

OH DEER: IDENTIFYING NATIVE HUNTING TERRITORIES IN THE NORTH
CAROLINA PIEDMONT USING STRONTIUM ($^{87}\text{Sr}/^{86}\text{Sr}$) ISOTOPE ANALYSIS

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ABSTRACT

Christine Mikeska: “Oh Deer: Identifying Native Hunting Territories in the North Carolina Piedmont Using Strontium ($^{87}\text{Sr}/^{86}\text{Sr}$) Isotope Analysis
(Under the direction of Benjamin Arbuckle)

In this study, archaeological deer teeth from five sites within the Eno and Dan River Basins in the North Carolina Piedmont were selected for strontium (Sr) analysis. These Sr data are used to identify hunting zones, referred to as hunting territories, used by these Native Piedmont communities from AD 1450 to 1710. This study provides new spatial information about deer exploitation at these five sites, further contextualizing Native exploitation of resource-rich white tailed deer. Furthermore, these Sr data are used to identify patterns of change over time, identifying ways in which Native hunting territories changed from the late Precontact to Late Contact Periods. Multiple patterns of changes in hunting behaviors are identified. Situating these contrasting patterns of exploitation within the broader cultural context of the seventeenth and eighteenth centuries, these results highlight the dynamic and community-specific responses of Native communities to the disruptions and opportunities resulting from colonial encounter.

To Shupi, I couldn't have done this without you.
And to my mom, who helped me with a lot of things, one of which was Shupi.

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TABLE OF CONTENTS

LIST OF TABLES.....	vii
LIST OF FIGURES.....	vii
LIST OF TABLES.....	viii
LIST OF ABBREVIATIONS.....	ix
CHAPTER 1: INTRODUCTION.....	1
CHAPTER 2: DEER EXPLOITATION IN THE MID-ATLANTIC AND SOUTHEAST.....	4
Ethnohistorical Accounts.....	4
Zooarchaeological Evidence of Deer Exploitation.....	12
CHAPTER 3: ARCHAEOLOGICAL SITES AND HISTORICAL CONTEXT.....	17
The Wall Site.....	18
The Jenrette Site.....	19
The Fredricks Site.....	21
The Hairston Site.....	24
The Upper Saratown Site.....	25
Deer Exploitation at the Eno and Dan Rivers.....	26
CHAPTER 4: METHODS.....	30
Strontium Isotopes.....	30
The Geological Terranes of North Carolina.....	32
Sample Selection and Processing.....	34

CHAPTER 5: RESULTS.....	38
General Trends in $^{87}\text{Sr}/^{86}\text{Sr}$ Composition.....	38
$^{87}\text{Sr}/^{86}\text{Sr}$ Values of Eno River Individuals.....	46
$^{87}\text{Sr}/^{86}\text{Sr}$ Values of Dan River Individuals.....	49
Comparison of Eno and Dan River Individuals.....	52
CHAPTER 6: DISCUSSION.....	55
General Trends.....	55
Diachronic Trends from the Eno River Individuals.....	56
Diachronic Trends from the Dan River Individuals.....	58
Continuity and Change: Deer Exploitation in the Post-Contact Period.....	63
CHAPTER 7: CONCLUSION.....	69
REFERENCES.....	71

LIST OF FIGURES

Figure 1: Map of Eno and Dan River sites, as well as the Indian Trading Path.....	18
Figure 2. %NISP of deer at the Eno and Dan River sites.....	28
Figure 3. %Biomass of deer at the Eno and Dan River sites.....	29
Figure 4. Geological terranes of North Carolina.....	36
Figure 5. Approximate Sr isoscape of North Carolina.....	37
Figure 6. $^{87}\text{Sr}/^{86}\text{Sr}$ values of deer samples from the Eno and Dan River sites with baseline Sr values covering an area of 35km^2	43
Figure 7. $^{87}\text{Sr}/^{86}\text{Sr}$ values derived from Molars 1, 2, and 3 from the same mandible.....	44
Figure 8. $^{87}\text{Sr}/^{86}\text{Sr}$ values of archaeological rodent samples.....	45
Figure 9. Histogram of $^{87}\text{Sr}/^{86}\text{Sr}$ values from the Eno River individuals.....	48
Figure 10. Histogram of $^{87}\text{Sr}/^{86}\text{Sr}$ Values from the Dan River individuals.....	51
Figure 11. Histograms of $^{87}\text{Sr}/^{86}\text{Sr}$ Values from the Eno and Dan River individuals.....	53
Figure 12. Parameters of minimum estimated hunting territory used by Eno and Dan River communities based on Sr values.....	60
Figure 13. Parameters of minimum estimated hunting territory used by Eno River communities based on Sr values.....	61
Figure 14. Parameters of minimum estimated hunting territory used by Dan River communities based on Sr.....	62

LIST OF TABLES

Table 1: %NISP and %Biomass of Deer by Site.....	28
Table 2: $^{87}\text{Sr}/^{86}\text{Sr}$ Values from Eno and Dan River Individuals.....	40
Table 3. Levene's test p-values: Contemporary Sites.....	54
Table 4. Welch's t-test p-values: Contemporary Sites.....	54

LIST OF ABBREVIATIONS

31OR11	The Wall Site
31OR231A	The Jenrette Site
31OR231	The Fredricks Site
31SK1	The Hairston Site
31SK1A	The Upper Saratown Site
Ca.	Approximately
MNI	Minimum Number of Individuals
NCDEQ	North Carolina Department of Environmental Quality
NISP	Number of Identified Specimens
%NISP	NISP by Percent

CHAPTER 1: INTRODUCTION

Archaeological and ethnohistorical sources indicate that white-tailed deer (*Odocoileus virginianus*) were the single most important faunal resource exploited by Native American communities across the Mid-Atlantic and Southeast for millennia. A widely accessible and extremely valuable resource, a single deer would provide Native communities far more meat by weight than any other available faunal resource, while the rest of the carcass provided a diverse array of products to Native communities, including leather, tools, and even musical instruments (Lefler 1967:29, 217; Swanton 1946:249). Previous scholarship on deer exploitation within the Mid-Atlantic and Southeast has focused on taphonomic and taxonomic characteristics of faunal assemblages, identifying the central role of deer within Native subsistence economies, as well as changes in exploitation through time (Holm 1994; Lapham 2005; Longo 2018; Waselkov 1978; Vanderwarker and Stanyard 2009). However, the spatial parameters of deer hunting territories have not previously been addressed, particularly in the case of provisioning residential villages, the dominant settlement type of the late Precontact Period in the region. Using Sr isotopes from archaeological deer teeth, this study builds on previous work on Indigenous deer exploitation, specifically addressing the spatial dimension of deer exploitation in the North Carolina Piedmont during the late Precontact, Middle Contact, and Late Contact Periods.

Archaeological deer teeth were selected for strontium (Sr) analysis from five sites within the Eno and Dan River Basins in North Carolina in order to define the territories exploited by Native Piedmont communities dating from AD 1450 to 1710, as well as investigate how these territories changed over time. Through the application of Sr isotope analysis, this study provides

new spatial information about deer exploitation at these five sites, providing further contextualization of Native exploitation practices as they concern the most important animal resource available to these communities. Unlike many large mammals, deer occupy very small home ranges and thus function as a good source for identifying hunting territories. While there is some seasonal variability in home range, deer are known to inhabit the same home range year after year, occupying areas between 16 and 135 hectares (Trani and Chapman 2007:535). Therefore, because of the boundedness of their home ranges, the teeth of adult deer should reflect the Sr values of specific local geographies. As a result, Sr values derived from tooth enamel are a useful proxy for estimating the general geographic parameters of the hunting territories used to provision villages in the Eno and Dan River Basins. Situating these data within the broader cultural contexts of the Pre- and Post-Contact Periods, this study identifies the minimum geographic parameters of hunting territories used by Native communities, as well as changes to these territories through time and between regions. Through the comparison of archaeological Sr isotope ratios ($^{87}\text{Sr}/^{86}\text{Sr}$) from deer enamel to values generated from geological baselines, which form the regional Sr isoscape, these data are applied to the following research questions relating to deer exploitation and hunter mobility:

1. What were the minimum geographic parameters of hunting territories exploited by Native hunters from residential sites in the Eno and Dan River Basins? Were most deer harvested locally (<35km) or is there evidence for the hunting and transport of deer to residential sites from more distant hunting grounds?
2. Did hunting territories change over time and, if so, how?
3. What factors may have affected the geographic parameters of hunting territories during the Pre- and Post-Contact Periods?

