

NEAR AND DEER: VARIABILITY IN ANIMAL ECONOMIES OF THE LATE  
WOODLAND AND HISTORIC PIEDMONT OF NORTH CAROLINA AND VIRGINIA

Julia Anne Longo

A thesis submitted to the faculty at the University of North Carolina at Chapel Hill in partial fulfillment of the requirements for the degree of Master of Art in the Department of Anthropology in the College of Arts and Sciences.

Chapel Hill  
2018

Approved by:

Benjamin Arbuckle

R. P. Stephen Davis, Jr.

Heather Lapham

C. Margaret Scarry

© 2018  
Julia Anne Longo  
ALL RIGHTS RESERVED

## **ABSTRACT**

Julia A. Longo: Near and Deer: Variability in Animal Economies of the Late Woodland and Historic Piedmont of North Carolina and Virginia  
(Under the direction of Benjamin Arbuckle)

The continuity and change of Native Piedmont foodways during the Late Woodland (AD 800-1600) and Historic (after c. AD 1600) periods have been explored from several perspectives. In the larger context of piecing together the culture history of the southern Piedmont, however, there are still questions to be asked at the regional level. The current study builds on preexisting zooarchaeological research to identify patterns of subsistence practices within and among river basins before and during the process of cultural contact, spanning AD 1000-1710. Through a multi-scalar and geospatial meta-analysis of 22 faunal assemblages from 19 sites within the North Carolina and Virginia Piedmont, I ask how did past Native communities shape their animal economies to the particular environmental and cultural settings of the Piedmont during the Late Woodland and Historic Periods?

*For my union sisters, now and always*

## ACKNOWLEDGEMENTS

I have received my secondary education and all of the opportunities it affords me on occupied ancestral Catawba territory. The university that will eventually award me my degree was built on this occupied land by enslaved Black people. This sordid past—and the inequitable and unjust present it continues to shape—can never be divorced from the work produced at this university. That undeniably includes this thesis and my future scholarship.

This thesis would not have been possible without the support and involvement of a number of individuals, institutions, and communities. First and foremost, I would like to thank the scholars on whose research this thesis is based: Mary Ann Holm and Amber Vanderwarker. I am indebted to the members of my committee: Benjamin Arbuckle, Heather Lapham, Steve Davis, and Margie Scarry. I deeply appreciate the guidance and support of my advisor, Ben. I especially want to thank Heather for her inspiring mentorship that renewed my enthusiasm and curiosity. My sincerest gratitude to Steve for sharing his encyclopedic knowledge of North Carolina prehistory and his thoughtful comments throughout this process. I am indebted to Margie for sharing her advice to strengthen this thesis and opening doors to exciting opportunities. I would also like to thank Silvia Tomášková and Colin West. I would especially like to thank Silvia for her unwavering support throughout my time at UNC (and for the many fires she lit under my seat to finish my degree). Thank you to Colin for allowing me to experiment with GIS methods as his research assistant. Special thanks to Matt McAlister, Lisa-Jean Michienzi, Irina Olenicheva, Katie Poor, and Jan Scopel for keeping the Department of Anthropology and the Research of Laboratories of Archaeology running.

I have had the great fortune to meet so many wonderful colleagues throughout my academic career and I count many of them among my closest friends. I want to thank my fellow union members, particularly Molly Green (and Newton), Maja Jeranko, Alyssa Bowen, April Munroe, Jen Standish, Aubrey Lauersdorf, Willa Dong, Miranda Elston, Lindsay Ayling, Maya Little, Susan O'Rourke, Samee Siddiqui, Sam Finesurrey, Steve Pedroza, Mark He, and Michael Conroy, among many others. I have been continually encouraged by the camaraderie of Achsah Dorsey, Eric Thomas, Meg Twomey (and Oliver), Tony Rossodivito, Will Partin, Zac Parker, Jeremy Simon (and Miles), Colleen Betti, Isa Godinez, Dawn Rivers, and Lucía Stavig. I am so touched by their impact on my life.

Lastly, I want to thank my family for their endless encouragement. I especially want to thank my dad and step-mom, Jim and Debbie Longo, who have supported me while following my dreams. I want to acknowledge my mom, Catherine Peacock, for her limitless compassion regardless of the distance between us. The love of my sister and her partner, Elizabeth Longo and Dan Neilan, and their wonderful dog, Maggie, sustained me through my time at UNC. Without the thoughtful support of my aunt and uncle, Elena and Shane Longo, I could not have imagined an enjoyable graduate school experience. The never-ending light and love pouring from my aunt, Terri Tobyn, allowed me to believe in myself without reservations. I am especially grateful for my partner, Andrew Pado, for his infinite love, kindness, and patience. Lastly, any semblance of sanity while in graduate school would have proven impossible without the unconditional love of my dog, Tosh, and our daily walks through the beautiful Carolina Piedmont.

## TABLE OF CONTENTS

LIST OF TABLES .....	ix
LIST OF FIGURES .....	x
CHAPTER 1: INTRODUCTION .....	1
Previous Research and Data Sources .....	2
Study Site Descriptions .....	4
Piedmont Chronology .....	10
Research Questions .....	12
CHAPTER 2: BACKGROUND .....	14
Environmental Setting .....	14
Cultural Setting .....	18
Historical Accounts of the Piedmont .....	24
CHAPTER 3: CASE STUDIES.....	35
Historic Coast: Subsistence Practices at Jordan’s Landing .....	35
Late Woodland Mountains: Agricultural Sedentism of the Northwest Mountains ...	38
CHAPTER 4: METHODS .....	41
Meta-Analysis .....	41
Quantitative Measures .....	44
Geographic Information Systems Analysis .....	48
CHAPTER 5: RESULTS .....	52

Regional Trends .....	53
Mammals.....	55
Birds .....	63
Reptiles .....	68
Fish.....	71
Sub-Regional Trends .....	77
Roanoke River Drainage.....	77
Cape Fear River Drainage.....	87
Neuse River Drainage .....	94
CHAPTER 6: DISCUSSION.....	102
Trends in the Roanoke River Drainage.....	103
Trends in the Cape Fear River Drainage.....	107
Trends in the Neuse River Drainage .....	110
CHAPTER 7: CONCLUSIONS .....	113
Future Directions .....	114
REFERENCES .....	116



## LIST OF TABLES

Table 1.1: Study Sites .....	8
Table 1.2: Assemblage Information.....	9
Table 5.1: Total NISP .....	54
Table 5.2: Mammal NISP .....	57
Table 5.3: Bird NISP .....	64
Table 5.4: Reptile NISP .....	69
Table 5.5: Fish NISP .....	73
Table 5.6: Percent of Identified NISP (%ID'd NISP) across Drainages .....	75
Table 5.7: Roanoke River Drainage: Percent of Identified NISP (%ID'd NISP) for Taxonomic Classes .....	80
Table 5.8: Roanoke River Drainage: Percent of Associated Taxonomic Class Identified NISP (%ID'd NISP) for Species of Interest .....	84
Table 5.9: Cape Fear River Drainage: Percent of Identified NISP (%ID'd NISP) for Taxonomic Classes .....	89
Table 5.10: Cape Fear River Drainage: Percent of Associated Taxonomic Class Identified NISP (%ID'd NISP) for Species of Interest .....	91
Table 5.11: Neuse River Drainage: Percent of Identified NISP (%ID'd NISP) for Taxonomic Classes .....	96
Table 5.12: Neuse River Drainage: Percent of Associated Taxonomic Class Identified NISP (%ID'd NISP) for Species of Interest .....	99

## LIST OF FIGURES

Figure 1.1: North Carolina and Virginia Physiographic Regions and River Drainages .....	6
Figure 1.2: Study Area.....	7
Figure 5.1: Species Diversity and Sample Size .....	56
Figure 5.2: Heat Map: Percent Taxonomic Class of Total NISP Excluding Unidentified Specimens (%NISP-Unid).....	59
Figure 5.3: Heat Map: Percent Species of Interest of Identified Specimens of Associated Taxonomic Class (%ID'd NISP).....	62
Figure 5.4: Late Woodland Period, Roanoke River Drainage: Percent Taxonomic Class of Identified Specimens (%ID'd NISP) .....	81
Figure 5.5: Historic Period, Roanoke River Drainage: Percent Taxonomic Class of Identified Specimens (%ID'd NISP) .....	82
Figure 5.6: Late Woodland Period, Roanoke River Drainage: Percent Species of Interest of Identified Specimens of Associated Taxonomic Class (%ID'd NISP) .....	85
Figure 5.7: Historic Period, Roanoke River Drainage: Percent Species of Interest of Identified Specimens of Associated Taxonomic Class (%ID'd NISP) .....	86
Figure 5.8: Cape Fear River Drainage: Percent Taxonomic Class of Identified Specimens (%ID'd NISP).....	90
Figure 5.9: Cape Fear Drainage: Percent Species of Interest of Identified Specimens of Associated Taxonomic Class (%ID'd NISP) .....	92
Figure 5.10: Neuse River Drainage: Percent Taxonomic Class of Identified Specimens (%ID'd NISP).....	97
Figure 5.11: Neuse Drainage: Percent Species of Interest of Identified	

Specimens of Associated Taxonomic Class (%ID'd NISP) .....	100
Figure 6.1: Change Over Time: Average Percent Taxonomic Class of Total Identified Specimens (%ID'd NISP) .....	104
Figure 6.2: Change Over Time: Average Percent Species of Interest of Identified Specimens of Associated Taxonomic Class (%ID'd NISP) .....	105

## **CHAPTER 1: INTRODUCTION**

During the Late Woodland period (AD 800-1600) the Native communities of the North Carolina and Virginia Piedmont developed a suite of specialized subsistence strategies that shaped and were shaped by their local environmental and cultural settings. As such, cultural identities of the region were inextricably linked to and inspired by these sustaining human-environment interactions. By the time European traders and settlers made their way through the area in the seventeenth and eighteenth centuries, it was apparent that Native groups had been thriving in the region for thousands of years; European explorers such as John Lawson and John Lederer noted as much in their expedition journals (Lawson 1709; Lederer 1672).

Yet it cannot be denied that the waves of European influence permeating the Piedmont during this time had a lasting effect on the construction of Native ways of being, not the least of which were the subsistence strategies that formed the basis of daily life for these Native communities. The degree to which these strategies, associated practices and activities, and the cultural identities constructed around them were reconfigured to meet the changing environmental and cultural settings of the Historic period has been the subject of decades of archaeological research, yet clear regional and temporal trends have been tricky to elucidate as of yet.

The continuity and change of Native Piedmont foodways during the Late Woodland (AD 800-1600) and Historic (after c. AD 1600) periods have been explored from several perspectives. In the larger context of piecing together the culture history of the southern Piedmont, however, there are still questions to be asked at the regional level. The current study builds on preexisting

research to identify patterns of subsistence practices within and among river basins before and during the period of cultural contact (c. AD 1000-1710). I ask, through a multi-scalar meta-analysis of 22 faunal assemblages from 19 sites within the North Carolina and Virginia Piedmont, how did Native communities shape their subsistence practices to the particular environmental and cultural settings of the Piedmont during the Late Woodland period and in the years spanning the transition to the Historic period?

## PREVIOUS RESEARCH AND DATA SOURCES

Extensive research has been conducted by the Research Laboratories of Archaeology (RLA) at the University of North Carolina at Chapel Hill (UNC) on the subject of Piedmont foodways. The present study hinges on two major contributions to North Carolina archaeology: the Siouan Project (Dickens et al. 1987; Holm 1994; Ward and Davis 1993) and a study conducted for the US Fish and Wildlife Service (Vanderwarker 2001).

Beginning in 1983, the RLA embarked on the Siouan Project. Focusing on three river basins of the North Carolina and Virginia Piedmont (Haw, Eno, and Dan), the Siouan Project investigated over 25 archaeological sites that were once occupied by Native groups during the Late Woodland and Historic periods. These groups came to be known historically as the Occaneechi, Eno, Shakori, Saxapahaw, and Sara, among others. The primary goal of this project was to understand the “culture change precipitated by the interaction between Indians and English traders” (Ward and Davis 1993:10) such as “changes in technology, settlement patterns, social organization, mortuary practices, subsistence activities, and physical conditions on the Piedmont” (Dickens et al. 1987:1).

The breadth and depth of research conducted during the Siouan Project has provided and continues to provide ample material for subsequent theses and dissertations, as well as many reports and publications. Specifically, the zooarchaeological data collected by Mary Ann Holm as a part of the Siouan Project (Holm 1987, 1993), and her subsequent dissertation (Holm 1994), form the basis of the present study. The faunal assemblages from 14 of the 19 archaeological sites included in this study were first analyzed by Holm during her tenure in the RLA. These sites include the Powerplant (AD 1000-1450), Hairston (AD 1250-1670), Lower Saratown (AD 1620-1670), Upper Saratown (AD 1620-1710), and William Kluttz (AD 1670-1710) sites of the Roanoke River drainage; the Holt (AD 1000-1400), Webster (AD 1000-1400), George Rogers (AD 1400-1600), Edgar Rogers (AD 1500-1600), and Mitchum (AD 1600-1670) sites of the Cape Fear River drainage; and the Wall (AD 1400-1600), Jenrette (AD 1660-1680), and Fredricks (AD 1680-1710) sites of the Neuse River drainage.

Through her research, Holm sought to “define and describe the pattern(s) of faunal utilization” and compare Late Woodland and Historic “use of animal resources to examine the effect of European presence on the subsistence-related activities of the Piedmont Indians” (Holm 1994:3). Ultimately, she argued that the subsistence strategies practiced by the Siouan-speaking communities of the Late Woodland Piedmont were remarkably resilient in the face of increasing contact with European traders and the colonial settlers who followed. Yet, she concedes, “it is possible ... that the devastation wrought by contact moved with such a swift and relentless pace through the northern Piedmont that the [N]ative populations were given no time to adjust their long-standing practices to their new cultural environment” (Holm 1994:191). In the present study, I seek to build on Holm’s conclusions to investigate patterns in subsistence practices and

resilience across a broader spatiotemporal scale, using targeted date ranges and river basins as analytical units of comparison.

This project also includes data from six faunal assemblages (five sites total) collected by Amber Vanderwarker (2001) during a survey of North Carolina freshwater fisheries for the US Fish and Wildlife Service. These sites include the Vir 150 (AD 1000-1400), Koehler (AD 1250-1450), Leatherwood Creek (AD 1250-1450), Gravelly (AD 1250-1450), and Dallas Hylton (AD 1250-1450) sites of the Roanoke River drainage. Her research aimed to “determine the pre-Columbian distribution and abundance of fish and other animals in the Roanoke River basin in North Carolina and Virginia” (Vanderwarker 2001:1) in order to develop “policy regarding fishery management plans, recover plans for threatened and endangered species, federal land management plans, and dam re-licensing” (Vanderwarker 2001:3). Given these project goals, her findings only alluded to differences in Late Woodland Native subsistence practices among the sites. Instead, she focused on the environmental and biogeographical shifts in local catchment zones and ranges of certain species of fish. It would be impossible without her foundational research to bring to life a picture of pre-contact environmental settings. Furthermore, I aim to investigate in more detail the variety of subsistence practices Vanderwarker identified in the Roanoke River basin.

## STUDY SITE DESCRIPTIONS

In the present study, I examine data collected from 22 faunal assemblages representing 19 Late Woodland and Historic archaeological sites spanning three river basins within the northern North Carolina and south-central Virginia Piedmont (Figure 1.1 and Figure 1.2). The majority of these archaeological sites are situated within the Roanoke River basin: Vir 150 (AD 1000-1450),

Stockton (AD 1000-1450), Powerplant (AD 1000-1450), Koehler (AD 1250-1450), Leatherwood Creek (AD 1250-1450), Gravely (AD 1250-1450), Dallas Hylton (AD 1250-1450), Hairston (AD 1000-1710), Lower Saratown (AD 1620-1710), Upper Saratown (AD 1660-1710), and William Kluttz (AD 1670-1710). Five sites are situated within the Cape Fear River basin: Holt (AD 1000-1400), Webster (AD 1000-1400), George Rogers (AD 1400-1600), Edgar Rogers (AD 1500-1600), and Mitchum (AD 1600-1670). Lastly, three sites are located within the Neuse River basin: Wall (AD 1400-1600), Jenrette (AD 1660-1680), and Fredricks (AD 1680-1710).

Pertinent information about each site and their associated faunal assemblages are listed in Table 1.1 and Table 1.2. More in depth site descriptions can be found in the data sources and references listed in Table 1.2.



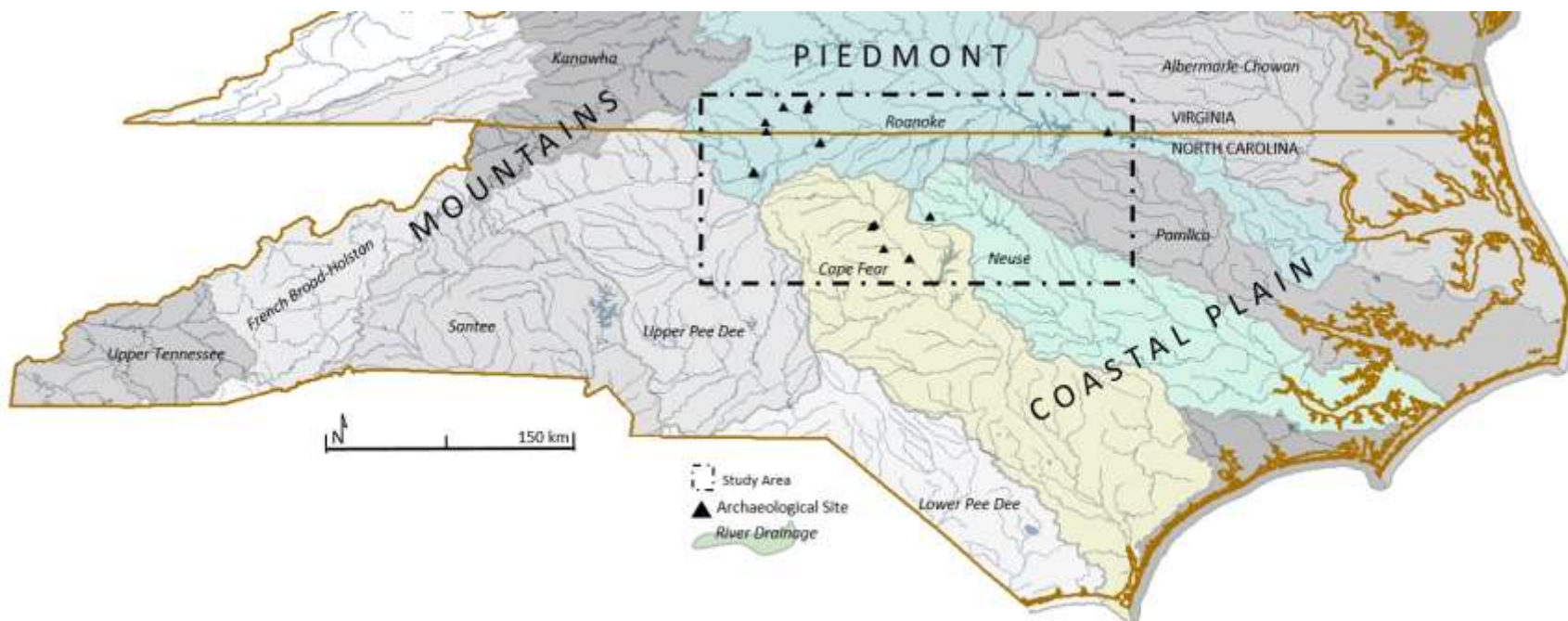


Figure 1.1: North Carolina and Virginia Physiographic Regions and River Drainages

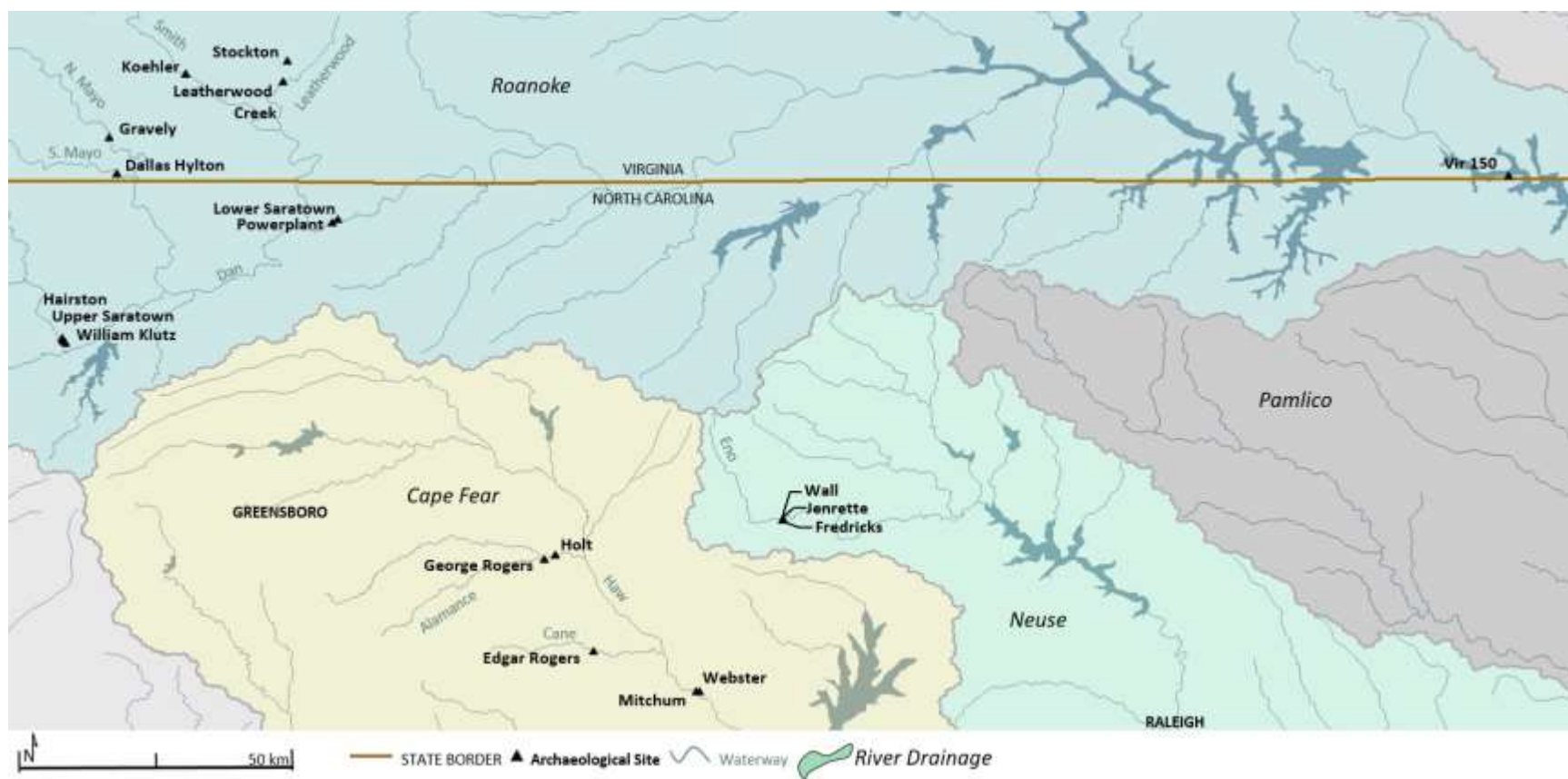


Figure 1.2: Study Area

Table 1.1: Study Sites

Site Name	County, State	River Basin	River	Occupation (AD)	Date Range (AD)	Phase
Vir 150	Mecklenburg, VA	Roanoke	Roanoke	1000-1400	1000-1450	Unknown
Stockton	Henry, VA	Roanoke	Smith	1000-1450		Dan River
Powerplant	Rockingham, VA	Roanoke	Dan	1000-1450		Dan River
Koehler	Henry, VA	Roanoke	Smith	1250-1450		Dan River (Late)
Leatherwood Creek	Henry, VA	Roanoke	Smith	1250-1450		Dan River (Late)
Gravely	Henry, VA	Roanoke	N. Mayo	1250-1450		Dan River (Late)
Dallas Hylton	Henry, VA	Roanoke	S. Mayo	1250-1450		Dan River
Hairston I	Stokes, NC	Roanoke	Dan	1250-1450		Dan River (Late)
Hairston II	Stokes, NC	Roanoke	Dan	1450-1620	1450-1620	Early Saratown
Hairston III	Stokes, NC	Roanoke	Dan	1620-1670	1620-1710	Middle Saratown
Lower Saratown	Rockingham, NC	Roanoke	Dan	1620-1670		Middle Saratown
Upper Saratown	Stokes, NC	Roanoke	Dan	1620-1710		Historic
William Klutz	Stokes, NC	Roanoke	Dan	1670-1710		Late Saratown
Holt	Alamance, NC	Cape Fear	Haw	1000-1400	1000-1450	Haw River
Webster	Chatham, NC	Cape Fear	Haw	1000-1400		Haw River
George Rogers	Alamance, NC	Cape Fear	Haw	1400-1600	1450-1620	Hillsboro
Edgar Rogers	Alamance, NC	Cape Fear	Haw	1500-1600		Hillsboro (Late)
Mitchum	Chatham, NC	Cape Fear	Haw	1600-1670	1620-1710	Mitchum
Wall	Orange, NC	Neuse	Eno	1400-1600	1450-1620	Hillsboro
Jenrette	Orange, NC	Neuse	Eno	1660-1680		Jenrette
Fredricks	Orange, NC	Neuse	Eno	1680-1710	1620-1710	Fredricks

Table 1.2: Assemblage Information

Site Name	State Site No.	Recovery Method	Screen Mesh Size	Data Source	Site Report Reference
Vir 150	44Mc645	screened, dry	3/8	VanDerwarker 2001:Table 4	Vanderwarker 2001
Stockton	44Hr35	hand recovery	n/a	VanDerwarker 2001:Table 6	Davis et al. 1997a
Powerplant	31Rk5	screened, water	1/2, 1/4, 1/16	Holm 1993:Table 10.4	Ward & Davis 1993
Koehler (Gravely exc.) <sup>1</sup>	44Hr6	hand recovery	n/a	VanDerwarker 2001:Table 12	Coleman & Gravely 1992
Koehler (Clark exc.) <sup>2</sup>	44Hr6	screened	1/16	VanDerwarker 2001:Table 14	
Leatherwood Creek	44Hr1	hand recovery	n/a	VanDerwarker 2001:Table 16	Gallivan 1997
Gravely	44Hr29	screened, dry & water	1/2, 1/4, 1/16	VanDerwarker 2001:Table 8	Davis et al. 1997b
Dallas Hylton	44Hr20	hand recovery	n/a	VanDerwarker 2001:Table 10	Davis et al. 1998
Hairston	31Sk1	screened, water	1/2, 1/4, 1/16	Holm 1994:Table 5.3	Wilson 1983 Ward & Davis 1988
Lower Saratown	31Rk1	screened, water	1/2, 1/4, 1/16	Holm 1993:Table 9.8	Ward & Davis 1993
Upper Saratown	31Sk1a	screened, water	1/2, 1/4, 1/16	Holm 1994:Table 5.2	Wilson 1983
William Klutz	31Sk6	screened, water	1/2, 1/4, 1/16	Holm 1993:Table 11.8	Ward & Davis 1993
Holt	31Am168	screened, water	1/2, 1/4, 1/16	Holm 1993:Table 4.4	
Webster	31Ch465	screened, water	1/2, 1/4, 1/16	Holm 1993:Table 8.4	
George Rogers	31Am220	screened, water	1/2, 1/4, 1/16	Holm 1993:Table 6.4	
Edgar Rogers	31Am167	screened, water	1/2, 1/4, 1/16	Holm 1993:Table 3.4	
Mitchum	31Ch452	screened, water	1/2, 1/4, 1/16	Holm 1993:Table 7.6	Dickens et al. 1987 Ward & Davis 1993
Wall	31Or11	screened, dry & water	1/2, 1/4, 1/16	Holm 1987:Table 10.1	Dickens et al. 1987
Jenrette	31Or231a	screened, water	1/2, 1/4, 1/16	Holm 1993:Table 12.8	Ward & Davis 1993
Fredricks	32Or231	screened, dry & water	1/2, 1/4, 1/16	Holm 1987:Table 10.2	Dickens et al. 1987

<sup>1</sup> The first excavation at the Koehler site was conducted by Richard Gravely in 1968. No screening or flotation was used, which may result in sampling bias.

