processing practice. Because the fragments are small and have characteristics that match both metatarsals and metacarpals, they cannot be definitively identified. Such specimens are categorized as metapodials. The traditional method of dividing skeletal elements into high, medium, and low utility categories does not factor in the presence of metapodials (undetermined metatarsals or metacarpals) (Madrigal 2004; Madrigal and Holt 2002; Purdue et al. 1989). The approach by Purdue et al. (1989) has become one of the standards for food utility calculations, as well as economic utility indices, meat utility indices, and marrow utility indices (Jacobson 2000; Madrigal and Holt 2000; Outram and Rowley-Conwy 1998). For this research project food utilities was used to analyze white-tailed deer consumption. In food utility calculations, by Purdue et al. (1989), metacarpals were placed into the low utility value and the metatarsals in the medium utility value (Table 1). This model was modified to accommodate data from the Kuhne faunal collection (Table 2). The metacarpals, metatarsals, and metapodials were placed into one category, the medium utility value. While the metacarpal and metatarsals do yield different average return rates, the high number of metapodials in the Kuhne faunal collection requires an adjustment of FUI element groupings (Madrigal and Holt 2002).

Reasoning for the change in utility levels is the importance of marrow for subsistence and for possible use in hide tanning (Binford and Binford 1968; Outram 1998).

Table 1. Purdue et al. 1989 White-tailed Deer Food Utility Index (FUI)
Low Utility (FUI <1000)
Antler
Skull
Mandible
Tooth
Atlas + Axis
Metacarpal + Carpal
Phalange
Mid Utility (1000 < FUI < 3000)
Vertebra
Pelvis + Sacrum
Rib
Scapula
Humerus
Radius + Ulna
Metatarsal
High Utility (FUI > 3000)
Sternum
Femur
Tibia + Tarsals

Table 2. Adapted White-tailed Deer Food Utility Index (FUI)
Low Utility
Antler
Skull
Mandible
Tooth
Atlas + Axis
Carpal
Phalange
Mid Utility
Vertebra
Pelvis + Sacrum
Rib
Scapula
Humerus
Radius + Ulna
Metatarsal
Metacarpal
Metapodial
High Utility
Sternum
Femur
Tibia + Tarsals

Several issues exist within the Kuhne site's faunal collection. The small box of the materials analyzed by Paul Parmalee included a list of species that were identified, along with quantification by Number of Identified Specimens (NISP). After verification of the Parmalee's identifications, the NISP values were compared to Parmalee's report table and lab analysis notes in order to try to determine if Parmalee had analyzed this

second collection. The large number of mussel shells for the Kuhne site identified by Parmalee obviously does not match the number in the collection. However, it was recently discovered that Stuart Struever returned the bulk of the artifacts from the site, and it is possible that the remainder of the faunal collection is in the family's possession.

Another set of issues that needs to be addressed include the significant differences in excavation techniques between the Kuhne site and the Rench and Apple Creek sites. Important developments in field techniques and methodology have occurred in the discipline over the past several decades since the Kuhne site was excavated and Parmalee initially analyzed the faunal collection. The lack of notes or any documentation detailing the excavation methods and provenience information for the Kuhne sites also hinders a more detailed intra-site interpretation of the faunal assemblage. The size of the screen, depth of levels, and delineation of features are not known. Instead of analyzing the faunal collection on a feature-by-feature, or level-by-level basis, the faunal assemblage has been analyzed as one large homogeneous sample from the site, an example of Grayson's (1973) minimum distinction approach to calculating MNIs.

After the Kuhne site's analysis was completed, it was compared to a Central Illinois River Valley late Middle Woodland occupation at the Rench Site (11P4), and the Lower Illinois River Valley Middle Woodland Apple Creek Site (McConaugh 1993; Parmalee et al. 1972; Styles 1981). The NISP, MNI, and biomass, were compared between the three sites where possible. The purpose of these comparisons was to determine if similar species were consumed in different regions of the Illinois River Valley, and if so, the reasons behind it. Whether access to similar species was available,

or a preference for different species existed, this comparison will help us better understand the variety of subsistence strategies during the greater Middle Woodland period in the Illinois River Valley. The excavation methods used at Rench and Apple Creek are well known, and the faunal assemblages and analysis techniques were thorough. Discrepancies among the three sites in the recovery techniques, and analysis methods must be considered during the comparison of the faunal collections.

Besides comparing habitat settings, a key factor to be considered in the comparison of Rench, Apple Creek, and the Kuhne is the relative sizes of the faunal collections. The Rench and Apple Creek sites have significantly larger data sets. Also significant is the difference in recovery methods; the Rench and Apple Creek sites included flotation recovery, whereas the Kuhne site did not have any systematic small-scale recovery techniques. This difference in methods will cause disparities in the types and amounts of species that were recovered and collected.

CHAPTER IV

THE KUHNE SITE FAUNAL ANALYSIS

This chapter presents the composition of the Kuhne faunal collection by taxonomic class and a comparison of NISP tabulations made in this study with those from Parmalee's analysis. Bone modifications, seasonality indicators, and evidence of specific habitat exploitation were examined. This analysis of animal remains relates the importance of certain classes, as well as individual species within these classes, to the subsistence of the Kuhne site inhabitants, based on NISP, MNI, and biomass. Seasonality indicators were based on resource availability (e.g. migratory waterfowl) and morphological changes for individual species (e.g. presence of newborn white-tailed deer, shedding of deer antlers).

Every artifact bag from the Kuhne site, including the un-numbered faunal remains were used in this analysis. This sample includes all of the unit bags, as well as the faunal materials determined to be previously analyzed by Paul Parmalee. This approach was chosen because of the small size of the Kuhne faunal collection, and it would provide a more complete understanding of the subsistence economy.

Species Composition By Taxonomic Class

The composition by taxonomic class, Table 3, shows that mammals were exploited the most based on the faunal resources represented in the collection. Both

birds and reptiles were also extensively exploited, but on a much smaller scale. The excellent preservation of the materials allowed for 75.2% (83% by weight) of the collection to be identified more specifically than class. The high proportions of identified specimens suggests that some selection of what were considered “identifiable” specimens may have taken place before the present analysis occurred (T. Martin, personal communication, 2014)

Table 3. Composition by Class of the Kuhne Faunal Assemblage				
Class	Total Assemblage		Identified Below Class	
NISP:	#	%	#	%
Mammalia	1405	78.40%	993	73.66%
Aves	144	8.04%	119	8.83%
Reptilia	155	8.65%	155	11.50%
Osteichthyes	71	3.96%	65	4.82%
Pelecypoda	17	0.95%	16	1.19%
Totals	1792	100.00%	1348	100.00%
WEIGHT:	(g)	%	(g)	%
Mammalia	7016.7	83.81%	5637.2	81.11%
Aves	373.9	4.47%	339.9	4.89%
Reptilia	357.1	4.27%	357.1	5.14%
Osteichthyes	67.2	0.80%	64.2	0.92%
Pelecypoda	557.7	6.66%	551.6	7.94%
Totals	8372.6	100.00%	6950	100.00%
BIOMASS:	(kg)	%	(kg)	%
Mammalia	85.979	89.73%	67.825	87.93%
Aves	5.262	5.49%	4.736	6.14%
Reptilia	3.277	3.42%	3.277	4.25%
Osteichthyes	1.299	1.36%	1.299	1.68%
Totals	95.817	100.00%	77.137	100.00%

Mammals

Seventeen species of mammals, represented by 993 bones, were identified from the Kuhne site. More than 78% of the Kuhne faunal collection is mammals, with 73.66%

of remains identified to the species level. White-tailed deer were the most exploited mammal remains, which contributed about 56% to the total sample of mammals (794 NISP, 15 MNI) (See Table 4.). Besides white-tailed deer, other mammals, such as raccoon (8 MNI) and muskrat (9 MNI) were procured to supplement the Kuhne subsistence economy. Because the MNIs were calculated for the site as a whole, these figures are likely to be more conservative than if individual features, stratigraphy, and spatial dispersal could be considered as a way of segregating samples (i.e., maximum distinction approach; Grayson 1973). The unidentified very large mammal and large mammal categories are most likely elk or white-tailed deer.

Birds

Avian species represent 8.83% of all identified remains, but 6.14% of biomass, making them the second most important category by biomass for subsistence purposes. A minimum of 18 species was recorded. Several of these species may not have been a part of the subsistence economy, but were collected instead for the use of their plumage (e.g., whooping crane, eastern screech owl) (Crabtree 1990; Reitz and Wing 2008). About 38% of all identified bird bones are from wild turkey, accounting for 41.9% of biomass from birds. Two other species that account for a large portion of the NISP and biomass are the trumpeter swan and Canada goose, at 12 NISP each, with 44.4% and 29.5% respectively. Similar to mammals, the MNI of two for wild turkey is probably highly conservative since the estimate does not consider feature, stratigraphic, or spatial contexts within the site.