The primary goal of this study is to identify the minimum geographic parameters of hunting territories exploited by communities in two regions of the North Carolina Piedmont. In the case of this study, the term “territory” is used in reference to Site Exploitation Territories (SETs), which refers to the geographic area of habitual exploitation. This concept is intentionally separated from the concept of “territoriality,” which implies ownership, defensibility, or exclusivity of use, none of which are implied within the scope of this study (Bailey and Davidson 1983:88; Dyson-Hudson and Smith 1978:22; Peterson 1979:55). The samples selected for Sr analysis were recovered from residential sites and are thus assumed to represent those deer that were exploited in order to provision the settlements themselves. Models of carcass processing predict that deer exploited far from permanent settlements are likely to be processed at kill sites, and elements such as crania and distal extremities are less likely to be transported back to the permanent settlement (Perkins and Daly 1968:104). As a result, this project, which samples teeth, is expected to address only a portion of the total spatial distribution of deer exploitation, likely underrepresenting distant hunting territories. Based on models of carcass processing and transport, it is expected that the majority of deer analyzed in this study, and for which dental elements are transported to a village site, will have been harvested locally (<35km, based on ethnographic comparison). The identification of distant hunting territories would therefore be of particular interest, suggesting the long distance transport of whole deer carcasses by human porters or via waterways –behaviors not well documented in the ethnohistoric record.

Second, this study focused on contexts spanning from the late Precontact Period (c.a. AD 1500) to the Late Contact Period (c.a. AD 1710), and therefore seeks to investigate change over time in deer exploitation during the period of European colonization of the region. The temporal context of this study reflects a period of enormous cultural, political, and economic change. It is

hypothesized that hunting territories will change from the late Precontact Period to the Contact Period as a result of disruptions caused by European colonization and the diverse responses of Native communities. In particular, it is likely that the market for deer hides, which emerged as a major economic factor in the 17th century, affected Native hunting strategies, as well as perhaps deer populations themselves. It is thus hypothesized that the two different site locations, one closer to and one more distant from colonial settlements, will result in different engagements with the deerskin trade and differences in deer exploitation strategies that will be reflected in the scale of hunting territories.

Third, this study seeks to contextualize the evidence for the spatial scale of deer hunting territories by exploring the factors that may have affected native hunters' decision making. Potential factors may have included changes resulting from participation in the deerskin trade, population movement disrupting access to hunting territories, incoming populations breaking continuity with preceding communities, the threat of slave-raiding, and overhunting.

CHAPTER 2: DEER EXPLOITATION IN THE MID-ATLANTIC AND SOUTHEAST

Ethnohistorical accounts from the Post-Contact Period emphasize the importance of deer in Native subsistence economies, with European colonists and explorers describing the functional utility of deer productions, Native hunting techniques, and the impact of deer hunting on seasonal mobility decisions. However, while these ethnohistorical sources provide a useful starting point from which to understand Pre- and Post-Contact hunting strategies, the strategies they describe and the European perspective from which they are written are intrinsically linked to their historical and colonial context. In order to more fully understand the deer hunting strategies of Native communities both before and after European colonization, it is necessary to contextualize the available ethnohistorical accounts using archaeological data. In combining these two bodies of evidence, scholars have developed several models for understanding Native deer exploitation in the Mid-Atlantic and Southeast.

Ethnohistorical Accounts

European ethnohistorical accounts of Native hunting strategies begin as early as the late 1500s, with explorers and colonists documenting the English colonial encounter in the Mid-Atlantic and Southeast from its onset. These sources describe the diversity of hunting strategies deployed by Native communities, detailing a wide range of hunting methods, seasonal hunting decisions, and distances traveled in order to hunt. These accounts emphasize the diversity of exploitation strategies used by communities across the region. Though these accounts exclusively describe the hunting strategies of Post-Contact Native communities, they provide a

tantalizing glimpse into Native hunting practices and provide some degree of context to archaeological evidence of deer exploitation both before and after European contact. Though these accounts occasionally note the diverse array of products produced from deer exploitation within the traditional subsistence economies of the Mid-Atlantic and Southeast, they tend to highlight a general trend towards increasingly specialized deer exploitation strategies during the Contact Period, emphasizing the importance of the historic deerskin trade in exploitation decisions.

The most geographically and temporally relevant ethnohistorical account of deer exploitation comes from John Lawson, an eighteenth-century explorer and author of *A New Voyage to Carolina* (Lefler 1967), in his description of deer exploitation strategies in the North Carolina Piedmont. Lawson provides a comprehensive list of products produced from deer carcasses, highlighting the importance of deer exploitation in almost every facet of Native life. In addition to providing the largest source of animal protein and fats to Native diets, deer carcasses were partitioned in a wide range of tools and products by Native communities. Lawson notes that deer hides were traditionally used to make a wide variety of Native products, including clothes, shoes, and drums, though ethnohistorical sources, including that of Lawson himself, tend to focus largely on the value of deer hides within the historic deerskin market (Lefler 1967:29, 51, 58, 217). Furthermore, Lawson notes that the hides themselves were produced from tools and substances made of other parts of the deer, namely brain tissue and metapodials (Lefler 1967:208). Deer brain tissue was mixed with water to produce a solution in which hides soaked during the tanning process, while metapodials, referred to as “The Bone of a Deer's Foot” (Lefler 1967:217), were shaped into processing tools called beamers. These tools were used to scrape fur and fat from hides during the production process (Lapham 2005:10, 23). Additionally, the rest of

the deer carcass could be further partitioned into other products, such as bracelets fashioned from ribs, flutes from tibiae, and awls from ulnae (Swanton 1946:249). Sinew and skin were shaped into fishnets and bowstrings, antlers and hooves were boiled to make glue or worked into tools and ornaments, and crania and skins were used to make hunting decoys – one of several hunting methods documented in the region (Lefler 1967:29; Swanton 1946:249). Lawson’s account demonstrates that traditional Native subsistence economies of the North Carolina Piedmont relied heavily on deer exploitation and the products derived from deer carcasses.

The use of hunting decoys, as noted in Lawson’s account, is one of several ethnohistorically documented methods of deer hunting within the Mid-Atlantic and Southeast. Decoy hunting is a method of stalking, which involves the hunter wearing the antlers, skull, and hide of a deer in order to mask his presence (Waselkov 1978:20). Jamestown colonist, John Smith, describes the use of decoys by Powhatan hunters in Virginia, noting:

One Savage hunting alone, useth the skinne of a Deare slit on the one side, and so put on his arme, through the neck, so that his hand comes to the head which is stuffed; and the homes, head, eies, eares, and every part as arteficially counterfeited as they can devise. Thus shrowding his body in the skinne, by stalking he approacheth the Deare, creeping on the ground from one tree to another. If the Deare chance to find fault, or stande at gaze, hee tumeth the head with his hand to his best advantage to approach, having shot him, hee chaseth him by his blood and straine till he get him (Smith 1910:70-71).

Stalking also occurred without the use of decoys, as described in the 1587 journal of John White, governor of the Roanoke Colony, who states that Native hunters “beeing secretly hidden

among high reedes, where oftentimes they finde the Deer asleepe, and so kill them” (Quinn and Quinn 1973:98).

Ethnographic sources, including that of John Lawson, also describe the use of communal drives by Native communities in the Virginia and North Carolina territories (Waselkov 1978:25). A 1728 account by William Byrd details the use of drives by Saponi hunters in Virginia, who “drove the Woods in a Ring [...] from the circumference of a Large Circle they all march’t inwards, and drove the Game towards the center” (Byrd 1967:244). Jamestown colonist Henry Spelman describes Native hunters in Virginia deploying fire to drive deer. While smaller drives using fire may have involved fewer people, ethnographic sources describe the involvement of several hundred hunters working in unison to drive and kill large quantities of deer:

Ther maner of ther Huntinge is thiss wher they meett sum 2 or 300 together and havinge ther bowes and arrows and every one with a fier sticke in ther hand they besett a great thikett round about . . . which ye Deare seinge fleeth from ye fier, and the menn comminge in by a litell and litle incloseth ther game in a narrow roome, so as with ther Bowes and arrowes they kill them (Smith 1910:cvii).