<sup>2</sup> The second excavation at the Koehler site was conducted by Wayne Clark in 1968. All features were dry screened. Most features were also water-screened.

## PIEDMONT CHRONOLOGY

The Piedmont region of what is currently North Carolina and southern Virginia was first occupied as early as 13,000 years ago. Five major cultural traditions demarcate the culture history of this region: Paleo-Indian (before 8000 BC), Archaic (8000-1000 BC), Woodland (1000 BC-AD 1600), Mississippian (c. AD 1200-1600), and Historic (after c. AD 1600) (Ward and Davis 1993:Figure 1.5). The present study focuses on three components of the Late Woodland and Historic periods as analytical units of comparison: the years of village development and population growth between AD 1000-1450; the period of pre-contact coalescence and early, sporadic, and indirect contact during AD 1450-1620; and the early contact time of tenuous negotiations of regional identity, changing power relations, and new modes of production and exchange (AD 1620-1710). When referring to village sites in my discussion, I will reference these date ranges rather than their specific dated occupations. For site occupation dates, consult Table 1.1.

The Late Woodland period between AD 1000 and 1450 was characterized by growing populations, larger and more consolidated villages, and more complex social structures than the preceding cultural traditions (Ward and Davis 1999:76). Through the eleventh to thirteenth centuries, the communities of the Piedmont continued to solidify local identities and had distinct cultural practices including unique ceramic production techniques and subsistence strategies, but adhered to overarching regional traditions, like the organization of settlements, for example (Ward and Davis 1999:77-78). Beginning in the late fourteenth and early fifteenth centuries, this period saw increasing intensification of agricultural practices that later incorporated corn and beans (Gremillion 1995). Furthermore, bioarchaeological evidence for interpersonal violence, paired with the appearance of stockade settlements, indicates intergroup conflict. Violence also

increased after c. AD 1450, possibly as a result of Iroquois raiding parties invading the Piedmont as early as the mid-fifteenth century (Davis and Ward 1989:2). These changes in subsistence practices and sociopolitical settings coincided with an increase in population size within more densely consolidated (and later, stockaded) villages and towns (Ward and Davis 1999:98-99).

The earliest European presence in the Southeast is represented by the Spanish expeditions led by Hernando de Soto (AD 1539-1541) and Juan Pardo (AD 1566-1568). Piedmont tribes, however, did not experience prolonged European contact until the early eighteenth century when English began settling the area. After the establishment of Jamestown in 1607 and subsequent decimation of Chesapeake game by 1650 (Holm 1994:15), English and German colonizers began exploring the Southeast and indirectly trading with Native Piedmont communities. As Holm (1994:15) stated, “intercultural exchange had little impact” on daily life during AD 1450-1620. Even European pathogens had not yet affected some Piedmont communities by c. 1680 (Ward and Davis 1999:237).

During the mid to late seventeenth century between AD 1680-1710, however, intensifying trade and the introduction of European diseases, paired with the founding of new colonial towns such as New Bern, altered Native ways of being and intensified preexisting intergroup conflict (Melton 2018); for example, many Native communities were forced out of their ancestral homelands, resulting in “considerable cultural disruption” (Holm 1994:21). As Holm argued “[i]n an approximately 20-year period, the tribes of the Piedmont changed from groups which were barely touched by the European presence to groups that were forced to participate heavily in the deerskin trade in order to obtain the weapons necessary to defend themselves against warriors from the north who had themselves received firearms through trade with the Europeans” (Holm 1994:20). Thus, the effects of cultural diaspora, intertribal violence,

and spread of disease resulted in strained and fraught Native coalescence in the first decade of the eighteenth century. The impact of these changes on local foodways on a regional scale and in comparison to preceding traditions, however, has not been explicitly interrogated.

## RESEARCH QUESTIONS

With this rich culture history and the supporting archaeological research in mind, I pursue research questions aimed at providing detailed regional information about the subsistence practices of the Piedmont. First, I review what Vanderwarker (2001) and Holm (1987, 1993, 1994) have identified regarding which animals were utilized (and in what capacity) by Native groups for subsistence within the Piedmont during the Late Woodland and Historic periods. Based on their findings I ask, were Native groups practicing regionally specific subsistence strategies that can be distinguished among and between river basins? Vanderwarker (2001) identified one possible regional pattern within the Roanoke River basin: vertebrate species abundance and diversity differ between sites located along main waterways and sites located along their tributaries. She suggested this pattern may be the result of different local catchment zones, as Lapham (2011:413) has noted elsewhere. Is this pattern also discernable within the Cape Fear and Neuse River basins? And, do rigorous spatiotemporal analyses reveal any other potential explanations for this variation?

In this study, I explore whether a typical Late Woodland Piedmont foodway can be identified zooarchaeologically. Alternatively, I also ask, were Late Woodland subsistence practices of the Piedmont villages variable and heterogeneous? If so, why might such variation have existed? Holm (1994:183-4) found that the Native Piedmont subsistence systems were resilient in the face of climatic shifts and cultural disruption by tailoring hunting, gathering, and

planting activities to seasonal availability. In this regard, Late Woodland Piedmont subsistence strategies were varied and broad-based, but withstanding through time. I seek to identify these patterns of subsistence practices through time.

In addition, I address the question, did Native communities alter their subsistence strategies from the Late Woodland period to the Historic period? How so, and why? Holm (1994:185) found that “many of the results of contact were not really innovations, but rather were intensifications of previously existing patterns.” Did all subsistence practices intensify in the Historic? If not, which ones were changed, and how so?

I will address these questions through a zooarchaeological and geospatial meta-analysis. First, I describe the environmental and cultural settings of the Late Woodland and Historic periods. In this discussion, I also review previous research conducted in this area. Second, I discuss two case studies from the neighboring geophysical regions, the mountains and the coast, that aid in answering questions about Native Piedmont subsistence practices. Third, I explain my methods of inquiry. I discuss meta-analysis and why might it be important to the future of zooarchaeological research. Then, I address what geographic information sciences can offer zooarchaeological research. Fourth, I detail the results of my study to elucidate patterns between and across sites in different river drainages. In the discussion following, I consider how such patterns could have arisen in the context of the Late Woodland and Historic environmental and cultural settings. Lastly, I offer potential avenues for future research in light of my findings.



## **CHAPTER 2: BACKGROUND**

In this chapter, I detail the particular geographic, ecological, and cultural settings of the Late Woodland and Historic Piedmont. First, I describe the general characteristics of Piedmont physiogeography and the move to a description of the ecologies of each river drainage of interest more specifically. I rely on both current ecological data as well as historical accounts to construct a picture of Piedmont life during this time. Second, I offer a more detailed understanding of the culture history of the Piedmont based on previous archaeological research. In this discussion, I return to explaining the analytical categories into which I grouped the sites of interest.

### **ENVIRONMENTAL SETTING**

A major goal of the present study is to explore the ways in which subsistence practices vary within the Late Woodland and Historic Piedmont. While characterized as a bounded physiographic region distinct from its neighboring regions of the Blue Ridge Mountains to the west and Coastal Plains to the east, the Piedmont of today is a patchy, uneven ecosystem recognized as highly heterogeneous and variable (Winterhalder 1980:136). Furthermore, the current ecological character of the Piedmont is remarkably different from the area as it existed between AD 1000 and the 1700s. Even within this seven-hundred-year period, the Piedmont ecosystem was neither stable nor homogenous across time and space (Holm 1994). The following sections describe the spatial and temporal heterogeneity that characterized this portion of the Piedmont during this time period, but first I will describe the Piedmont region as a whole. After this brief review, I turn to describing the environmental setting of the spatiotemporal units

of comparison on which I rely for analysis: the Roanoke, Cape Fear, and Neuse River drainages and the years spanning AD 1000-1450, AD 1450-1620, and AD 1620-1710.

The Piedmont plateau of North Carolina and Virginia is bounded by the Atlantic Coast and Coastal Plains to the east and Appalachian Mountains to the west (Figure 1.1). The Piedmont extends beyond North Carolina and Virginia, stretching north to New Jersey and south to central Alabama. The present-day cities of Raleigh, Greensboro, Roanoke, and Lynchburg reside within the region of interest to the present study (Figure 1.2). The Piedmont of today can be broadly characterized by its remnant metamorphic mountains and dissected plateaus host to high velocity streams and rivers as well as mixed hardwood and pine forests comprised of oak, hickory, beech, maple, poplar, and white or loblolly pine trees (Duncan and Duncan 1988). The Piedmont's hills range from 122 meters in elevation at the coastal plain to 610 meters above sea level in the western foothills of the Appalachian Mountains (Mathis and Crow 1983). Its river valleys provide rich nourishment for fertile bottomlands, though the present-day Piedmont is experiencing mass wasting of soils due to erosion caused in large part by extensive deforestation for agricultural production and industrial development, which started as early as the late eighteenth century (Beyer 1991; Mathis and Crow 1983).

The present study area focuses on the Roanoke, Cape Fear, and Neuse River basins of the Piedmont in what is currently North Carolina and Virginia. Generally, this region witnesses distinct but temperate seasons that carve out ecological niches for hardy plants and animals to thrive throughout the year in the humid summers and cool winters, though this was not necessarily the case throughout the Late Woodland and Historic periods.

To the north, the Roanoke is the largest drainage, spanning over 25,000 square kilometers, though only 9,300 sq. km. fall within the study area. This drainage serves many

rivers, lakes, and estuaries, but of particular interest are the Roanoke and Dan Rivers and those that feed into them: the South and North Mayo rivers, Smith River, and Leatherwood Creek. According to the North Carolina Department of Environmental Quality, the Roanoke River basin comprises over 3,500 km of rivers and streams, over 81,000 acres of lakes, and almost 1,500 acres of estuary. It currently hosts the densest populations of white-tailed deer, wild turkey, and black bear out of all the river drainages in the present study (NC DEQ 2018a). Furthermore, over 200 species of birds are currently found within this basin, over 100 of which are migratory, and its rivers act as important migratory mating runs for bass, herring, and other anadromous fish. The Roanoke River carries more water and has the widest floodplain of any North Carolina river. As a result, frequent flooding events consistently alter the landscape of the Roanoke River drainage. At present, however, the Roanoke River has been dammed for almost 70 years, which mitigates fluxes in flooding but has also submerged historically dry areas of the basin. The Dan River forms part of the Roanoke headwaters and provides habitat for a diverse range of plants and animals that are also represented within the larger drainage.

The Cape Fear River drainage, located in the central Piedmont, is the largest basin within the study area; its 23,000 square kilometers include the Haw and Deep Rivers to the north forming the basin's headwaters, and the South, Cape Fear, and Black Rivers to the south. In total, this drainage contains over 10,000 km of streams and rivers, almost 35,000 acres of lakes, and 25,000 acres of estuary (NC DEQ 2018b). Of particular interest in the present study is the Haw River and its tributaries, Alamance and Cane creeks. Heavy industrial manipulation of these Cape Fear waterways as early as the mid-nineteenth century has affected the current biodiversity of the region. Further use of the Haw River as industrial fish, crab, and shrimp nurseries, coupled with prolonged pollution due to turpentine distilling and livestock operations, have

fundamentally altered the surrounding ecology. Still, the Haw River and its tributaries support almost 100 species of fish and many other mammalian, reptilian, and avian species including white-tailed deer, box turtle, and wild turkey.

The Neuse River drainage, to the east of Cape Fear, is the smallest of the study region at 15,700 sq. km., though it is home to the expansive and wandering Neuse River. At its mouth, the Neuse is currently the widest river in the United States at over 9 km across. The present study focuses on the archaeological sites situated along the Eno River, which acts as an important spawning area for shad, herring, bass, and other anadromous species of fish. Its brackish, slow-traveling water also supports a rich forest ecology home to white-tailed deer, wild turkey, small mammals, migratory birds, and reptiles such as snapping and box turtles (NC DEQ 2018c).

The Little Ice Age, spanning c. 1450 to 1850, helped to shape the humid subtropical climatic environment those of us in the Piedmont experience today. This climatic type is characterized by hot, humid summers and short, mild winters, both interspersed with fairly high precipitation (Peel et al. 2007). According to the North Carolina Climate Office, temperatures in the Southeast vary according to altitude and season. In the summer months, maximum temperatures vary between 88° F and 92 ° F, though the Piedmont has reached up to 110 ° F in recent years (Clay et al. 1975:93-101). Minimum temperatures in the Piedmont during the winter hover around the freezing point, but have reached as low as -3 ° F in recent years (NCCO 2008a). Mean annual rainfall for the Piedmont ranges between 40 and 50 inches, most of which falls during the humid summer months and very rarely occurs during the fall (NCCO 2008b). The Little Ice Age, however, was characterized by temperatures at an average of 5 ° F lower than those of today (Lamb 1963). This resulted in harsher, colder winters, though some researchers argue they alternated with “uncommonly warm” years, creating a somewhat unpredictable and

variable ecological landscape (Ogilvie 1984; Roundtree 1989). Before the Little Ice Age, regional variability characterized the locally distinct and “patchy” ecologies of the river basins (Gremillion 1989:138), though the Late Woodland Piedmont can be broadly characterized along parameters similar to those of today: forested and temperate.

The current understanding of Piedmont ecology, however, cannot simply be projected onto the environment of the Late Woodland and Historic periods. In the following sections, I review what we know about the cultural and environmental settings of these periods in the North Carolina Piedmont.

## CULTURAL SETTING

In the following section, I describe the various cultural trends and shifts characteristic of the range of time between AD 1000 and 1710. I also explain, from a culture history perspective, why I group the study sites into three date ranges: AD 1000-1450, AD 1450-1620, and AD 1620-1710. Later, when I outline my methodological considerations, I return to addressing this choice from an analytical perspective. In the present discussion, however, I contextualize the study sites within broader spatiotemporal cultural trends of the Southeast, and specifically, the Piedmont.

During the Late Woodland period, the once-sporadically utilized cultural innovations of pottery production, semi-sedentary villages, and horticulture became the norm (Ward and Davis 1999:76). Native communities of the Piedmont developed distinct regional styles of making and designing ceramic vessels (Ward and Davis 1999:76-137). These styles were probably influenced by the practices in other regions to the north and south of the Piedmont (Ward and Davis 1999:98), indicating a wide network of exchange and interaction beyond the Piedmont.

The increasing popularity of pottery-making may have, in part, been a result of peoples' increasing reliance on both wild and domestic seed crops at the end of the preceding Middle Woodland period (Smith 1986), such as knotweed, sumpweed, squash, bottle gourds, sunflower, maygrass, and goosefoot (Gremillion 2011:387-40; Scarry 2003:50-104; Smith 1992:14; Yarnell and Black 1985). Though maize was introduced well before this time (AD 200), archaeologists agree that Piedmont groups did not widely incorporate the crop into existing horticultural rounds until AD 1000 (Scarry 2008). In addition, beans were not incorporated into Piedmont subsistence for another 200 years after that (Smith 1992:203). To accommodate this intensification of horticultural practices, communities relied on more permanent settlements than the previous periods. Or perhaps, the intensification of horticultural practices was required in order to accommodate changes in lifeways of more permanent settlements.

As Steponaitis (1986:378) noted, however, these changes in subsistence and settlement organization did not alter people's reliance on or preference for hunting, scavenging, trapping, and gathering wild plants and animals for food. Hardwood nuts such as acorn, hickory, and beech nuts were the primary plant food collected and managed by Piedmont groups, but other plants such as wild grape, passionfruit, persimmon, sedges, and grasses were also integral to their subsistence (Scarry 2003). Broadly, researchers have found that animals such as white-tailed deer, muskrat, raccoon, tree squirrels, beaver, opossum, otter, turkey, box turtle, bullhead catfish, and freshwater mollusks were staples in Early and Middle Woodland subsistence of the Piedmont (Lapham 2006, 2011).

More specifically, Lapham (2011:412) characterizes Late Woodland subsistence strategies as having "incorporated a variety of locally available resources from nearby catchment areas," though they predominantly focused on deer as "the primary terrestrial meat." During this

time, Piedmont communities lived in both permanent or semi-permanent villages as well as short-term special-use camps. These camps often specialized in the “exploitation of species with limited seasonal availability, such as migratory waterfowl and certain fishes” (Lapham 2011:412). Lapham (2011:413) also noted that “even minor differences in local catchment areas influenced animal procurement strategies.” Collecting freshwater shellfish, however, was a “widespread practice in the late prehistoric Southeast” (Lapham 2011:414).

After about AD 1000, as people began focusing more heavily on horticulture and specifically the cultivation of corn, the small and scattered villages of the Piedmont grew into larger, more nucleated settlements (Ward and Davis 1999:78). Mortuary studies and bioarchaeological research indicate that some social distinctions and stratification existed within these largely egalitarian groups, and such distinctions were primarily based on age and gender (Ward and Davis 1999: 79). Yet, as villages continued to grow intergroup conflicts increased. As early as the beginning of the Late Woodland Period, and definitely by AD 1000, it became common for larger villages to be surrounded by stockades and palisades. Food surpluses brought on by intensified horticulture and agriculture practices were likely one of the enticing reasons for groups to raid neighboring villages (Ward and Davis 1999:98).

Such intercommunity interactions, subsistence practices, and techniques of settlement organization persisted well into the Late Woodland Period, but solidified further at around AD 1400-1450. People congregated in fewer but larger settlements and more densely populated villages, having to repeatedly and constantly rebuild and renovate their stockade walls and palisades (Ward and Davis 1999). By this time, the eastern agricultural triad of corn, beans, and squash had been adopted by most Native Piedmont communities. Elsewhere to the south, Mississippian peoples used this combination to develop extensive agricultural systems and, as a

result, supported the rise of complex, hierarchical societies (Ward and Davis 1999:78). In the Late Woodland Piedmont, feasting events marked communitywide ceremonies and celebrations. Some have described the period between c. AD 1400 and 1600 as the agricultural and socioeconomic peak of the Piedmont before European contact (Ward and Davis 1999). Holm (1994:15) poignantly refers to this period as the Protohistoric period (AD 1400-1600).

As early as AD 1525 the Spanish expedition team led by Pedro de Quejo investigated what is currently North Carolina's coast for potential sites for settlement (Hoffman 1994:40). Soon after, Hernando de Soto's expedition arrived in the Carolinas in 1540 (Hudson et al. 1984:73-75) and ventured inland. Twenty years later, Juan Pardo retraced de Soto's route through the Piedmont—twice (Ward and Davis 1999:229). While the Spaniards clearly travelled extensively through the region, they did not establish any permanent settlements in the Piedmont, although Pardo established a series of short-lived forts in the region (Beck et al. 2016). Additionally, there is no archaeological evidence for Spanish influence among the Native communities of the Piedmont during this time (Ward and Davis 1999:231).

The English invaders, by contrast, sought to establish lasting settlements both along the Carolina coast and within the Piedmont. Starting in AD 1584, Sir Walter Raleigh enacted plans for a colony on Roanoke Island—only for John White to return in AD 1590 to a ghost town (Morton 1960:3; Powell 1989:42-42; Quinn 1985). To the northwest, however, English settlers were more successful in such pursuits. By the early seventeenth century, multiple English colonies had been established within the Chesapeake and Piedmont regions of what is currently Virginia. Most archaeologists identify this time, c. AD 1600-1620, as the beginning of the Historic period (Ward and Davis 1993; 1999). Holm (1994:15) described the Early Contact period (AD 1600-1660) as a time of the first sustained, direct contact between Native



Chesapeake groups and European settlers, predominantly English. She noted that sites in the Piedmont (in the area surrounding the current border between North Carolina and Virginia) contain little evidence of such interaction. In AD 1644, tensions between occupying settlers and northern Native groups exploded in the Second Pamunkey (or Powhatan) War, only to be quashed by AD 1645 (Ward and Davis 1999:232). As a result, the town of Petersburg, Virginia was founded and served as a jumping off point for further futile overland expeditions in search of East Asia. Less than 30 years later, ports opened along the Virginia and North Carolina coasts and offered a vast exchange network for traders developing the deerskin trade (Ward and Davis 1999:233).

The following Middle Contact (AD 1660-1680) and Late Contact (AD 1680-1710) periods witnessed increased interactions between Native Piedmont groups and English Virginian traders (Eastman 1992:443; Holm 1994:16). The intensification of tobacco, deerskin, and beaver pelt trade networks led to an increase in interaction between eastern Piedmont communities and Virginia traders (McManus 1989:12). By AD 1670, Virginia tobacco planters expanded their reach into the eastern Piedmont and further displaced Native communities. The next 30 years, Holm (1994:20-21) wrote, was a “time of incredible devastation from European diseases and considerable cultural disruption. Participation in the deerskin trade reached an all-time high among Piedmont groups and the use of firearms and metal tools of European manufacture became common.” Moreover, ceramic and mortuary analysis, alongside ethnohistoric accounts, indicate that a diversity of disparate Native groups lived together in densely populated villages where they experienced high mortality rates (Holm 1994:21). With devastating consequence, European traders “ceased to obey Indian customs when visiting [N]ative villages” and by the

early eighteenth century Piedmont Native groups “had lost much of the power that had characterized their earlier relations with Virginia traders” (Holm 1994:22; Merrell 1989).

Indeed, by the time English explorer John Lawson arrived to the Piedmont in 1701, Native groups had suffered from: deadly European diseases such as smallpox, measles, and influenza; intense and violent conflict, both intertribal and with European settlers; and widespread forced relocation and displacement (Duffy 1997). Even still, archaeological evidence indicates that Native groups were very resistant to incorporating European crops and animals into their existing subsistence strategies (Ward and Davis 1999:236). Some plants, such as watermelon and peach, were widely adopted within preexisting frameworks of subsistence though they did not replace any traditional crops and were instead used alongside Native resources (Gremillion 1989, 1993, 1995). There is very little evidence for the presence of European domesticated animals in Native Piedmont communities during the Historic period, suggesting that livestock were actively rejected by Native communities. For example, only one site assemblage in the present study, that of Fredricks (1620-1710), contains single elements from a pig and horse (Holm 1987:Table 10.2). In spite of strong ties to particular longstanding Native identities and practices, Piedmont groups who survived “the ravages of disease and nearly continuous raiding” made the decision to emigrate either north to Fort Christanna or south to live in the emerging Catawba Nation (Holm 1994:23).

Based on this brief culture history, and given the accepted dates of occupation for the sites of the present study (Table 1.1), I adopted analytical categories of sites that fall within three separate date ranges: AD 1000-1450, AD 1450-1620, and AD 1620-1710. These categories are not meant to take the place of established cultural phases or periods but, rather, to act as

culturally and analytically meaningful groupings that aid in effective meta-analyses, which I define below in my discussion of the methodological considerations of this project.

## HISTORICAL ACCOUNTS OF THE PIEDMONT

Much of our understanding about the relationship between Piedmont ecology and Native American lifeways of the Late Woodland and Historic periods comes from the journals, sketches, and maps of John Lawson, an eighteenth century English colonial explorer who led a small expedition through the Carolinas in the winter months of 1700 and 1701. Ethnographic and Native research is continuously correcting, adjusting, and bolstering these early accounts of life in the Piedmont to not only add detail to such accounts but also to counter Lawson's euro- and ethno-centrism (Goertzen 2001; Jeffries 2015). Still, Lawson provides a descriptive account of eighteenth century Piedmont ecology and offer a unique point of departure for examining the human-animal interactions of the Late Woodland and Historic Piedmont communities. Quite frequently, Lawson's passages describe the intersection of subsistence activities and landscape ecology, as well as their sociocultural contexts. For example,

As we went up the River, we heard a great Noise, as if two Parties were engag'd against each other, seeming exactly like small Shot. When we approach'd nearer the Place, we found it to be some Sewee Indians firing the Canes Swamps, which drives out the Game, then taking their particular Stands, kill great Quantities of both Bear, Deer, Turkies, and what wild Creatures the Parts afford. These Sewees have been formerly a large Nation, though now very much decreas'd since the English hath seated their Land, and all other Nations of Indians are observ'd to partake of the same Fate, where the Europeans come, the Indians being a People very apt to catch any Distemper they are afflicted withal... [Lawson 1709:10]

In the above passage, Lawson details a game drive in which Sewee Indians capture bear, deer, turkeys, and other animals by burning the cane swamps to drive out game in what is currently the South Carolina coastal marshlands. While these marshlands are not the focus of the

present study, this excerpt exemplifies some important details. First, it allows for a glimpse into the types of animal resources available and those targeted as game. Second, this passage details how subsistence activities were shaped by landscape ecology—the swamp ecology attracted a variety of game and offered a particular setting for the success of a particular hunting technique. Third, Lawson describes the aftermath of the sociopolitical shifts of the early Historic period, and may even hint at earlier Mississippian sociopolitical dynamics. In fact, his description dovetails with interpretations of the earlier archaeological record that detail increased population density resulting from many independent Native nations occupying a relatively compacted area, which were then decimated by European invasion and the diseases they introduced (Crosby 1997; Rutman and Rutman 1997).

Lawson focused primarily on describing the ecology and landscape of the Carolinas to convince the colony's Lords Proprietors of the real estate's economic profits. Most of the detailed descriptions are found at the beginning of his journey in the coastal plains of what is currently South Carolina. For example:

Santee River, at this Time, (from the usual Depth of Water) was risen perpendicular 36 Foot, always making a Breach from her Banks, about this Season of the Year: The general Opinion of the Cause thereof, is suppos'd to proceed from the overflowing of fresh Water-Lakes that lie near the Head of this River, and others, upon the same Continent: But my Opinion is, that these vast Inundations proceed from the great and repeated Quantities of Snow that falls upon the Mountains, which lie at so great a Distance from the Sea, ... fills those Branches that feed these Rivers, and causes this strange Deluge, which oft-times lays under Water the adjacent Parts on both Sides this Current, for several Miles distant from her Banks; tho' the French and Indians affir'm'd to me, they never knew such an extraordinary Flood there before. [Lawson 1709:14-15]

Again, while this particular account is focused on the Santee River, such descriptions offer an understanding of regional ecological conditions. Here, Lawson not only described the seasonal flooding events typical of Carolina river basins, but also the acute changes observed by

French and Native inhabitants that may have been the result of the beginning of the end of the Little Ice Age, which is said to have ‘ended’ by c. 1850, 150 years after this account was written.