Table 4. Species Composition of Animal Remains from the Kuhne Site				
	NISP	MNI	NISP Wt(g)	Biomass (kg) ³
MAMMALS	1405	59	7016.7	85.979
Plains Pocket Gopher, <i>Geomys bursarius</i>	7	2	3.2	0.075
Eastern Cottontail, <i>Sylvilagus floridanus</i>	5	2	5.9	0.128
Woodchuck, <i>Marmota monax</i>	4	1	12.2	0.250
Fox Squirrel, <i>Sciurus niger</i>	1	1	1.1	0.029
Tree Squirrel, <i>Sciurus sp.</i>	1	1	0.8	0.022
Beaver, <i>Castor canadensis</i>	22	5	107.5	1.771
Muskrat, <i>Ondatra zibethicus</i>	41	9	56.7	0.996
Unidentified Medium Rodent	5	–	1.1	0.029
Dog/Wolf/Coyote, <i>Canis sp.</i>	29	4	121.7	1.980
Gray Fox, <i>Urocyon cinereoargenteus</i>	2	1	8.9	0.188
Red/Gray Fox, <i>Vulpes/Urocyon</i>	2	1	3.3	0.077
Bobcat, <i>Lynx rufus</i>	5	1	33.5	0.620
Raccoon, <i>Procyon lotor</i>	37	8	145.1	2.320
American Mink, <i>Neovison vison</i>	4	2	4.2	0.096
River Otter, <i>Lontra canadensis</i>	7	3	25.8	0.490
Striped Skunk, <i>Mephitis mephitis</i>	2	1	2.6	0.062
Elk, <i>Cervus elaphus</i>	25	2	332.9	4.899
White-tailed Deer, <i>Odocoileus virginianus</i>	794	15	4770.7	53.793
Unidentified Very Large Mammal	2	–	37.1	0.680
Unidentified Large Mammal	376	–	1308.6	16.793
Unidentified Medium/Large Mammal	19	–	17.1	0.339
Unidentified Medium Mammal	14	–	15.3	0.306
Unidentified Vertebrata	1	–	1.4	0.036
BIRDS	84	34	234.4	3.265
Common Loon, <i>Gavia immer</i>	1	1	3.7	0.067
Herring Gull, <i>Larus argentatus</i>	1	1	1.2	0.024
Pied-billed Grebe, <i>Podilymbus podiceps</i>	1	1	1.0	0.020
Double-crested Cormorant, <i>Phalacrocorax auritus</i>	1	1	2.0	0.038
Trumpeter Swan, <i>Cygnus buccinator</i>	12	1	109.4	1.464
Canada Goose, <i>Branta canadensis</i>	12	3	69.9	0.974
Northern Pintail, <i>Anas acuta</i>	2	1	2.4	0.045
American Wigeon, <i>Anas americana</i>	3	3	2.1	0.040
Green Winged Teal, <i>Anas crecca</i>	3	1	1.1	0.022
Blue Winged Teal, <i>Anas discors</i>	10	3	5.8	0.101
Green/Blue Winged Teal, <i>Anas crecca/discors</i>	16	7	13.0	0.200
Diving Duck, <i>Aythya sp.</i>	10	3	7.3	0.125
Duck - Large, Anatinae spp.	4	3	4.4	0.010
Duck - Medium, Anatinae spp.	5	2	4.3	0.077
Falcons - Medium, cf. <i>Falconiformes</i>	1	1	1.8	0.035
Bald Eagle, <i>Haliaeetus leucocephalus</i>	1	1	4.4	0.010
Greater Prairie Chicken, <i>Tympanuchus cupido</i>	1	1	0.6	0.013

Table 4. Species Composition of Animal Remains from the Kuhne Site				
	NISP	MNI	NISP Wt(g)	Biomass (kg) ³
Wild Turkey, <i>Meleagris gallopavo</i>	32	2	102.5	1.380
American Coot, <i>Fulica americana</i>	1	1	0.3	0.007
Whooping Crane, <i>Grus americanus</i>	1	1	2.6	0.049
Eastern Screech Owl, <i>Megascops asio</i>	1	1	0.1	0.003
Unidentified Large Bird	21	–	30.1	0.452
Unidentified Medium Bird	3	–	3.2	0.059
Unidentified Small/Medium Bird	1	–	0.7	0.015
Reptiles	155	20	357.1	3.277
Snapping Turtle, <i>Chelydra serpentina</i>	6	1	12.6	0.173
N. American Softshell Turtle, <i>Apalone sp.</i>	2	1	3.4	0.072
Blanding's Turtle, <i>Emydoidea blandingii</i>	20	2	41.8	0.386
Eastern Box Turtle, <i>Terrapene carolina</i>	2	1	2.4	0.057
Ornate Box Turtle, <i>Terrapene ornata</i>	28	4	54.6	0.461
Box Turtle, <i>Terrapene sp.</i>	20	3	25.2	0.275
Painted Turtle, <i>Chrysemys picta</i>	6	1	9.4	0.142
Painted Turtle, cf. <i>Chrysemys picta</i>	1	1	1.6	0.043
Slider, <i>Trachemys scripta</i>	27	2	127.9	0.816
Common Map Turtle, <i>Graptemys geographica</i>	3	1	10.4	0.152
Map Turtle, <i>Graptemys sp.</i>	7	1	24.3	0.268
Slider/Map Turtle, <i>Trachemys/Graptemys sp.</i>	1	1	1.8	0.047
Pond Turtle, Emydidae	32	1	41.7	0.385
Fish	66	26	67.2	1.371
Bowfin, <i>Amia calva</i>	15	3	11.0	0.206
Bigmouth Buffalo, <i>Ictiobus cyprinellus</i>	1	1	0.4	0.014
Buffalo sp., <i>Ictiobus sp.</i>	3	2	3.2	0.076
Redhorse Suckers, <i>Moxostoma spp.</i>	8	2	6.3	0.131
Suckers, Catostomidae	1	1	0.6	0.020
Brown Bullhead, <i>Ameiurus nebulosus</i>	2	1	0.6	0.020
Bullhead, <i>Ameiurus sp.</i>	1	1	<0.1	–
Channel Catfish, <i>Ictalurus punctatus</i>	5	3	17.3	0.297
Flathead Catfish, <i>Pylodictis olivaris</i>	1	1	1.4	0.039
Catfish, Ictaluridae	2	2	1.3	0.037
Pikes, <i>Esox sp.</i>	3	1	1.5	0.042
Largemouth Bass, <i>Micropterus cf. salmoides</i>	1	1	1.7	0.045
Black Bass sp., <i>Micropterus sp.</i>	6	2	3.1	0.074
Walleye, <i>Sander cf. vitreus</i>	1	1	1.7	0.046
Freshwater Drum, <i>Aplodinotus grunniens</i>	15	4	14.1	0.252
Unidentified Fish	1	–	3.0	0.072
Bivalves	17	9	557.7	–
Threeridge, <i>Amblema plicata</i>	3	2	231.1	–

Table 4. Species Composition of Animal Remains from the Kuhne Site				
	NISP	MNI	NISP Wt(g)	Biomass (kg) ³
Elephant-ear, <i>Elliptio crassidens</i>	6	4	160.3	–
Spike, <i>Elliptio dilatata</i>	6	2	155.8	–
Fatmucket, <i>Lampsilis siliquoidea</i>	1	1	4.4	–
Unidentified Mussel	1	–	6.1	–
Totals	1727	148	8233.1	93.892

Reptiles

Reptiles are the third most important class based on biomass calculations. Nine taxa were identified to the species level, out of a total of 155 bones. The most numerous single species is the ornate box turtle with at least four individuals, accounting for 14% of the biomass. Both eastern and ornate box turtles were identified. The eastern box turtle has a keeled carapace, with a variable pattern, while the ornate box turtle's carapace is not keeled, but has a constant pattern of radiating lines on pleurals and plastron (Ernst and Lovich 2009). The eastern box turtle is predominately found in open woodlands, but is also found in marshy meadows. Unlike the eastern box turtle, the ornate box turtle's habitat is the prairie, with grass and scattered low brush for vegetation (Ernst and Lovich 2009). The species that provided the greatest amount of biomass is the slider at 24.9%. Blanding's, box, and map turtles are also among the species that contributed between 8% and 11.7% of the biomass among Reptiles. The unidentified turtle specimens were categorized as Emydidae rather than other pond turtles because they had the general characteristics of this family unlike other turtle family groups such as Chelydriidae (snapping turtles) and Trionychidae (softshell turtles). No snake bones or any amphibian remains were found in the Kuhne faunal collection.

Fish

Fish provided only 1.68% of the estimated biomass at the Kuhne site, with channel catfish contributing 21.7% of the biomass for fish. A minimum of 26 individual fish are present in the collection. There is great diversity of fish with other abundant species recovered including bowfin, redhorse suckers, buffalofish, black bass, and freshwater drum. Habitats indicated from species recovered include large rivers, such as the Illinois River, as well as its tributaries, lakes, ponds, marshes, and small quiet streams. Based on size classes, as well as the habitats of the various species and artifacts recovered during the 1955-56 excavation, a variety of procurement strategies and techniques would have been utilized. Spear points were found, and would have been used to secure larger fish species, such as the channel catfish. It is also likely that the Kuhne site occupants also used netting techniques and baskets. There is a bias in this Kuhne faunal collection towards larger fish species and specimens, when there was most likely a much wider assortment of fish species of all sizes being exploited.