John Smith also describes the use of communal drives by fire to kill between 6 and 15 deer in a given drive:

At their huntings in the deserts they are commonly 2 or 300 together. Having found the Deare, they environ them with many fires, and betwixt the fires they place themselves. And some take their stands in the midst. The Deare being thus feared by the fires and their voices, they chace them so long within that circle, that many times they kill 6, 8, 10, or 15 at a hunting. They use also to drive them into some narrowe point of land, when they find that advantage; and so force

them into the river, where with their boats they have Ambuscadoes to kill them (Smith 1910:70-71).

In addition to documenting individual and group hunting methods, Lawson's account further documents the use of hunting grounds located some distance away from permanent settlements within the Mid-Atlantic and Southeast, with Lawson noting that hunters "commonly go out in great Numbers, and oftentimes a great many Days Journey from home" (Lefler 1967:215). Accounts such as Lawson's suggest the use of particular hunting territories located anywhere between tens and hundreds of miles away, depending on the community, product priorities, and season. Deer exploited from these hunting camps may therefore not be represented within settlement faunal assemblages, having been processed and discarded away from settlements.

However, despite the glimpses into Native hunting practices provided by ethnohistorical accounts, these datasets are very much a product of their historical and colonial context. This is most evident in colonial descriptions of the diminishing role of seasonality and increasing importance of deerskins to Contact Native hunting strategies. While Lawson notes "the Deer-Skins [were] in Season in Winter" (Lefler 1967:216) and the eighteenth-century trader, James Adair, describes Choctaw men spending the "winter hunt[ing] in the woods" (Adair 1968:284), Virginian colonist Ralph Hamor's 1615 account describes the year-round hunting of deer by Coastal Native communities:

for of the Deere (they kill as doe wee Beefes in England) all yeer long, neither sparing young nor olde, no not the Does readie to fawne, nor the young fawnes, if but two daiesould" (Hamor 1615:20).

While these discrepancies may also be a product of differing traditional hunting strategies by disparate communities located in different environments across the Southeast, historian Joshua Piker notes that by and large by the mid eighteenth-century seasonality factored less and less into the exploitation strategies of Native Southeastern communities. Piker states, “the winter hunt [of the Creek] expanded to such a degree that it merged with the summer hunt, traditionally both a shorter and less important undertaking than its cold-weather counterpart” (Piker 2004:81). Piker also notes increasing competition over rights to hunting territories and the expansion of existing territories into new areas (Piker 2004:81). Though Piker describes the exploitation strategies of the mid eighteenth-century Muskogean speaking groups situated to the southwest of the region on which this study focuses, the circumstances described by Piker parallel the experiences of seventeenth- and early eighteenth-centuries Native Piedmont communities.

This trend towards the abandonment of traditional hunting seasons in favor of year round hunting is thought to be the product of the historic deerskin trade, a lucrative trade network made up of Native communities and European colonists that specialized in the production and trade of deerskins. Native communities and individuals traded millions of deerskins for a wide variety of European products, though guns were highly prioritized due to escalating political tensions, particularly in eastern North Carolina. (Ward and Davis 2005). Though traditional deer exploitation practices produced a wide variety of products, including meat, hides, and tools, ethnohistorical sources indicate that the historic deerskin trade resulted in dramatic shifts in exploitation strategies and resource prioritization. English colonist, Robert Beverley, notes the prioritization of deerskins over meat and other tools in his description of Native Virginia hunters who “make all this Slaughter only for the sake of Skins, leaving the Carcases to perish in the Woods” (Wright 1947:155). Henry Spelman, in his description of fire drives, notes, “with ther

Bowes and arrows they kill them at ther pleasuer takinge ther skinnes which is the greatest thinge they desier, and sume flesh for their provision” (Smith 1910:cvii), presumably describing extensive exploitation of deer in order to participate in the deerskin trade. Even Lawson situates his description of Native hunting strategies within the context of the deerskin trade, concluding, “Here it is, that they get their Complement of Deer-Skins and Fur to trade with the English” (Lefler 1967:216).

Documentation of Native communities trading deerskins for European goods begins as early as 1584 with Roanoke colonist, Authur Barlowe, who notes the relative worth of the skins compared to European goods:

A daye or two after this, we fell to trading with them, exchanging some thinges that we had for Chammoys, Buffe, and Deere skinnes [...] We exchanged out tinne dishes for twentie skinnes, woorth twenties Crownes, or twentie Nobles: and a copper kettle for fiftie skinnes woorth fiftie Crownes (Quinn and Quinn 1973:4-5).

Barlowe’s account is echoed by fellow Roanoke colonist, Thomas Harriot, who further notes the mass quantities of deerskins acquired from Native hunters by way of trade as early as 1588:

Deere skinnes, dressed after the maner of Chamoos or undressed, are to be had of all the natural inhabitants thousands yearly by the way of traffique for trifles, and no more waste or spoile of Deere than is and hath bene ordinarily in time before (Quinn and Quinn 1973:52).

Though Harriot’s account suggests that the production of deerskins was equally intense prior to the establishment of the historic deerskin trade, export records indicate that the quantities of deerskin produced by Native hunters increase dramatically during the seventeenth- and early

eighteenth-centuries, with records noting that over two million deerskins were exported from the Virginia and Carolina territories to Great Britain between 1698 and 1724 (Crane 1928:328). By the eighteenth-century, the deerskin market had grown so large that colonists saw fit to establish the Carolina Commissioners of Indian Trade, regulating trade and controlling profit margins through the standardization of the market (Lapham 2005:12). Regulated prices, based on hide quality and size, suggest a preference towards large, processed hides, though late eighteenth-century accounts suggest that the European market had developed a preference toward raw hides, to be processed following purchase from Native hunters in order control the quality of tanning for European markets (Lapham 2005:11).

The development and maintenance of the deerskin trade relied largely on Native participation and exploitation decisions, despite colonial attempts at management and regulation. The active engagement of Native communities in the developing deerskin trade is one of several factors that likely resulted in a diversification of exploitation practices across the region during the Post-Contact Period, with some communities retaining traditional subsistence economies and others adapting their exploitation strategies to more intensively participate in the growing market (Lapham 2005; Waselkov 1978:26). This diversification is evident in ethnohistorical accounts from the period, which are at times conflicting depending on the community, region, and period in question. While part of this conflict probably also arises from the fact that these accounts were written from the perspective of European colonists, resulting in biased and potentially oversimplified descriptions of otherwise diverse and complicated Native subsistence and exploitation practices, archaeological evidence also suggests that decisions at both an individual and community level resulted in diverse deer exploitation strategies.

Zooarchaeological Evidence of Deer Exploitation

Zooarchaeological evidence provides another perspective from which to study Native deer hunting strategies within the North Carolina Piedmont. In addition to the archaeological evidence recovered from the sites on which this study focuses, which will be presented in the following section, this study is informed by three foundational case studies that use zooarchaeological evidence to understand Native hunting practices in the Mid-Atlantic and Southeast. In the first case study, Waselkov (1978) focuses on identifying Native hunting methods using faunal evidence, attempting to differentiate between faunal assemblages resulting from stalking and those resulting from communal drives. Next, Lapham (2005) uses several lines of archaeological evidence to create a holistic model of deer exploitation and trade participation by Native individuals and communities in the Mid-Atlantic, using both faunal data and trade goods. Finally, Vanderwarker and Stanyard (2009) use faunal evidence to identify the Sandy site, located on the North Carolina Coastal Plain, as a temporary, Precontact hunting camp. This final case study informs this study in that it establishes the use of temporary hunting camps by Native communities in North Carolina.

Attempting to identify the hunting techniques used by Native communities across the Midwest and Southeast, Waselkov (1978) constructs mortality profiles of archaeological deer from 20 Pre- and Post-Contact sites. Identifying both bimodal, which represent the exploitation of both young and old individuals, and unimodal, focused on prime-aged individuals, distributions of hunted deer populations, Waselkov concludes that Pre- and Post-Contact Native communities deployed different hunting methods. Waselkov's interpretation posits shifts in Post-Contact exploitation strategies that emphasize the procurement of large quantities of deer and deerskins. According to Waselkov, bimodal mortality profiles, which emphasize the exploitation

of young and, to a lesser extent, old deer, demonstrate that Precontact communities relied largely on stalking, assuming that young and old individuals are more easily killed, while unimodal distributions, focused on prime-aged individuals, indicate that Post-Contact communities participated in communal drives. While natural populations of deer tend to be dominated by young individuals, Waselkov compares the observed unimodal age distributions to prehistoric bison kill-off patterns observed in assemblages from the Great Plains, in which juveniles are also underrepresented. Due to the similarities between these distributions, Waselkov identifies these unimodal distributions from sites in the Midwest and Southeast as evidence of communal drives.