Though Lawson’s descriptive ecological writing is focused on the coastal plains, he does compare those environments to the Piedmont plateau ecology. Here, in his description of the Wateree Chickanee Nation of the southern Piedmont, Lawson notes, “[t]his Nation is much more populous than the Congerees, and their Neighbours, yet understand not one anothers Speech... Their Country is wholly free from Swamps and Quagmires, being high dry Land, and consequently healthful, producing large Corn-Stalks, and fair Grain” (Lawson 1709:32).

Furthermore, Lawson touches on the interaction between settlement pattern and the landscape:

Five Miles from this [Uwharrie] River, to the N. W. stands the Keyauwees Town. They are fortify'd in, with wooden Puncheons, like Sapona, being a People much of the same Number. Nature hath so fortify'd this Town, with Mountains, that were it a Seat of War, it might easily be made impregnable; having large Corn-Fields joining to their Cabins, and a Savanna near the Town, at the Foot of these Mountains, that is capable of keeping some hundred Heads of Cattle. And all this environ'd round with very high Mountains, so that no hard Wind ever troubles these Inhabitants. [Lawson 1709:50]

Lawson described the central Piedmont Keauwees Town as a palisaded, strategically protected settlement, nearby to a navigable river with agricultural fields and “Savanna,” or human-made clearings, abutting the town. This description offers a similar picture of the settlement patterns of the Piedmont that has been interpreted archaeologically (Ward and Davis 1999).

This high dry land also provided the habitats for a wide variety of animals. In fact, Lawson’s descriptions may provide critical details to parse out local differences in species abundance and richness. For example, in the “Kadapau Indian” territory, understood to be the Catawba Nation’s territory in the southern Piedmont (Mooney 1984:71), Lawson described an abundance of game birds such as passenger pigeons, ducks “of a strange Kind,” and Woodcocks,

all of which “prov’d excellent Meat” (Lawson 1709:44). Whereas in the Sapona territory, or in the central Piedmont, Lawson listed beavers, swans, and geese, as well as “amphibious Animals” (which, in his appendix listing the “Beasts of Carolina,” includes turtles and snakes), as incredibly common and sought-after (Lawson 1709:48, 115).

Included among these “amphibious Animals” are what Lawson refers to as the “Terebins,” or box turtle (*Terrapene* sp.):

The Land-Terebin is of several Sizes, but generally Round-Mouth'd and not Hawk-Bill'd, as some are. The *Indians* eat them. Most of them are good Meat, except the very large ones; and they are good Food too, provided they are not Musky. [...] Water Terebins are small; containing about as much Meat as a Pullet, and are extraordinary Food; especially, in *May* and *June*. When they lay, their Eggs are very good. [Lawson 1709:133-134]

Here, Lawson alluded to the Native preference for turtle meat. Furthermore, Lawson indicated that certain species of *Terrapene* are considered tastier in the late spring and early summer, which allows for an understanding of site seasonality.

Another highly utilized species, passenger pigeon (*Ectopistes migratorius*), can also shed light on the seasonal rounds of Native subsistence strategies. On the way to Sapona territory, Lawson wrote of the massive passenger pigeon flocks he encountered:

we went to shoot Pigeons, which were so numerous in these Parts that you might see many Millions in a Flock; they sometimes split off the Limbs of stout Oaks, and other Trees, upon which they roost o' Nights. You may find several *Indian* Towns, of not above 17 Houses, that have more than 100 Gallons of Pigeons Oil, or Fat; they using it with Pulse, or Bread, as we do Butter, and making the Ground as white as a Sheet with their Dung. The *Indians* take a Light, and go among them in the Night, and bring away some thousands, killing them with long Poles, as they roost in the Trees. At this time of the Year, the Flocks, as they pass by, in great measure, obstruct the Light of the day. [Lawson 1709:44-45]

Yet, despite their numbers, passenger pigeons were not a perennial food resource:

You must understand, that these Birds do not breed amongst us, (who are settled at, and near the Mouths of the Rivers, as I have intimated to you before) but come down (especially in hard Winters) amongst the Inhabitants, in great Flocks, as

they were seen to do in the Year 1707, which was the hardest Winter that ever was known, since Carolina has been seated by the Christians. [Lawson 1709:140]

Furthermore, flocks of passenger pigeon were most numerous in the western edges of the Piedmont near the foothills of the Blue Ridge Mountains:

Although the Flocks are, in such Extremities, very numerous; yet they are not to be mention'd in Comparison with the great and infinite Numbers of these Fowl, that are met withal about a hundred, or a hundred and fifty, Miles to the Westward of the Places where we at present live; and where these Pigeons come down, in quest of a small sort of Acorns, which in those parts are plentifully found... [Lawson 1709:140-141]

Still, passenger pigeon flocks were common (and welcome) seasonal visitors to the Piedmont, where John Lawson witnessed them near the Yadkin River:

I saw such prodigious Flocks of these Pigeons, in *January* or *February*, 1701-2, (which were in the hilly Country, between the great Nation of the *Esaw Indians*, and the pleasant Stream of *Sapona*, which is the West- Branch of *Clarendon*, or the *Cape-Fair* River) that they had broke down the Limbs of a great many large Trees all over those Woods, whereon they chanced to sit and roost; especially the great Pines, which are a more brittle Wood, than our sorts of Oak are. These Pigeons, about Sun-Rise, when we were preparing to march on our Journey, would fly by us in such vast Flocks, that they would be near a Quarter of an Hour, before they were all pass'd by; and as soon as that Flock was gone, another would come; and so successively one after another, for great part of the Morning. It is observable, that wherever these Fowl come in such Numbers, as I saw them then, they clear all before them, scarce leaving one Acorn upon the Ground... They were very fat, and as good Pigeons, as ever I eat. I enquired of the *Indians* that dwell'd in those Parts, where it was that those Pigeons bred, and they pointed towards the vast Ridge of Mountains, and said, they bred there. [Lawson 1709: 141-142]

Lawson recognized the importance of passenger pigeon as a winter resource. He wrote, “[i]n some parts, where Pigeons are plentiful, they get of their Fat enough to supply their Winter Stores. Thus they abide in these Quarters, all the Winter long, till the Time approach for planting their Maiz and other Fruits” (Lawson 1709:208).

Turkey (*Meleagris gallopavo*) and white-tailed deer (*Odocoileus virginianus*) seem to be ubiquitous across Piedmont sub-regions. These two animals were staples in all Late Woodland

Piedmont diets, regardless of the local variation Lawson described (see Lapham 2006; 2011 for an overview of Southeastern subsistence practices). Moreover, Lawson frequently references deer and turkey in tandem with one another in his descriptions of diet or hunting practices. He wrote,

[W]e view'd the Land on both Sides the River, and found as good Tracts of dry, well-wooded, pleasant, and delightful Ground, as we have seen any where in the World, with abundance of long thick Grass on it, the Land being very level, with steep Banks on both Sides the River, and in some Places very high, the Woods stor'd every where, with great Numbers of Deer and Turkies, we never going on Shoar, but we saw of each Sort. [Lawson 1709:67]

And later,

We found a very large and good Tract of Land, on the N. W. Side of the River, thin of Timber, except here and there a very great Oak, and full of Grass, commonly as high as a Man's Middle, and in many Places to his Shoulders, where we saw many Deer, and Turkies... [Lawson 1709:68]

Deer and turkey clearly played key, complementary roles to one another in Native Piedmont subsistence practices during the Historic period. Turkeys were plentiful across the Piedmont:

Of Turkeys they have abundance; especially, in Oak-Land, as most of it is, that lies any distance backwards. I have been often in their Hunting-Quarters, where a roasted or barbakued Turkey, eaten with Bears Fat, is held a good Dish; and indeed, I approve of it very well. [Lawson 1709:207]

Most of these turkeys, Lawson noted, “weigh’d no less than 40 Pounds,” providing ample meat for tasty dishes (Lawson 1709:27,207). “I have seen half a turkey,” Lawson wrote, “feed eight hungry Men for two Meals” (Lawson 1709:149).

Additionally, according to Lawson’s descriptions, Native Piedmont communities had domesticated or tamed turkeys by the Historic period:

There are great Flocks of [wild turkey] in *Carolina*. I have seen about five hundred in a Flock; some of them are very large. [...] Sometimes the wild breed with the tame ones, which, they reckon, makes them very hardy, as I believe it



must. I see no manner of Difference betwixt the wild Turkeys and the tame ones; only the wild are ever of one Colour, (*viz.*) a dark gray, or brown, and are excellent Food. They feed on Acorns, Huckle-Berries, and many other sorts of Berries that *Carolina* affords. The Eggs taken from the Nest and hatch'd under a Hen, will yet retain a wild Nature, and commonly leave you, and run wild at last, and will never be got into a House to roost, but always perch on some high Tree, hard-by the House, and separate themselves from the tame sort, although (at the same time) they tread and breed together. I have been inform'd that if you take these wild Eggs, when just on the point of being hatch'd, and dip them (for some small time) in a Bowl of Milk-warm Water, it will take off their wild Nature, and make them as tame and domestick as the others. Some *Indians* have brought these wild Breed hatch'd at home, to be a Decoy to bring others to roost near their Cabins, which they have shot. [Lawson 1709:149-150]

This excerpt suggests that not only were turkeys incredibly important and plentiful in Native Piedmont subsistence strategies but also Native communities had domesticated, or at the very least “tamed” wild turkeys well before Lawson wrote this in his diary.

Deer, by all accounts, were the most important mammalian species utilized by Native Piedmont communities during this time. In his appendix, “Beasts of Carolina,” Lawson described “Fallow-Deer” as

taller and longer-legg'd, than [those] in *Europe*; but neither run so fast, nor are so well haunch'd. Their Singles are much longer, and their Horns stand forward, as the others incline backward; neither do they beam, or bear their Antlers, as the *English* Deer do. Towards the Salts, they are not generally so fat and good Meat, as on the Hills. [Lawson 1709:123]

and “Stags of Carolina” as

lodg'd in the Mountains. They are not so large as in *Europe*, but much larger than any Fallow-Deer. They are always fat, I believe, with some delicate Herbage that grows on the Hills; for we find all Creatures that graze much fatter and better Meat on the Hills, than those in the Valleys: I mean towards and near the Sea. [Lawson 1709: 123]

Throughout his account, Lawson described innumerable encounters with deer (in the form of deer hunting, eating deer meat, using or trading deerskins and deer bone tools, et cetera) while

traveling through the Piedmont. In one instance, he described a particular method Native hunters utilized to capture deer:

[Native hunters] commonly go out in great Numbers, and oftentimes a great many Days Journey from home, beginning at the coming in of the Winter; that is, when the Leaves are fallen from the Trees, and are become dry. 'Tis then they burn the Woods, by setting Fire to the Leaves, and wither'd Bent and Grass, which they do with a Match made of the black Moss that hangs on the Trees in *Carolina*, and is sometimes above six Foot long. This, when dead, becomes black, (tho' of an Ash-Colour before) and will then hold Fire as well as the best Match we have in *Europe*. In Places, where this Moss is not found, (as towards the Mountains) they make Lintels of the Bark of Cypress beaten, which serve as well. Thus they go and fire the Woods for many Miles, and drive the Deer and other Game into small Necks of Land and Isthmus's, where they kill and destroy what they please. [Lawson 1709:206-207]

In this passage, he also described how Native hunters approached turkeys: “[a]ll small Game, as Turkeys, Ducks, and small Vermin, they commonly kill with Bow and Arrow, thinking it not worth throwing Powder and Shot after them” (Lawson 1709:207).

Furthermore, both deer and turkey play an active role in constructing the cosmology, worldviews, and social landscape of Piedmont life. In addition to the strategies described above, Native hunters adopted the likeness and persona of white-tailed deer to hunt:

He was the tallest *Indian* I ever saw, being seven Foot high, and a very straight compleat Person, esteem'd on by the King for his great Art in Hunting, always carrying with him an artificial Head to hunt withal: They are made of the Head of a Buck, the back Part of the Horns being scapt and hollow, for Lightness of Carriage. The Skin is left to the setting on of the Shoulders, which is lin'd all around with small Hoops, and flat Sort of Laths, to hold it open for the Arm to go in. They have a Way to preserve the Eyes, as if living. The Hunter puts on a Match-coat made of Deer's Skin, with the Hair on, and a Piece of the white Part of the Deer's Skin that grows on the Breast, which is fasten'd to the Neck-End of this stalking Head, so hangs down. In these Habiliments an *Indian* will go as near a Deer as he pleases, the exact Motions and Behaviour of a Deer being so well counterfeited by 'em, that several Times it hath been known for two Hunters to come up with a stalking Head together, and unknown to each other, so that they have kill'd an *Indian* instead of a Deer, which hath happen'd sometimes to be a Brother, or some Dear Friend; for which Reason they allow not of that Sort of Practice, where the Nation is populous. [Lawson 1709:22-23]

Similar practices have been explored elsewhere, such as the Mesolithic Star Carr site in northern England (Conneller 2004). Conneller examined the use of red deer antler masks to explore the agency of deer in producing different types of bodies, human or otherwise. It is possible a similar phenomenon was at play in the Carolina Piedmont, though that line of inquiry is beyond the scope of the present study.

In describing the Keyauwee treatment of deer and turkey bones after preparing and eating a meal, Lawson mentioned that “All the Indians hereabouts carefully preserve the Bones of the Flesh they eat, and burn them, as being of Opinion, that if they omitted that Custom, the Game would leave their Country, and they should not be able to maintain themselves by their Hunting” (Lawson 1709:52). This is not unlike the Santee practice of veneration bestowed on ancestors and community members who have passed:

As soon as the Flesh grows mellow, and will cleave from the Bone, they get it off, and burn it, making all the Bones very clean, then anoint them with the Ingredients aforesaid [Root beaten to Powder, which looks red as Vermilion; the same is mix'd with Bear's Oil], wrapping up the Skull (very carefully) in a Cloath artificially woven of Possoms Hair. [...] The Bones they carefully preserve in a wooden Box, every Year oiling and cleansing them: By these Means preserve them for many Ages... [Lawson 1709:22]

During this process, a member of the deceased's family

addresses himself to the People of that Town or Nation, and bids them supply the dead Man's Place, by following his steps, who, he assures them, is gone into the Country of Souls, (which they think lies a great way off, in this World, which the Sun visits, in his ordinary Course) and that he will have the Enjoyment of handsome young Women, great Store of Deer to hunt, never meet with Hunger, Cold or Fatigue, but every thing to answer his Expectation and Desire. This is the Heaven they propose to themselves. [Lawson 1709:180]

White-tailed deer undoubtedly had connections to the afterlife, as evidenced by this excerpt.

Furthermore, the treatment of white-tailed deer remains mirrored that of venerated ancestors, speaking to the potential consideration of deer as agentic and subjective beings.

Such practices and worldviews may have contributed to the fact that Native Piedmont communities were very resistant to adopting European domesticates, as has been argued elsewhere by Gremillion (1989, 1993, 1995) and others. In one case, for example, Lawson noted Native communities' lack of need or desire for horses:

They are of a quite contrary Disposition to Horses; some of their Kings having gotten, by great chance, a Jade, stolen by some neighbouring *Indian*, and transported farther into the Country, and sold; or bought sometimes of a *Christian*, that trades amongst them. These Creatures they continually cram, and feed with Maiz, and what the Horse will eat, till he is as fat as a Hog; never making any farther use of him than to fetch a Deer home, that is killed somewhere near the *Indian's* Plantation. [Lawson 1701:38]

Rather than understanding this aversion to horses and other European domesticates as disinterest, it is more useful to understand that, in light of the deeply held beliefs and practices surrounding traditional subsistence practices, Native Piedmont communities chose to disregard these animals in acts of self-determination, cultural expression, and resistance.

Despite the utility of journals such as Lawson's, it must be noted that they came at great costs to Native communities of the Piedmont. By Lawson's own account, for example, his company ransacked and partially burned the home of "a famous Hunter" with little remorse or accountability:

This Night we got to one Scipio's Hutt, a famous Hunter: There was no Body at Home; but we having (in our Company) one that had us'd to trade amongst them, we made our selves welcome to what his Cabin afforded, (which is a Thing common) the Indians allowing it practicable to the English Traders, to take out of their Houses what they need in their Absence, in Lieu where of they most commonly leave some small Gratuity of Tobacco, Paint, Beads. &c. We found great Store of Indian Peas, (a very good Pulse) Beans, Oyl, Thinkapin Nuts, Corn, barbacu'd Peaches, and Peach-Bread; which Peaches being made into a Quiddony, and so made up into Loves like Barley-Cakes, these cut into thin Slices, and dissolved in Water, makes a very grateful Acid, and extraordinary beneficial in Fevers, as hath often been try'd, and approv'd on by our English Practitioners. The Wind being at N. W. with cold Weather, made us make a large Fire in the Indian's Cabin; being very intent upon our Cookery, we set the Dwelling on Fire, and with

much ado, put it out, tho' with the Loss-of Part of the Roof. The next Day we travell'd on our Way... [Lawson 1709: 17-18]

In conclusion, the Piedmont region during the years spanning AD 1000-1710 experienced environmental and cultural shifts. From ecological, archaeological, and ethnohistoric sources, I have constructed a sense of what the Late Woodland and Historic Piedmont might have looked like. The Piedmont consisted of forested rolling hills and valleys, cut apart by navigable and wandering river systems. Such river drainages contained distinct, local, and patchy ecologies which hosted myriad plants and animals. This landscape was further shaped by temperate seasons, and as such, offered many localized patches for a variety of plants and animals, including migratory species.

As the present culture history shows, these time periods were characterized by the mediation and navigation of social change by the Native communities who lived in the Piedmont. While archaeological evidence implies a broad-based subsistence economy across the Late Woodland and Historic Piedmont, Lawson's accounts hint at local variation in ecology, cultural preference, and practice. Though deer and turkey are ubiquitous across the region in both the archaeological and ethnohistoric understandings of the Piedmont, the role and impact of other species across time and space is not clear. Furthermore, as Lawson's accounts suggest, the role of animals in Native Piedmont societies spanned realms of interaction from subsistence practices to the very construction of Native worldviews.

### **CHAPTER 3: CASE STUDIES**

The present study explores zooarchaeological modes of understanding past Native subsistence practices. This exercise will directly inform the ways in which archaeologists understand how these practices were integral to the construction of identities, traditions, and worldviews. In order to first interpret faunal remains I not only build off of robust disciplinary traditions but also synthesize multiple theoretical frameworks addressing subsistence practices. As such, this section reviews two case studies of previous research conducted on Late Woodland and Historic subsistence from the neighboring mountainous and coastal environmental regions to the Piedmont (Byrd 1997; Whyte 2003). In tandem with the present study, these case studies allow for a regional perspective of patterns in subsistence practices.

#### **HISTORIC COAST: SUBSISTENCE PRACTICES AT JORDAN’S LANDNG**

In his study of Cashie phase (c. AD 673 – 1444) Tuscarora subsistence practices at the coastal Jordan’s Landing site, John Byrd addressed issues of human-environment interactions (Byrd 1997). He argued that “rising complexity does not have to relate to specific environmental circumstances” (Byrd 1997:1). Resisting environmental determinism, Byrd constructed a theoretical relationship between “subsistence and other economic data” with technology, sedentism, occupational specialization, territoriality, intergroup conflict, and class differentiation (Byrd 1997:1). With this in mind Byrd set out to make “inferences concerning subsistence practices of the Cashie phase occupants of the site as well as of Cashie peoples in general” using an evolutionary model (Byrd 1997:1-2). This model relied on diversity as a “parameter of

ecological communities” that relates to “stability, maturity, productivity, evolutionary time, predation pressure, and spatial heterogeneity” (Byrd 1997:56). In utilizing an evolutionary model, Byrd assumed two things. First, temporal continuity was not a given. Second, responses to environmental change did exhibit some spatial continuity.

Careful to resist simply applying what is known about subsistence practices in the Historic period to prehistoric cultures, Byrd argued that such falsely constructed and arbitrary continuity would “obscure any differences that might exist between subsistence practices” of different time periods (Byrd 1997:10). Instead, Byrd focused his research on faunal assemblages which originated from four Cashie phase components to make inferences about pre-contact subsistence.

His results indicated that all archaeological features analyzed lacked small mammal remains (e.g., voles, moles) and contained more large mammal (e.g., deer, bear, wolf) bone fragments than medium mammal (e.g., beaver, raccoon, squirrel) (Byrd 1997:20, 28). Reptile remains consisted mainly of turtle, while birds were poorly represented across the assemblages and what few remains were found were predominantly turkey. Distribution, evenness, and richness of fish taxa offer the most variation across features. Bony fish were most common. Lastly, freshwater mussels were present in all features.

Based on these results, Byrd inferred that “venison was in good supply” near the Jordan’s Landing site, though due to low reproduction rates of deer, “it would have been possible for a sedentary population of humans to hunt a local deer population to extinction” (Byrd 1997:64). Due to increased sedentism coinciding with the increased pressure to engage in the hide trade of the Historic period, Byrd argued that Tuscarora hunters utilized “extended hunting foray[s]

because deer and other large mammals were no longer available in sufficient numbers close to the home village” (Byrd 1997:64).

Furthermore, due to the predomination of turkey remains, Byrd concluded that waterfowl were not heavily exploited during the Cashie phase in part due to the difficulty of hunting them with so-called “primitive” weapons and the overabundance of low-cost alternatives (Byrd 1997:65-66). I find this particular conclusion suspect due to well-recorded and continuing Native traditions of expertly hunting waterfowl with what Byrd presumed were “primitive” weapons (for an alternative perspective, see Lawson 1709).

Other aquatic fauna such as reptiles, amphibians, and fish were abundant in the faunal assemblages analyzed by Byrd. This was congruent with the site’s location at the intersection of a small stream with a major river. In addition to providing abundant faunal resources, such a location offered clean drinking water, abundant easily-exploited fauna in the river, shallow areas for fish traps, “hot spots” and microhabitats for desired prey, and protected waters (Byrd 1997:66).

Byrd concluded that these results displayed characteristics of the diversification process, or the process by which “intensification in subsistence practices” occurs as “hunter-gatherers become more culturally complex,” a process that “include[s] the exploitation of new species along with technological innovation and reorganization of labor” (Byrd 1997:56). In congruence with this theory, Christensen (1980:42) hypothesized that “groups that have adopted plant horticulture but have no domesticated animals will exploit rather evenly a wide variety of animal species.” Byrd argued that the results of the diversity analysis confirm Christensen’s theory, in that “the Jordan’s Landing villagers’ subsistence practices incorporated the use of a wide variety of animal species” and “that the villagers worked to maintain a steady, high diversity of prey



species” (Byrd 1997:59-60). Ultimately, he argued that there are two major conclusions that can be drawn from his analysis. First, that agriculture “offered dependable, storable sustenance and encouraged sedentism” (Byrd 1997:67). Second, that the orientation toward aquatic resources complemented both agricultural production and sedentary living because they were easily exploitable near the site throughout the year.

Byrd’s study offers an important case study for a number of reasons. First, he outlines a particular theoretical framework for understanding subsistence practices. In combining an evolutionary model with diversification processes, Byrd displays an interpretive framework that resists a teleological application of environmental determinism across time and space. Second, his conclusions shed light on the ways in which Native communities utilized and prioritized varied subsistence practices in response to changing social and environmental settings particular to the Late Woodland.

## LATE WOODLAND MOUNTAINS: AGRICULTURAL SEDENTISM OF THE NORTHWEST MOUNTAINS

Thomas Whyte (2003) explored subsistence practices of the Late Woodland Appalachian Summit of northwestern North Carolina. In a study of Dan River-associated sites, Whyte considered the particular climatic changes, settlement patterns, and social context influencing the subsistence choices made by residents in these agricultural villages. He proposed that the Little Ice Age “brought about agricultural failures in the northern latitudes and higher elevations” in the southern Appalachian farming communities of the Late Woodland (Whyte 2003:2). This explained, he argued, the “lack of evidence of permanent human settlement at higher altitudes in the region after about AD 1450” (Whyte 2003:2).

Whyte examined assemblages from two village sites in the southern Appalachian Mountains. First, the Ward site was occupied primarily between AD 980 and 1300, though the site was often visited at earlier and later dates (Whyte 2003:5). Second, the Katie Griffith site was occupied between AD 1280 and 1400, or the middle of the Pisgah phase, and immediately post-dates the Ward site village occupation (Whyte 2003:11). Using ceramic analysis, Whyte contested the prevailing interpretation that occupants of both sites were “in some way affiliated with Mississippian chiefdoms” (Whyte 2003:11). Instead, he argued, that “their artifact assemblages simply do not fit the pattern” when taken in consideration with architectural and settlement traits (Whyte 2003:11). As a result, Whyte concluded that both sites are “assignable to the Late Woodland (not Mississippian) period,” and more specifically, to the Dan River phase (Whyte 2003:13).

Whyte also considered climatological data to make this connection. Due to variations in moisture between AD 1000 and 1600, such as prolonged droughts followed by relatively wet conditions, Whyte argued that evidence of occupation above 2,500 feet in the Appalachian Summit is most likely the result of “only seasonal visitation, probably in the fall when food resources, especially those providing protein, are at a maximum” (Whyte 2003:14-15). Unpredictable or hostile climatic conditions devastated crop production at higher altitudes and “may have led to the relocation of households to lower elevations,” especially during winter months, drought, or increased rainfall (Whyte 2003:15).

In this regard, Whyte’s study allowed for a nuanced understanding of the relationship between Piedmont and Appalachian communities in the Late Woodland and Historic period. He concluded that Appalachian villages were in close contact with Piedmont Dan River phase communities to the north and east “rather than [with] Mississippian groups to the south and

west” (Whyte 2003:16). Furthermore, according to Whyte’s conclusions, it is entirely possible that Native communities migrated seasonally across physiographic regions, from the mountains into the Piedmont and back again. Understanding such regional connections is integral to examining Piedmont subsistence practices and their far-reaching implications and influences.

## **CHAPTER 4: METHODS**

In this section I describe the analytical methods used in the present study. First, I detail the methodological considerations I addressed in building the database of zooarchaeological data and in conducting subsequent meta-analyses. In doing so I discuss best practices for performing these analyses with data collected from other researchers. Furthermore, I explain the justification behind the comparative quantitative categories I chose for my analysis. Second, I outline the geospatial analyses used for visualizing patterns in the data, specifically inverse distance weighting. In combining both traditional zooarchaeological methods with geospatial analyses, I elucidate patterns of subsistence practices across the region and throughout time.

### **META-ANALYSIS**

In order to conduct this research, I constructed a site database from previously recorded and disparate zooarchaeological datasets with the direction of Dr. Heather Lapham (details in Table 1.2). This accumulation of large datasets collected from disparate sources to address broad research questions has been referred to as meta-analysis (see Jones and Gabe [2015] and Koricheva and Gurevitch [2014] for descriptions and case studies of meta-analyses). Such types of analyses have been gaining popularity in zooarchaeological research to take advantage of the immense amount of data already collected but rarely synthesized (McKechnie and Moss 2016; Orton et al. 2014).