Freshwater Mussels

Only four species of bivalves were determined in the remains: Threeridge, Elephant-ear, Spike, and Fatmucket. Biomass was not calculated for bivalves because the 16 mussel shells would have provided such a minuscule amount of food; it would not be significant to the subsistence economy of the Kuhne site (Parmalee and Klippel 1974). Elephant-ear is the single most abundant mussel species at the site, providing four out of the nine total MNI (Parmalee and Klippel 1974).

Comparison of Parmalee and Beyer NISP Tabulations

Final tabulations made in this study have been compared to Parmalee's NISP identifications from his report tables and lab analysis notes (Table 5). The total number of specimens calculated in this study is 1295, compared to Parmalee's total of 3239 specimens. At first glance, it is very clear that there are significant differences in the totals of mammals, birds, reptiles, fish, bivalves, and snails. However, these differences are not consistently larger in either analysis, varying between Parmalee and my tabulations containing more specimens by class and by species. The largest portion of discrepancy comes from the mussels, with a difference of 1,110 NISP. In addition to the mussel shell difference, white-tailed deer provides a difference of 726 NISP. Parmalee did not calculate MNI during his analysis, making a comparison of individuals impossible.

There are many species that were unique to each collection. A total of thirty-five unique species were found during this comparison. Parmalee's analysis determined nineteen species not found in this study. Most of these species were bivalves and snails, however, there were species in each taxonomic class. These unique species are the eastern mole, gadwall, wood duck, soft shell turtle (*Trionyx* sp.), longnose gar, walleye and/or sauger. The sixteen unique species from this study are not from every taxonomic class, but only from mammals, birds, reptiles, and fish. The species unique to the present study are red/gray fox, falcons, whooping crane, several of the turtles, and several taxa of fish (bigmouth buffalo, redhorse suckers, brown bullhead, flathead catfish, black bass, and pike). Differences in species compositions may reflect expertise of the analysts and access to adequate reference collections. Duck skeletal elements in this study were

identified to the subfamily level because of the difficulty in distinguishing most species of ducks. This is also true for distinguishing most bones of red fox from gray fox. Turtles are also especially challenging, especially if skeletal remains of carapaces and plastrons are highly fragmented.

Table 5. Comparison of Faunal Analysis: Parmalee and Beyer Tabulations		
	NISP	
	Parmalee	Beyer
Mammals	1779	977
Eastern Mole, <i>Scalopus aquaticus</i>	1	0
Eastern Cottontail, <i>Sylvilagus floridanus</i>	5	5
Woodchuck, <i>Marmota monax</i>	9	4
Fox Squirrel, <i>Sciurus niger</i>	2	1
Tree Squirrel, <i>Sciurus sp.</i>	2	1
Plains Pocket Gopher, <i>Geomys bursarius</i>	10	7
Beaver, <i>Castor canadensis</i>	29	22
Muskrat, <i>Ondatra zibethicus</i>	85	41
Dog/Wolf/Coyote, <i>Canis sp.</i>	23	29
Gray Fox, <i>Urocyon cinereoargenteus</i>	6	2
Red/Gray Fox, <i>Vulpes/Urocyon</i>	0	2
Raccoon, <i>Procyon lotor</i>	51	37
American Mink, <i>Neovison vison</i>	8	4
River Otter, <i>Lontra canadensis</i>	11	7
Striped Skunk, <i>Mephitis mephitis</i>	5	2
Bobcat, <i>Lynx rufus</i>	4	5
Elk, <i>Cervus elaphus</i>	27	25
White-tailed Deer, <i>Odocoileus virginianus</i>	1520	794
Birds	63	82
Common Loon, <i>Gavia immer</i>	1	1
Pied-billed Grebe, <i>Podilymbus podiceps</i>	1	1
Double-crested Cormorant, <i>Phalacrocorax auritus</i>	1	1
Trumpeter Swan, <i>Cygnas buccinator</i>	1	12
Canada Goose, <i>Branta canadensis</i>	10	12
Green-winged teal, <i>Anas crecca</i>	4	3
Blue-winged teal, <i>Anas discors</i>	19	10
Green/Blue-winged teal, <i>Anas crecca/discors</i>	3	16
Northern Pintail, <i>Anas acuta</i>	1	2
Gadwall, <i>Anas strepera</i>	1	0
American Wigeon, <i>Anas americana</i>	3	3
Wood Duck, <i>Aix sponsa</i>	1	0
Diving Duck, <i>Aythya sp.</i>	10	10
Duck, Anatinae spp.	6	9
Bald Eagle, <i>Haliaeetus leucocephalus</i>	1	1
Falcons - Medium, cf. <i>Falconiformes</i>	0	1

Table 5. Comparison of Faunal Analysis: Parmalee and Beyer Tabulations		
	NISP	
	Parmalee	Beyer
Greater Prairie Chicken, <i>Tympanuchus cupido</i>	1	1
Wild Turkey, <i>Meleagris gallopavo</i>	10	32
American Coot, <i>Fulica americana</i>	1	1
Whooping Crane, <i>Grus americanus</i>	0	1
Herring Gull, <i>Larus argentatus</i>	1	1
Eastern Screech Owl, <i>Megascops asio</i>	1	1
Reptiles	95	155
Snapping Turtle, <i>Chelydra serpentina</i>	38	6
N. American Softshell Turtle, <i>Apalone sp.</i>	32	2
Blanding's Turtle, <i>Emydoidea blandingii</i>	0	20
Eastern Box Turtle, <i>Terrapene carolina</i>	0	2
Ornate Box Turtle, <i>Terrapene ornata</i>	0	28
Box Turtle, <i>Terrapene sp.</i>	6	20
Painted Turtle, <i>Chrysemys picta</i>	0	6
Painted Turtle, cf. <i>Chrysemys picta</i>	0	1
Slider, <i>Trachemys scripta</i>	18	27
Common Map Turtle, <i>Graptemys geographica</i>	0	3
Map Turtle, <i>Graptemys sp.</i>	1	7
Slider/Map Turtle, <i>Trachemys/Graptemys sp.</i>	0	1
Pond Turtle, Emydidae	0	32
Fish	173	65
Longnose Gar, <i>Lepisosteus osseus</i>	2	0
Bowfin, <i>Amia calva</i>	23	15
Bigmouth Buffalo, <i>Ictiobus cyprinellus</i>	0	1
Buffalo sp., <i>Ictiobus sp.</i>	2	3
Redhorse Suckers, <i>Moxostoma spp.</i>	0	8
Suckers, Catostomidae	7	1
Brown Bullhead, <i>Ameiurus nebulosus</i>	0	2
Bullhead, <i>Ameiurus sp.</i>	36	1
Channel Catfish, <i>Ictalurus punctatus</i>	36	5
Flathead Catfish, <i>Pylodictis olivaris</i>	0	1
Catfish, Ictaluridae	5	2
Pikes, <i>Esox sp.</i>	0	3
Largemouth Bass, <i>Micropterus cf. salmoides</i>	1	1
Black Bass sp., <i>Micropterus sp.</i>	0	6

Table 5. Comparison of Faunal Analysis: Parmalee and Beyer Tabulations		
	NISP	
	Parmalee	Beyer
Walleye/Sauger, <i>Sander sp.</i>	1	0
Freshwater Drum, <i>Aplodinotus grunniens</i>	62	15
Bivalves	1126	16
Threeridge, <i>Amblema plicata</i>	79	3
Pig-toe, <i>Fusconaia flava</i>	1	0
Elephant-ear, <i>Elliptio crassidens</i>	268	6
Spike, <i>Elliptio dilatata</i>	501	6
Mucket, <i>Actinonaias ligamentina</i>	138	0
Fatmucket, <i>Lampsilis siliquoidea</i>	20	1
Pocketbook, <i>Lampsilis cardium</i>	41	0
Black Sandshell, <i>Ligumia recta</i>	6	0
Washboard, <i>Megalonaias nervosa</i>	40	0
Pink Heel-splitter, <i>Potamilus alatus</i>	16	0
Ohio Pigtoe, <i>Pleurobema cordatum</i>	6	0
Pimple-back, <i>Quadrula pustulosa</i>	4	0
Purple Wartyback, <i>Cyclonaias tuberculata</i>	4	0
Butterfly, <i>Ellipsaria lineolata</i>	2	0
Snails	3	0
Flamed Disc, <i>Anguispira alternata</i>	1	0
Banded Globe, <i>Anguispira kochi</i>	1	0
<i>Mesodon sp.</i>	1	0
NISP Totals	3239	1295

It is difficult to determine whether Parmalee analyzed the same material used in this study. The collection housed at the ISM-RCC possibly does not include the specimens that Parmalee included in his study. The location of this material is not known, but it is possible that it was included in the collection that was returned to the Kuhne site property owners.

For the purposes of analyzing and determining the Kuhne site subsistence strategy, the NISP tabulations by Parmalee was not included because it is unknown whether these collections include some of the same material, which is likely, or if it is a completely separate collection. Figure 9 shows the comparison by percentage of the two NISP tabulations. Parmalee's faunal analysis shows a preference towards mammals and bivalves, as opposed to the dominance of mammals, birds, and reptiles from this study. If Parmalee's material is included in determining the subsistence economy at the Kuhne site, it would increase the importance of riverine resources, with the higher NISP values for aquatic resources, specifically fish and bivalves. However, it is not possible to truly know how Parmalee's analysis would change the Kuhne site subsistence economy interpretation because MNI was not calculated, which would give a more accurate representation of faunal exploitation.