Based on these interpretations of the age-distributions of exploited deer, Waselkov suggests that smaller Post-Contact communities shifted their exploitation practices towards communal drives with the advent of European colonization and the introduction of the historic deerskin trade in order to more intensively exploit local hunting grounds. He argues that this strategy was intended to offset the devastating effects of disease and warfare, which would have limited the population of hunters available to exploit deer and generally contribute to the subsistence economy in smaller-scale Native communities. In contrast, Waselkov argues, larger communities such as the Cherokee and Iroquois were more easily able to buffer themselves against external pressures and therefore did not need to alter their hunting strategies following European settlement.

However, rather than representing a catastrophic mortality profile that would indicate the use of communal drives, Waselkov's Post-Contact unimodal distribution may also be indicative of an exploitation strategy focused on targeted exploitation of prime-aged individuals (Stiner 1990). In this case, prime-aged individuals may have been targeted for specific qualities associated with their hides, laid out in Lapham's (2015:15) "hunting for hides" model (see

below). Regardless of the specific method deployed by the Native communities under study, however, Waselkov's data does indicate a shift in deer exploitation strategies following European contact.

Lapham's (2015:15) "hunting for hides" model provides another archaeological method of assessing changes in Native deer exploitation practices. The "hunting for hides" model assumes that some Post-Contact Native communities shifted their deer exploitation practices from a traditional model of exploitation, which emphasized deer as a multi-faceted resource for food and other products, towards a strategy that emphasized the production of economically valuable deerskins. Lapham argues that the "hunting for hides" model can be demonstrated by an overall increase in the importance of deer within faunal assemblages, increasingly selective hunting strategies evidenced by the selective harvesting of prime-aged deer (particularly males due to the economic benefits of large hides), and an increase in year-round hunting as evidenced by age data and antler development. Additionally, there are some data to indicate that butchery practices shift to maximize hide removal, though this is less well documented. This model stands in contrast to Precontact deer exploitation strategies, which focus largely on the seasonal exploitation of juveniles and occasionally older adult deer, as evidenced by multiple zooarchaeological assemblages from the Crab Orchard (44TZ1), Hoge (44TZ6), and Trigg (44MY3) sites in Virginia. These criteria provide the best model for understanding zooarchaeological faunal evidence and overall patterns of Native deer exploitation during the Pre- and Post-Contact Periods in the Mid-Atlantic and Southeast.

Lapham (2005) further ties these changes in hunting strategy to the development of the historic deerskin trade through the analysis of European trade goods within Post-Contact contexts, noting that their presence is suggestive of increased interaction with European colonists

and Native intermediaries working within developing trade networks. Lapham notes that the development of trade relationships with European colonists, as well as with Native intermediaries, created new opportunities for the acquisition of social prestige and political authority, emphasizing the active involvement of Native communities and individuals in the development and maintenance of the deerskin trade. This model shifts agency back to Native communities and individuals of the Post-Contact Period, while also acknowledging the potential for multiple exploitation strategies and ways of negotiating the changing social landscape of the seventeenth- and early eighteenth-centuries.

Finally, zooarchaeological data have been used to verify the use of temporary hunting camps within the Mid-Atlantic and Southeast. Vanderwarker and Stanyard (2009) identify the Sandy site, located in the Coastal Plain, as a rare example of a short term, or logistical (Binford 1980), hunting camp. Dating to the Late Woodland Period (ca. AD 900–1607) and located in the Roanoke River Valley in southwestern Virginia, the faunal assemblage of the Sandy site consists almost entirely of deer (Vanderwarker and Stanyard 2009:129). Additionally, the body part distribution of deer elements represented at the site is argued to reflect that of a butchery or kill-site. The assemblage is dominated by low meat-yielding elements, while high meat-yielding elements are poorly represented. With a dearth of so-called high utility elements such as meaty limb bones and ribs, and an abundance of lower utility elements, such as mandibles and crania, the Sandy site is interpreted to reflect a site of field processing from which butchered carcass portions were transported to other settlements (Vanderwarker and Stanyard 2009:144). The Sandy site demonstrates archaeologically that Native communities within North Carolina used temporary hunting camps located away from permanent settlements during the Precontact Period, corroborating ethnohistorical accounts of Post-Contact Native hunters and provides a model for

the organization of deer exploitation the Precontact Period in the neighboring Piedmont region of North Carolina where similar sites have not yet been excavated.

CHAPTER 3: ARCHAEOLOGICAL SITES AND HISTORICAL CONTEXT

This study focuses on five village sites within the Eno and Dan River drainages (Figure 1) with phases dating to the Precontact (A.D. 1526 – 1625), Middle Contact (A.D. 1626 – 1675), and Late Contact Periods (A.D. 1675 – 1710), the latter two of which are referred to as the Post-Contact Period within this study. The Wall (31OR11), Jenrette (31OR231A), and Fredricks (31OR231) sites are situated adjacent to one another within a bend in the Eno River in Orange County, North Carolina, whereas the Hairston (31SK1) and Upper Saratown (31SK1a) sites are located near the mouth of one of the major tributaries of the Dan River in Stokes County, North Carolina (Figure 1; Ward and Davis 2005:132). These sites were selected for analysis based on their proximity to each other, as well as their general environmental and chronological similarity (Ward and Davis 1991:171). All of the sites are located along rivers in environments consisting of hills and woodlands. Furthermore, the Wall, Jenrette, and Fredricks sites are roughly contemporaneous with the Hairston site, and the Middle and Late Contact Upper Saratown site, respectively.

Despite their similarities, there are two important differences between these sites that may have effected exploitation decisions, particularly in the Post-Contact Period. Firstly, the Eno River sites are located on the Indian Trading Path, an important trade route for the historic deerskin trade of the seventeenth and early eighteenth centuries (Figure 1). The Eno sites are therefore closer and more connected to European settlements and settlers concentrated in the coastal plain and eastern piedmont regions of Southeast Virginia. Dan River sites, located

approximately 90km to the west, are more distant from centers of European settlement. Secondly, the Dan River sites are located closer to the Blue Ridge Mountains, a resource-rich upland environment located in western North Carolina. Proximity to these two important geographic features may have effected Native exploitation decisions in important and unique ways.

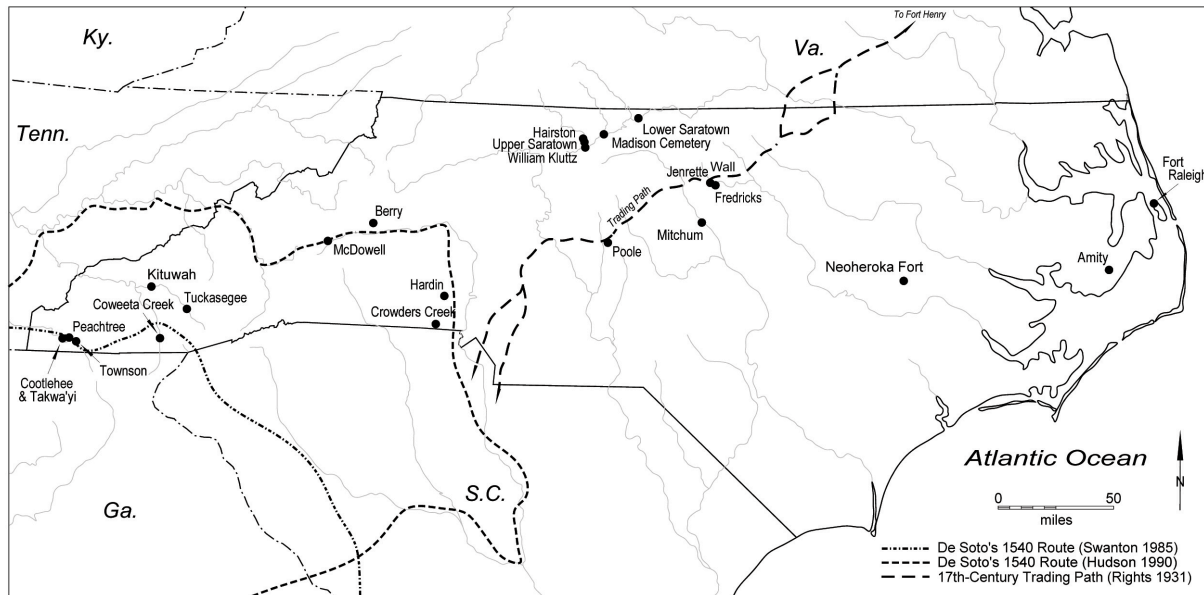


Figure 1. Map of Eno and Dan River sites, as well as the Indian Trading Path (RLA 2019)