For example, Orton and colleagues (2014: 517) drew on accumulated zooarchaeological data to trace the role of traded marine resources in the development of London as the urban

center we recognize today. Similarly, McKechnie and Moss (2016: 470) assembled zooarchaeological data from over two hundred sites to explore the cultural and ecological dimensions of ancient fisheries on the northwestern coast of North America. Their studies revealed dynamic variability of fish utilization up and down the Pacific Coast that describe “spatial patterning within geographically and culturally distinct regions” (McKechnie and Moss 2016: 483). Such conclusions would not be possible without large datasets spanning vast geographic regions—as well as robust geospatial analyses, which I will return to later in this chapter. These types of analyses have more rarely been attempted in the analysis of terrestrial sites. While meta-analyses are a new trend in Southeastern archaeology; archaeologists of the region have a long history of comparing notes and combining datasets in order to construct broad culture histories of the region (see Coe 1952, 1964). While zooarchaeologists of the region have also been integral collaborators in understanding Piedmont lifeways (see the works of Mary Ann Holm, Heather Lapham, and Amber Vanderwarker, among others) meta-analyses of this scope have yet to gain popularity in the study of subsistence practices.

To construct the database for the present study, I chose sites of interest for their location and cultural phase, quality and appropriateness of assemblage, and accessibility. The sites are clustered near the current state border between North Carolina and Virginia in the central Piedmont region, and their dates of occupation range from AD 1000 to 1710. Their assemblages contain zooarchaeological remains that had been previously analyzed and the results of these analyses are easily accessible through the publications (see Table 1.2) as well as databases maintained by the Research Laboratories of Archaeology at the University of North Carolina at Chapel Hill. Lastly, they represent an expanse of time that witnessed the major ecological and cultural shifts that had documented effects on subsistence practices.

The methods used in the collection, recovery, and identification of these assemblages vary widely (Table 1.2). In addition to differential preservation conditions, this variability has an undeniable and well-documented effect on how representative assemblages are of the original deposit (Reitz and Wing 2008). Preservation of a specimen is affected by soil acidity and moisture, the basic physical structure and condition of the bone, and the way in which it was discarded (Holm 1994:94). Smaller or less dense bones and cartilage do not survive well even in the best conditions, while denser and larger bones do. As such, specimens from larger taxa may be over-represented (and those from smaller taxa under-represented) in most of the assemblages, but especially those that were recovered without the use of screens or with poor soil quality. Carnivore and rodent scavenging can also be detrimental to bone preservation.

With this in mind, I carefully recorded both contextual information and quantitative data for each of the 22 assemblages. The contextual information I recorded including site location and coordinates; associated river drainage, river, and/or tributary; dates of occupation and cultural phase; and recovery methods, and site report references.

The quantitative data I recorded in the database are based primarily on the number of identified specimens, or NISP, for particular taxa of interest. While Holm and Vanderwarker recorded additional metrics and details about specimens in their assemblages (element modification, for example), at present it is difficult to standardize this information across the work of multiple researchers with idiosyncratic practices analyzing assemblages recovered using different collection methods.

In fact, creating a database for meta-analysis required strict parameters for site assemblages to be included. For example, I had initially included assemblages from the Gaston (31Hx7), Parker (31Dv4), and Falls Lake (31Dh6 and 31Dh7) sites, yet certain aspects of these

assemblages prohibited standardization alongside other assemblages in the database. The Gaston site faunal data reported the cumulative results of multiple components from the Vincent phase (1000 BC-AD 300), Clements phase (AD 300-1000), and Gaston phase (AD 1000-1600). Based on the published data, I was unable to separate these components and therefore unable to include them in the database (Vanderwarker 2001: Table 2). The faunal data from the Parker site reported faunal data in minimum faunal count (MFC) rather than NISP (Newkirk 1978). MFC, which is calculated in a similar fashion to the more commonly used minimum number of individuals (MNI), may be a useful analytical category, but it is not comparable to NISP data used in this study. Lastly, the NISP of the Falls Lake site assemblages was reported as an estimation (e.g., “more than 110 bones”) (McCullough, Bass, Autrey, and Lenhardt 1980:55). For these reasons, my meta-analysis was restricted to 22 assemblages, though ideally, such a project would include a more robust sample size.

For these reasons, I chose to focus my analysis on NISP in order to maintain standardized comparative units. Using NISP, I also calculated secondary data, “which involve interpretation, extrapolation, or estimations based on primary data” (Wing and Brown 1979:118). I define and explain these categories below. First, I explain the benefits and risks of using NISP as a comparative measure.

## QUANTITATIVE MEASURES

The number of identified specimens (NISP) is a standard quantification unit used in reporting zooarchaeological data (Lyman 1994; Reitz and Wing 2008:202). NISP represents the count of the bones of different animals present in an assemblage. Reitz and Wing (2008:202-242) note its advantage lies in the fact that it is simple to calculate and aggregate at various

scales of analysis, from features and excavation units to entire sites. It can also be used to calculate additional secondary measures.

Inherent to NISP, however, is the problem that it does not address differential representation of skeletal elements (Reitz and Wing 2008:202-242). Moreover, NISP cannot address taphonomic processes that contribute to differential preservation of elements. Rather, the use of NISP requires acknowledgement that each specimen is not afforded the same chance at preservation in light of differences in modification, transport, fragmentation, soil quality, and excavation and recovery methods (Chaplin 1971:64; Perkins and Daly 1968; Reitz and Wing 2008:202-242). Fragmentation, especially, introduces bias in NISP metrics (Klein and Cruz-Uribe 1984:25). For example, turtle shells are frequently over-represented by NISP because one shell (corresponding to one animal) can break into dozens of fragments. Furthermore, bones of larger animals are frequently broken into many smaller pieces, while bones of smaller animals often do not suffer the same fate. In this light, while it is entirely possible that multiple incomplete specimens come from the same animal, in most cases it is difficult or impossible to determine whether they are codependent (Grayson 1984:23). As a result of these issues, quantification based on NISP does not necessarily directly represent the overall economic or even symbolic importance of a taxon in an assemblage. Regardless, NISP data provide a comparable unit of analysis and, when taken in consideration with these issues, offer a starting point for identifying patterns in animal exploitation.

In spite of these issues, NISP is often the only consistent metric used by zooarchaeologists. For this reason, and in the context of meta-analysis, I use NISP values as the basis for this analysis. Following Dr. Lapham's framework, I utilized two base secondary



measures to analyze the present study's data: NISP-Unid and ID'd NISP, which I describe below.

A typical secondary measure calculated from NISP counts is percent NISP (%NISP), or the percent of the total count that is represented by a particular taxa of interest. In addition to %NISP, I also use two additional categories called NISP minus unidentified (NISP-Unid) and NISP of identified taxa (ID'd NISP). NISP-Unid is the total NISP minus specimens that have been recorded as unidentified or unidentifiable. In other words, NISP-Unid contains all specimens identified to the taxonomic level of class and lower. This category catches taxa of interest across assemblages regardless of minor differences in identification and recording methodologies used by the original researchers.

The second metric I chose to use for analytical comparisons is ID'd NISP. This measure is more discriminatory than NISP-Unid. It represents the number of specimens identified to the taxonomic level of family and lower. ID'd NISP also excludes commensal and intrusive taxa. Commensal taxa include small rodents and other taxa (such as frogs and toads) not related to Native subsistence practices. I also excluded miscellaneous human remains that were reported alongside faunal data. In the absence of comparable and independent metrics such as MNI, ID'd NISP offers additional comparative information that can be derived from total NISP values alone. For example, I use this category to ascertain the relative importance of specific species across sites within and among river drainages. Due to issues of over-representation discussed above, total NISP alone is not sufficient in computing relative species abundance without additional and independent measures.

To illustrate how ID'd NISP addresses this problem, the fish bone specimens from the George Rogers site (31Am220) assemblage offer a particularly salient example. Both site

assemblages were analyzed by Holm (1993:103-106). She reported additional measures, such as minimum number of individuals (MNI) to support her findings. Briefly and most simply, MNI represents the minimum number of animals of each taxa that could represent the maximum number of any particular sided element (White 1953). Though it carries its own set of benefits and issues, MNI is useful because it is considered to be completely independent of NISP (Grayson 1973:70; Lyman 1994; Reitz and Wing 2008:202-242). Thus, when available, MNI can be used to support the conclusions based on NISP metrics.

The George Rogers site assemblage offers a good example of the utility of ID'd NISP. The reported NISP for specimens identified as fish is 66.7% of the total count of NISP (Holm 1993:Table 6.4). Meanwhile, Holm calculated the %MNI of fish to be 30.56%. In her discussion, Holm noted this is due to the high number of fish scales present in the George Rogers assemblage. Due to the fact one fish can have many scales, the count of fish scales does not accurately represent the number of individuals represented by an assemblage. This discrepancy cannot be determined by NISP alone. In addition, many grey literature reports do not contain discussions of the assemblages, or such details are not available in standardized databases such as the RLA database. Thus, ID'd NISP removes counts of unidentified specimens (including unidentified fish scales) and can account for these sorts of issues of over-representation.

In addition to those measures calculated from NISP, I also recorded the total number of taxa (NT) and the number of identified taxa (NIT). While NT represents all specimens identified to the taxonomic level of family, NIT removes from that number commensal and any intrusive taxa that may have been included in the report tables. Together, these counts address species richness at each site. Furthermore, they also offer standardized comparative units of analysis to identify patterns across regions. Specifically, NIT addresses the same issues of over-

representation as the measures I discussed above. The accuracy of NIT, however, relies on the researcher's ability to precisely identify specimens as well as the quality of comparative collections available to the researcher.

Together, NISP, %NISP, NISP-Unid, ID'd NISP, NT, and NIT are measures that can be derived from commonly reported zooarchaeological data. They each offer complementary secondary information with which it is possible to ask broader, more comprehensive questions. In the context of meta-analyses, these measures prove extremely useful in the absence of other secondary or independent measures such as MNI, bone weights, and utility indices.

## GEOGRAPHIC INFORMATION SYSTEMS ANALYSIS

Using geographic coordinates from source materials and the RLA collections database, I conducted geospatial analysis of the 19 village sites across the Roanoke, Cape Fear, and Neuse River drainages. Geospatial analysis, with the aid of geographic information science (GIS) systems, is fundamental to the understanding of human-environment interactions as they are rooted in experiences of the landscape. GIS systems can also aid in producing visual representations of regional patterns, making them apparent to the researcher who, without this tool, may not be able to recognize subtleties. Furthermore, geospatial analysis can interpolate patterns across regions for use in predictive modeling.

Due to the issues of meta-analyses discussed above, I constructed the units of my geospatial analysis based on NISP data. I rely heavily on %NISP-Unid to identify patterns of the presence and absence of taxa of interest. In order to do so, I grouped species into their respective taxonomic classes of mammals, birds, reptiles and amphibians to avoid obscuring broad patterns with potential differences or errors inherent in combining data from multiple sources. I also

focused explicitly on certain species of interest such as white-tailed deer, turkey, and passenger pigeon due to their importance indicated by ethnohistoric records and archaeological evidence (see Lapham 2005, 2011; Lawson 1709; Lederer 1672). It is possible, however, that the present knowledge of the regional and sub-regional variation of their relative importance in Late Woodland and Historic Piedmont subsistence practices is incomplete.

In order to analyze the spatial relationships between subsistence practices and landscape, I imported my database into ArcMap 10.5 and georeferenced each site as a point feature according to the coordinates in the database. I then added supplementary layers to the map including topographic, river drainage, and ecological zone layers. Then, I used structured query language (SQL) queries to select the site point features which were identified as having specimens of the taxon of interest. Paired with topographic and watershed data, this simple analysis easily identifies sites that do not fit the expected pattern of species diversity given the local ecology. Thus, it illuminates local factors at play in subsistence strategies, such as local preference, choice, and conflict.

Using the ArcMap Spatial Analyst toolbox, I conducted various inverse distance weighting (IDW) analyses to assess regional patterns of relative abundance (based on %NISP-Unid), species ubiquity, and species richness (cf. McKechnie and Moss 2016). IDW is a tool that uses a nearest neighbor technique to interpolate patterns across a landscape from a set of known points. For unknown areas within the bounds of the outermost points, it calculates weighted averages of probable values based on its proximity to other known values. The product of this technique is a classified raster layer denoting the weight and density of the given variable at any point in the landscape. This method bolsters the presence/absence data by creating a heat-map of relative species abundance and frequency. This heat-map can be used as a predictive model of

expected subsistence practices utilized by neighboring villages, but unfortunately IDW does not extrapolate beyond the bounds of the known site locations, so such predictions are relegated to the confines of the known points.

This process relies on multiple assumptions. First, when used to model ecological resources, IDW assumes all resources are available evenly across a landscape. Vanderwarker (2001) herself showed this is not the case in the Late Woodland Roanoke River drainage. Second, IDW assumes that, given this evenness, any changes in resource availability or in subsistence practices occur gradually across the landscape. In other words, interpreting IDW in this way assumes that neighboring villages utilized similar subsistence strategies regardless of cultural or strategic differences. Historical records (Lawson 1709) indicate this may not be the case, at least in the Historic period. Last, IDW is subject to the same limitations and concerns of the core NISP data used to generate its visual representations. Still, this method offers a visual representation of the core data across the entire region and holds potential for comparative analysis.

IDW and the heat maps it produces are typically interpreted following the above assumptions, most importantly that a variable or resource is distributed evenly across a landscape. This is obviously not the case for some of the present data, most notably fish specimens. As one committee member stated, “you can’t catch a fish on top of a hill.” That said, I interpret these heat maps not as showing ecological distributions of resources but rather, as showing patterns in the types of choices people made in regards to subsistence. I interpret the following heat maps as representing the likelihood that an unknown site in between two known sites would exhibit that same makeup of faunal remains. If there is variation in the heat map, or a particular hot spot, I interpret that as a unique subsistence choice in contrast to neighboring sites

and not necessarily as a representation of a natural distribution of animal resources. Fish may not be swimming on the tops of hills, but people may be eating them there.

With this methodological toolkit, I am able to ask complex questions about subsistence practices of Late Woodland and Historic Piedmont communities.

## CHAPTER 5: RESULTS

In this chapter, I report the results of the present meta-analysis. Previous analyses of the faunal assemblages from these sites indicated that Piedmont villages were utilizing subsistence strategies tailored for local ecologies, though regional spatiotemporal trends were not within the scope of previous studies (Holm 1987, 1993, 1994; Vanderwarker 2001). It appears that, within the present study region at least, there are regional and sub-regional trends in subsistence strategies that go beyond adhering solely to local ecologies. Rather, the trends identified in the present study represent both stalwart cultural practices resistant to change and malleable and flexible subsistence strategies adaptable to changing sociocultural and environmental settings. It must be noted, however, that recovery method, preservation, and the contexts producing faunal samples vary widely across the study sites. Careful consideration of this variation is beyond the scope of the present study, though the patterns discussed below are undoubtedly influenced by such factors.

First, I describe regional trends apparent in the NISP data of taxonomic classes of interest including mammals, birds, reptiles, and fish. Within this section I focus on four species of interest: white-tailed deer (*Odocoileus virginianus*), turkey (*Meleagris gallopavo*), passenger pigeon (*Ectopistes migratorius*), and box turtle (*Terrapene carolina*). I rely on patterns across the region apparent in the heat-maps created through inverse distance weighting (IDW) analysis. These results can be used both as a predictive model and as a visualization method to identify trends and outliers. Second, I discuss sub-regional temporal and spatial trends apparent within

the Roanoke, Cape Fear, and Neuse River drainages. In the following chapter I offer some interpretations of these patterns and trends.

## REGIONAL TRENDS

The number of identified specimens (NISP) in assemblages ranges from 663 NISP from the Gravely excavation of the Koehler site to 47,878 NISP from the Vir 150 site (Table 5.1). The average sample size of the region is 11,734 total NISP. The average sample size of the Roanoke, Cape Fear, and Neuse River drainages is 12,122; 3,796; and 23,156; respectively.

Excluding unidentified specimens (NISP-Unid), the number of specimens ranges from 622 NISP-Unid (again, from the Gravely excavation of the Koehler site) to 47,840 NISP-Unid (again, from the Vir 150 site) (Table 5.1). The average NISP-Unid of the region is 7,702 specimens. The average NISP-Unid of the Roanoke, Cape Fear, and use River drainages are 8,601; 3,216; and 10,979; respectively. The William Kluttz site exhibits the largest percent decrease 5,122 NISP to 747 NISP-Unid. The Vir 150 site exhibits the smallest percent decrease from 47,878 NISP to 47,840 NISP-Unid. When excluding unidentified specimens from total NISP, sample size decreases by 32.0% on average.

Excluding specimens identified as commensal and intrusive taxa (ID'd NISP), the number of specimens ranges from 154 ID'd NISP from the Webster site to 9,562 ID'd NISP from the Vir 150 site (Table 5.1). The average ID'd NISP of the region is 2,209 specimens. The average ID'd NISP of the Roanoke, Cape Fear, and use River drainages are 2,246; 408; and 5,041; respectively. The Middle Saratown phase component of the Hairston site exhibits the largest percent decrease from 4,560 total NISP to 250 ID'd NISP. The Dallas Hylton site exhibits



Table 5.1: Total NISP

	Site Name	NISP	NISP-Unid	ID'd NISP	NIT
Roanoke River Drainage	Vir 150	47,878	47,840	9,562	38
	Stockton	4,029	3,838	1,607	29
	Powerplant	1,854	630	223	21
	Koehler (Gravelly)	663	622	226	12
	Koehler (Clark)	5,006	4,134	908	34
	Leatherwood Creek	1,371	1,345	516	17
	Gravelly	4,247	1,003	364	10
	Dallas Hylton	6,992	6,895	3,335	34
	Hairston –I	16,471	9,911	2,603	29
	Hairston –II	22,075	14,639	3,390	13
	Hairston –III	4,560	2,869	250	14
	Lower Saratown	32,975	12,050	5,915	39
	Upper Saratown	16,464	13,894	2,160	34
	William Klutz	5,122	747	381	14
	Drainage Average	12,122	8,601	2,246	24
Cape Fear River Drainage	Holt	3,701	3,066	564	17
	Webster	1,147	932	154	10
	George Rogers	9,985	8,956	579	17
	Edgar Rogers	1,916	1,602	270	13
	Mitchum	2,233	1,523	474	13
	Drainage Average	3,796	3,216	408	14
Neuse River Drainage	Wall	30,256	17,544	6,631	24
	Jenrette	22,818	6,750	5,703	25
	Fredricks	16,393	8,643	2,790	30
	Drainage Average	23,156	10,979	5,041	26
	Regional Average	11,734	7,702	2,209	22
		--	↓ = 32.0%	↓ = 80.6%	--

the smallest percent decrease from 6,992 NISP to 3,335 ID'd NISP. When excluding commensal and intrusive specimens from total NISP, sample size decreases by 19.4% on average.

The number of identified taxa (NIT) ranges from 10 taxa in both the Gravely and Webster site assemblages to 39 taxa in the Lower Saratown assemblage (Table 5.1). The average NIT is 22 taxa. NIT is a codependent variable correlating closely with total NISP (Lyman 1994; Wolverton, Nagoaka, & Rick 2016:28). The site assemblages of the present study exhibit this correlation (Figure 5.1), though some assemblages do fall outside of the expected species diversity for their reported ID'd NISP values. Six out of the 14 assemblages from the Roanoke River drainage (43%) exhibit higher than expected NIT: the Stockton (AD 1000-1450), Powerplant (AD 1000-1450), Koehler (AD 1000-1450), Dallas Hylton (AD 1000-1450), Lower Saratown (AD 1620-1710), and Upper Saratown (AD 1620-1710) site assemblages. The assemblages from the Gravely (AD 1000-1450) and Hairston (AD 1450-1620) sites of the Roanoke River drainage, the Mitchum site (AD 1620-1710) of the Cape Fear River drainage, and the Wall and Jenrette sites (AD 1450-1620) of the Neuse River drainage exhibit lower than expected NIT. I discuss these data in more detail below.

### *Mammals*

Mammals are by far the most prevalent taxonomic group in faunal assemblages throughout the study region. These include white-tailed deer (*Odocoileus virginianus*), opossum (*Didelphis virginianus*), rabbit (*Sylvilagus*), squirrel (*Sciurus* sp.), beaver (*Castor canadensis*), raccoon (*Procyon lotor*), domestic dog (*Canis familiaris*), and black bear (*Ursus americanus*), among others. The number of specimens identified as mammalian (NISP Mammals) range from 355 in the Webster site assemblage to 42,016 in the Vir 150 assemblage (Table 5.2). The average

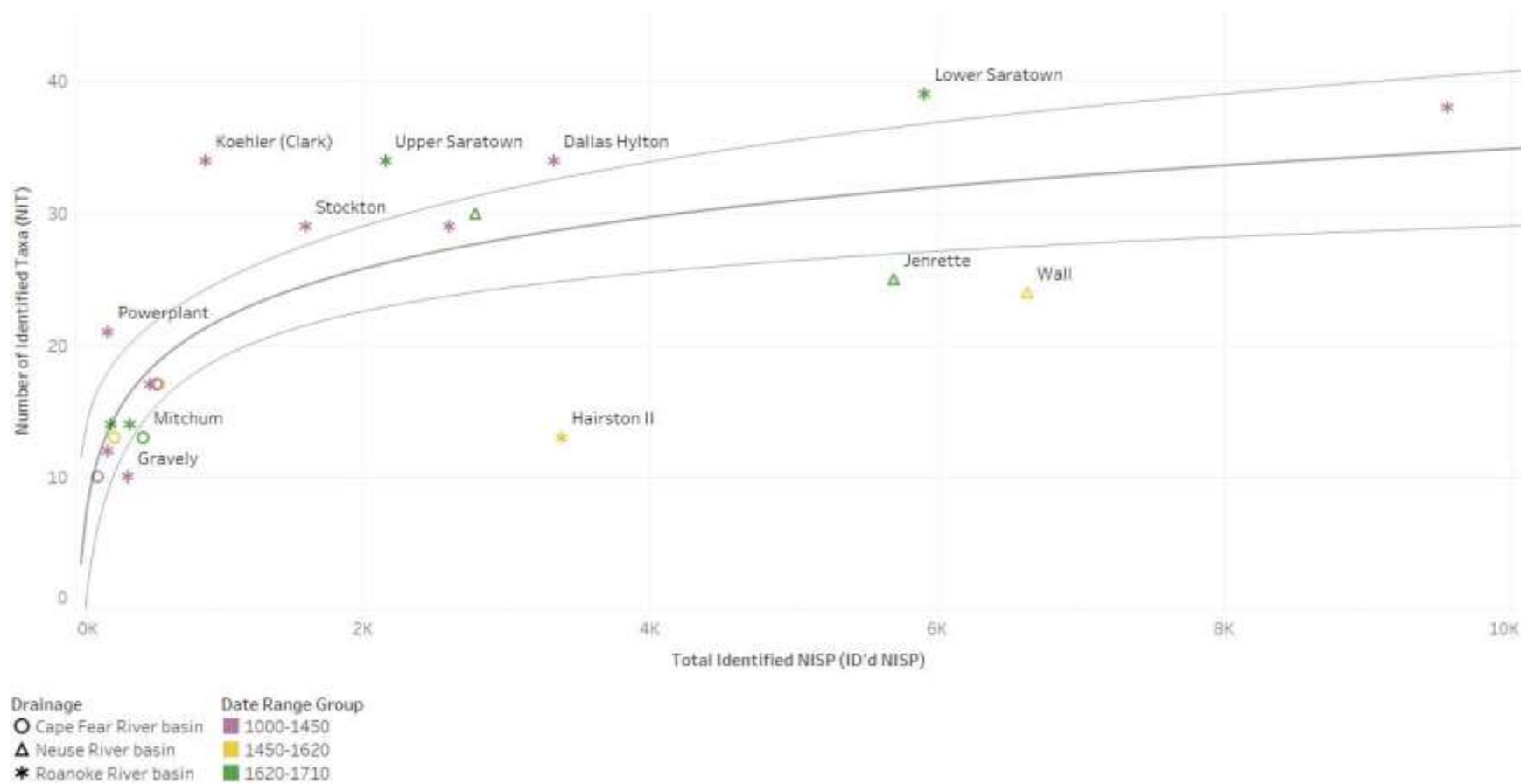


Figure 5.1: Species Diversity and Sample Size  
(labeled site assemblages fall outside of the confidence bands of the trend line)

Table 5.2: Mammal NISP

	Site Name	NISP- Unid	NISP Mammals	%NISP- Unid Mammals	ID'd NISP Mammals	NISP Deer	%ID'd NISP Deer
Roanoke	Vir 150	47,840	42,016	87.8	8,014	6,983	87.1
	Stockton	3,838	2,483	64.7	879	764	86.9
	Powerplant	630	441	70.0	124	104	83.9
	Koehler (Gravely)	622	450	72.3	138	106	76.8
	Koehler (Clark)	4,134	1,617	39.1	481	386	80.2
	Leatherwood Creek	1,345	1,007	74.9	368	306	83.2
	Gravely	1,003	839	83.6	309	283	91.6
	Dallas Hylton	6,895	4,631	67.2	1,950	1,618	83.0
	Hairston –I	9,911	6,926	69.9	1,205	1,131	93.9
	Hairston –II	14,639	8,710	59.5	1,636	1,404	85.8
	Hairston –III	2,869	2,125	74.1	128	115	89.8
	Lower Saratown	12,050	7,314	60.7	2,480	2,050	82.7
	Upper Saratown	13,894	10,423	75.0	1,391	1,260	90.6
	William Klutz	747	512	68.5	193	178	92.2
	Drainage Avg.	8,601	6,392	69.1	1,378	1,192	86.3
Cape Fear	Holt	3,066	1,501	49.0	243	176	72.4
	Webster	932	355	38.1	43	23	53.5
	George Rogers	8,956	2,480	27.7	354	273	77.1
	Edgar Rogers	1,602	1,126	70.3	170	153	90.0
	Mitchum	1,523	797	52.3	227	203	89.4
	Drainage Avg.	3,216	1,252	47.5	207	166	76.5
Neuse	Wall	17,544	13,009	74.2	5,285	4,731	89.5
	Jenrette	6,750	3,948	58.5	3,369	3,277	97.3
	Fredricks	8,643	4,837	56.0	1,309	1,134	86.6
	Drainage Avg.	10,979	7,265	62.9	3,321	3,047	91.1
	Regional Avg.	7,702	5,343	63.3	1,377	1,212	84.7

NISP of mammals is 5,343 specimens across the study area. The average NISP of mammals of the Roanoke, Cape Fear, and Neuse River drainages is 6,392; 1,252; and 7,265; respectively.