Figure 9. Comparison of Parmalee and Beyer NISP Percentages by Class

White-tailed Deer

White-tailed deer were the most important species to the Kuhne site inhabitants, providing 62.6% of biomass for mammals, and 53.3% of the total biomass for the Kuhne site. As stated in Chapter 3, MNI calculations are determined on a site wide basis.

White-tailed deer could have been shared between groups occupying the Kuhne site, and an individual deer could have skeletal elements throughout the site. The MNI calculations total the number of individual white-tailed deer at fifteen, based on right astragali.

Table 6 separates white-tailed deer by NISP of skeletal portions and Table 7 gives the food utility index of white-tailed deer. The distribution of skeletal portions is evenly distributed between cranial, axial skeleton (i.e., ribs and vertebrae), forequarter, and hindquarter elements, with a smaller number of distal appendages (foot bones). The largest percentages come from the forequarter and hindquarter elements, providing 56.1% of the total skeletal elements. In this table, metapodials were placed in the distal appendage category, but if they had been able to be identified to element, they would be placed into either the forequarter or hindquarter categories, raising their percentages. The percentage of the rib, vertebrae, and distal leg bones indicates that large portions of deer carcasses (if not whole individuals) were frequently transported back from the kill site.

Table 6. White-tailed Deer Skeletal Portions from the Kuhne Site					
Element	#	%	Element	#	%
CRANIAL ELEMENTS			HINDQUARTER ELEMENTS		
Antler	68		Innominate	31	
Cranium	28		Femur, proximal	14	
Mandible	43		Femur, distal	7	
Teeth	26		Femur, shaft pieces	8	
TOTALS	165	20.78%	Tibia, proximal	39	
RIB-VERTEBRAE ELEMENTS			Tibia, distal	17	
Atlas vertebra	5		Tibia, shaft pieces	6	
Axis vertebra	2		Calcaneus	19	
Cervical vertebra	15		Astragalus	28	
Thoracic vertebra	16		Tarsals	6	
Lumbar vertebra	16		Metatarsal, proximal	42	
sacrum	1		Metatarsal, distal	2	
sternabra	1		Metatarsal, shaft pieces	55	
Ribs	60		TOTALS	274	34.51%
TOTALS	116	14.61%	DISTAL APPENDAGES		
FOREQUARTER ELEMENTS			Metapodial, proximal	6	
Scapula	26		Metapodial, distal	8	
Humerus, proximal	4		Metapodial, shaft	24	
Humerus, Distal	25		Phalanx 1	19	
Humerus, shaft pieces	7		Phalanx 2	5	
Radius, proximal	13		Phalanx 3	6	
Radius, distal	7		TOTALS	68	8.56%
Radius, shaft pieces	19				
Ulna, proximal	13		TOTAL DEER ELEMENTS	794	100.00%
Ulna, distal	1				
Ulna, shaft pieces	10				
Carpals	5				
Metacarpal, proximal	14				
Metacarpal, distal	5				
Metacarpal, shaft pieces	22				
TOTALS	171	21.54%			

Table 7. Food Utility Index of White-tailed Deer in Each Food Utility at the Kuhne Site				
	# of Frags	% Total Deer	Standard Deer	% of St. Deer
LOW UTILITY				
Antler	68	8.56%	2	0.90%
Mandible	43	5.42%	2	0.90%
Tooth	26	3.27%	32	14.41%
Other Skull Fragments	28	3.53%	27	12.16%
Atlas/Axis	7	0.88%	2	0.90%
Phalanx/Sesamoid	30	3.78%	48	21.62%
<i>Low Utility Subtotal</i>	<i>202</i>	<i>25.44%</i>	<i>129</i>	<i>50.90%</i>
MEDIUM UTILITY				
Other Vertebrae	47	5.92%	24	10.81%
Pelvis/Sacrum	32	4.03%	10	4.50%
Rib	60	7.56%	26	11.71%
Scapula	26	3.27%	2	0.90%
Humerus	36	4.53%	2	0.90%
Radius/Ulna	63	7.93%	4	1.80%
Metacarpal/carpals	46	5.79%	16	7.21%
Metapodial	38	4.79%	–	–
Metatarsal	99	12.47%	2	0.90%
<i>Medium Utility Subtotal</i>	<i>447</i>	<i>56.30%</i>	<i>70</i>	<i>38.74%</i>
HIGH UTILITY				
Sternum	1	0.13%	7	3.15%
Femur	29	3.65%	2	0.90%
Tibia/tarsals	115	14.48%	14	6.31%
<i>High Utility Subtotal</i>	<i>145</i>	<i>18.26%</i>	<i>23</i>	<i>10.36%</i>
Totals	794	100.00%	222	100.00%

Modified Bones

Cultural Modification

Cut Marks. Cut marks were examined both macro- and microscopically. Examples of knife cuts can be seen in Figures 10 and 11. Knife cuts were found on 60 specimens, or 3.3% of the collection. Species that had cut marks include: white-tailed deer (36), unidentified large mammal (12), canids (2), elk (2), wild turkey (2), trumpeter swan (1), box turtle (1), pond turtle (1), unidentified medium mammal (1), and unidentified large bird (1). Several species had elements that were cut and snapped including a wild turkey radius, and a white-tailed deer antler. Three other white-tailed deer bones had cut marks: a chopped antler, a sawed antler, and a metatarsal with a chopped margin. The white-tailed deer cut marks were found on the radius, scapula, humerus, naviculo-cuboid, metatarsal, metapodial, astragali, femur, ischium, ribs, and mandible. On the long bones, the cut marks are mostly found on the proximal and/or distal end. One large unidentified large mammal bone was notched.

Figure 10. Photo of Cut Mark on Elk Thoracic Vertebra (Photograph by Autumn Beyer, used by permission of the Illinois State Museum)

Figure 11. Photo of Cut Marks on Trumpeter Swan Ulna (Photograph by Autumn Beyer, used by permission of the Illinois State Museum)

Burned Bone. 47 individual bones were burned or calcined, representing 2.6% of the faunal remains. Species include dog/wolf/coyote (1), beaver (1), bobcat (2), white-tailed deer (26), unidentified medium bird (1), unidentified fish (1), unidentified large mammal (14), and unidentified medium mammal (1). The burned/calcined bone could be the result of cooking, accidental/incidental burning or refuse disposal. As an example of what burned and calcined bone looks like see Figure 12.

Figure 12. Photo of Calcined Bobcat Radius and Burned Bobcat Metacarpal (Photograph by Autumn Beyer, used by permission of the Illinois State Museum)

Artifact Modification. Several species had purposeful modifications (Figures 13-19). Two wild turkey tarsometatarsals were modified into awls or pins. White-tailed deer antlers, seven in total, were intentionally modified into points, one of which had the interior hollowed out. A large three-ridged mussel was perforated, most likely used as a hoe, digging tool, or scraper. Five turtle species were altered, including pond turtles, Blanding's, map, and slider. The modifications on the turtle carapaces include ground interiors, ground margins, vertebrae removed, and sawed margins. The scraping and grinding of the interior of the turtle carapaces indicates that they were most likely fragments of turtle carapace bowls, spoons, or rattles (Martin and Masulis 1993; Munson et al. 1971)

Figure 13. Photo of Modified White-Tailed Deer Antlers (Photograph by Autumn Beyer, used by permission of the Illinois State Museum)

Figure 14. Photo of Perforated Three-Ridge Mussel Shell [exterior]
(Photograph by Autumn Beyer, used by permission of the Illinois State Museum)

Figure 15. Photo of Perforated Three-Ridge Mussel Shell [interior]
(Photograph by Autumn Beyer, used by permission of the Illinois State Museum)

Figure 16. Photo of Map Turtle Modified Carapace with Vertebrates Removed (Photograph by Autumn Beyer, used by permission of the Illinois State Museum)

Figure 17. Photo of Map Turtle Modified Carapace with Ground Interior (Photograph by Autumn Beyer, used by permission of the Illinois State Museum)

Figure 18. Photo of Assorted Modified Turtle Species (Photograph by Autumn Beyer, used by permission of the Illinois State Museum)

Figure 19. Photo of Assorted Modified White-Tailed Deer and Large Mammal Specimens (Photograph by Autumn Beyer, used by permission of the Illinois State Museum)

Natural Modification

Gnawed Bone. Natural modifications on the mammal bones includes rodent and carnivore gnaw marks on 118 specimens or 6.6% of the specimens. Only four species, beaver, elk, deer, and trumpeter swan were identified to have rodent and/or carnivore gnawing, along with unidentified specimens of bird and mammal. The low percent of natural modification on the faunal material indicates that the remains were covered up quickly after consumption/butchering. Examples of rodent and carnivore gnaw marks can be seen in Figures 20 and 21.