The Eno River Sites

The Wall Site (31OR11)

The Wall site (ca. A.D. 1500 – 1600) is a nucleated settlement within the North Carolina Piedmont, dating to the Precontact Period and covering an estimated 1.25 acres. The site lies in a bend of the Eno River, by which the seventeenth-century Indian Trading Path would eventually come to pass during the Post-Contact Period (Figure 1). Though early excavations, led by Joffre Coe in 1938 and Robert Wauchope in 1940-1941, sought to identify the site as the Contact Period Occaneechi village visited by John Lawson during his exploration of the North Carolina interior in 1701 (Cumming 1958), subsequent excavation and radiocarbon dating of the site by

the Siouan Project has clarified site chronology, with calibrated radiocarbon dates averaging A.D. 1545±80 (Ward and Davis 2005:129). Within this study, samples selected from the Wall site provide a window into late Precontact deer exploitation strategies within the Eno River drainage.

Excavation of the Wall site has revealed a small settlement containing several circular housing structures of single-post construction surrounded by a series of palisades. The nucleated village is estimated to have contained between 15 and 20 households, housing a population of about 100-150 individuals (Davis and Ward 1991:175). Site occupation has been estimated on the order of several decades, as evidenced archaeologically by site expansion, housing maintenance, and substantial midden accumulation at the north edge of the site (Petherick 1987). Scholars have concluded that the Wall site occupation represents a period of increasing population density, as well as resulting intensification and diversification of subsistence practices (Ward and Davis 2005:121).

Zooarchaeological analysis confirms that deer played a key role in the subsistence economy at the Wall site, with deer dominating the faunal assemblage both in terms of NISP (Number of Identified Specimens) and biomass (Table 1; Holm 1994:104; Longo 2018:57). Deer make up 89.5% of the identified mammals by NISP, 71.3% of the entire faunal assemblage by %NISP, and 68.13% of the biomass based on a combination of body weight estimates and MNI (Minimum Number of Individuals) of the assemblage (Table 1, Figure 2, Figure 3; Holm 1994:104; Longo 2018:57).

The Jenrette Site (31OR231A)

The Jenrette site represents a village settlement dating to the late 17th century (ca. A.D. 1650 – 1680). It was discovered in 1989 by the Siouan Project during auger testing adjacent to

the previously excavated Fredricks site and may have been the Shakori village of Shakor that was visited by John Lederer in 1670 (Cumming 1958:27-28; Ward and Davis 2005:131). Between 1989 and 1998, excavation exposed a circular, palisaded village with wall-trench houses, pit features, and both pit and shaft-and-chamber burials (Ward and Davis 2005:128-131). The site covers approximately 0.5 acres and housed an estimated population of 150 individuals for about a decade, as suggested by the absence of midden accumulation or evidence of rebuilding (Ward and Davis 1993:383). Despite the chronological gap between Jenrette and the nearby Wall site, Jenrette displays strong evidence of cultural continuity with Wall based on space allocation and community structure (Ward and Davis 1993). Housing structures are either circular or rectangular and consist both of wall-trench and single-post construction, which has been used to argue continuity with the preceding Wall site and the succeeding Fredricks site (Ward and Davis 1993).

As at the Wall site, deer dominate the faunal assemblage of the Jenrette site. Deer represent 97.3% of the identified mammals at the site and 57.4% of the total faunal assemblage (Table 1, Figure 2; Holm 1994:104; Longo 2018:57). Biomass measurements are not available for this site. The relative increase in deer among the mammalian remains at Jenrette compared to the Wall site has been interpreted as possible evidence of increased deer exploitation for the purpose of participation in the deerskin trade (Longo 2018:111). This conclusion is also supported by the presence of European trade goods at the Jenrette site, including almost 2000 European glass beads, kaolin pipe fragments, and gunflints (Ward and Davis 2005:138), which have been interpreted as evidence for participation in trade with Europeans through other Native intermediaries (Ward and Davis 2005:137). While deer dominate the mammalian portion of the assemblage, faunal data also indicate diversification of exploitation practices, with the overall

contribution of deer to the %NISP of the assemblage decreasing by 13.9% between the Wall and Jenrette sites (Longo 2018:57). This change is reflected in a dramatic increase in the abundance of turtle remains, perhaps reflecting more intensive use of local aquatic and riparian resources.

The Fredricks Site (31OR231)

The Fredricks site represents the remains of an historic period residential settlement dating to the late 17th century (ca. A.D. 1680 – 1710). It was excavated between 1983 and 1986, as well as in 1995, and has been identified as the historic Occaneechi village visited by John Lawson in 1701. The Fredricks site consists of a small, palisaded settlement of just 0.25 acres, surrounded by a single palisade or fence, of significantly lighter construction than those of the preceding Wall and Jenrette sites (Ward and Davis 2005:132). The settlement contains approximately 11 circular houses of both single-post and wall-trench construction, which centered on an open plaza and sweat lodge (Ward and Davis 1991:46). These structures housed an estimated population of less than 75 individuals (Ward and Davis 1991:46). The length of occupation, low population density, and structural changes at the site has been used to suggest a shift in settlement permanence and dramatic depopulation of the Piedmont by the early eighteenth-century (Ward and Davis 2005:132).

The Fredricks site also contains the most evidence for trade participation with English colonists of any site in this study, most likely due to its late occupation and strategic location along the main trade highway of the period. The presence of European trade goods dramatically increases during this period, including almost 12,000 glass beads (Ward and Davis 2005:138). Other European artifacts include building materials (mostly iron nails), ammunition and gun parts, clothing, food preparation and storage items such as kettles and bottles, personal

adornments such as beads and bells, entertainments items such as pipes and a mouth harp, and tools and hardware such as axes, knives, and even metal fishing hooks (Carnes 1987:143). Furthermore, burial data indicate that the settlement mortality rate was particularly high compared both to earlier and even contemporaneous sites in the region, suggesting the increasing prevalence of epidemic disease resulting from sustained contact with European colonists (Ward and Davis 2005:140). Mortuary practices also shift away from burials in and around houses, as was standard in previous periods, to incorporate the use of cemeteries, possibly in response to contagions (Ward and Davis 2005:137).

The subsistence economy of the Occaneechi occupants of the Fredricks site seems to have diversified compared to the subsistence economies of the Wall and Jenrette sites. Although deer represent 86.6% of the identified mammals by NISP at the Fredricks site, they only represent 40.6% of the total faunal assemblage by NISP (Table 1, Figure 2; Holm 1994:109; Longo 2018:57). This pattern reflects a greater abundance of turtle, fish, and bird remains in the Fredricks assemblage. The contribution of deer based on the total identified faunal assemblage at the Fredricks site faunal assemblage decreased by 16.8% compared to the Middle Contact Jenrette assemblage and by 30.7% compared to the Precontact Wall assemblage (Longo 2018:57). Furthermore, deer make up less than half (46.87%) of the assemblage based on biomass (Table 1, Figure 3; Holm 1994:109), decreasing by 21.26% compared to the Wall site. Although deer retained their role as the single most important animal resource in Native Piedmont subsistence economies during the Late Contact Period, these data indicate that Fredricks site occupants continued to diversify their animal economy targeting local resources compared to their Precontact and Middle Contact counterparts.

The Fredricks site is believed to have been occupied by the Occaneechi, a Siouan speaking group residing in the Piedmont region. Following the Occaneechi's forced relocation from their previous village on an island in the Roanoke River after Bacon's Rebellion in 1676, they resettled at the Fredricks site for approximately 10 years (Davis et al. 2003; Ward and Davis 2005:137). Prior to their relocation, the Occaneechi controlled access to trade routes from their island community in the Roanoke River, which was located along the same Indian Trading Path on which the Fredricks Site was located (Alvord and Bidgood 1912:80). The Indian Trading Path itself was notably referred to as "the Occoneechee," highlighting the omnipresence of the Occaneechi when it came to historic trade networks within the Mid-Atlantic and Southeast, and the deerskin trade, in particular (Alvord and Bidgood 1912:80). Though Bacon's Rebellion resulted in the end of the Occaneechi's monopoly over the deerskin trade, John Lawson's observation that "no Indians hav[e] greater Plenty of Provisions than [the Occaneechi]" (Lefler 1967:61) during his visit to the Fredricks site, along with the quantity European trade goods found at the site, seem to suggest that the Occaneechi may have continued working as middlemen in some capacity during the early eighteenth-century.