Excluding unidentified specimens, the percent NISP of mammals ranges from 27.7% in the George Rogers site assemblage to 87.8% in the Vir 150 site assemblage (Table 5.2). The average percent NISP of mammals (out of NISP-Unid) is 63.3% across the study area. The average percent NISP of mammals (out of NISP-Unid) of the Roanoke, Cape Fear, and Neuse River drainages is 69.1%, 47.5%, and 62.9%, respectively. In other words, mammals represent, on average, almost or over half of faunal assemblages from archaeological sites in the Piedmont, regardless of date range or drainage.

In addition to the Vir 150 site assemblage, the Gravely site assemblage is also comprised of a high concentration of mammalian remains at 83.6% NISP-Unid (Table 5.2). As seen in the heat-map derived from inverse distance weighting (IDW) (Figure 5.2a), these two sites mark opposite edges of the Piedmont, though both are located within the Roanoke River drainage. To the west, the Gravely site is situated along the North Mayo River, a major tributary to the Dan River to the south. To the east, however, the Vir 150 site, though currently submerged under the man-made Lake Gaston, was once a settlement along the lower Roanoke River. It is notable that both the Gravely and Vir 150 sites are dominated by mammalian taxa and not by riverine taxa like fish and reptiles. While this may be due to recovery method, such a pattern may also speak to Byrd's findings that Native communities of the Late Woodland were more likely to focus subsistence practices on riverine species if diverse riparian niches were readily available at intersections of streams and major rivers (Byrd 1997). It is possible, then, that living near major waterways was not conducive to a subsistence strategy focused on riverine species because they only offered one kind of ecological habitat for a small array of species.

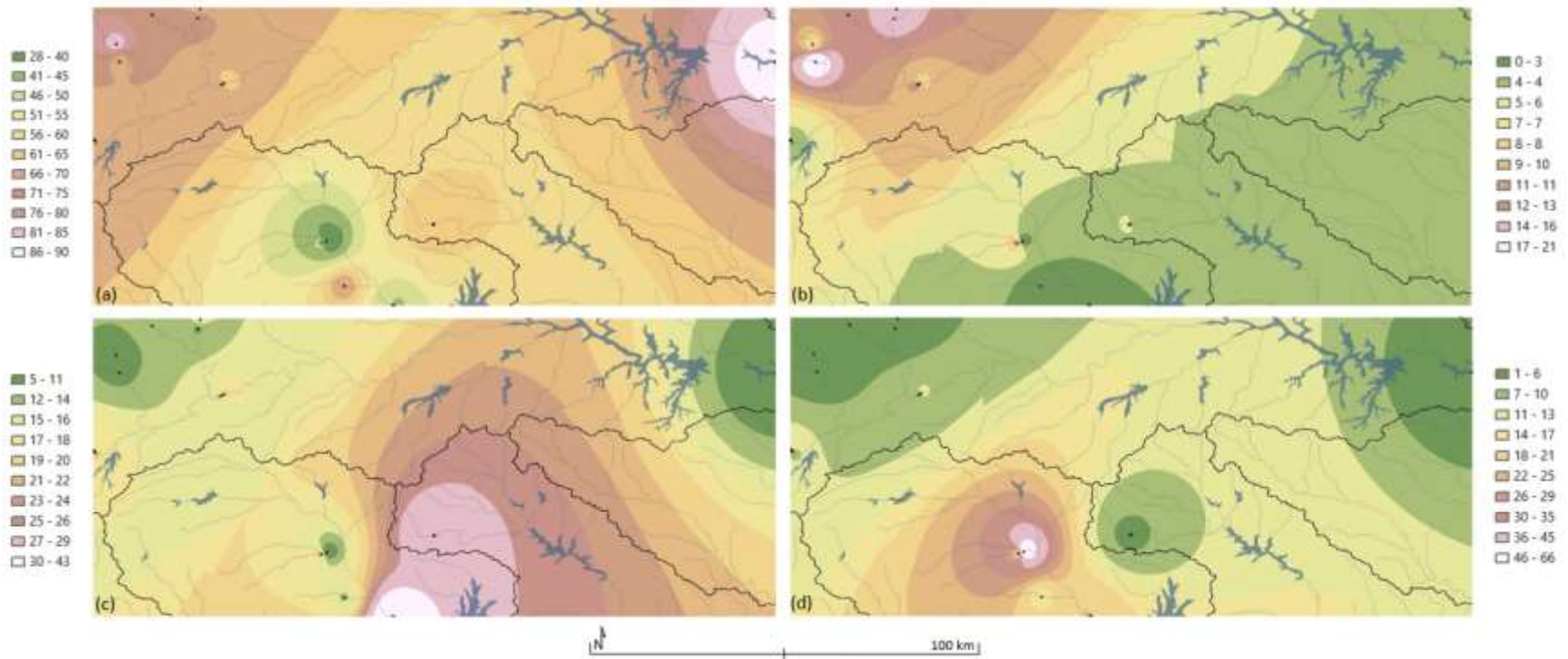


Figure 5.2: Heat Map: Percent Taxonomic Class of Total NISP Excluding Unidentified Specimens (NISP-Unid)  
 (a) mammals; (b) birds; (c) reptiles; (d) fish

In contrast, the George Rogers, Webster, Koehler (Clark excavation), and Holt site assemblages exhibit low %NISP-Unid for mammalian taxa at 27.7%, 38.1%, 39.1%, and 49.0%, respectively (Table 5.2). Both the George Rogers and Holt sites are situated at the intersection of a tributary and a major river, Alamance Creek and Haw River. Similarly, the Webster site is located along a tributary of the Haw River, Cane Creek. Koehler, however, is located along a much larger river, Smith River, and is near to sites with higher percentages of mammalian taxa like the Gravelly site. Their locations are indicated by the cooler green colors on the IDW heat-map (Figure 5.2a). These colors are concentrated around the sites of the Cape Fear River drainage, which suggests this drainage exhibits the lowest %NISP-Unid for mammals.

During the Late Woodland, this region of the central Piedmont was home to communities with broad-based subsistence strategies that utilized diverse animal resources, exemplified by the assemblages from the Webster and Mitchum sites. Of these sites, those with the lowest percentages of mammals are typically located along tributaries or at intersections of tributaries and larger rivers, supporting Byrd's interpretation that such locations support broad-based subsistence strategies. The variation and patterns apparent in the %NISP-Unid data indicates that communities of the Piedmont region, contrary to common interpretations, did not adhere to pan-regional subsistence practices, but rather, to localized traditions that varied at the site-level.

White-tailed deer (*Odocoileus virginianus*) stand out as the majority of identified mammalian specimens in all site assemblages across the study region. This may be a result of differential preservation (i.e., large deer bones may preserve better than, say, the relatively more fragile bones of a sturgeon [*Acipenser* sp.]), recovery strategy (e.g., hand recovery compared to water screening through fine mesh), or identification methods (e.g., availability of comparative specimens, research goals of the analyst, etc.). Given the robust ethnohistoric and archaeological

evidence available, the prevalence of white-tailed deer in these assemblages more likely represents the importance of the species as a food resource across the region, as well as the broad reach of the deerskin trade during the Historic period (Lapham 2005; Lawson 1709).

Specifically, the number of specimens identified as white-tailed deer (NISP Deer) ranges from 23 in the Webster site assemblages to 6,983 in that of the Vir 150 site (Table 5.2). The Webster site is an outlier, which may be a result of the site's poor bone preservation, as the next lowest NISP of white-tailed deer is 104 in the Powerplant site assemblage. The average NISP of white-tailed deer across the study region is 1,212 specimens. The average NISP of white-tailed deer in the Roanoke, Cape Fear, and Neuse River drainages is 1,192; 166; and 3,047; respectively.

Thus, white-tailed deer represent anywhere between 72.4% (Holt) to 97.3% (Jenrette) of identified mammalian specimens (ID'd NISP Mammals) in each site assemblage, with Webster being an outlier at 53.5% (Table 5.2). The average percent identified NISP of white-tailed deer (out of identified mammalian specimens) is 84.7% across the study area. The average of the Roanoke, Cape Fear, and Neuse River drainages is 86.3%, 76.5%, and 91.1%, respectively.

As Figure 5.3a shows, white-tailed deer are very common throughout the region, as indicated by the swaths of warm colors. The Cape Fear River drainage, however, exhibits the lowest percent of white-tailed deer in the region, exhibited by the cooler green colors along Alamance Creek and the lower Haw River. Notably, the Edgar Rogers site along Cane Creek is a hot-spot for white-tailed deer in the Cape Fear River drainage. Contrastingly, the Neuse River drainage exhibits the highest percentage of white-tailed deer, as evidenced by the large white halo around the Hillsborough Archaeological District.



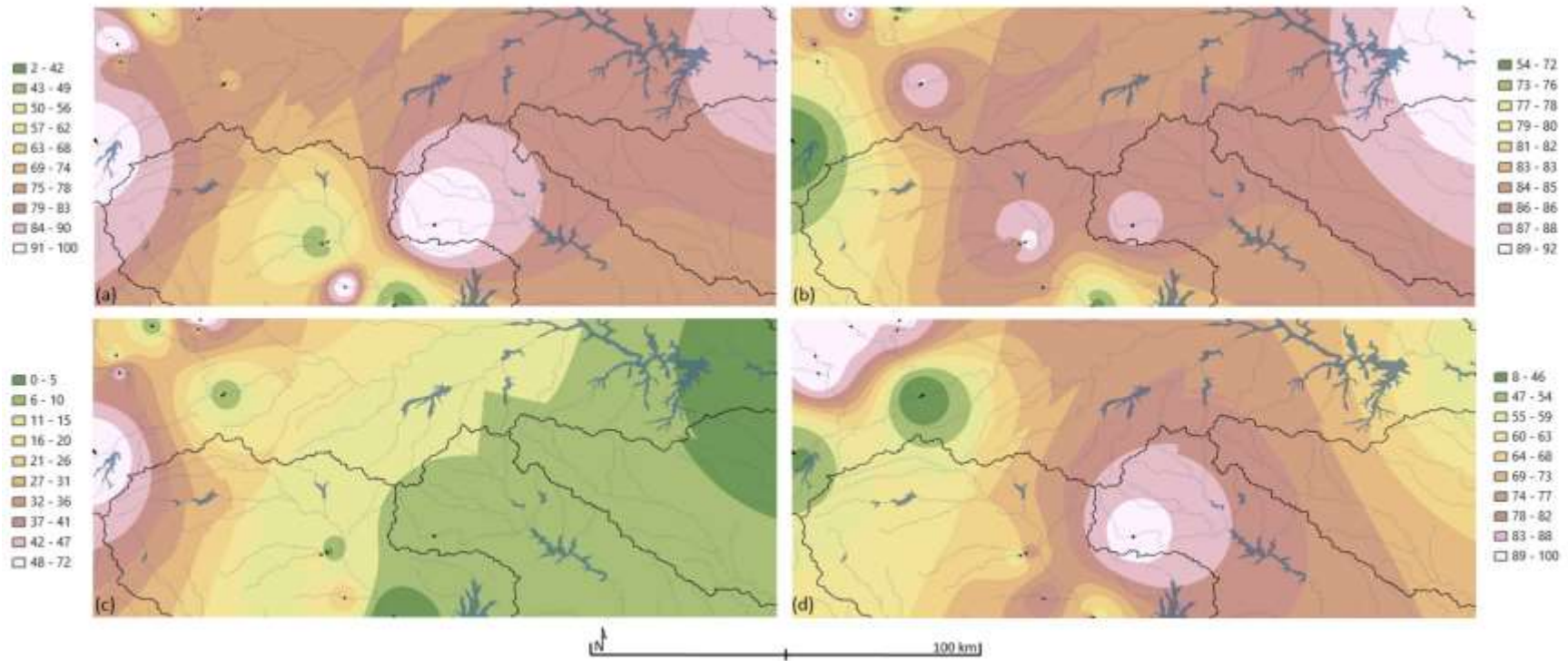


Figure 5.3: Heat Map: Percent Species of Interest of Identified Specimens of Associated Taxonomic Class (ID'd NISP)  
 (a) white-tailed deer, (b) wild turkey, (c) passenger pigeon, (d) box turtle

The predominance of mammals across the study region may be explained by this prevalence of white-tailed deer. Both measures indicate the region's Native communities intensely focused their hunting on white-tailed deer. When comparing the two IDW heat-maps (Figures 5.2a and 5.3a), it becomes apparent, however, that the overarching patterns in mammalian utilization are not mirrored in those of white-tailed deer utilization. For example, three of the sites along the Dan River in the Roanoke River Drainage (Hairston, Upper Saratown, and William Kluttz) exhibit a bright hot-spot for percent white-tailed deer (of ID'd NISP Mammals) but exhibit lower levels of mammal remains overall. Mammals writ large, however, do not seem particularly important at these sites, as evidenced by the moderate shades of orange in this region in Figure 5.2a. As a result, it seems that non-deer mammals such as squirrel, raccoon, and opossum played a minor role in Native subsistence strategies. In both instances, however, the Cape Fear River drainage is colored cool, green shades, indicating low percentages of both mammals and white-tailed deer.

### *Birds*

In the current study region, a variety of bird species are present in the various assemblages, including ducks (*Anatidae*), Canada geese (*Branta canadensis*), common crows (*Corvus brachyrhynchos*), and blue jays (*Cyanocitta cristata*), among others. By far the most common avian species, however, are wild turkey (*Meleagris gallopavo*) and passenger pigeon (*Ectopistes migratorius*). I return to a discussion about these specific species below. The number of specimens identified as avian (NISP Birds) range from 6 in the Webster site assemblage to 1,460 in the Vir 150 assemblage (Table 5.3). The average NISP of birds is 409 specimens across

Table 5.3: Bird NISP

	Site Name	NISP- Unid	NISP Bird	%NISP- Unid Bird	ID'd NISP Bird	NISP Turkey	%ID'd NISP Turkey	NISP Pass. Pigeon	%ID'd NISP Pass. Pigeon
Roanoke	Vir 150	47,840	1,460	3.1	525	515	98.1	0	0.0
	Stockton	3,838	588	15.3	367	111	30.2	246	67.0
	Powerplant	630	77	12.2	17	14	82.4	2	11.8
	Koehler (Gravelly)	622	78	12.5	36	33	91.7	2	5.6
	Koehler (Clark)	4,134	235	5.7	124	57	46.0	54	43.5
	Leatherwood Creek	1,345	184	13.7	76	55	72.4	20	26.3
	Gravelly	1,003	61	6.1	41	31	75.6	7	17.1
	Dallas Hylton	6,895	1,419	20.6	929	513	55.2	402	43.3
	Hairston –I	9,911	1,215	12.3	760	37	4.9	667	87.8
	Hairston –II	14,639	819	5.6	233	48	20.6	170	73.0
	Hairston –III	2,869	104	3.6	5	4	80.0	1	20.0
	Lower Saratown	12,050	623	5.2	186	172	92.5	7	3.8
	Upper Saratown	13,894	361	2.6	89	46	51.7	13	14.6
	William Klutz	747	28	3.7	14	4	28.6	10	71.4
	Drainage Avg.	8,601	518	8.7	243	117	59.3	114	34.6
Cape Fear	Holt	3,066	297	9.7	32	24	75.0	8	25.0
	Webster	932	6	0.6	0	0	0.0	0	0.0
	George Rogers	8,956	14	0.2	3	3	100.0	0	0.0
	Edgar Rogers	1,602	23	1.4	4	3	75.0	1	25.0
	Mitchum	1,523	11	0.7	9	8	88.9	0	0.0
	Drainage Avg.	3,216	70	2.5	10	8	67.8	2	10.0
Neuse	Wall	17,544	628	3.6	114	103	90.4	2	1.8
	Jenrette	6,750	187	2.8	41	39	95.1	1	2.4
	Fredricks	8,643	590	6.8	216	148	68.5	47	21.8
	Drainage Avg.	10,979	468	4.4	124	97	84.7	17	8.7
	Regional Avg.	7,702	409	6.7	174	89	64.7	76	25.5

the study area. The average NISP of birds of the Roanoke, Cape Fear, and Neuse River drainages is 518; 70; and 468; respectively.

Excluding unidentified specimens, the percent NISP of birds ranges from less than 1% in the George Rogers, Webster, and Mitchum site assemblage to 20.6% in the Dallas Hylton site assemblage (Table 5.3). The average percent NISP of birds (out of NISP-Unid) is 6.7% across the study area. The average percent NISP of birds (out of NISP-Unid) of the Roanoke, Cape Fear, and Neuse River drainages is 8.7%, 2.5%, and 4.4%, respectively. As such, it seems birds did not make up a significant portion of these assemblages when considered at a regional level.

At a slightly higher resolution of analysis, however, birds gain importance. While birds represent the smallest proportion of the site assemblages from both the Cape Fear and Neuse Rivers, that is not the case in the Roanoke River drainage where bird remains outnumber those of fish. In addition, the majority of the bird specimens in the Roanoke River drainage assemblages have been identified as turkey or passenger pigeon. I return to a discussion of these particular species below.

As seen in the heat-map derived from inverse distance weighting (IDW) (Figure 5.2b), the site assemblages with the highest percentage of bird specimens (out of NISP-Unid) are derived from sites in the northwest region of the Roanoke River drainage. Sites in the foothills of the Appalachian Summit region, such as the Dallas Hylton (20.6%), Stockton (15.3%), and Leatherwood Creek (13.7%) sites, have much higher percentages of avian taxa than the rest of the sites (Table 5.3). These site assemblages may be representing the pattern of seasonal bird visitation Whyte (2001) identified in the aforementioned case study, as they are derived from sites located amongst the foothills of the Appalachian Mountains in the ecological borderlands between the mountains and the Piedmont.

As mentioned previously, wild turkey is the most prevalent avian species in the present study. The number of specimens identified as turkey (NISP Turkey) ranges from 0 in the Webster site assemblages to 515 in that of the Vir 150 site (Table 5.3). The average NISP of turkey across the study region is 90 specimens. The average NISP of turkey in the Roanoke, Cape Fear, and Neuse River drainages is 117, 8, and 97, respectively.

Thus, wild turkey represent anywhere from 0% (Webster) to 100% (George Rogers) of identified avian specimens (ID'd NISP Bird) in each site assemblage (Table 5.3), with over half of the site assemblages in the present study represented by over 50% wild turkey (of ID'd NISP Bird). Furthermore, all but two assemblages (from the Dan River phase component of the Hairston site and Webster site) are comprised of over 20% wild turkey (of ID'd NISP Bird). The average percent identified NISP of turkey (out of ID'd NISP Bird) is 64.7% across the study area, though when Hairston-I and Webster are excluded, the average is 70.9%. The average percent identified NISP of turkey of the Roanoke, Cape Fear, and Neuse River drainages is 59.3%, 67.8%, and 84.7%, respectively. Excluding the Hairston-I and Webster assemblages, the average of the Roanoke and Cape Fear River drainages jump to 63.5% and 84.7%, respectively.

As Figure 5.3b shows, turkey is very common throughout the region. The IDW heat-map shows five distinct hot-spots for percent turkey (out of ID'd Bird), one each in the Cape Fear and Neuse River drainages and three in the Roanoke River drainage. Notably, three sites located along the Dan River (Hairston, Upper Saratown, and William Kluttz) exhibit a clear cool-spot. The area surrounding the Mitchum and Webster sites, along the Haw River, also exhibit a cool-spot. This indicates that while turkeys were pervasive across the Piedmont, certain communities chose to utilize other resources.

As mentioned previously, passenger pigeon is another one of the most prevalent avian species in the present study. Now extinct, passenger pigeon was a migratory species that flocked to the foothills and the Piedmont during the winter months (Shorger 1955). The number of specimens identified as passenger pigeon (NISP Passenger Pigeon) ranges from 0 in the Webster, Mitchum, Vir 150, and George Rogers site assemblages to 667 in that of the Dan River phase component of the Hairston site (Table 5.3). The average NISP of passenger pigeon across the study region is 76 specimens. The average NISP of passenger pigeon in the Roanoke, Cape Fear, and Neuse River drainages is 114, 2, and 17, respectively.

Thus, passenger pigeon represents anywhere from 0% (Webster, Mitchum, Vir 150, and George Rogers) to 87.8% (Hairston-I) of identified avian specimens (ID'd NISP Bird) in each site assemblage (Table 5.3). The average percent identified NISP of passenger pigeon (out of ID'd NISP Bird) is 25.5% across the study area. The average of the Roanoke, Cape Fear, and Neuse River drainages is 34.6%, 10.0%, and 8.7%, respectively.

As Figure 5.3c shows, passenger pigeon are most common in the westernmost region of the Roanoke River drainage, proximate to the foothills of the Appalachian Mountains and a likely flyway for the extinct species. There is a notable hotspot surrounding the three sites along the Dan River mentioned above: the Hairston, Upper Saratown, and William Kluttz sites. These sites represent the westernmost sites of the study region. In contrast, the entire eastern portion of the study region is cloaked in dark green, indicating that the passenger pigeon were not as common in the Central Piedmont as in the Western Piedmont. While there are two cool-spots surrounding the Koehler, Lower Saratown, and Powerplant sites in the Roanoke River drainage, the trend is clear: passenger pigeon was more prevalent in the western region more proximate to the foothills of the Appalachian Mountains. It is possible that, during the winter passenger

pigeon migration season, both Piedmont and Mountain communities followed this species to the foothills to take advantage of the copious resource (see Lawson 1709:44).

### *Reptiles*

A variety of reptilian species are present in the various assemblages, including snapping turtle (*Chelydra serpentina*), mud turtle (*Kinosternon subrubrum*), musk turtle (*Sternotherus oderatus*), poisonous snakes (Crotalidae) and non-poisonous snakes (Colubridae), among others. By far the most common reptilian taxa are turtles, specifically box turtle (*Terrapene carolina*). I return to a discussion about box turtle specifically below. The number of specimens identified as reptilian (NISP Reptile) range from 71 in the assemblage from the Powerplant site to 3,983 from that of the Vir 150 assemblage (Table 5.4). The average NISP of reptiles is 1,133 specimens across the study area. The average NISP of reptiles of the Roanoke, Cape Fear, and Neuse River drainages is 1,066; 421; and 2,628; respectively.

Excluding unidentified specimens, the percent NISP of reptiles ranges 5.3% in the George Rogers site assemblage to 43.2% in the Webster site assemblage (Table 5.4). The average percent NISP of reptiles (out of NISP-Unid) is 17.9% across the study area. The average percent NISP of reptiles (out of NISP-Unid) of the Roanoke, Cape Fear, and Neuse River drainages is 14.6%, 21.4%, and 27.4%, respectively.

As seen in the IDW heat-map (Figure 5.2c), the sites with the highest percentage of reptiles are confined to a particular area in the Central Piedmont. Sites such as the Mitchum, Jenrette, Fredricks, and Webster sites (23.8%, 27.7%, 37.7%, and 43.2%, respectively) are located at lower elevations and along major rivers (the Haw and Eno Rivers). Webster and Mitchum, interestingly, are downriver from sites with some of the lower percentages of reptiles

Table 5.4: Reptile NISP

	Site Name	NISP- Unid	NISP Reptile	%NISP- Unid Reptile	ID'd NISP Reptile	NISP Box Turtle	%ID'd NISP Box Turtle
Roanoke	Vir 150	47,840	3,983	8.3	829	459	4.8
	Stockton	3,838	593	15.5	344	336	20.9
	Powerplant	630	71	11.3	48	14	6.3
	Koehler (Gravelly)	622	77	12.4	51	51	22.6
	Koehler (Clark)	4,134	918	22.2	156	153	16.9
	Leatherwood Creek	1,345	144	10.7	70	58	11.2
	Gravelly	1,003	86	8.6	13	13	3.6
	Dallas Hylton	6,895	735	10.7	441	429	12.9
	Hairston –I	9,911	1,028	10.4	415	233	9.0
	Hairston –II	14,639	2,773	18.9	1,115	533	15.7
	Hairston –III	2,869	624	21.7	114	96	38.4
	Lower Saratown	12,050	2,494	20.7	1,908	880	14.9
	Upper Saratown	13,894	1,221	8.8	518	473	21.9
	William Klutz	747	180	24.1	147	0	0.0
	Drainage Avg.	8,601	1,066	14.6	441	266	70.4
Cape Fear	Holt	3,066	647	21.1	224	115	20.4
	Webster	932	403	43.2	38	15	9.7
	George Rogers	8,956	478	5.3	168	138	23.8
	Edgar Rogers	1,602	215	13.4	89	73	27.0
	Mitchum	1,523	362	23.8	137	121	25.5
	Drainage Avg.	3,216	421	21.4	131	92	68.7
Neuse	Wall	17,544	2,944	16.8	1,017	1,000	15.1
	Jenrette	6,750	2,542	37.7	2,279	1,819	31.9
	Fredricks	8,643	2,397	27.7	1,081	1,065	38.2
	Drainage Avg.	10,979	2,628	27.4	1,459	1,295	92.2
	Regional Avg.	7,702	1,133	17.9	509	367	73.0



(George Rogers and Edgar Rogers, 5.3% and 13.4%, respectively). The Rogers sites, however, are located along tributaries, not the Haw River itself. Based on this information, reptiles (and more specifically, turtles) were a preferred food resource for communities within the Cape Fear and Neuse River drainages if situated along lower portions of major waterways. It must be considered, however, that these data are influenced by the bias presented by the high fragmentation rates of carapace fragments and the possible use and curation of turtle shells for other purposes, such as bowls.

As mentioned previously, box turtle is the most common reptilian species represented by the assemblages of the present study. The number of specimens identified as box turtle (NISP Box Turtle) ranges from 0 in the William Kluttz site assemblage to 1,819 in the Jenrette assemblage (Table 5.4). It is curious that no box turtle specimens were identified in the William Kluttz site assemblage, even though musk, mud, and other unidentified species of turtle were identified in this assemblage. The average NISP of box turtle across the study region is 367 specimens. The average NISP of box turtle in the Roanoke, Cape Fear, and Neuse River drainages is 266; 92; and 1,294; respectively.

Thus, box turtle represents anywhere from 0% (William Kluttz) to 100% (Gravelly excavation of Koehler) of identified reptilian specimens (ID'd NISP Reptile) (Table 5.4). William Kluttz seems to be an outlier, as the next lowest percentage of box turtle is 29.2% of the Powerplant assemblage. The average percent identified NISP of box turtle (out of ID'd NISP Reptile) is 73.0% across the study area. Excluding the William Kluttz site, the average increases to 76.5%. The average of the Roanoke, Cape Fear, and Neuse River drainages is 70.4%, 68.7%, and 92.2%, respectively.

As Figure 5.3d shows, box turtle are most common in the Central Piedmont, specifically the Neuse River drainage. There are two notable hot-spots surrounding the Hillsborough Archaeological District (the Wall, Jenrette, and Fredricks sites) and surrounding the sites along the Smith and Mayo Rivers, as well as Leatherwood Creek. In contrast, there are two cool-spots surrounding the Lower Saratown and Powerplant sites along the Dan River and the Hairston, Upper Saratown, and William Kluttz sites just upriver. This patterning in the IDW suggests that box turtle was most commonly utilized as a food resource by communities living along tributaries of major rivers, though the sites of the Neuse River drainage are an exception. Furthermore, it also suggests that communities living along the Dan River did not make the same choice and instead focused their subsistence practices on other animal resources.