Figure 20. Photo of Rodent Gnawing on Unidentified Large Mammal Specimens. (Photograph by Autumn Beyer, used by permission of the Illinois State Museum)

Figure 21. Photo of Carnivore Gnawing on Elk Distal Metatarsal and Phalanx 2.
(Photograph by Autumn Beyer, used by permission of the Illinois State Museum)

Seasonality Indicators

Seasonality indicators from the Kuhne site include evidence from white-tailed deer and migratory birds. Metapodials and a juvenile mandible from fetal/newborn deer indicate that the site was occupied during the late spring and summer (see Figure 22) (Hoffmeister and Mohr 1972). Several species of migratory birds are in the faunal collection, including Canada goose and trumpeter swan (Wage and Raveling 1983). These birds indicate spring and/or fall use of the site (Wage and Raveling 1983). This information indicates that the Kuhne site may have been occupied for most of the year, however there are no indicators for the site being occupied during the winter months.

Figure 22. Photo of Newborn White-Tailed Deer Metapodial (Photograph by Autumn Beyer, used by permission of the Illinois State Museum)

Habitat Use

Several types of habitats were exploited by the species represented in the collection. Forest and forest-edge species are dominant among mammals; they include cottontail, woodchuck, tree squirrel, foxes, raccoons, mink, striped skunk, elk, and white-tailed deer. The Illinois River and the banks surrounding it would have been the closest location for the sites occupants to harvest many of the species found among the faunal remains, including the ducks, beaver, muskrat, river otter, trumpeter swan, Canada goose, and double-crested cormorant. The main channel of the Illinois River would have been the source for the buffalo-fish, redhorse, channel catfish, flathead catfish, walleye, and freshwater drum. Shallow ponds and sloughs would have been the probable source for

gar, bowfin, brown bullhead, and largemouth bass (Hubbs and Lagler 2004). The greater prairie chicken and plains pocket gopher were probably procured from prairie areas in the vicinity of the Kuhne site. The whooping crane, sandhill crane, American coot, pied billed grebe and teals would have been found in shallow ponds, swamps and marshy areas. The whooping crane and sandhill crane also frequent prairie areas during migrations (Martin and Masulis 1993; Styles 1981).

Kuhne Site Subsistence Strategy

Determining the subsistence strategy for the Kuhne site was the first investigative question for this research. Animal remains from the Kuhne collection indicate that a variety of faunal resources were exploited throughout the Upper Illinois River Valley. Both terrestrial and aquatic resources were obtained, but mammals (39% of MNI) provided the most biomass out of all animal classes recovered. The species that was exploited the most at the Kuhne site, and the most important species is the white-tailed deer, providing 57.2% of biomass for the site. White-tailed deer would have been readily available in this region with high population density, annually renewable, as well as the large size of the mammal would have been the optimal choice to provide the sustenance required to survive, compared to smaller animals, such as fish and mussels (Smith 1975). Many other mammals, including raccoon, muskrat, and beaver were exploited contributing 4.8% of the total biomass for the site. However, as discussed in Chapter 2, the excavation methods are not known, and the reason for the small number of fish remains (26 MNI and 1.5% of biomass) could be a result of larger screen sizes and the lack of flotation samples. The Illinois River's close proximity to the site could have provided a greater amount of fish specimens, as seen at other sites located along the

Illinois River Valley (e.g. Rench and Apple Creek sites) (Parmalee et al. 1972; Martin and Masulis 1993). Migratory birds played a large role in the subsistence economy at the Kuhne site. Trumpeter swan, and Canada goose afforded 73.9% of biomass of the birds, and 2.6% of the total faunal collection.

If Parmalee's NISP calculations for mussel shell were included in the overall tallies of the Kuhne site faunal remains, mussels would account for 46.5% of the Kuhne site NISP. The inclusion of these mussel shells would change the interpretation of the Kuhne subsistence strategy to include using a greater amount of mussels to supplement everyday consumption. Parmalee's analysis also included over twice as many fish specimens (173 NISP) than were tabulated in this study (65 NISP). If these fish tabulations were included in the interpretation of the subsistence strategy, it would appear similar to the mussels, that fish was used as a supplemental source for everyday consumption. Parmalee's NISP tabulations do not give us a full picture of the amount of fish and mussels utilized by the Kuhne people, because Parmalee did not calculate MNIs in the collection he analyzed.

Several different types of modification, both natural and cultural were observed in the faunal collection. Human modifications include cutting, sawing, chopping, grinding, perforating, and burning. These modifications made to the remains indicate processing of the animals for consumption and for utilitarian needs. The three-ridge mussel shell modification into a hoe indicates that it was being used as an implement for gardening. The largest extent of modifications were made to the white-tailed deer and the turtle specimens. The deer bones were mostly food processing modifications, however, many of the antler pieces were purposefully modified into tools, including possible awls or

needles. Turtle specimens were consistently modified by the grinding and scraping of the interior carapace, most likely for the creation of bowls, spoons, or rattles. Natural modifications to the faunal remains (rodent- and carnivore-gnawing) were not abundant in that only 6.6% of specimens showed any indications of scavenging. Based on the small amount of gnawed bone, both from rodents and carnivore, it appears that the animal remains were buried shortly after consumption or use, restricting access by scavengers.

The seasonal occupation of the Kuhne site has been determined to be from the spring to fall. Seasonal indicators used to make this determination include migratory birds and fetal/newborn white-tailed deer specimens. This occupation span differs from other Middle Woodland sites along the Illinois River, because it was not occupied during the winter months. However, it is possible that the portion of the collection that was returned to the site's owners contains specimens that could indicate that period of occupation.

CHAPTER V

SITE COMPARISONS AND CONCLUSIONS

In this chapter, the last two research questions are addressed. Summaries of both the Rench and Apple Creek sites faunal analysis are detailed and then the findings for the Kuhne site subsistence economy are compared against these two sites. The purpose of this comparison is to determine if any differences exist between the subsistence strategies at these three Middle Woodland sites, and why those differences may exist. Biomass could not be calculated for the Apple Creek site because archaeological specimens were not weighed during the previous analysis, so Apple Creek could not be compared to the Kuhne and Rench sites biomass totals. In addition to subsistence strategies, this chapter concludes with a discussion about how the methodology and practices within archaeology and zooarchaeology changed throughout time, as seen through the Kuhne, Rench and Apple Creek collections, and how Stuart Struever influenced these changes.

Rench Site Subsistence Strategy

Analysis completed on the Weaver component of the Rench site determined that a wide variety of faunal resources were exploited throughout the central Illinois River Valley (Martin and Masulis 1993). Forest and Forest-edge species were most prominent in the collection, contributing over 77% of the total biomass in the collection, a small proportion of species originate from a prairie environment, contributing only 1% of the total biomass. Aquatic habitats were also significantly important to the Rench

inhabitants, with 9 out of 12 species being from riverine environments. Several of these most significant taxa include freshwater drum, buffalo-fish, and river catfish, indicating that the main channel of the Illinois River was the primary focus of fishing practices at the Rench site. White-tailed deer dominated the faunal remains, in terms of both MNI and biomass, and has been classified as the most important species in the collection. Based on the faunal remains recovered, whole deer carcasses were brought from the kill site to the habitation site for processing. From the deer specimens, Martin and Masulis (1993) determined that the Rench site was occupied year round.

Apple Creek Site Subsistence Strategy

The Apple Creek site subsistence strategy was determined by Parmalee et al. (1972) to be dominated by mammalian species, contributing the most significant portion of meat and meat by-products. Another class of animals that greatly supported daily subsistence was fish; species including bowfin, catfish, and suckers being the most prevalent in the collection. Smaller mammals were also used to supplement the everyday diet at Apple Creek; raccoons, dogs, beaver, muskrats, and cottontails were significant taxa being exploited. Freshwater mussels were prominent at the Apple Creek site, and were found throughout the site's midden deposits, with most species being from small streams and tributaries. Minor waterways were easily accessible because of their close proximity to the site. The overall most important species to the Apple Creek inhabitants was white-tailed deer. Based on the analysis by Parmalee et al. (1972), white-tailed deer provided over half of all meat from the collection, as well as many specimens of bone and antler, which were being repurposed into tools such as awls. Seasonal occupation for the Apple Creek site was determined from deer remains, specifically deer skulls with

attached antlers and skulls with shed antlers, indicating that the site may have been occupied year-round (Parmalee et al. 1972).

Kuhne, Rench, and Apple Creek Site Comparisons

Table 8 compares the three sites NISP and MNI tabulations from every identified species. Unfortunately, the sizes of the Kuhne, Rench, and Apple Creek faunal collections are very different and may lead to unintended bias. The Middle Woodland Apple Creek collection is the smallest at 1,024 NISP, the Kuhne at 1,343 NISP, and Rench Weaver era collection with the largest total at 7,036 NISP (Martin and Masulis 1993; Parmalee et al. 1972). The significant differences in the collection sizes are the most likely the result of differences in research design and the development of new excavation methods. Similar to the Kuhne site, the Apple Creek site had all of the faunal material included in the analysis, but only the Middle Woodland portion of the faunal remains were used in this comparison; the total faunal assemblage for the Apple Creek site occupation was over 130,000 specimens. However, a sampling strategy was employed at the Rench site; faunal analysis was completed on 19 of 44 features, as well as 29 randomly selected features from the 1983 excavation. Both the Rench and Apple Creek site excavation methodologies were documented. Fine screen size and flotation samples were used at the Rench and Apple Creek sites. The unknown screen size for the Kuhne site excavation, along with the lack of flotation samples are the main reasons why the Kuhne site faunal collection is thousands of specimens fewer than the Rench and Apple Creek collections. It is also possible that preservation differences may be a factor in the drastic differences in collection sizes, as well as the possibility that the Kuhne site may have been a smaller occupation than the Rench and Apple Creek sites.