These values may also indicate an increase in the use of hunting camps or butchery sites, located away from the settlement itself, the existence of which is archaeologically evidenced by the Precontact Sandy Site (Vanderwarker and Stanyard 2009:144). Since it is likely that hunters from each of the Wall, Jenrette, and Fredricks communities utilized short term hunting camps located some distance from residential sites, the deer remains from these village sites likely only represents a portion of the overall deer hunting economy. Even though the ratio of deer to other taxa decreases in the historic period at the Fredricks site, it is possible that the inhabitants of the site were heavily involved in the deer skin trade.

The Dan River Sites

Hairston (31SK1)

The Hairston site (ca. A.D. 1450 – 1620), also known as Early Upper Saratown, is located on the Dan River just upstream from the mouth of the Town Fork Creek in the northwestern Piedmont (Ward and Davis 1991:49; Eastman 1999:14). The Hairston site is composed of a substantial midden, and a single excavation in 1981 revealed numerous pit features, at least two palisades, twelve burials, and at least two circular structures (Eastman 1999:16, 150-152). Burials are notable for their large quantities of grave goods, which stands in contrast to the earlier Dan River phase. Shifts in mortuary behavior such as an increase in grave goods, along with increasing settlement density, suggest that the occupation of the Hairston site represents a period of increasing social stratification within the Piedmont, which is not seen further east at the contemporary Wall site. Furthermore, cultural similarities with other regions suggest that this period represents the coalescence of the Siouan cultural markers in the Dan River drainage (Ward and Davis 2005:135). The Early Saratown phase, on which this study focuses, contains no European trade goods, though shells and pottery evidence trade relationships with distant Native communities in the Piedmont and Blue Ridge mountains (Eastman 1999:296).

As at the Precontact Wall site, deer played a central role in the Precontact subsistence economy of the Hairston site, with deer making up 85.8% of the identified mammals by NISP and 41.4% of the total identified faunal assemblage by NISP from the Hairston II phase, as well as 59.3% of the %biomass of the faunal assemblage (Table 1, Figure 2, Figure 3; Holm 1994:114; Longo 2018:57). These values are similar to those for the Fredricks site, indicating an

animal economy in which deer were the single most important resource but which also included a wide range of taxa including turtles, fish and birds—especially passenger pigeon.

Upper Saratown (31SK1a)

The Upper Saratown site (ca. A.D. 1650 - 1710), located along the Town Fork Creek near the Hairston site, was excavated between 1972 and 1981 by the RLA and consists of at least four palisades, 13 circular structures, 225 pit features, and 111 burials. These remains include two Contact Period archaeological phases representing the Middle Contact Period (A.D. 1650 – 1670) and Late Contact Period (A.D. 1670 – 1710) (Eastman 1999:14; Ward and Davis 1991:49). This palisaded village was occupied by an estimated 200 to 250 individuals (Ward and Davis 2005:135) and is believed to be the historical home of the Sara Indians, whom John Lederer encountered during his journey into the Piedmont (Davis 2002:141; Lederer 1901:21). It represents the largest settlement included in this study.

Trade with Europeans or Native intermediaries is evidenced both by the presence of large quantities of European trade goods and the introduction of epidemic disease, as evidenced by 111 burials, the development of cemeteries, and housing abandonment (Eastman 1999:311; Ward and Davis 1991:50). The extremely high mortality rate at the site most likely resulted from increasing direct contact with either European traders or infected intermediaries. Though the European trade goods recovered from the site are dominated by a huge number of glass beads (n=324,779), almost a thousand other goods were also recovered, including decorative ornaments such as buttons and bells, tools such as hoes and knives, and weapons such as gunflints and lead shot (Ward and Davis 2005:137). Based on the abundance of trade goods, and supported by

historic texts, it is likely that the Sara were actively involved in the deerskin trade by the early eighteenth-century.

As expected, the Sara of Upper Saratown largely focused their animal exploitation strategies on deer, which make up 90.6% of the identified mammals by NISP and 58.3% of the total faunal assemblage based on NISP (Table 1, Figure 2; Longo 2018:57). Unlike at the Eno River sites, where deer become less prevalent within faunal assemblages during the Post-Contact Period, faunal data from the Dan River show an increase in the relative abundance of deer during the Post-Contact Period, with a 16.9% increase deer based on total NISP. However, similarly to exploitation trends at the Eno sites, %biomass of deer at the Upper Saratown site indicate a small scale decrease in the %biomass of deer by 7.63%, with deer making up more than half (51.67%) of the %biomass from the assemblage (Table 1; Figure 3; Holm 1994:122). This decrease is smaller in scale than that evident in the Eno sites, but may also indicate a parallel shift in exploitation practices during the Post-Contact Period towards diversification.

Deer Exploitation at the Eno and Dan Rivers

Zooarchaeological analysis suggests two patterns of deer exploitation evident in the Eno and Dan River sequences. Faunal data from the Wall, Jenrette, and Fredricks sites suggest that subsistence economies became increasingly diversified and localized during the Post-Contact Period. Non-deer taxa increase from 29% to 60% of the total identified faunal assemblages from the Wall to Fredericks site indicating more intensive use of local aquatic resources. At the Dan River sites, the relative prevalence of deer increases compared to both mammals (from 86% to 91%) and other faunal resources (from 41% to 58%). This change may reflect intensification in deer exploitation by Dan River communities in the Post-Contact Period. The combination of

increasing NISP and slight decrease in %biomass of deer in the Upper Saratown assemblage may also indicate the use of more distant hunting territories, as well as the use of butchery sites located away from the settlement itself. The process of field butchering may have resulted in the discard of large, meat-bearing elements at processing sites located away from the permanent settlement, resulting in a decrease in %biomass but a potential increase in overall NISP. This scenario echoes ethnohistorical accounts such as that of English colonist, Robert Beverley, who claimed that Native Virginian hunters would “make all this Slaughter only for the sake of Skins, leaving the Carcases to perish in the Woods” (Wright 1947:155).

When these patterns are combined with other archaeological data, such as increasing amounts of European trade goods and prevalence of epidemic disease, it suggests that Post-Contact Period changes in exploitation strategies were not uniform across the Piedmont. While archaeological and ethnohistorical data suggest direct and sustained contact between European colonists and the Occaneechi of the Fredricks site and the Sara of the Upper Saratown site, the faunal data suggest that deer exploitation strategies were regionally specific. The Sr data presented in this study provide another component to the current understanding of deer exploitation practices at these sites.

Table 1. %NISP and %Biomass of Deer by Site (Holm 1994; Longo 2018)		
Site	%NISP	%Biomass
Wall (ca. AD 1500-1600)	71.3%	68.13%
Jenrette (ca. AD 1650-1680)	57.5%	NA
Fredricks (ca. AD 1680-1710)	40.6%	46.87%
Hairston (ca. AD 1450-1620)	41.4%	59.3%
Upper Saratown (ca. AD 1650-1710)	58.3%	51.67%