### *Fish*

The representation of fish is highly variable across the study region. Fish species present in the assemblages of the current study include many species of bass (e.g., *Morone* sp., *Ambloplites* sp., and *Micropterus* sp.), minnows (Cyprinidae), suckers (Catostomidae), gar (*Lepisosteus* sp.), sunfish (*Lepomis* sp.), sturgeon (*Acipenser* sp.), and catfish (Ictaluridae), among others.

The number of specimens identified as fish (NISP Fish) range from 8 in the Leatherwood Creek site assemblage to 5,969 in the George Rogers site assemblage (Table 5.5). The average NISP of fish is 770 specimens across the study area. The average NISP of fish of the Roanoke, Cape Fear, and Neuse River drainages is 584; 1,423; 548; respectively.

Excluding unidentified specimens, the percent NISP of fish ranges from less than 1% of the Hairston-II, Leatherwood Creek, Vir 150, and Jenrette assemblages to 66.6% of the George

Rogers site assemblage (Table 5.5). The George Rogers site is an outlier in the dataset, as the assemblage with the next highest percentage of fish is that of the Clark excavation of the Koehler site (28.3%). The average percent NISP of fish (out of NISP-Unid) is 11.1% across the study area, though it decreases to 8.5% when the George Rogers assemblage is excluded. The average percent NISP of fish (out of NISP-Unid) of the Roanoke, Cape Fear, and Neuse River drainages is 6.9%, 26.9%, and 4.7%, respectively. Similar to avian taxa, fish do not seem to make up a significant portion of assemblages when considered at a regional level.

The local importance of fish is illuminated when examining the IDW heat-map (Figure 5.2d). As evidenced by the heat-map, the Cape Fear River drainage exhibits a hot-spot for assemblages dominated by fish specimens. The bright white and red colors (denoting higher percentages of fish) cover much of the Cape Fear River drainage, though this pattern should look familiar. When viewed as a pair, the maps of the distributions of mammals and fish are the inverse of one another. This may be an artifact of using percentages as a metric of analysis—if fish are well-represented in an assemblage, other taxonomic groups will necessarily have lower percentages as part of a whole, and vice versa. It is also possible, however, that Byrd's interpretation holds (1997). Located at the intersection of tributaries and major rivers, the sites within the Cape Fear River drainage were perfectly situated for subsistence strategies focused on riparian resources including riverine fish. Again, this may indicate that communities living within the Cape Fear River drainage practiced localized subsistence traditions that varied at the site-level from their neighbors to the north and west.

In conclusion, there are a few identifiable spatiotemporal regional trends at both the taxonomic and species level. First, the percent mammals of identified NISP (ID'd NISP) decreases from AD 1000-1450 (55.1%) to AD 1450-1620 (46.9%) but increases during AD

Table 5.5: Fish NISP

	Site Name	NISP-Unid	NISP Fish	%NISP-Unid Fish	ID'd NISP Fish
Roanoke	Vir 150	47,840	375	0.8	194
	Stockton	3,838	93	2.4	17
	Powerplant	630	39	6.2	34
	Koehler (Gravelly)	622	14	2.3	1
	Koehler (Clark)	4,134	1,171	28.3	147
	Leatherwood Creek	1,345	8	0.6	2
	Gravelly	1,003	17	1.7	1
	Dallas Hylton	6,895	87	1.3	15
	Hairston –I	9,911	699	7.1	223
	Hairston –II	14,639	2,255	15.4	406
	Hairston –III	2,869	15	0.5	3
	Lower Saratown	12,050	1,493	12.4	1,341
	Upper Saratown	13,894	1,884	13.6	162
	William Klutz	747	27	3.6	27
	Drainage Avg.	8,601	584	6.9	184
Cape Fear	Holt	3,066	404	13.2	65
	Webster	932	163	17.5	73
	George Rogers	8,956	5,969	66.6	54
	Edgar Rogers	1,602	227	14.2	7
	Mitchum	1,523	353	23.2	101
	Drainage Avg.	3,216	1,423	26.9	60
Neuse	Wall	17,544	856	4.9	215
	Jenrette	6,750	61	0.9	14
	Fredricks	8,643	727	8.4	184
	Drainage Avg.	10,979	548	4.7	138
	Regional Avg.	7,702	770	11.1	149

1620-1710 (61.3%) (Table 5.6). This results in an increase in percent mammals from the Late Woodland period (51.0%) to the Historic period (61.3%). Furthermore, assemblages derived from sites situated along major waterways exhibit lower percent mammal (54.2%) than those derived from sites situated along tributaries (62.0%).

White-tailed deer, however, do not follow this pattern. They remain an important and prevalent resource throughout time and space. Of identified mammalian specimens, white-tailed deer represent over 80% of the assemblages regardless of date range, time period, or site location. The percent of white-tailed deer (out of ID'd NISP Mammal) decrease slightly from AD 1000-1450 (83.4%) to AD 1450-1620 (83.0%) but increase slightly in AD 1620-1710 (84.3%). This results in a slight increase from 83.2% in the Late Woodland period to 84.3% in the Historic period. Furthermore, assemblages derived from sites situated along major waterways exhibit a slightly higher percent white-tailed deer (86.4%) than those derived from sites situated along tributaries (81.8%).

Second, the percent bird of identified NISP (ID'd NISP) decreases from AD 1000-1450 (10.6%) to AD 1450-1620 (2.9%) and continues to do so during AD 1620-1710 (2.2%) (Table 5.6). This results in a decrease in percent mammals from the Late Woodland period (6.9%) to the Historic period (2.2%). Furthermore, assemblages derived from sites situated along major waterways exhibit lower percent bird (6.9%) than those derived from sites situated along tributaries (11.4%).

Turkey, however, do not follow this pattern. They increase in importance and pervasiveness throughout time. Of identified avian specimens, turkey represent over 50% of the assemblages regardless of date range, time period, or site location. The percent of turkey (out of ID'd NISP Bird) increases from AD 1000-1450 (56.5%) to AD 1450-1620 (63.9%) and

Table 5.6: Percent of Identified NISP (%ID'd NISP) across Drainages

Unit of Analysis	Mammal	Deer	Bird	Turkey	Passenger Pigeon	Reptiles	Box Turtle	Fish
AD 1000-1450	55.1	83.4	10.6	56.5	31.9	27.2	67.3	7.1
AD 1450-1620	46.9	83.0	2.9	63.9	21.3	25.0	64.6	14.5
AD 1620-1710	61.3	84.3	2.2	70.5	15.5	31.4	70.1	5.1
Late Woodland	51.0	83.2	6.8	60.2	26.6	26.1	66.0	10.8
Historic	61.3	84.3	2.2	70.5	15.5	31.4	70.1	5.1
Rivers <sup>a</sup>	54.2	86.4	6.9	59.4	26.8	27.7	65.2	11.2
Tributaries <sup>b</sup>	62.0	81.8	11.4	73.9	23.2	21.5	86.7	5.1

continues to increase in AD 1620-1710 (70.5%). This results in an increase from 60.2% in the Late Woodland period to 70.5% in the Historic period. Furthermore, assemblages derived from sites situated along major waterways exhibit a lower percent turkey (59.4%) than those derived from sites situated along tributaries (73.9%).

Passenger pigeon, however, do follow the pattern set forth by their associated taxonomic class. The percent of passenger pigeon (out of ID'd NISP Bird) decreases from AD 1000-1450 (31.9%) to AD 1450-1620 (21.3%) and continues to decrease in AD 1620-1710 (15.5%). This results in a decrease from 26.5% in the Late Woodland period to 15.5% in the Historic period. Furthermore, assemblages derived from sites situated along major waterways exhibit a higher percent passenger pigeon (26.8%) than those derived from sites situated along tributaries (23.2%).

Third, the percent reptile of identified NISP (ID'd NISP) decreases from AD 1000-1450 (27.2%) to AD 1450-1620 (25.0%) but increases during AD 1620-1710 (31.4%) (Table 5.6). This results in an increase in percent reptiles from the Late Woodland period (26.1%) to the Historic period (31.4%). Furthermore, assemblages derived from sites situated along major waterways exhibit a slightly higher percent reptile (27.7%) than those derived from sites situated along tributaries (21.5%).

Of identified reptilian specimens, box turtle represent over 60% of the assemblages regardless of date range, time period, or site location. The percent of box turtle (out of ID'd NISP Reptile) decreases from AD 1000-1450 (67.3%) to AD 1450-1620 (64.6%) but increases in AD 1620-1710 (70.1%). This results in an increase from 66.0% in the Late Woodland period to 70.1% in the Historic period. Furthermore, assemblages derived from sites situated along major

waterways exhibit a lower percent box turtle (65.2%) than those derived from sites situated along tributaries (86.7%).

Fourth, the percent fish of identified NISP (ID'd NISP) increases from AD 1000-1450 (7.1%) to AD 1450-1620 (14.5%) but decreases during AD 1620-1710 (5.1%) (Table 5.6). This results in a decrease in percent fish from the Late Woodland period (10.8%) to the Historic period (5.1%). Furthermore, assemblages derived from sites situated along major waterways exhibit a higher percent fish (11.2%) than those derived from sites situated along tributaries (5.1%).

## SUB-REGIONAL TRENDS

While regional analysis offers insight into the subsistence strategies utilized by Native Piedmont communities, it can obfuscate both spatial and temporal sub-regional trends. In the following section, I detail trends apparent within the Roanoke, Cape Fear, and Neuse River drainages. At this sub-regional level, it is also possible to see more clearly trends of change or continuity over time. For the following sections I rely on two measures derived from ID'd NISP. First, when discussing taxonomic class (e.g., mammal, bird, reptile, and fish) I report the percentage of that class out of total ID'd NISP. Second, when discussing particular species of interest (e.g., white-tailed deer, turkey, passenger pigeon, and box turtle) I report the percentage of that species out of ID'd NISP of the associated class (e.g., ID'd NISP Mammal).

### *Roanoke River Drainage*

Within the Roanoke River drainage, there are many distinct trends illuminated by the patterns in the identified NISP (ID'd NISP) data. First, the percentage of mammals in the



Roanoke ranges from 41.9% of the Lower Saratown assemblage (AD 1620-1710) to 83.8% of the Vir 150 assemblage (AD 1000-1450). The average percentage of mammals decreases sharply from AD 1000-1450 (63.2%) to AD 1450-1620 (48.3%) and slightly increases during AD 1620-1710 (52.0%), resulting in a decrease in average percent mammals from the Late Woodland period (55.7%) to the Historic period (52.0%) (Table 5.7; Figures 5.4 and 5.5). Assemblages derived from sites situated along main rivers, such as the Dan and Roanoke Rivers, have slightly lower average mammals (55.3%) than those derived from sites situated along tributaries of the Roanoke (63.9%), such as the North and South Mayo Rivers, Smith River, and Leatherwood Creek.

Of mammalian taxa, white-tailed deer are the most prevalent species in the Roanoke. The percentage of white-tailed deer ranges from 76.8% of the Gravely excavation's assemblage from the Koehler site (AD 1620-1710) to 93.9% of the Dan River phase component of the Hairston site (AD 1000-1450) (Table 5.8; Figures 5.6 and 5.7). In contrast to their overarching taxonomic class, white-tailed deer increase slightly from AD 1000-1450 (85.2%) to AD 1450-1620 (85.8%) and continue to do so in AD 1620-1710 (88.8). Thus, the percentage of white-tailed deer increases from the Late Woodland period (85.2%) to the Historic period (88.8%), though very slightly. These data indicate that, even though the percentage of mammals in these assemblages decreases over time, white-tailed deer increasingly dominate what mammals these communities are hunting. Assemblages derived from sites situated along main rivers exhibit slightly higher average white-tailed deer (88.2%) than those derived from sites situated along tributaries of the Roanoke (83.6%).

Second, the percentage of birds in the Roanoke ranges from 2.0% of the Hairston-III assemblage (AD 1620-1710) to 29.2% of the Hairston I assemblage (AD 1000-1450). Similar to

mammals, the average percent birds also starkly decreases from AD 1000-1450 (16.5%) to AD 1450-1620 (6.9%) (Table 5.7; Figures 5.4 and 5.5). In contrast to mammals, average percent birds continues to decrease into the Historic period during AD 1620-1710 (3.2%). This resulted in a very steep decrease in average percent birds from the Late Woodland (11.7%) to the Historic (3.2%). Assemblages derived from sites situated along main rivers exhibit much lower average bird (7.8%) than those derived from sites situated along tributaries of the Roanoke (17.7%).

Of avian taxa, turkey is an important species in the Roanoke. The percentage of turkey ranges from 4.9% of the Dan River phase component of the Hairston site (AD 1000-1450) to 98.1% of the Vir 150 assemblage (AD 1000-1450) (Table 5.8; Figures 5.6 and 5.7). Similar to their overarching taxonomic class, the percent of turkey also decreases from AD 1000-1450 (61.8%) to AD 1450-1620 (20.6%), but increases in AD 1620-1710 to 63.2%. Thus, the average percentage of turkey increases from the Late Woodland period (57.7%) to the Historic period (63.2%), despite the drop during the transition years of AD 1450-1620. Assemblages derived from sites situated along main rivers exhibit slightly lower average turkey (57.3%) than those derived from sites situated along tributaries of the Roanoke (61.8%).

Another important avian taxa in the Roanoke River drainage is passenger pigeon. The percentage of passenger pigeon ranges from 0% of Vir 150 site assemblage (AD 1000-1450) to 87.8% of the Dan River phase component of the Hairston site (AD 1000-1450) (Table 5.8; Figures 5.6 and 5.7). Evidently, there was a wide range in utilization of passenger pigeon within the Roanoke River drainage during this period of time. In contrast to their overarching taxonomic class, the percent of passenger pigeon increases from AD 1000-1450 (33.6%) to AD

Table 5.7: Roanoke River Drainage: Percent of Identified NISP (%ID'd NISP) for Taxonomic Classes

Date Range (AD)	Site Name	Dates of Occupation (AD)	ID'd Mammal	Average ID'd Mammal	ID'd Bird	Average ID'd Bird	ID'd Reptile	Average ID'd Reptile	ID'd Fish	Average ID'd Fish
1000-1450	Vir 150 <sup>a</sup>	1000-1400	83.8	63.2	5.5	16.5	8.7	15.3	2.0	5.0
	Stockton <sup>b</sup>	1000-1450	54.7		22.8		21.4		1.1	
	Powerplant <sup>a</sup>	1000-1450	55.6		7.6		21.5		15.2	
	Koehler <sup>b</sup> (Gravely)	1250-1450	61.1		15.9		22.6		0.4	
	Koehler <sup>b</sup> (Clark)	1250-1450	53.0		13.7		17.2		16.2	
	Leatherwood Creek <sup>b</sup>	1250-1450	71.3		14.7		13.6		0.4	
	Gravely <sup>b</sup>	1250-1450	84.9		11.3		3.6		0.3	
	Dallas Hylton <sup>b</sup>	1250-1450	58.5		27.9		13.2		0.4	
	Hairston <sup>a</sup> –I	1250-1450	46.3		29.2		15.9		8.6	
1450-1620	Hairston <sup>a</sup> –II	1450-1620	48.3	48.3	6.9	6.9	32.9	32.9	12.0	12.0
1620-1710	Hairston <sup>a</sup> –III	1620-1670	51.2	52.0	2.0	3.2	45.6	35.1	1.2	9.6
	Lower Saratown <sup>a</sup>	1620-1670	41.9		3.1		32.3		22.7	
	Upper Saratown <sup>a</sup>	1660-1710	64.4		4.1		24.0		7.5	
	William Klutz <sup>a</sup>	1670-1710	50.7		3.7		38.6		7.1	
Late Woodland			55.7		11.7		24.1		5.7	
Historic			52.0		3.2		35.1		9.6	
Sites along main rivers <sup>a</sup>			55.3		7.8		27.4		9.5	
Sites along tributaries <sup>b</sup>			63.9		17.7		15.3		3.1	



Figure 5.4: Late Woodland Period, Roanoke River Drainage: Percent Taxonomic Class of Identified Specimens (%ID'd NISP)

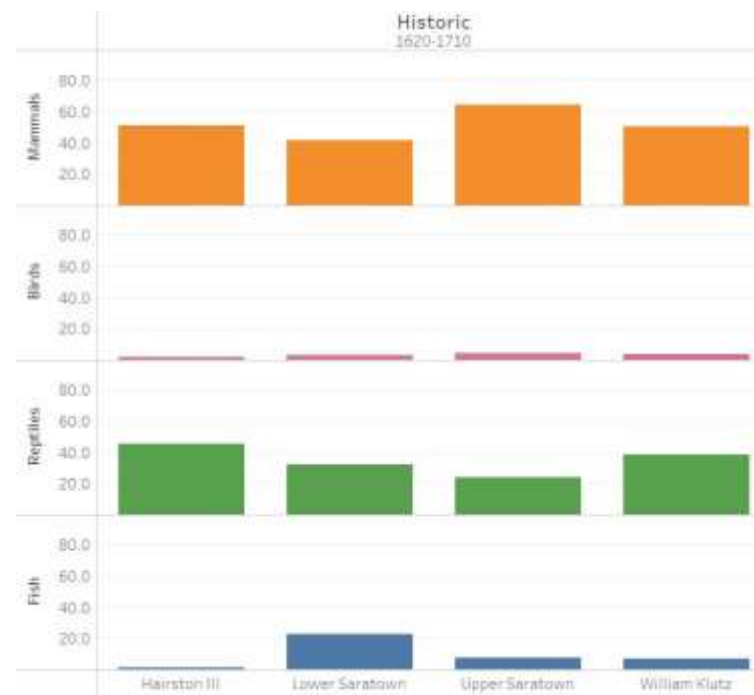


Figure 5.5: Historic Period, Roanoke River Drainage: Percent Taxonomic Class of Identified Specimens (%ID'd NISP)

1450-1620 (73.0%), but decreases in AD 1620-1710 to 27.4%. Thus, the average percentage of passenger pigeon decreases from the Late Woodland period (37.5%) to the Historic period (27.4%), despite the drastic increase from AD 1000-1450 to AD 1450-1620. Assemblages derived from sites situated along main rivers exhibit slightly higher average passenger pigeon (35.3%) than those derived from sites situated along tributaries of the Roanoke (33.8%)

Third, the percentage of reptiles in the Roanoke ranges from 8.7% of the Vir 150 assemblage (AD 1000-1450) to 38.6% of the William Kluttz assemblage (AD 1620-1710). The average percentage of reptiles more than doubles from AD 1000-1450 (15.3%) to AD 1450-1620 (32.9%) and continues to increase in AD 1620-1710 (35.1%) (Table 5.7; Figures 5.4 and 5.5). This results in an increase from the Late Woodland period (24.1%) to the Historic period (35.1%), though the major increase in average percent reptiles occurs within the Late Woodland period between AD 1000-1450 and AD 1450-1620. Assemblages derived from sites situated along main rivers exhibit much higher average reptile (27.4%) than those derived from sites situated along tributaries of the Roanoke (15.3%).

Of the reptilian taxa, box turtle is clearly an important animal resource in the Roanoke. The percentage of box turtle ranges from 29.2% of the Powerplant site assemblage (AD 1000-1450) to 100% of the Gravely excavation's assemblage of the Koehler site (AD 1000-1450) (Table 5.8 Figures 5.6 and 5.7). Surely, there was a wide range in utilization of box turtle within the Roanoke River drainage during this period of time. In contrast to their overarching taxonomic class, the percent of box turtle decreases from AD 1000-1450 (79.6%) to AD 1450-1620 (47.8%), but increases in AD 1620-1710 to 55.4%. Thus, the average percentage of box turtle decreases from the Late Woodland period (76.4%) to the Historic period (55.4%), despite the slight increase from AD 1450-1620 to AD 1620-1710. Assemblages derived from sites

Table 5.8: Roanoke River Drainage: Percent of Associated Taxonomic Class Identified NISP (%ID'd NISP) for Species of Interest

Date Range (AD)	Site Name	Dates of Occupation (AD)	Deer	Average Deer	Turkey	Average Turkey	Passenger Pigeon	Average Passenger Pigeon	Box Turtle	Average Box Turtle
1000-1450	Vir 150 <sup>a</sup>	1000-1400	87.1	85.2	98.1	61.8	0.0	33.6	55.4	79.6
	Stockton <sup>b</sup>	1000-1450	86.9		30.2		67.0		97.7	
	Powerplant <sup>a</sup>	1000-1450	83.9		82.4		11.8		29.2	
	Koehler <sup>b</sup> (Gravely)	1250-1450	76.8		91.7		5.6		100.0	
	Koehler <sup>b</sup> (Clark)	1250-1450	80.2		46.0		43.5		98.1	
	Leatherwood Creek <sup>b</sup>	1250-1450	83.2		72.4		26.3		82.9	
	Gravely <sup>b</sup>	1250-1450	91.6		75.6		17.1		100.0	
	Dallas Hylton <sup>b</sup>	1250-1450	83.0		55.2		43.3		97.3	
	Hairston <sup>a</sup> –I	1250-1450	93.9		4.9		87.8		56.1	
1450-1620	Hairston <sup>a</sup> –II	1450-1620	85.8	85.8	20.6	20.6	73.0	73.0	47.8	47.8
1620-1710	Hairston <sup>a</sup> –III	1620-1670	89.8	88.8	80.0	63.2	20.0	27.4	84.2	55.4
	Lower Saratown <sup>a</sup>	1620-1670	82.7		92.5		3.8		46.1	
	Upper Saratown <sup>a</sup>	1660-1710	90.6		51.7		14.6		91.3	
	William Klutz <sup>a</sup>	1670-1710	92.2		28.6		71.4		0.0	
Late Woodland			85.2		57.7		37.5		76.4	
Historic			88.8		63.2		27.4		55.4	
Sites along main rivers <sup>a</sup>			88.2		57.3		35.3		51.3	
Sites along tributaries <sup>b</sup>			83.6		61.8		33.8		96.0	

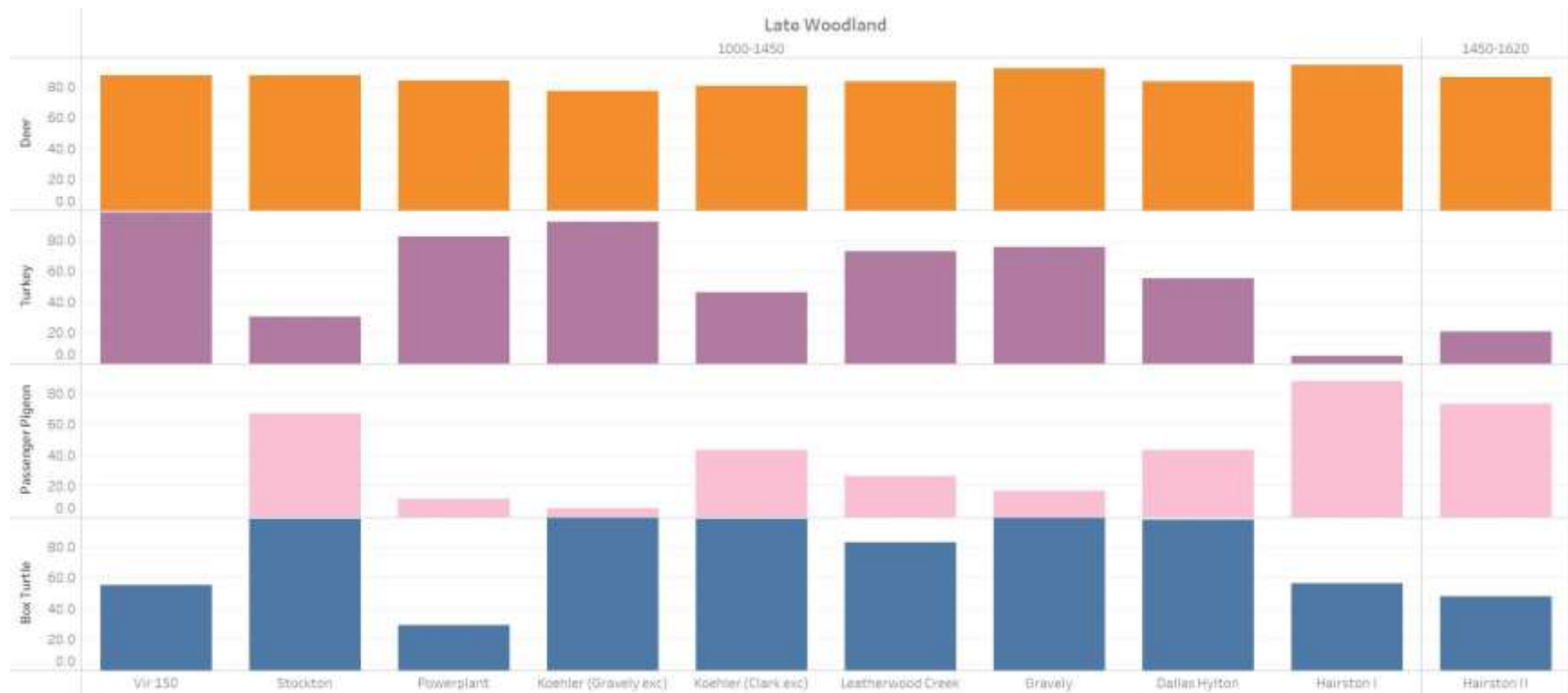


Figure 5.6: Late Woodland Period, Roanoke River Drainage: Percent Species of Interest of Identified Specimens of Associated Taxonomic Class (%ID'd NISP)



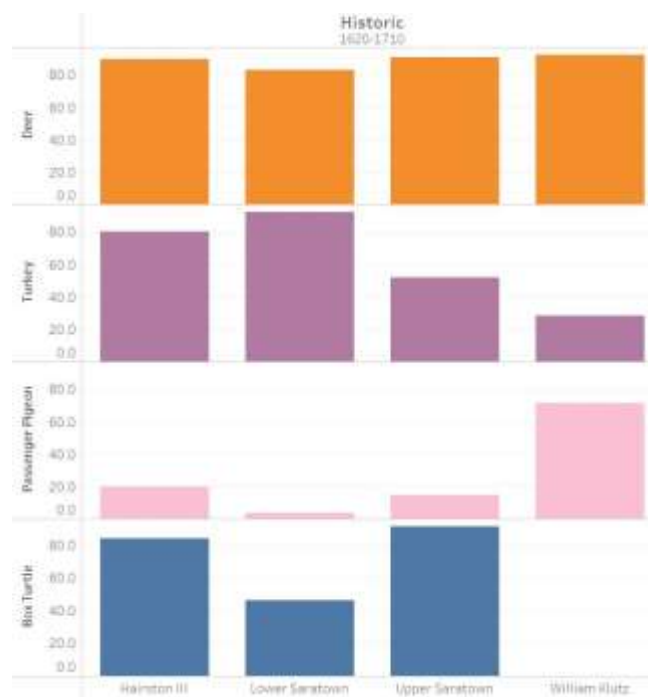


Figure 5.7: Historic Period, Roanoke River Drainage: Percent Taxonomic Class of Identified Specimens (%ID'd NISP)

situated along main rivers exhibit much lower average box turtle (51.3%) than those derived from sites situated along tributaries of the Roanoke (96.0%).