Table 8. Comparison of Kuhne, Rench, and Apple Creek Site Fauna						
	NISP			MNI		
	Kuhne	Rench	Apple Creek	Kuhne	Rench	Apple Creek
MAMMALS	988	3124	294	59	170	23
Eastern Cottontail, <i>Sylviaqus floridanus</i>	5	60	2	2	15	1
Eastern Chipmunk, <i>Tamias striatus</i>	-	18	-	-	8	-
Woodchuck, <i>Marmota monax</i>	4	17	1	1	7	1
Franklin's Ground Squirrel, <i>Spermophilus franklini</i>	-	2	-	-	2	-
Gray Squirrel, <i>Sciurus carolinensis</i>	-	6	-	-	5	-
Fox Squirrel, <i>Sciurus niger</i>	1	67	1	1	15	1
Tree Squirrel, <i>Sciurus sp.</i>	1	10	1	1	1	1
Plains Pocket Gopher, <i>Geomys bursarius</i>	7	-	-	2	-	-
Beaver, <i>Castor canadensis</i>	22	21	3	5	11	1
Vole, <i>Microtus sp.</i>	-	1	-	-	1	-
Muskrat, <i>Ondatra zibethicus</i>	41	144	4	9	24	3
Domestic Dog, <i>Canis cf. lupis familiaris</i>	-	-	5	-	-	1
Gray Wolf, <i>Canis cf. lupis</i>	-	-	1	-	-	1
Dog/Wolf/Coyote, <i>Canis sp.</i>	29	18	-	4	9	-
Red Fox, <i>Vulpes vulpes</i>	-	1	-	-	1	-
Gray Fox, <i>Urocyon cinereoargenteus</i>	2	6	2	1	4	1
Red/Gray Fox, <i>Vulpes/Urocyon</i>	2	5	-	1	3	-
Raccoon, <i>Procyon lotor</i>	37	23	6	8	14	2
Long-tailed Weasel, <i>Mustela frenata</i>	-	1	-	-	1	-
American Mink, <i>Neovison vison</i>	4	17	-	2	12	-
Badger, <i>Taxidea taxus</i>	-	1	-	-	1	-
River Otter, <i>Lontra canadensis</i>	7	-	4	3	-	1
Striped Skunk, <i>Mephitis mephitis</i>	2	4	1	1	2	1
Bobcat, <i>Lynx rufus</i>	5	-	-	1	-	-
Elk, <i>Cervus elaphus</i>	25	18	1	2	3	1
White-tailed Deer, <i>Odocoileus virginianus</i>	794	2683	262	15	31	7
Deer/Elk, Cervidae	-	1	-	-	-	-

Table 8. Comparison of Kuhne, Rench, and Apple Creek Site Fauna						
	NISP			MNI		
	Kuhne	Rench	Apple Creek	Kuhne	Rench	Apple Creek
BIRDS	119	282	90	39	110	26
Common Loon, <i>Gavia immer</i>	1	-	-	1	-	-
Pied-billed Grebe, <i>Podilymbus podiceps</i>	1	5	1	1	4	1
Horned Grebe, <i>Podiceps auritus</i>	-	2	-	-	1	-
Double-crested Cormorant, <i>Phalacrocorax auritus</i>	1	1	-	1	1	-
American Bittern, <i>Botaurus lentiginosus</i>	-	2	-	-	1	-
Trumpeter Swan, <i>Cygnus buccinator</i>	12	9	1	1	4	1
Snow Goose, <i>Chen caerulescens</i>	-	1	-	-	1	-
Snow/Blue Goose, <i>Chen hyperborea/caerulescens</i>	-	-	2	-	-	2
Canada Goose, <i>Branta canadensis</i>	12	10	13	3	8	6
Goose/Swan, Anserinae	-	2	-	-	2	-
Wood Duck, <i>Aix sponsa</i>	-	1	-	-	1	-
Mallard/Black Duck, <i>Anas platyrhynchos/rubripes</i>	-	9	6	-	4	2
Green-winged teal, <i>Anas crecca</i>	3	-	-	1	-	-
Blue-winged teal, <i>Anas discors</i>	10	-	-	3	-	-
Green/Blue-winged teal, <i>Anas crecca/discors</i>	16	24	1	7	7	1
Northern Pintail, <i>Anas acuta</i>	2	-	-	1	-	-
American Wigeon, <i>Anas americana</i>	3	-	-	3	-	-
Diving Duck, <i>Aythya sp.</i>	10	3	-	3	2	-
Bufflehead, <i>Bucephala albeola</i>	-	3	-	-	2	-
Common Merganser, <i>Mergus merganser</i>	-	1	-	-	1	-
Duck - Large, Anatinae spp.	4	-	-	3	-	-
Duck - Medium, Anatinae spp.	5	-	-	2	-	-
Duck - Small, Anatinae spp.	-	2	-	-	2	-
Unidentified Duck Species, Anatinae spp.	-	39	10	-	14	4
Bald Eagle, <i>Haliaeetus leucocephalus</i>	1	-	2	1	-	1

Table 8. Comparison of Kuhne, Rensch, and Apple Creek Site Fauna						
	NISP			MNI		
	Kuhne	Rensch	Apple Creek	Kuhne	Rensch	Apple Creek
Peregrine Falcon, <i>Falco peregrinus</i>	-	-	1	-	-	1
Falcons - Medium, cf. <i>Falconiformes</i>	1	-	-	1	-	-
Greater Prairie Chicken, <i>Tympanuchus cupido</i>	1	31	6	1	12	1
Wild Turkey, <i>Meleagris gallopavo</i>	32	113	2	2	28	1
Bobwhite, <i>Colinus virginianus</i>	-	4	-	-	2	-
King Rail, <i>Rallus elegans</i>	-	1	-	-	1	-
Virginia Rail, <i>Rallus limicola</i>	-	3	-	-	2	-
American Coot, <i>Fulica americana</i>	1	3	-	1	3	-
Whooping Crane, <i>Grus americanus</i>	1	-	-	1	-	-
cf. Sandhill Crane, <i>Grus cf. canadensis</i>	-	5	43	-	3	3
Herring Gull, <i>Larus argentatus</i>	1	-	-	1	-	-
Eastern Screech Owl, <i>Megascops asio</i>	1	-	-	1	-	-
Barred Owl, <i>Strix varia</i>	-	6	1	-	2	1
Common Grackle, <i>Quiscalus quiscula</i>	-	-	1	-	-	1
Hudsonian Godwit, <i>Limosa cf. haemastica</i>	-	2	-	-	2	-
Reptiles	155	603	177	20	183	22
Snapping Turtle, <i>Chelydra serpentina</i>	6	21	5	1	11	2
Musk Turtle, <i>Sternotherus odoratus</i>	-	-	4	-	-	2
N. American Softshell Turtle, <i>Apalone sp.</i>	2	-	-	1	-	-
Blanding's Turtle, <i>Emydoidea blandingii</i>	20	34	-	2	17	-
Stinkpot, <i>Sternotherus odoratus</i>	-	7	-	-	5	-
Eastern/Mud Turtle, <i>Kinosternon sp.</i>	-	1	-	-	1	-
Eastern Box Turtle, <i>Terrapene carolina</i>	2	4	4	1	4	4
Ornate Box Turtle, <i>Terrapene ornata</i>	28	2	1	4	1	1
Box Turtle, <i>Terrapene sp.</i>	20	3	110	3	3	8
Painted Turtle, <i>Chrysemys picta</i>	6	47	-	1	15	-
cf. Painted Turtle, cf. <i>Chrysemys picta</i>	1	-	-	1	-	-