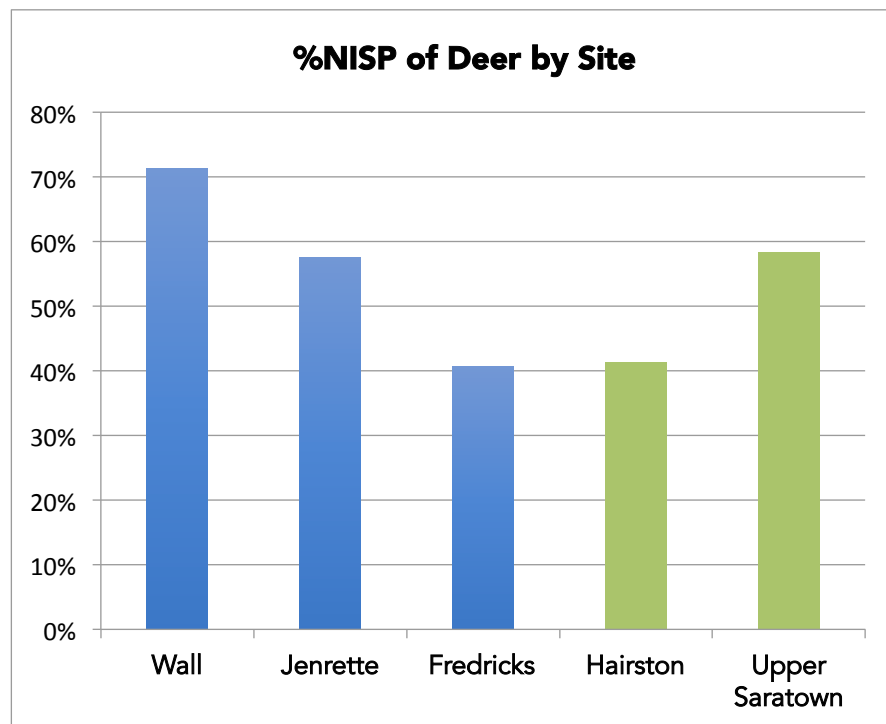


Figure 2. %NISP of deer at the Eno and Dan River sites (Longo 2018:57)

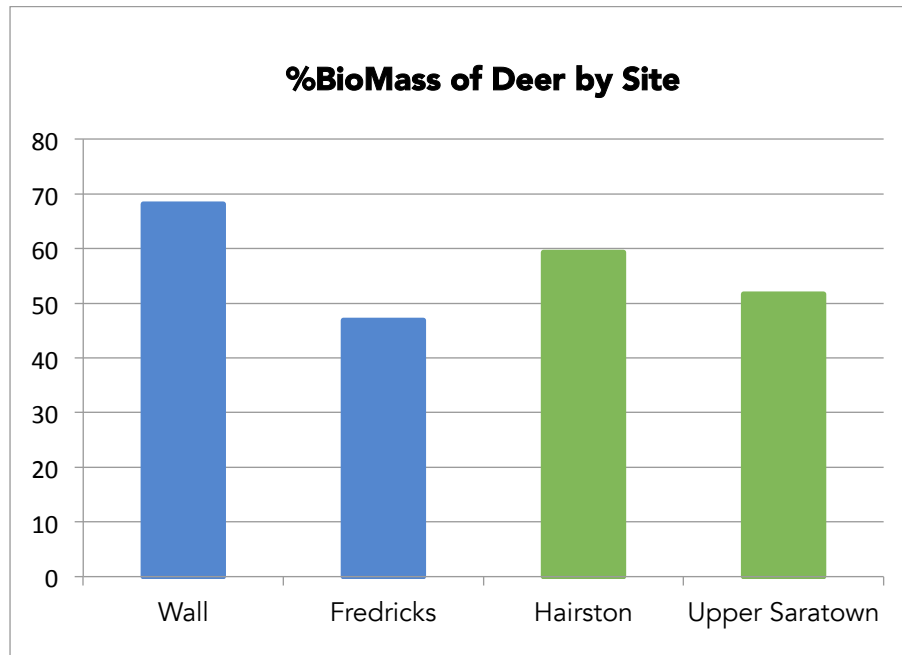


Figure 3. %Biomass of deer at the Eno and Dan River sites (Holm 1994:104)

CHAPTER 4: METHODS

Strontium Isotopes

In order to explore patterns of deer exploitation by Native communities at the Eno and Dan River settlements, this study uses Sr isotope analysis of archaeological deer teeth to reconstruct the geographical parameters of native hunting territories during the Precontact, Middle Contact, and Late Contact Periods. Analysis of the Sr isotopes present in archaeological bones and teeth, measured as the ratio of $^{87}\text{Sr}/^{86}\text{Sr}$, has become a standard practice within archaeological studies of population mobility due to the demonstrable correlation between the Sr present in the hard tissues of living organisms and the underlying geology of a given locality (Bentley 2006:136, Price et al. 2000:906). Though the isotopic ratios of a given locale result from a mixture of atmospheric sources (primarily rainfall) and weathering of underlying geology, atmospheric contributions are assumed to be minimal in most areas (Bentley 2006:152) and are demonstrably minimal in the Carolinas (Watts et al. 2019:21). Using values derived from well-known geological components and outcrops, an expected strontium isoscape, or isotope landscape, can be constructed. This isoscape base-map can be used to identify the general geological provenience of archaeological samples. In the context of North Carolina, geological patterns characterized by the presence of very old rocks in the west and generally younger strata to the east result in a situation where strontium values can readily distinguish between the major geologic zones, including the coastal plain, Piedmont and Blue Ridge mountains in the west.

Sr has three non-radiogenic isotopes (^{84}Sr , ^{86}Sr , and ^{88}Sr) and one radiogenic isotope (^{87}Sr), the latter of which is formed during the β -decay of Rubidium-87 (^{87}Rb) (Bentley

2006:137). Because ^{87}Sr is produced over time as a product of decay, the relationship between the amount of radiogenic ^{87}Sr , relative to non-radiogenic ^{86}Sr , is dependent on the ratio of Rb/Sr in a given geological formation and the age of the rock itself (Bentley 2006:137). Thus, in general, rocks with high Rb/Sr, and old rocks will have high $^{87}\text{Sr}/^{86}\text{Sr}$ relative to rocks with low Rb/Sr and young rocks (Bentley 2006:137). An important exception to this generalization is oceanic sedimentary rock that reflects the averaged $^{87}\text{Sr}/^{86}\text{Sr}$ from millennia of continental weathering (Bentley 2006:139). Because these sedimentary rocks have very low Rb/Sr, they preserve these ratios, independent of age. The weathering of rocks enriches the soil and water with a locally characteristic ratio of $^{87}\text{Sr}/^{86}\text{Sr}$. This Sr acts as a substitute for calcium (Ca), cycling up the trophic chain and incorporating into hydroxyapatite during the formation of vertebrate hard tissues such as bones and teeth (Bentley 2006:137, Price et al. 2000:906). Unlike lighter isotopes (e.g., C, O and N), Sr does not measurably fractionate during biologic processes, allowing for the comparison of the biological Sr incorporated into bones and teeth to geological sources (Bentley 2006:141, Price et al. 2000:906).

Tooth enamel is the preferred tissue from which to study the isotopic composition of archaeological fauna for two reasons. Unlike bone tissue, which is porous and undergoes remodeling every few months, tooth enamel does not undergo remodeling after initial development, and its dense structure inhibits diagenetic alteration after burial (Bentley 2006:158). In order to provenience individual deer to geological zones and identify the zone of exploitation used by Native Piedmont communities, this study compares the Sr isotopic composition of archaeological deer enamel to the composition of geological terranes across North Carolina, as measured by previous geological studies (Cary 2019; Crenshaw 2019; Watts et al. 2019).

The Geological Terranes of North Carolina

Because the $^{87}\text{Sr}/^{86}\text{Sr}$ present in tooth enamel is thought to be reflective of the surficial geology of the region in which the specimen lived during tooth formation, it is necessary to understand the geology where the specimens are sampled. North Carolina is divided into three broad physiographic provinces from west to east, the Blue Ridge, the Piedmont and the Coastal Plain (NCDEQ 2019). These physiographic provinces are further subdivided into geological terranes (Figure 4), with $^{87}\text{Sr}/^{86}\text{Sr}$ that is reflective of their age and geological composition. The Eno and Dan River sites are situated within the Piedmont terrane, which is composed of rocks with $^{87}\text{Sr}/^{86}\text{Sr}$ values ranging from approximately 0.704 to 0.715 (Watts et al. 2019:13-15, Cary 2018:6). The Eno River sites are situated on the Carolina Slate Belt, which is one of the geological provinces that makes up the Piedmont and is composed of metamorphosed igneous rocks that formed approximately 540-630 million years ago (NCDEQ 2019). In the drainages of the Eno River, however, Watts et al. (2019:21) demonstrate that the $^{87}\text{Sr}/^{86}\text{Sr}$ values of groundwater and surface water are dominated by contributions from the much younger (~200 million year) rocks. Groundwater and river water samples from the Neuse and Cape Fear River Basins, particularly at the headwaters of these rivers, both of which are located in the Carolina Slate Belt, suggest that the isotopic composition of this area is influenced by precipitation, granitic rock, and diabase dikes (Watts et al. 2019:21). Deer exploited from the region immediately surrounding the Eno River sites are therefore expected to have $^{87}\text{Sr}/^{86}\text{Sr}$ values ranging from 0.7040 to 0.710. In contrast, Sr in surface water from the Dan River sites is dominated by contributions from older metamorphic rocks of the Slate Belt (NCDEQ 2019) and has much higher $^{87}\text{Sr}/^{86}\text{Sr}$ values between 0.712 and 0.718 (Crenshaw 2019). These ranges provide an expectation for locally exploited deer, though it is important to note that the deer in

this study may be in-taking Sr from a variety of sources, including surficial and deeper geological Sr from browse, forbs, and grasses (Fulbright and Ortego-Santos 2013:12), as well as both springs and river water Sr through drinking. Watts et al. (2019:19) demonstrate that there are significant differences between the Sr composition of surficial and deeper bedrock, which may effect the Sr composition of deer, which would be consuming both surficial and river water, as well as deep-rooted vegetation. However, much like the river water samples in Watts et al. (2019), these varied sources can be expected to produce averaged Sr values that fall within the expected local range established using geological and water samples from across North Carolina.