Fourth, the percentage of fish in the Roanoke ranges from below 1% of the Leatherwood Creek, Gravely, and Dallas Hylton site assemblages (AD 1000-1450) to 22.7% of the Lower Saratown site assemblage (AD 1620-1710) (Table 5.7; Figures 5.4 and 5.5). The average percent fish more than doubles from AD 1000-1450 (5.0%) to AD 1450-1620 (12.0%), though slightly decreases during AD 1620-1710 (9.6%). This results in a slight increase from the Late Woodland period (5.7%) to the Historic period (9.6%). Assemblages derived from sites situated along main rivers exhibit higher average fish (9.5%) than those derived from sites situated along tributaries of the Roanoke (3.1%).

#### *Cape Fear River Drainage*

Within the Cape Fear River drainage, there are many distinct trends illuminated by the patterns in the identified NISP (ID'd NISP) data. First, the percentage of mammals in the Cape Fear ranges from 27.9% of the Webster assemblage (AD 1000-1450) to 63.0% of the Edgar Rogers assemblage (AD 1450-1620). The average percentage of mammals increases from AD 1000-1450 (35.5%) to AD 1450-1620 (54.3%), but slightly decreases during AD 1620-1710 (47.9%). This results in very slight decrease in average percent mammals from the Late Woodland period (48.8%) to the Historic period (47.9%) (Table 5.9; Figure 5.8). Assemblages derived from sites situated along main rivers, such as the Haw River, have much lower average mammal (37.9%) than those derived from sites situated along tributaries of the Cape Fear, such as Alamance and Cane Creeks (55.7%).

Of mammalian taxa, white-tailed deer are the most prevalent species in the Cape Fear River drainage. The percentage of white-tailed deer ranges from 76.8% of the Gravely excavation's assemblage from the Koehler site (AD 1000-1450) to 93.9% of the Dan River phase component of the Hairston site (AD 1000-1450) (Table 5.10; Figure 5.9). In contrast to their overarching taxonomic class, white-tailed deer increase slightly from AD 1000-1450 (85.2%) to AD 1450-1620 (85.8%) and continue to do so in AD 1620-1710 (88.8%). Thus, the percentage of white-tailed deer increases from the Late Woodland period (85.2%) to the Historic period (88.8%), though only slightly. These data indicate that, even though the percentage of mammals in these assemblages decreases over time, white-tailed deer increasingly dominate what mammals these communities are hunting. Assemblages derived from sites situated along main rivers have slightly higher average white-tailed deer (88.2%) than those derived from sites situated along tributaries of the Cape Fear (83.6%).

Second, the percentage of birds in the Cape Fear ranges from 0% of the Webster assemblage (AD 1000-1450) to 5.7% of the Holt assemblage (AD 1000-1450). The average percent birds decreases from AD 1000-1450 (2.8%) to AD 1450-1620 (1.0%) but increases slightly to 1.9% during AD 1620-1710 (Table 5.9; Figure 5.8). As a result, the average percent birds does not change from the Late Woodland to the Historic period (1.9%), though regardless of time period these averages are low overall. Assemblages derived from sites situated along main rivers have lower average bird (0.9%) than those derived from sites situated along tributaries of the Cape Fear (2.6%).

Of avian taxa, turkey is an important species in the Cape Fear. The percentage of turkey ranges from 0% of the Webster assemblage to 100% of the George Rogers assemblage (Table 5.10; Figure 5.9), though excluding these sites the average of percent turkey in this drainage is

Table 5.9: Cape Fear River Drainage: Percent of Identified NISP (%ID'd NISP) for Taxonomic Classes

Date Range (AD)	Site Name	Dates of Occupation (AD)	ID'd Mammal	Average ID'd Mammal	ID'd Bird	Average ID'd Bird	ID'd Reptile	Average ID'd Reptile	ID'd Fish	Average ID'd Fish
1000-1450	Holt <sup>b</sup>	1000-1400	43.1	35.5	5.7	2.8	39.7	32.2	11.5	29.5
	Webster <sup>a</sup>	1000-1400	27.9		0.0		24.7		47.4	
1450-1620	George Rogers <sup>b</sup>	1400-1600	61.1	54.3	0.5	1.0	29.0	31.0	9.3	6.0
	Edgar Rogers <sup>b</sup>	1500-1600	63.0		1.5		33.0		2.6	
1620-1710	Mitchum <sup>a</sup>	1600-1670	47.9	47.9	1.9	1.9	28.9	28.9	21.3	21.3
Late Woodland			48.8		1.9		31.6		17.7	
Historic			47.9		1.9		28.9		21.3	
Sites located along main rivers <sup>a</sup>			37.9		0.9		26.8		34.4	
Sites located along tributaries <sup>b</sup>			55.7		2.6		33.9		23.8	

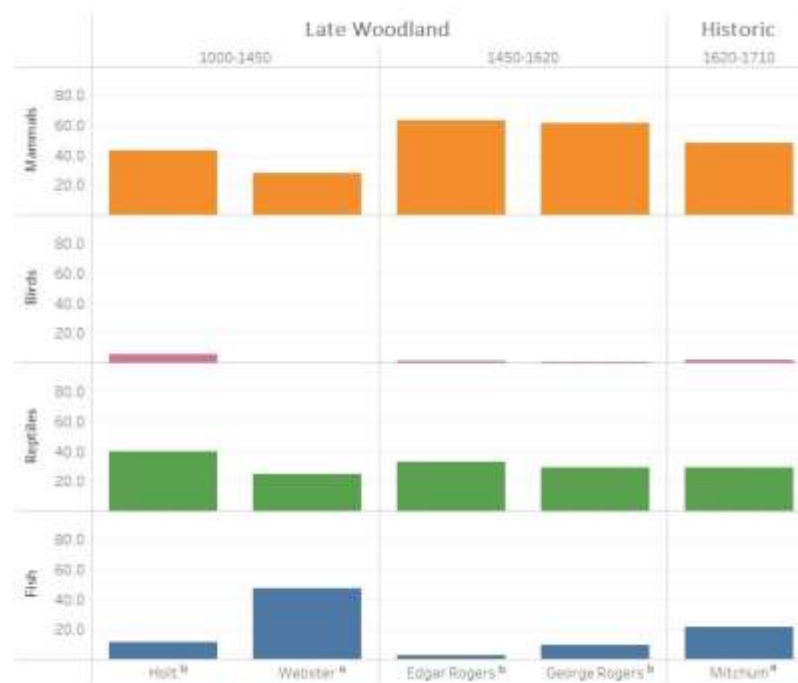


Figure 5.8: Cape Fear River Drainage: Percent Taxonomic Class of Identified Specimens (%ID'd NISP)

Table 5.10: Cape Fear River Drainage: Percent of Associated Taxonomic Class Identified NISP (%ID'd NISP) for Species of Interest

Date Range (AD)	Site Name	Dates of Occupation (AD)	Deer	Average Deer	Turkey	Average Turkey	Passenger Pigeon	Average Passenger Pigeon	Box Turtle	Average Box Turtle
1000 – 1450	Holt <sup>b</sup>	1000-1400	72.4	63.0	75.0	37.5	25.0	12.5	51.3	45.4
	Webster <sup>a</sup>	1000-1400	53.5		0.0		0.0		39.5	
1450 – 1620	George Rogers <sup>b</sup>	1400-1600	77.1	83.6	100.0	87.5	0.0	12.5	82.1	82.1
	Edgar Rogers <sup>b</sup>	1500-1600	90.0		75.0		25.0		82.0	
1620 – 1710	Mitchum <sup>a</sup>	1600-1670	89.4	89.4	88.9	88.9	0.0	0.0	88.3	88.3
Late Woodland				73.3		62.5		12.5		63.7
Historic				89.4		88.9		0.0		88.3
Sites located along main rivers <sup>a</sup>				71.5		44.4		0.0		63.9
Sites located along tributaries <sup>b</sup>				79.8		83.3		16.7		71.8

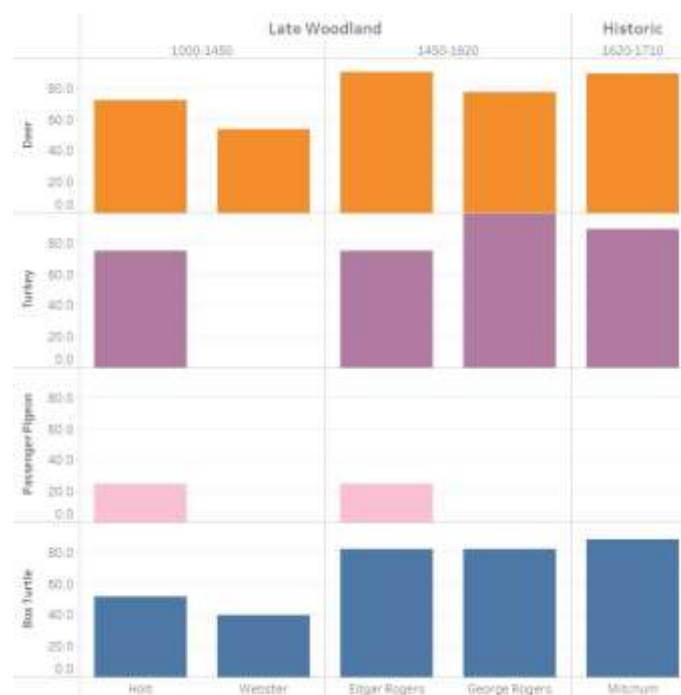


Figure 5.9: Cape Fear Drainage: Percent Species of Interest of Identified Specimens of Associated Taxonomic Class (%ID'd NISP)

79.6%. In contrast to their overarching taxonomic class, the percent of turkey increases drastically from AD 1000-1450 (37.5%) to AD 1450-1620 (87.5%) and continues to do so in AD 1620-1710 (88.9%). Thus, the average percentage of turkey increases from the Late Woodland period (62.5%) to the Historic period (88.9%). Assemblages derived from sites situated along main rivers have lower average turkey (44.4%) than those derived from sites situated along tributaries of the Cape Fear (83.3%).

Another important avian taxa in the Cape Fear River drainage is passenger pigeon. The percentage of passenger pigeon ranges from 0% of the Webster (AD 1000-1450), George Rogers (AD 1450-1620), and Mitchum (AD 1620-1710) site assemblages to 25% of the Webster (AD 1000-1450) and Edgar Rogers (AD 1450-1620) assemblages (Table 5.10; Figure 5.9). Utilization of passenger pigeon was highly varied across time and space and, for this reason, it is difficult to identify trends. The average percent of passenger pigeon does not change from AD 1000-1450 to AD 1450-1620 (12.5%), but decreases in AD 1620-1710 to 0%. Thus, the average percentage of passenger pigeon decreases from the Late Woodland period (12.5%) to the Historic period (0%). Assemblages derived from sites situated along main rivers contain no passenger pigeon specimens (0%) while those derived from sites situated along tributaries of the Cape Fear have an average of 16.7% passenger pigeon.

Third, the percentage of reptiles in the Cape Fear ranges from 28.9% of the Mitchum site assemblage (AD 1620-1710) to 39.7% of the Holt site assemblage (AD 1000-1450). The average percentage of reptiles decreases slightly from AD 1000-1450 (32.2%) to AD 1450-1620 (31.0%) and continues to do so in AD 1620-1710 (28.9%) (Table 5.9; Figure 5.8). This results in a decrease from the Late Woodland period (31.6%) to the Historic period (28.9%). Assemblages



derived from sites situated along main rivers have lower average reptiles (26.8%) than those derived from sites situated along tributaries of the Cape Fear (33.9%).

Of the reptilian taxa, box turtle is clearly an important animal resource in the Cape Fear. The percentage of box turtle ranges from 39.5% of the Webster site assemblage (AD 1000-1450) to 88.3% of the Mitchum site assemblage (AD 1620-1710) (Table 5.10; Figure 5.9). In contrast to their overarching taxonomic class, the percent of box turtle increases from AD 1000-1450 (45.4%) to AD 1450-1620 (82.1%) and continues to increase in AD 1620-1710 to 88.3%. Thus, the average percentage of box turtle increases from the Late Woodland period (63.7%) to the Historic period (88.3%). Assemblages derived from sites situated along main rivers have lower average box turtle (63.9%) than those derived from sites situated along tributaries of the Cape Fear (71.8%).

Fourth, the percentage of fish in the Cape Fear ranges from 2.6% of the Edgar Rogers site assemblage (AD 1450-1620) to 21.3% of the Mitchum site assemblage (AD 1620-1710) (Table 5.9; Figure 5.8). The average percent fish steeply decreases from AD 1000-1450 (29.5%) to AD 1450-1620 (6.0%), though bounces back during AD 1620-1710 (21.3 %). This results in an overall increase from the Late Woodland period (17.7%) to the Historic period (21.3%), though at this resolution the decrease within the Late Woodland period is obfuscated. Assemblages derived from sites situated along main rivers have slightly higher average fish (34.4%) than those derived from sites situated along tributaries of the Cape Fear (23.8%).

### *Neuse River Drainage*

Within the Neuse drainage, there are many distinct trends illuminated by the patterns in the identified NISP (ID'd NISP) data. First, the percentage of mammals in the Neuse ranges

from 46.9% of the Fredricks assemblage (AD 1620-1710) to 79.7% of the Wall assemblage (AD 1450-1620) (Table 5.11; Figure 5.10). The average percentage of mammals decreases from AD 1450-1620 (79.7%) to AD 1620-1710 (53.0%). This decline also represents the change from the Late Woodland period to the Historic period, as there are no sites from the first date range (AD 1000-1450) in the Neuse River drainage. All assemblages within this drainage are derived from sites located along the Eno River and average 61.9% mammals.

Of mammalian taxa, white-tailed deer are the most prevalent species in the Neuse River drainage. The percentage of white-tailed deer in the Neuse ranges from 97.3% of the Jenrette assemblage (AD 1620-1710) to 86.6% of the Fredricks assemblage (AD 1620-1710) (Table 5.12; Figure 5.11). In contrast to their overarching taxonomic class, the average percentage of white-tailed deer increases from AD 1450-1620 (89.5%) to AD 1620-1710 (92.0%). This increase also represents the change from the Late Woodland period to the Historic period, as there are no sites from the first date range (AD 1000-1450) in the Neuse River drainage. All assemblages within this drainage are derived from sites located along the Eno River and average 91.1% white-tailed deer.

Second, the percentage of birds in the Neuse ranges from 0.7% of the Jenrette site assemblage (AD 1620-1710) to 7.7% of the Fredricks site assemblage (AD 1620-1710) (Table 5.11; Figure 5.10). The average percentage of birds increases from AD 1450-1620 (1.7%) to AD 1620-1710 (4.2%). This increase also represents the change from the Late Woodland period to the Historic period, as there are no sites from the first date range (AD 1000-1450) in the Neuse River drainage. All assemblages within this drainage are derived from sites located along the Eno River and average 3.4% birds.

Table 5.11: Neuse River Drainage: Percent of Identified NISP (%ID'd NISP) for Taxonomic Classes

Date Range (AD)	Site Name	Dates of Occupation (AD)	ID'd Mammal	Average ID'd Mammal	ID'd Bird	Average ID'd Bird	ID'd Reptile	Average ID'd Reptile	ID'd Fish	Average ID'd Fish
1450 – 1620	Wall <sup>a</sup>	1400-1600	79.7	79.7	1.7	1.7	15.3	15.3	3.2	3.2
1620 – 1710	Jenrette <sup>a</sup>	1660-1680	59.1	53.0	0.7	4.2	40.0	39.4	0.2	3.4
	Fredricks <sup>a</sup>	1680-1710	46.9		7.7		38.7		6.6	
Late Woodland				79.7		1.7		15.3		3.2
Historic				53.0		4.2		39.4		3.4
Sites along main rivers <sup>a</sup>				61.9		3.4		31.3		3.4
Sites along tributaries <sup>b</sup>				--		--		--		--



Figure 5.10: Neuse River Drainage: Percent Taxonomic Class of Identified Specimens (%ID'd NISP)

Of avian taxa, turkey is an important species in the Neuse. The percentage of turkey in the Neuse ranges from 95.1% of the Jenrette assemblage (AD 1620-1710) to 68.5% of the Fredricks assemblage (AD 1620-1710) (Table 5.12; Figure 5.11). In contrast to their overarching taxonomic class, the average percentage of turkey decreases from AD 1450-1620 (90.4%) to AD 1620-1710 (81.8%). This decrease also represents the change from the Late Woodland period to the Historic period, as there are no sites from the first date range (AD 1000-1450) in the Neuse River drainage. All assemblages within this drainage are derived from sites located along the Eno River and average 84.7% turkey.

Another important avian taxa in the Neuse River drainage is passenger pigeon. The percentage of passenger pigeon in the Neuse ranges from 1.8% of the Wall assemblage (AD 1450-1620) to 21.8% of the Fredricks assemblage (AD 1620-1710) (Table 5.12; Figure 5.11). In contrast to turkey, the average percentage of passenger pigeon increases from AD 1450-1620 (1.8%) to AD 1620-1710 (12.1%). This increase also represents the change from the Late Woodland period to the Historic period, as there are no sites from the first date range (AD 1000-1450) in the Neuse River drainage. All assemblages within this drainage are derived from sites located along the Eno River and average 8.7% passenger pigeon.

Third, the percentage of reptiles in the Neuse ranges from 15.3% of the Wall assemblage (AD 1450-1620) to 40.0% of the Jenrette assemblage (AD 1620-1710). The average percentage of reptiles more than doubles from AD 1450-1620 (15.3%) to AD 1620-1710 (39.4%) (Table 5.11; Figure 5.10). This increase also represents the change from the Late Woodland period to the Historic period, as there are no sites from the first date range (AD 1000-1450) in the Neuse River drainage. All assemblages within this drainage are derived from sites located along the Eno River and average 31.3% reptiles.

Table 5.12: Neuse River Drainage: Percent of Associated Taxonomic Class Identified NISP (%ID'd NISP) for Species of Interest

Date Range (AD)	Site Name	Dates of Occupation (AD)	Deer	Average Deer	Turkey	Average Turkey	Passenger Pigeon	Average Passenger Pigeon	Box Turtle	Average Box Turtle
1450 – 1620	Wall <sup>a</sup>	1400-1600	89.5	89.5	90.4	90.4	1.8	1.8	98.3	98.3
1620 – 1710	Jenrette <sup>a</sup>	1660-1680	97.3	92.0	95.1	81.8	2.4	12.1	79.8	89.2
	Fredricks <sup>a</sup>	1680-1710	86.6		68.5		21.8		98.5	
Late Woodland			89.5		90.4		1.8		98.3	
Historic			92.0		81.8		12.1		89.2	
Sites along main rivers <sup>a</sup>			91.1		84.7		8.7		92.2	
Sites along tributaries <sup>b</sup>			--		--		--		--	



Figure 5.11: Neuse Drainage: Percent Species of Interest of Identified Specimens of Associated Taxonomic Class (%ID'd NISP)

Of the reptilian taxa, box turtle is clearly an important animal resource in the Neuse River drainage. The percentage of box turtle in the Neuse ranges from 79.8% of the Jenrette assemblage (AD 1620-1710) to 98.5% of the Fredricks assemblage (AD 1620-1710) (Table 5.12; Figure 5.11). In contrast to their overarching taxonomic class, the average percentage of box turtle decreases from AD 1450-1620 (98.3%) to AD 1620-1710 (89.2%). This increase also represents the change from the Late Woodland period to the Historic period, as there are no sites from the first date range (AD 1000-1450) in the Neuse River drainage. All assemblages within this drainage are derived from sites located along the Eno River and average 92.2% box turtle.

Fourth, the percentage of fish in the Neuse ranges from 0.2% of the Jenrette assemblage (AD 1620-1710) to 6.6% of the Fredricks site assemblage (AD 1620-1710). The average percentage of fish increases slightly from AD 1450-1620 (3.2%) to AD 1620-1710 (3.4%) (Table 5.11; Figure 5.10), though this does not capture the difference in percent fish between the Jenrette (0.2%) and Fredricks (6.6%) sites. This increase also represents the change from the Late Woodland period to the Historic period, as there are no sites from the first date range (AD 1000-1450) in the Neuse River drainage. All assemblages within this drainage are derived from sites located along the Eno River and average 3.4% fish.



## **CHAPTER 6: DISCUSSION**

The multiple lines of evidence gleaned from the current study present an interesting picture of the Native subsistence strategies of the Late Woodland and Historic Piedmont. In the following chapter, I discuss potential interpretations of the data presented above. The patterns I discuss below indicate that the time between AD 1450 and 1620 was one of major transformation for Native subsistence strategies of the Piedmont.

It is possible that the trends I discuss below are evidence of localized subsistence practices that speak to sub-drainage variation over time. Following this interpretation, villages of the Piedmont subscribed to community-specific subsistence practices that varied from village to village during the Late Woodland and Historic periods. These trends may also speak to increasing sedentism—and changes in foodways associated with it—during AD 1450-1620.

During AD 1450-1620, communities of the Piedmont adopted corn, bean, and squash agriculture as an important staple in addition to gathering and managing wild plant resources. In contrast to focusing solely on gathering and managing wild crops, tending to fields requires nearly year-round labor, and as a result, it may not have been feasible for community members to leave villages on extended hunting or gathering forays. As a result, the types of animal resources once utilized earlier in the Late Woodland might not have been feasible to continue to incorporate into Native subsistence strategies.

These trends may be a result of other phenomena at play in the Late Woodland and Historic Piedmont. The ecological patchiness of faunal resources and highly localized ecological make-up of each village played a part in variation of subsistence practices. Furthermore, these

trends may speak to the increasing participation of Native communities in the exploding deerskin trade into the Historic period. Dedication of significant time, effort, and resources to procuring hides influenced subsistence strategies greatly (Lapham 2005).

## TRENDS IN THE ROANOKE RIVER DRAINAGE

Within the Roanoke River drainage, there are three distinct trends illuminated by the results of this analysis (Figures 6.1 and 6.2). First, mammalian taxa decrease in importance from the Late Woodland period to the Historic period, though the steepest decline occurs during the Late Woodland between AD 1000-1450 and AD 1450-1620. In contrast, however, the importance of white-tailed deer increases steadily over time. Second, avian taxa decrease in importance from the Late Woodland period to the Historic period. Furthermore, their decline began in the Late Woodland period during AD 1450-1620. While the importance of turkey increases from the Late Woodland to the Historic period that of passenger pigeon decreases starkly. It should be noted, however, that the time between AD 1450 and 1620 disrupts this pattern, which I will discuss below. Third, the importance of reptilian taxa increases from the Late Woodland period to the Historic period, though this increase is most evident from AD 1000-1450 to AD 1450-1620, as their importance slightly decreases in the succeeding centuries of the Historic period. Furthermore, box turtles were more commonly utilized by communities located near tributaries than those situated near major rivers.

The steady increase in the importance of white-tailed deer, despite the overall decrease of mammalian resources, may be a result of this phenomenon. As Native communities settled permanently, subsistence strategies broadened to incorporate a wide variety of animal resources in order to either sustain local animal populations and stave off overhunting or make up for the

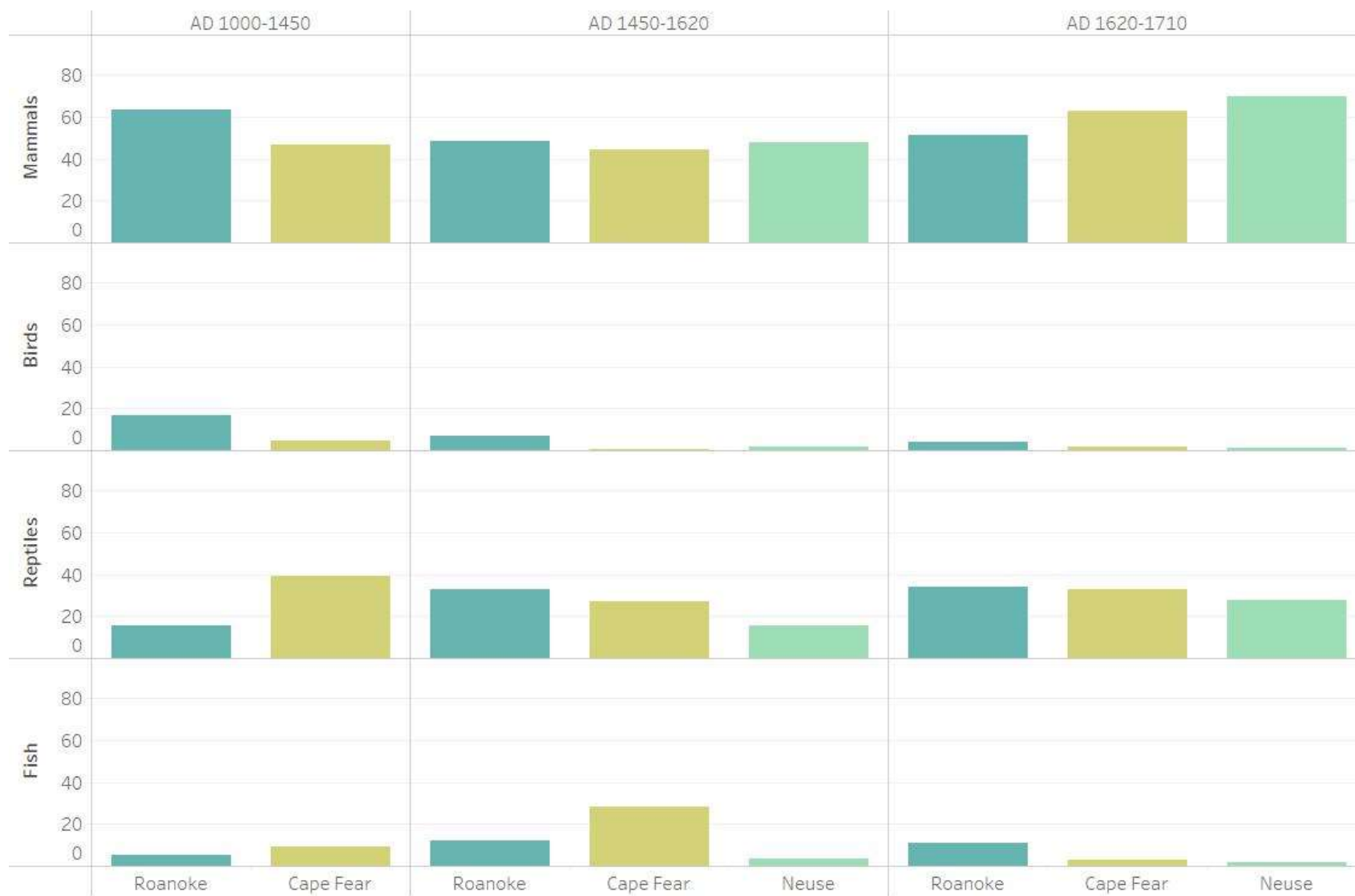


Figure 6.1: Change Over Time: Average Percent Taxonomic Class of Total Identified Specimens (%ID'd NISP)



Figure 6.2: Change Over Time: Average Percent Species of Interest of Identified Specimens of Associated Taxonomic Class (%ID'd NISP)

inadequate numbers of certain local animal populations. As a result, then, it is intuitive that the proportion of mammals decreases over time as other taxonomic groups are incorporated. The increase in deer, however, does not follow this intuition. This may be a result of the burgeoning deerskin trade. While communities were decreasing their emphasis on mammalian resources overall, what mammalian species they did utilize were, in the majority, white-tailed deer. This choice may have been to maximize the amount of hides procured while still collecting enough meat (and other primary products) to meet communities' needs.