Table 8. Comparison of Kuhne, Rensch, and Apple Creek Site Fauna							
	NISF			MNI			
	Kuhne	Rensch	Apple Creek	Kuhne	Rensch	Apple Creek	
Slider, <i>Trachemys scripta</i>	27	2	10	2	2	2	
Common Map Turtle, <i>Graptemys geographica</i>	3	1	-	1	1	-	
False Map Turtle, <i>Graptemys pseudogeographica</i>	-	4	-	-	2	-	
Map Turtle, <i>Graptemys sp.</i>	7	14	-	1	4	-	
Slider/Map Turtle, <i>Trachemys/Graptemys sp.</i>	1	-	-	1	-	-	
Basking Turtle, <i>Chrysemys/Trachemys sp.</i>	-	7	-	-	1	-	
<i>Chrysemys/Trachemys/Graptemys sp.</i>	-	2	39	-	-	3	
Pond Turtle, Emydidae	32	-	4	1	-	-	
Spiny Softshell Turtle, <i>Apalone spiniferus</i>	-	5	-	-	4	-	
Smooth Softshell Turtle, <i>Apalone cf. muticus</i>	-	1	-	-	1	-	
Softshell Turtle, <i>Apalone sp.</i>	-	31	-	-	15	-	
Kinosternidae/Emydidae	-	110	-	-	4	-	
Unid Turtle, <i>Testudines</i>	-	5	-	-	-	-	
Nonvenomous Snake, Colubridae	-	302	-	-	92	-	
Fish	65	2847	180	26	903	105	
Shovelnose/Lake Sturgeon, Acipenseridae	-	11	-	-	4	-	
Paddlefish, <i>Polyodon spathula</i>	-	5	-	-	4	-	
Longnose gar, <i>Lepisosteus osseus</i>	-	29	-	-	14	-	
Shortnose gar, <i>Lepisosteus platostomus</i>	-	22	-	-	14	-	
Gar, <i>Lepisosteus sp.</i>	-	191	30	-	42	8	
Bowfin, <i>Amia calva</i>	15	232	59	3	76	41	
Shiner, <i>Notropis sp.</i>	-	-	2	-	-	1	
Minnnows and Carps, Cyprinidae	-	-	2	-	-	2	
Bigmouth Buffalo, <i>Ictiobus cyprinellus</i>	1	62	-	1	24	-	
Smallmouth/Black Buffalo, <i>Ictiobus bubalus/niger</i>	-	100	-	-	43	-	
Buffalo sp., <i>Ictiobus sp.</i>	3	277	1	2	48	1	

Table 8. Comparison of Kuhne, Rensch, and Apple Creek Site Fauna							
	NISP			MNI			
	Kuhne	Rensch	Apple Creek	Kuhne	Rensch	Apple Creek	
Carpsucker, <i>Carpiodes</i> sp.	-	12	-	-	5	-	-
Redhorse Suckers, <i>Moxostoma</i> sp.	8	-	-	2	-	-	-
Silver Redhorse, <i>Moxostoma anisurum</i>	-	1	-	-	1	-	-
Black Redhorse, <i>Moxostoma duquesnei</i>	-	28	-	-	19	-	-
Golden Redhorse, <i>Moxostoma erythrurum</i>	-	35	-	-	20	-	-
Shorthead Redhorse, <i>Moxostoma macrolepidotum</i>	-	34	-	-	21	-	-
Unidentified Redhorse, <i>Moxostoma</i> sp.	-	164	-	-	42	-	-
Suckers, Catostomidae	1	47	22	1	1	15	15
Black Bullhead, <i>Ameiurus melas</i>	-	30	-	-	16	-	-
Yellow Bullhead, <i>Ameiurus natalis</i>	-	81	-	-	37	-	-
Brown Bullhead, <i>Ameiurus nebulosus</i>	2	40	-	1	15	-	-
Bullhead, <i>Ameiurus</i> sp.	1	22	-	1	-	-	-
Blue Catfish, <i>Ictalurus furcatus</i>	-	6	-	-	6	-	-
Channel Catfish, <i>Ictalurus punctatus</i>	5	175	-	3	82	-	-
Flathead Catfish, <i>Pylodictis olivaris</i>	1	12	-	1	10	-	-
Catfish and/or Bullhead, <i>Ictalurus</i> spp.	-	27	83	-	4	37	37
Catfish, Ictaluridae	2	14	-	2	1	-	-
Northern Pike, <i>Esox lucius</i>	-	104	1	-	48	1	1
Pikes, <i>Esox</i> sp.	3	6	1	1	5	1	1
White Bass, <i>Morone chrysops</i>	-	1	-	-	1	-	-
Pumpkinseed, <i>Lepomis gibbosus</i>	-	5	-	-	2	-	-
Blue Gill, <i>Lepomis macrochirus</i>	-	19	-	-	11	-	-
Green Sunfish, <i>Lepomis cyanellus</i>	-	3	-	-	3	-	-
Sunfishes, Centrarchidae	-	79	1	-	6	1	1
Sunfish, <i>Lepomis</i> spp.	-	40	3	-	16	2	2
Rock Bass, <i>Ambloplites rupestris</i>	-	2	-	-	2	-	-
Smallmouth Bass, <i>Micropterus dolomieu</i>	-	6	-	-	5	-	-
Largemouth Bass, <i>Micropterus cf. salmoides</i>	1	95	-	1	31	-	-

Table 8. Comparison of Kuhne, Rensch, and Apple Creek Site Fauna						
	NISF			MNI		
	Kuhne	Rensch	Apple Creek	Kuhne	Rensch	Apple Creek
Black Bass sp., <i>Micropterus</i> sp.	6	86	2	2	35	1
White Crappie, <i>Pomoxis annularis</i>	-	30	-	-	12	-
Black Crappie, <i>Pomoxis</i> spp.	-	10	-	-	7	-
White/Black Crappie, <i>Pomoxis</i> spp.	-	38	-	-	19	-
Walleye, <i>Sander</i> cf. <i>vitreus</i>	1	29	-	1	13	-
Walleye/Sauger, <i>Sander</i> sp.	-	2	-	-	1	-
Yellow Perch, <i>Perca flavescens</i>	-	2	-	-	2	-
Freshwater Drum, <i>Aplodinotus grunniens</i>	15	633	3	4	135	2
Bivalves						
Threeidge, <i>Amblema plicata</i>	16	180	313	9	120	-
Washboard/Threeidge, <i>Megalanaia/Amblema</i>	3	94	124	2	46	-
Elephant-ear, <i>Elliptio crassidens</i>	6	4	1	4	3	-
Spike, <i>Elliptio dilatata</i>	6	27	45	2	23	-
Spike/Elephant's Ear, <i>Elliptio</i> sp.	-	1	-	-	-	-
Wabash Pigtoe, <i>Fusconaia flava</i>	-	-	12	-	-	-
Pig-toe, <i>Fusconaia</i> sp.	-	2	1	-	2	-
Maple-leaf, <i>Quadrula quadrula</i>	-	1	-	-	1	-
Pimple-back, <i>Quadrula pustulosa</i>	-	1	2	-	1	-
Washboard, <i>Megalanaia nervosa</i>	-	5	-	-	4	-
<i>Quadrula</i> sp.	-	-	1	-	-	-
Pistolgrip, <i>Tritogonia verrucosa</i>	-	-	3	-	-	-
White Heel-splitter, <i>Lasmigona complanata</i>	-	-	3	-	-	-
Fluted shell, <i>Lasmigona costata</i>	-	-	3	-	-	-
Squaw Foot, <i>Strophitus undulatus</i>	-	1	-	-	1	-

Table 8. Comparison of Kuhne, Rensch, and Apple Creek Site Fauna							
	NISP			MNI			
	Kuhne	Rensch	Apple Creek	Kuhne	Rensch	Apple Creek	
Mucket, <i>Actinonaias ligamentia</i>	-	11	11	-	8	-	-
Yellow Sandshell, <i>Lampsilis teres</i>	-	1	3	-	1	-	-
Rock Pocketbook, <i>Arcidens confragosus</i>	-	1	-	-	1	-	-
Pocketbook, <i>Lampsilis ovata</i>	-	3	15	-	3	-	-
Butterfly, <i>Ellipsaria lineolata</i>	-	1	-	-	1	-	-
Ohio pigtoe, <i>Pleurobema cordatum</i>	-	4	8	-	4	-	-
Black Sand Shell, <i>Ligumia recta</i>	-	-	1	-	-	-	-
Higgin's Eye, <i>Lampsilis higginsii</i>	-	2	-	-	2	-	-
<i>Lampsilis</i> sp.	-	4	-	-	3	-	-
Fragile/Pink Paper Shell, <i>Leptodea</i> sp.	-	2	-	-	2	-	-
Pink Heel-splitter, <i>Proptera alatus</i>	-	11	-	-	10	-	-
Fatmucket, <i>Lampsilis siliquoidea</i>	1	3	80	1	3	-	-

The MNI percentage calculations for each site do show differences between the Kuhne, Rensch, and Apple Creek sites (See Figure 23). However, bivalve MNI was not calculated for the Apple Creek site, so for this analysis, the NISP total for bivalves was also used as the MNI. This conversion most likely does not skew the bivalve data very much, if at all, because determining MNI for bivalves are difficult, unless each left and right was compared for a match. With these differing recovery methods in mind, as well as the small number of mussels present in the Kuhne collection, mammals dominate the Kuhne site at 39%, fish at 61% are most prevalent at the Rensch site, and the Apple Creek fauna are dominated by bivalves at 63%. It is not possible to include Parmalee's analysis in this comparison because MNI was not calculated, however, it is likely that it would change the interpretation of the Kuhne subsistence strategy towards a focus in riverine resources, specifically bivalves.

Figure 23. MNI Percentage by Class

Similar to the Kuhne site, the Rench site's animal remains were varied, with species being exploited throughout the Central Illinois Valley, although a prevalence of forest and forest-edge species does exist. However, unlike the Kuhne site, the Rench site faunal collections shows a dominance of riverine species, with 9 out of the 12 most significant taxa being from aquatic habitats. The secondary focus of faunal exploitation at Rench is on fish and freshwater mussels from the main channel of the Illinois River. Very little emphasis was placed on birds and waterfowl (Martin and Masulis 1993). The comparison of animal exploitation at Kuhne and Apple Creek sites show great differences in the faunal collections. Contrasting Kuhne, Apple Creek shows a focus on bivalves and fish, instead of the mammal and bird emphasis at Kuhne (Parmalee et al. 1972). However, Parmalee did identify mussels from Kuhne, but those identifications were not included in this analysis. The Apple Creek site's subsistence strategy is more similar to the Rench site because a large portion of the faunal assemblage is also from riverine environments.