Furthermore, the importance of turkey and passenger pigeon changes dramatically over time. While turkeys seem to gain in importance, passenger pigeons lose their importance. The decreased importance of passenger pigeon may be a result of increased sedentism. The importance of mobility in Late Woodland subsistence strategies was highlighted by Whyte (2001) in the mountains, just west of the Roanoke River drainage. As he argued, hunting migratory avian resources requires some degree of seasonal mobility, especially of the eastern Piedmont communities who may have had to travel west to the foothills to take advantage of the migrating passenger pigeons. It is possible that hunting parties could make seasonal visits to migration paths, or that communities were located within such migratory routes. The increased focus on agricultural production and corresponding increased sedentism of AD 1450-1620, however, may have influenced the choice to de-emphasize passenger pigeon utilization due to increased labor requirements of maintaining a sedentary village and agricultural fields.

The increasing importance of turkey may be a result of a shift in subsistence practices influenced by Native and Native-European exchange networks. As Lawson (1709:67-68, 207) noted, turkeys congregated in oak groves along rivers. Such rivers were also used as thoroughfares for transportation by Piedmont tribes and European explorers, shipping routes for

trade goods like deerskins and weapons, and sites of conflict between Piedmont tribes as well as between them and the European interlopers. As a result, it is possible that Native communities who engaged in these interactions focused their subsistence strategies on the riverine landscapes in which they spent increasingly more time. In addition, it's possible increased sedentism was paired with an intensified turkey management practice, as Lawson described (1709:149).

While it is unclear why the importance of reptiles increases over time, there is a notable spatial pattern apparent in the box turtle data. Box turtles are more heavily utilized by communities situated near tributaries than those located near major rivers. This may be a result of box turtle catchment zones. As terrestrial animals, box turtles do not congregate near large rivers. As a result, it is possible that communities near tributaries had access to more prolific box turtle territories than communities near major rivers. Likewise, it is possible that communities near major rivers had access to more prolific riverine resources than communities near tributaries and, as a result, did not seek out box turtle as a prominent food resource. This is supported by the fact that fish are more intensely utilized by communities situated along main rivers than communities located along tributaries.

## TRENDS IN THE CAPE FEAR RIVER DRAINAGE

The sites located within the Cape Fear River drainage are starkly different from those of the other regions. Within the Cape Fear River drainage, there are two apparent trends. First, there is a major spatial patterning of subsistence practices illuminated by the results of this analysis (Figures 6.1 and 6.2). Communities located along the Haw River (the Webster and Mitchum sites) utilized vastly different subsistence strategies than communities located along Alamance Creek (the George Rogers and Holt sites) and Cane Creek (the Edgar Rogers site). For brevity's

sake, I will refer to the former as river communities and the latter as tributary communities. First, river communities utilized fewer mammalian resources than tributary communities. Additionally, tributary communities utilize more deer than river communities. Second, river communities did not utilize as many avian resources as tributary communities, though birds are all but absent in this drainage's assemblages. This trend is supported by the patterns in the turkey and passenger pigeon data. Third, tributary communities relied more heavily on reptilian resources than the river communities, which is supported by the patterns in box turtle utilization. Fourth, river communities relied on fish resources more so than tributary communities. These trends offer a picture of subsistence strategies tailored to local ecological and cultural environments that supports the conclusions of Vanderwarker (2001).

In step with Vanderwarker's findings in the Roanoke River drainage, river communities of the Cape Fear River drainage also practiced noticeably different subsistence strategies than tributary communities. Vanderwarker argued such differences are "likely related to differences in local catchment zones" (2001:35), though they could also be related to differences in community cultural traditions and preferences. For example, tributary communities emphasized mammalian, avian, and reptilian resources in lieu of abundant fish resources. Alternatively, river communities focused their subsistence strategies more intensely on fish resources in lieu of mammalian, avian, and reptilian resources. River communities also exhibit broader subsistence strategies than the tributary sites. For example, no taxonomic class represents a majority of or dominates the assemblage, though birds are remarkably absent. Contrastingly, mammals comprise over half of the tributary communities' assemblages. These results indicate that, for ecological or cultural reasons, communities of the Cape Fear River drainage utilized locally specific subsistence strategies.

Second, there is an overarching temporal trend apparent in the Cape Fear River drainage. The communities of AD 1000-1450 exhibit a broad-based subsistence strategy utilizing mammals, reptiles, and fish evenly, though birds are not well represented. This shifts to a subsistence strategy intensely focused on mammals during AD 1450-1620, where both birds and fish are not well represented. The time between AD 1620 and 1710 is characterized by a similar pattern in which mammals are the most prevalent animals utilized, though fish become more important in contrast to AD 1450-1620.

These findings do not support Byrd's diversification framework (1997:56). Again, as he defines it, the process of diversification occurs when villages shifting from subsistence strategies based on hunting and gathering to agricultural strategies bolster agricultural production with a broad and evenly distributed range of wild food resources. If that were the case, then the faunal evidence would show more evenly distributed classes of animals in the Historic period, rather than a focus on mammals. This would be most evident in a comparison of the Webster and Mitchum sites. Both sites are located in similar locations along the Haw River so the differences outlined above should not be a factor in this comparison. The Webster site was occupied during AD 1000-1450 while the Mitchum site was occupied during AD 1620-1710. If diversification was at play in the Cape Fear River drainage, these sites would have distinct patterns in assemblages, where the Webster assemblage would exemplify narrowly-focused subsistence practices while the Mitchum site would exemplify broad-based strategies. Instead, the Webster site is characterized by an even distribution of mammals, reptiles, and fish while the Mitchum site is characterized by an intensified focus on mammals and a lesser focus on reptiles and fish. Birds, again, are remarkably absent from both assemblages. This pattern indicates that distinct, locally available animal resources remained important regardless of agricultural production.



Though the importance of mammals varies across time in the Cape Fear River drainage, the importance of white-tailed deer clearly increases from AD 1000-1450 to AD 1620-1710, with the largest increase occurring between AD 1000-1450 and 1450-1620. This dependence on white-tailed deer in the Late Woodland indicates that communities of the Cape Fear River drainage were already specializing in targeting deer before the introduction of the deerskin trade in the Historic period, though these communities were probably participating heavily in the trade when it was eventually introduced into the region.

## TRENDS IN THE NEUSE RIVER DRAINAGE

The sites within the present study that are located within the Neuse River drainage are all located within a 25-acre bend in the Eno River known as the Hillsborough Archaeological District (Davis 2009). With this in mind, it is difficult to reach any broad conclusions about the entire Neuse River drainage. Rather, this section will discuss the localized differences between site occupations spanning AD 1450-1710.

Within the Hillsborough Archaeological District, two major trends are apparent (Figures 6.1 and 6.2). First, though the importance of mammals decreases from AD 1450-1620 to 1620-1710, the importance of white-tailed deer increases during this time. Two of the Neuse River drainage study sites were occupied during the Historic period: first the Jenrette site during AD 1660-1680 and then the Fredricks site during AD 1680-1710. While white-tailed deer increase in importance from the Wall site (AD 1450-1620) to the Jenrette site, their importance decreases from the Jenrette occupation to the Fredricks occupation. This may be a result of over-hunting white-tailed deer as Byrd (1997) hypothesized elsewhere. The community living at the Jenrette site almost exclusively hunted deer in lieu of any other mammal resource, but the Fredricks

community utilized fewer deer than those living at the Wall site. This may indicate that, in the mid-seventeenth century, the people living at the Jenrette site were engaged in the booming deerskin trade. This may have decimated local deer populations for the subsequent inhabitants of the Fredricks site. Alternatively, this pattern may be a result of reduced mobility and inter-group tensions or conflict that resulted in smaller hunting territories near settlements like Fredricks.

Second, the importance of bird, reptile, and fish resources increases from AD 1450-1620 to 1620-1710. The increased importance of bird resources may be fueled by the exponential increase in passenger pigeon utilization during AD 1620-1710, especially at the Fredricks site, the most recent occupation in the Hillsborough Archaeological District. This may be a result of the beginning of the end of the Little Ice Age. As the Piedmont warmed, migratory species such as passenger pigeon may have expanded their migration roosting territory eastward into the Cape Fear and Neuse River drainages, just as Lawson (1709:141-142) witnessed in 1701. This would have allowed communities living in the Hillsborough Archaeological District to take advantage of this resource without engaging in long-range hunting forays into the foothills.

In contrast to passenger pigeon, however, box turtle decreases in importance from AD 1450-1620 to 1620-1710. Reviewing Holm's reported data (1987:Tables 10.1 and 10.2; 1993:Table 12.8) reveals this decrease in box turtle is supplanted by an increase in a wider variety of aquatic turtle species in larger quantities. These other species include snapping turtle (*Chelydra serpentina*), mud turtle (*Kinosternon* sp.), painted turtle (*Chrysemys picta*), and cooter (*Pseudemys floridana*). This pattern may support the prevailing understandings of Historic period Native subsistence strategies as incorporating increasingly broader-based subsistence strategies to bolster agricultural practices and support sedentary lifestyles.

These results indicate that the Late Woodland and Historic period Piedmont was an ecologically and culturally diverse region. River drainages hosted a wide variety of animals that were utilized in varying capacities by Native communities depending on localized catchment zones, cultural traditions, and preference. These results also show that the differences between Late Woodland and Historic Native subsistence strategies were most likely established before the Historic period during the transition period between AD 1450 and 1620. The present study offered a compelling case for taking this intermediary period more seriously as a unit of analysis. Subsistence strategies changed from the Late Woodland to the Historic, but maintained reliance on endemic species rather than relying on introduced animals and plants. As European settlers encroached upon Native land and Native communities turned to intensified agricultural production and the deerskin trade, these communities forewent subsistence strategies that relied on mobility. Communities instead relied on a wide variety of species close to home and were resistant to adopt European domesticates such as cattle and swine. These patterns speak to entrenched, highly valued, and resilient Native traditions that were either solidified or modified during the time between AD 1450 and 1620.

## **CHAPTER 7: CONCLUSIONS**

The present study has addressed the degree to which Native subsistence strategies were reconfigured to meet changing environmental and cultural settings during the Late Woodland and Historic period. This work built on preexisting research by Holm (1987, 1993) and Vanderwarker (2001) to identify regional, sub-regional, and temporal patterns of subsistence practices among 19 sites (22 occupations in total) within three river drainages (Roanoke, Cape Fear, and Neuse River) of the Piedmont during the years spanning AD 1000-1710. Specifically, I asked if past Native groups practiced regionally specific subsistence strategies that can be distinguished among and between river drainages and across time.

During this time span, the Native populations of the Piedmont had developed local cultural traditions and identities that varied between villages and communities. These communities experienced cultural upheaval not only due to European colonization in the seventeenth and eighteenth centuries, but also due to the preceding centuries' concentrated population density, intensified agricultural production, and increased intertribal conflict. As Holm (1993) and others have argued, Native subsistence practices were generally resilient in the face of regional sociopolitical and environmental changes, though, as I have shown here, communities did alter their subsistence strategies at the sub-regional level.

This study presents three major contributions to the study of Native Piedmont subsistence practices. First, I have shown that the time between AD 1450 and 1620 saw the most radical shifts in subsistence practices across the study region. Second, communities located along major waterways practiced subsistence strategies distinct from communities situated near tributaries,

creeks, and other minor waterways. Third, despite a region-wide decrease in the utilization of mammals as food resources, communities across the region increased their emphasis on white-tailed deer from the Late Woodland period to the Historic period, perhaps reflecting the expansive reach of the deerskin trade in the post-contact Piedmont. These trends paint a picture of resilient and locally variable Native subsistence economies.

## FUTURE DIRECTIONS

While this work is a continuation and expansion on the research conducted by Holm (1993, 1994) and Vanderwarker (2001), it is by no means based on an exhaustive and complete dataset. The scope of this study can be further expanded to encompass the rest of the Piedmont region through additional research of existing literature, analysis of previously un- and under-studied samples, creation of publicly available faunal data, and careful excavation of sites within the Piedmont.

In addition to a larger dataset, the standardization of types of data collected and reported in zooarchaeological analysis would supply more data to further advance the observations about past Native subsistence practices presented in this study. As I noted in Chapter 4, some of the faunal data available in the Piedmont was not comparable to a larger dataset and thus unusable for this project. Inconsistencies in which data and how data were recorded compounded this issue. The act of creating and implementing data collection standards, which some analysts already adhere to—and making data publicly available for meta-analyses—would positively impact future work in this area, and inform a more complete understanding of Native foodways. Although the present study focused specifically on the analysis of faunal remains, the natural progression of this study would combine faunal data with other information from

archaeobotanical, ceramic, and lithic assemblages in future meta-analysis to paint a more holistic picture of Native foodways in the Piedmont.

## REFERENCES

- Beck, Robin, Gayle Fritz, Heather Lapham, David Moore, and Christopher Rodning  
2016 The Politics of Provisioning: Food and Gender at Fort San Juan de Joara, 1566-1568. *American Antiquity* 81(1):3-26.
- Beyer, Fred  
1991 *North Carolina: The Years Before Man: A Geologic History*. Carolina Academic Press, Durham.
- Byrd, John E.  
1997 *Tuscarora Subsistence Practices in the Late Woodland Period: The Zooarchaeology of the Jordan's Landing Site*. North Carolina Archaeological Council Publication No. 27.
- Chaplin, Raymond E.  
1971 *The Study of Animal Bones from Archaeological Sites*. William Claus and Sons, London.
- Clay, James W., Douglas M. Orr, Jr., and Alfred W. Stewart  
1975 *North Carolina Atlas*. University of North Carolina Press, Chapel Hill.
- Coe, Joffre L.  
1952 The Cultural Sequence of the Carolina Piedmont. In *Archaeology of the Eastern United States*, edited by James B. Griffin. University of Chicago Press, Chicago:  
  
1964 *The Formative Cultures of the Carolina Piedmont*. Transactions of the American Philosophical Society, n.s., 54, pt. 5. American Philosophical Society, Philadelphia.
- Coleman, Gary N. and Richard P. Gravely, Jr.  
1992 Archaeological Investigations at the Koehler Site (44Hr6). *Quarterly Bulletin of the Archaeological Society of Virginia* 47:1-41.
- Crosby, Alfred W.  
1997 Conquistador y Pestilencia: The First New World Pandemic and the Fall of the Great Indian Empires. In *Biological Consequences of the European Expansion, 1450-1800*, edited by Kenneth F. Kiple and Stephen V. Beck. Ashgate Publishing Company: Vermont: 91-108.
- Davis, R.P. Stephen, Jr., Jane Eastman, Thomas O. Maher, and Richard P. Gravely, Jr.  
1997a *Archaeological Investigations at the Stockton Site, Henry County, Virginia*. Research Report 14. Research Laboratories of Anthropology, University of North Carolina, Chapel Hill.

- 1997b *Archaeological Investigations at the Gravely Site, Henry County, Virginia*. Research Report 17. Research Laboratories of Archaeology, University of North Carolina, Chapel Hill.
- 1998 *Archaeological Investigations at the Dallas Hylton Site, Henry County, Virginia*. Research Report 18. Research Laboratories of Archaeology, University of North Carolina, Chapel Hill.
- Davis, R.P. Stephen, Jr. and H. Trawick Ward
- 1989 The Evolution of Siouan Communities in Piedmont North Carolina. Paper presented at the 46<sup>th</sup> Annual Meeting of the Southeastern Archaeological Conference, Tampa.
- Dickens, Roy S., Jr., H. Trawick Ward, and R.P. Stephen Davis, Jr. (editors)
- 1987 *The Siouan Project: Seasons I and II*. Monograph Series 1, Research Laboratories of Anthropology, University of North Carolina, Chapel Hill.
- Duffy, John
- 1997 Smallpox and the Indians in the American Colonies. In *Biological Consequences of the European Expansion, 1450-1800*, edited by Kenneth F. Kiple and Stephen V. Beck. Ashgate Publishing Company: Vermont: 233-250.
- Duncan, Wilbur .H. and Marion .B. Duncan
- 1988 *Trees of the Southeastern United States*. University of Georgia Press, Athens.
- Eastman, Jane
- 1992 Seventeenth-Century Lithic Technologies on the North Carolina Piedmont. In *Indian Communities on the North Carolina Piedmont, A.D. 1000 to 1700*, edited by H. Trawick Ward and R.P. Stephen Davis Jr. Monograph 2. Research Laboratories of Anthropology, University of North Carolina, Chapel Hill.
- Gallivan, Martin
- 1997 The Leatherwood Creek Site: A Dan River Phase Site in the Southern Virginia Piedmont. *Quarterly Bulletin of the Archaeological Society of Virginia* 52(4):150-171.
- Goertzen, Chris
- 2001 Powwows and Identity on the Piedmont and Coastal Plains of North Carolina. *Ethnomusicology* 45(1):58-88.
- Grayson, Donald K.
- 1984 *Quantitative Zooarchaeology: Topics in the Analysis of Archaeological Faunas*. Academic Press, New York.



Gremillion, Kristen J.

- 1989 *Late Prehistoric and Historic Period Paleoethnobotany of the North Carolina Piedmont*. PhD dissertation, Department of Anthropology, University of North Carolina, Chapel Hill.
- 1993 Adoption of Old World Crops and Processes of Cultural Change in the Historic Southeast. *Southeastern Archaeology* 12:15-20.
- 1995 Comparative Paleoethnobotany of Three Native Southeastern Communities of the Historic Period. *Southeastern Archaeology* 14:1-16.

Hoffman, Paul

- 1994 Lucas Vázquez de Ayllón's Discovery and Colony. In *The Forgotten Centuries: Indians and Europeans in the American South, 1521-1704*, edited by Charles M. Hudson and Carmen Chaves Tesser. The University of Georgia Press, Athens.

Holm, Mary Ann

- 1994 *Continuity and Change: The Zooarchaeology of Aboriginal Sites in the North Carolina Piedmont*. Unpublished Ph.D. dissertation, Department of Anthropology, University of North Carolina, Chapel Hill.

Hudson, Charles, Marvin T. Smith, and Chester DePratter

- 1984 The Hernando de Soto Expedition: From Apalachee to Chiaha. *Southeastern Archaeology* 3:65-77.

Jeffries, Marshall

- 2015 Re-Membering Our Own Power: Occaneechi Activism, Feminism, and Political Action Theories. *Frontiers: A Journal of Women Studies* 36(1):160-195.

Jones, Emily Lena and Caroline Gabe

- 2015 The Promise and Peril of Older Collections: Meta-Analyses and the Zooarchaeology of Late Prehistoric/Early Historic New Mexico. *Open Quaternary* 1(6):1-13.

Klein, Richard G. and K. Cru-Urbe

- 1984 *The Analysis of Animal Bones from Archaeological Sites*. University of Chicago Press, Chicago.

Koricheva, J. and J. Gurevitch

- 2014 Uses and Misuses of Meta-analysis in Plant Ecology. *Journal of Ecology* 102:828-844.

Lamb, Hubert H.

- 1963 On the Nature of Certain Climatic Epochs Which Differed from the Modern

(1900-1939) Normal. In *Changes of Climate: Proceedings of the Rome Symposium*, pp. 125-150. UNESCO, Paris.

Lapham, Heather

- 2005 *Hunting for Hides: Deerskins, Status, and Cultural Change in the Protohistoric Appalachians*. University of Alabama Press, Tuscaloosa.
- 2006 Southeast Animals. In *Handbook of North American Indians: Environment, Origins, and Population*, vol. 3, edited by William C. Sturtevant, Douglas H. Ubelaker, Dennis Stanford, Bruce D. Smith, and Eموke J.E. Szathmary. Smithsonian Institution, Washington: 396-404.
- 2011 Animals in Southeastern Native American Subsistence Economies. In *The Subsistence Economies of Indigenous North American Societies: A Handbook*, edited by Bruce D. Smith. Smithsonian Institution, Washington: 401-430.

Lawson, John

- 1709 *A New Voyage to Carolina*. University of North Carolina Press, Chapel Hill.

Lederer, John

- 1672 *The Discoveries of John Lederer*. Samuel Heyrick, London.

Lyman, R. Lee

- 1994 Quantitative Units and Terminology in Zooarchaeology. *American Antiquity* 59(1):36-71.

Mathis, Mark A. and Jeffrey J. Crow (editors)

- 1983 *The Prehistory of North Carolina: An Archaeological Symposium*. Division of Archives and History, North Carolina Department of Cultural Resources, Raleigh.

McKechnie, Iain and Madonna L. Moss

- 2016 Meta-analysis in Zooarchaeology Expands Perspectives on Indigenous Fisheries of the Northwest Coast of North America. *Journal of Archaeological Science: Reports* 8:470-485.

McManus, Jane

- 1989 The Incorporation of Historic Trade Goods at Upper Saratown: A Study of Culture Contact. Ms. on File, Research Laboratories of Archaeology, University of North Carolina, Chapel Hill.

Melton, Mallory A.

- 2018 Cropping in an Age of Captive Taking: Exploring Evidence for Uncertainty and Food Security in the Seventeenth-Century North Carolina Piedmont. *American Antiquity* 83(2):204-223.

Mooney, James

- 1984 *The Siouan Tribes of the East*. Bureau of Ethnology Bulletin 22. Smithsonian Institution, Washington.

Morton, Richard L.

- 1960 *The Tidewater Period, 1607-1710*. Vol. I of *Colonial Virginia*. University of North Carolina Press, Chapel Hill.

North Carolina Climate Office

- 2008a Temperature. *General Synopsis*. Retrieved from <http://www.nc-climate.ncsu.edu/climate/synopsis>.
- 2008b Precipitation. *General Synopsis*. Retrieved from <http://www.nc-climate.ncsu.edu/climate/synopsis>.

North Carolina Department of Environmental Quality

- 2018a *Roanoke River Basin*. North Carolina Environmental Education. Retrieved from <http://www.eenorthcarolina.org/riverbasins.html>.
- 2018b *Cape Fear River Basin*. North Carolina Environmental Education. Retrieved from <http://www.eenorthcarolina.org/riverbasins.html>.
- 2018c *Neuse River Basin*. North Carolina Environmental Education. Retrieved from <http://www.eenorthcarolina.org/riverbasins.html>.

Ogilvie, A.E.J.

- 1984 The Past Climate and Sea-Ice Record from Iceland, Part I: Data to A.D. 1780. *Climatic Change* 6:131-152.

Orton, David C., James Morris, Alison Locker, and James H. Barrett

- 2014 Fish for the City: Meta-analysis of Archaeological Cod Remains and the Growth of London's Northern Trade. *Antiquity* 88:516-530.

Peel, M.C., B.L. Finlayson, and T.A. McMahon

- 2007 Updated World Map of the Köppen-Geiger Climate Classification. *Hydrology and Earth System Sciences* 11:1633-1644.

Perkins, Dexter and Patricia Daly

- 1968 A Hunters' Village in Neolithic Turkey. *Scientific American* 219(5):97-106.

Powell, William S.

- 1989 *North Carolina through Four Centuries*. University of North Carolina Press, Chapel Hill.

Quinn, David B.

- 1985 *Set Fair for Roanoke: Voyages and Colonies, 1584-1606*. University of North

Carolina Press, Chapel Hill.

Reitz, Elizabeth J. and Elizabeth S. Wing

2008 *Zooarchaeology*. Second Edition. Cambridge University Press, Cambridge.

Rutman, Darrett B. and Anita H. Rutman

1997 Of Agues and Fevers: Malaria in the Early Chesapeake. In *Biological Consequences of the European Expansion, 1450-1800*, edited by Kenneth F. Kiple and Stephen V. Beck. Ashgate Publishing Company, Vermont: 203-232.

Scarry, C. Margaret

2003 Patterns of Wild Plant Utilization in the Prehistoric Eastern Woodlands. In *People and Plants in Ancient Eastern North America*, edited by Paul E. Minnis. Smithsonian Books, Washington: 50-104.

2008 Crop Husbandry Practices in North America's Eastern Woodlands. In *Case Studies in Environmental Archaeology*, second edition, edited by Elizabeth J. Reitz, C. Margaret Scarry, and Sylvia J. Scudder. Springer: New York:391-404.

Schorger, A.W.

1955 *The Passenger Pigeon: Its Natural History and Extinction*. The University of Wisconsin Press, Madison.

Smith, Bruce D.

1986 "The Archaeology of Southeastern United States: From Dalton to De Soto, 10,500 B.P.—500 B.P." In *Advances in World Archaeology*, vol. 5, edited by F. Wendorf and A. Close. Academic Press, Orlando: 1-92.

1992 *Rivers of Change: Essays on Early Agriculture in Eastern North America*. Smithsonian Institution Press, Washington, D.C.

Steponaitis, Vincas P.

1986 Prehistoric Archaeology in the Southeastern United States, 1970-1985. *Annual Review of Anthropology* 15:363-404.

Vanderwarker, Amber

2001 An Archaeological Study of Late Woodland Fauna in the Roanoke River Basin. *North Carolina Archaeology* 50:1-46.

Ward, H. Trawick and R.P. Stephen Davis, Jr. (editors)

1988 Archaeology of the Historic Occaneechi Indians. *Southern Indian Studies* 36-37.

1993 *Indian Communities on the North Carolina Piedmont, A.D. 1000 to 1700*. Monograph 2. Research Laboratories of Anthropology, University of North Carolina, Chapel Hill.

- Ward, H. Trawick and R.P. Stephen Davis, Jr.  
 1999 *Time Before History*. University of North Carolina Press, Chapel Hill.
- White, T.E.  
 1953 A Method for Calculating the Dietary Percentage of Various Food Animals Utilized by Aboriginal Peoples. *American Antiquity* 18(4):396-398.
- Whyte, Thomas R.  
 2003 Prehistoric Sedentary Agriculturalists in the Appalachian Summit of Northwestern North Carolina. *North Carolina Archaeology* 52:1-19.
- Wilson, Jack H., Jr.  
 1983 *A Study of Late Prehistoric, Protohistoric, and Historic Indians of the Carolina and Virginia Piedmont: Structure, Process, and Ecology*. Unpublished Ph.D. dissertation, Department of Anthropology, University of North Carolina, Chapel Hill.
- Wing, Elizabeth and Antoinette Brown  
 1979 *Paleonutrition: Method and Theory in Prehistoric Foodways*. Academic Press, New York.
- Winterhalder, Bruce  
 1980 Environmental Analysis in Human Evolution and Adaptation Research. *Human Ecology* 8(2):135-170.
- Wolverton, Steve, Lisa Nagaoka, Torben C. Rick  
 2016 *Applied Zooarchaeology: Five Case Studies*. Eliot Werner Publications, Clinton Corners.
- Yarnell, Richard A. and M. Jean Black  
 1985 "Temporal Trends Indicated by a Survey of Archaic and Woodland Plant Food Remains from Southeastern North America," in *Southeastern Archaeology* 1:1-7.