Biomass comparison between the Kuhne and Rench site is shown in Figure 24. The Kuhne and Rench sites are fairly similar, with the major differences being in the fish and bivalve classes. Martin and Masulis (1993:305) determined that the "most significant animal taxa to the Weaver subsistence economy at Rench were white-tailed deer, freshwater drum, buffalo-fish, and river catfish." At the Kuhne site, based on biomass, the most significant animal taxa are white-tailed deer, canis sp., beaver, trumpeter swan, and wild turkey.

Figure 24. Biomass Percentages by Class for Kuhne and Rench Sites

Kuhne, Rench, and Apple Creek Sites Conclusions

A variety of faunal resources were exploited throughout the length of the Illinois River Valley. The Kuhne, Rench, and Apple Creek sites show that there are differences in faunal exploitation based on MNI and biomass calculations. The Upper Illinois River Valley, represented by the Kuhne site, shows an emphasis on mammals, specifically white-tailed deer. This emphasis also occurs at the central Illinois River Valley Rench site, but with an additional emphasis on fish that would have been found in the main channel of the Illinois River. However, at the Apple Creek site in the lower Illinois River Valley the emphasis was placed on backwater habitats as indicated by the abundance of fish and bivalves. The reason for the Rench and Apple Creek sites showing increased

utilization of fish species compared to the Kuhne site may partly be the result of excavation recovery techniques. The lack of fine screening and flotation samples may be the reason for the small number of fish remains in the Kuhne collection.

If fish are not included in the comparison of the Kuhne, Rench, and Apple Creek sites (See Figure 25), the percentages by class are similar for the Kuhne and Apple Creek sites. The Rench site shows a large difference in percentages, because fish were a large portion of the site's MNI, at 61%, resulting in the changed percentages to be more evenly distributed between mammals, birds, reptiles, and bivalves. The Kuhne site is still dominated by mammals (46%), and the Apple Creek by bivalves with 82% of MNI contribution. Not including fish in the faunal analysis comparison does not change the comparison of subsistence strategies between the three sites in a substantial way from the previous comparison (with fish included), except for the interpretation of the Rench site. The analysis of mussels at each site was significantly different. The Kuhne site has few mussel shells, however in Parmalee's tabulations (NISP), there are over a thousand more specimens. The Rench had both NISP and MNI calculated, whereas the Apple Creek only had NISP. For the comparison of these three sites in terms of mussels, it appears that they are not collected in the same proportions, and that the shell analyses vary considerably.

Figure 25. MNI Percentage by Class, Without Fish

As discussed in Chapter 4, the Kuhne site was only occupied from the spring to fall while the central and lower Illinois River Valley sites were occupied year-round based on seasonal faunal indicators (Parmalee et al. 1972; Martin and Masulis 1993). The faunal remains that indicated a winter occupation for the Rench and Apple Creek site include white-tailed deer skull sections with both attached antler and shed antlers (Parmalee et al. 1972; Martin and Masulis 1993).

Environmental Zones

Environmental zones for each site were determined by digitizing and analyzing presettlement vegetation township maps from the Federal Township Plats of Illinois (1804-1891). These hand drawn maps depict presettlement vegetation on a section-by-section basis, created by the U.S. Surveyor General and his deputy surveyors. Each site's township was identified and then these maps were digitized using FreeHand Illustrator

(Figures 26-28). Using those maps, data compiled for the Kuhne site and data previously collected and analyzed for the Rensch and Apple Creek sites was analyzed in terms of each site's location in relation to different environmental zones and water resources. Timber, prairie, and marsh vegetation, as well as major or minor rivers, are optimal habitats for very different terrestrial and aquatic species and, consequently, could have a major impact on the types of animals that were available to be exploited for food at these sites.

Figure 26. Kuhne Site Vegetation Map (Map Created by Autumn Beyer, adapted from Federal Township Plats of Illinois)

Figure 27. Rench Site Vegetation Map (Map Created by Autumn Beyer, adapted from Federal Township Plats of Illinois)

Figure 28. Apple Creek Site Vegetation Map (Map Created by Autumn Beyer, adapted from Federal Township Plats of Illinois)

The differences that can be seen between the range and total amounts of species recovered from these three sites may be related to the sites location along the Illinois River as well as excavator bias in what was collected, but the data are unclear. The Apple Creek site and its close proximity to the Illinois River, small tributaries, and small lakes can account for the overwhelming amount of mussel shells recovered, which would have flourished in that environment (Parmalee et al. 1972). The Rench site was dominated by fish species, which can be linked to the close proximity of the Illinois River. However, the location of the Rench site and the Kuhne site are similarly located in relation to the Illinois River, therefore the differences in the types of species recovered cannot be explained completely by ecological surroundings alone, but may be related to

the archaeological collecting strategies and different recovery techniques, as well as the difference in seasonal occupation. These results must be interpreted within a framework that takes into consideration biases in the data created by different excavators and implementation of recovery techniques. The excavation methods conducted for each site varied (as did training and experience of each crew), and these differences can be directly correlated to differences in the size and amount of faunal remains recovered during the archaeological excavation.

Changes in Methodology

When Stuart Struever excavated the Kuhne site, it was at the start of his archaeological career. In 1953, several years previous, he created Archaeological Research, Incorporated, a not-for-profit organization with the purpose of funding archaeological fieldwork in the Eastern United States (Wiant 2014). Struever's practice of engaging with the public began with the creation of this organization, and began a standard in which archaeologists incorporated public lectures into their outreach programs. As his career and education continued, he made significant contributions in methodology in anthropology and subsistence studies. Stuart Struever and Dr. Hugh Cutler developed the flotation technique in 1960. The collection of flotation samples allows archaeologists to increase the quantity of both floral and faunal specimens recovered, as well as allow for the collection of smaller and more delicate remains (including artifacts) which may be missed during hand excavation. This technological development allowed for a more accurate representation of plant and animal exploitation in the past (Struever 1968b). It also forever changed the way archaeology and zooarchaeology is conducted. Excavations that occurred before this development,

including the Kuhne site, used recovery techniques that were biased towards larger fragments of animal remains. This bias most likely inflates the importance of larger animals. The use of flotation samples and finer mesh screens in archaeological excavations helps eliminate the bias against smaller specimens and plant remains (Casteel 1972, 1976; Payne 1972; Shaffer 1992; Shaffer and Sanchez 1994; Struever 1968b).

Using the Kuhne, Rench, and Apple Creek sites as case studies it is possible to see differences in collection size and size of specimens recovered. Both the Rench and Apple Creek sites had much larger total collection sizes compared to the Kuhne site, which may be the result of the length of occupation at each site, but it may also be because of differences in excavation strategies (crew sizes, time permitted for excavations) as well as the advancements made in excavation techniques and tools. As discussed in Chapter 2, the number of features analyzed and cubic feet of soil excavated was significantly larger for the Rench and Apple Creek sites compared to the Kuhne site. The larger collections size is partially explained by the excavation, but, the number of species that are absent in the Kuhne site, compared to the Rench site is most likely related to the lack of small-scale recovery samples. Smaller bones, fish bones for example, are more likely to be recovered when fine mesh screens and flotation samples are utilized.

Summary and Conclusion

In this study, I have determined that the Kuhne site subsistence strategy consisted of mostly upland resources, with a focus on white-tailed deer. Smaller mammals, and birds supplemented the Kuhne site's subsistence strategy. There was a lack of small bones, specifically fish bones in the Kuhne faunal collection, which is most likely the result of excavation method bias. If the Parmalee faunal analysis is incorporated, the

Kuhne site subsistence economy changes, with a increased emphasis on bivalves and other riverine resources in addition to mammals. When the Kuhne collection was compared against the Rensch and Apple Creek sites, the subsistence strategies were similar, with white-tailed deer being the most important species at each site. The Rensch site inhabitants supplemented their everyday diet with fish, while the Apple Creek inhabitants used mussels. It is likely that the Kuhne site inhabitants also utilized fish from the Illinois River, but the lack of flotation techniques bias the collection towards larger specimens.

Future research directions include the analysis of the faunal material owned and housed by the Kuhne site property owners. The analysis of these materials would inform the interpretation of the Kuhne site subsistence strategy. Additional avenues of research include analyzing faunal collections from the Illinois River Valley, with an emphasis on the Upper Illinois River Valley. Analysis of Upper Illinois River Valley sites would give a more in depth understanding of the regions subsistence economy, and allow for a comprehensive analysis of the Illinois River Valley region's subsistence strategies. I would also strongly recommend that more conscious attention be given to faunal analysis in five areas: (1) research design, (2) consideration of appropriate recovery techniques, (3) decisions as to what is saved for analysis, (4) use of comprehensive reference collections in order to make accurate identifications, and (5) consideration of lab procedures and techniques such as weighing specimens in addition to specimen counts. The consideration of these five areas will allow researchers to better understand and interpret faunal materials, as well as the causes of variations within and between faunal collections.

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