To the east of the Piedmont terrane, the Coastal Plain covers almost half of the state and exposes mainly of marine sedimentary rock dating to the Tertiary and Cretaceous periods. These younger rocks are associated with distinctive $^{87}\text{Sr}/^{86}\text{Sr}$ values averaging 0.709 and ranging from 0.708 to 0.713 (Crenshaw 2019; Watts et al. 2019:13-15; Cary 2018:6). The Blue Ridge province borders the Piedmont terrane to the west. The Blue Ridge province is composed of the oldest rocks in the region (>900 million years) and reflects the highest $^{87}\text{Sr}/^{86}\text{Sr}$ values in the state, ranging from approximately 0.718 to 0.726 (Cary 2018:6). These geological zones create an overall pattern of intermediate values in the east, low to intermediate values in the Piedmont, and high values to the west.

Bioavailable strontium isotopic ratios are broadly reflective of the geologic terranes from which they are derived, and therefore serve as effective baselines from which to compare the archaeological specimens. The large variation of $^{87}\text{Sr}/^{86}\text{Sr}$ (<0.704 to >0.725) of the geological terranes in North Carolina allows for distinction of provinces through variation in the third decimal place of the isotopic composition. The approximate ranges of expected $^{87}\text{Sr}/^{86}\text{Sr}$ values across North Carolina have been visualized through the construct of an estimated isoscape, or

isotopic landscape, of North Carolina using the available literature (Figure 5; Cary 2018, Crenshaw 2019, Watts et al. 2019).

Sample Selection and Processing

Deer specimens from the Wall, Jenrette, Fredricks, Hairston, and Upper Saratown sites were selected from the collections of the Research Labs of Archaeology at the University of North Carolina at Chapel Hill. Deer teeth were selected based on tooth number, side, and context. Whenever possible, mandibular third molars of the same anatomical side were sampled, in order to avoid unintentional repeated sampling of the same individual. Three mandibular second molars (31OR11.1, 31OR231A.1, and Sk1.2) and one deciduous fourth premolar (31OR11.4) were the exception to this protocol. These teeth were extracted from complete mandibles, assuring that individuals were not repeatedly sampled. The third molars of these mandibles were determined to be unusable due either to excessive wear or underdevelopment. The anatomical side varied between sites, depending on the prevalence of the mandibular third molar in a given assemblage. For example, all teeth sampled from the Hairston Site (Sk1) were anatomical lefts, whereas all teeth sampled from Upper Saratown (Sk1a) were anatomical rights. Additionally, in order to determine the scale and impact of deer mobility on $^{87}\text{Sr}/^{86}\text{Sr}$ values, five individual deer (Individuals 12, 27, 30, 40, and 42) were sampled multiple times using the first, second, and third molars, which develop sequentially in the first year of life. These specimens provide a measurement of Sr variability within an individual deer's home range over a period of more than a year. Finally, five rodent specimens were selected to establish site-specific Sr baselines.

Samples were processed in the Department of Geological Sciences isotope geochemistry laboratory at the University of North Carolina at Chapel Hill. Specimens were cleaned of

contaminants using a smoothing bit secured on a Dremel rotary tool, after which the dentine layers were removed from the specimen. Approximately 2-3 mg of enamel was crushed using a mortar and pestle and dissolved in 3.5 M HNO₃. Sr was isolated using ion-exchange column chromatography with EiChrom Sr-Spec™ resin. Approximately 1 µL of concentrated H₃PO₄ was added to the isolated Sr, which was evaporated to dryness. The Sr samples were loaded on single Re filaments with TaCl₅ and analyzed in triple-dynamic multicollector mode with ⁸⁸Sr = 3 V (10¹¹ Ω resistor) on the VG Sector-54 thermal ionization mass spectrometer. All data are normalized to ⁸⁶Sr/⁸⁸Sr = 0.1194 assuming exponential fractionation behavior. All data are reported relative to a value for NBS-987 of ⁸⁷Sr/⁸⁶Sr = 0.710250 ± 0.000014 (2σ, n = 50). The internal run precision of all analyses (<0.0010%) is far smaller than the long-term external reproducibility of the standards (0.0020%). Therefore, we report all uncertainties using the larger value (± 0.000014, 2σ, absolute).

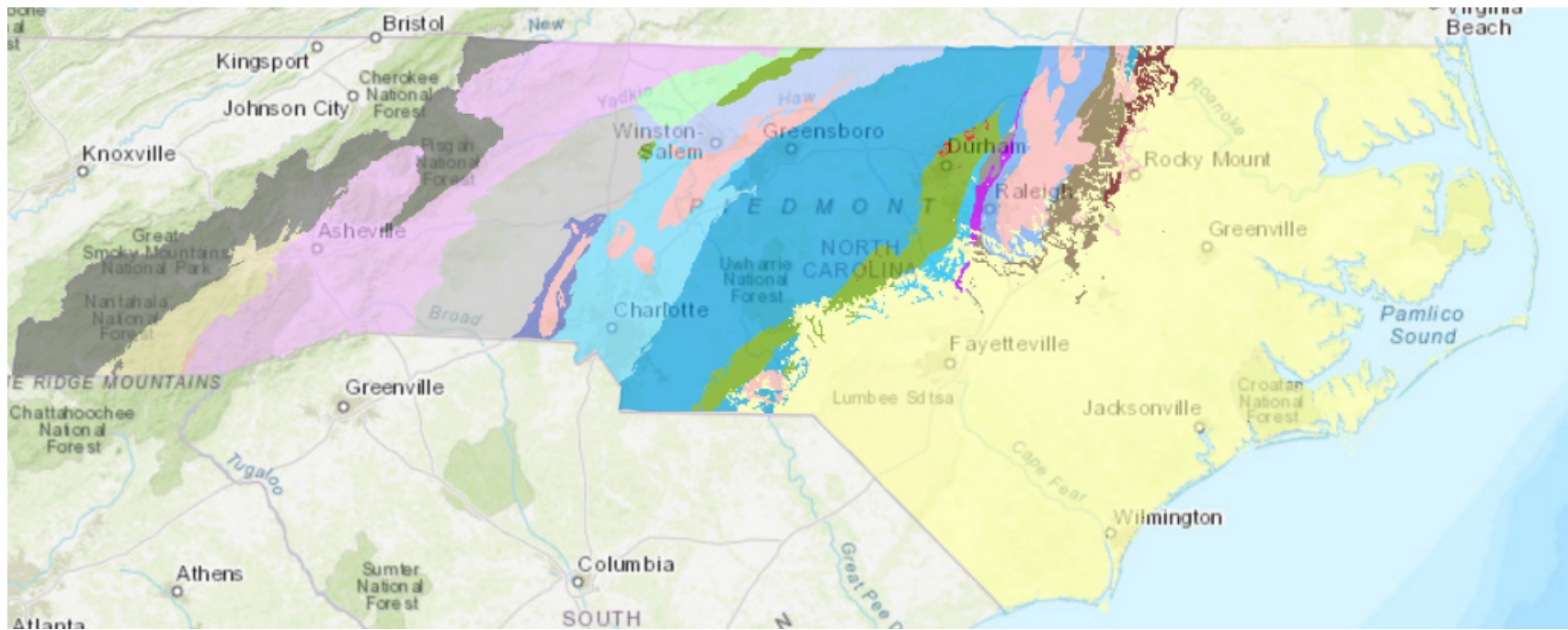


Figure 4. Geological Terranes of North Carolina (NCDEQ 2019)

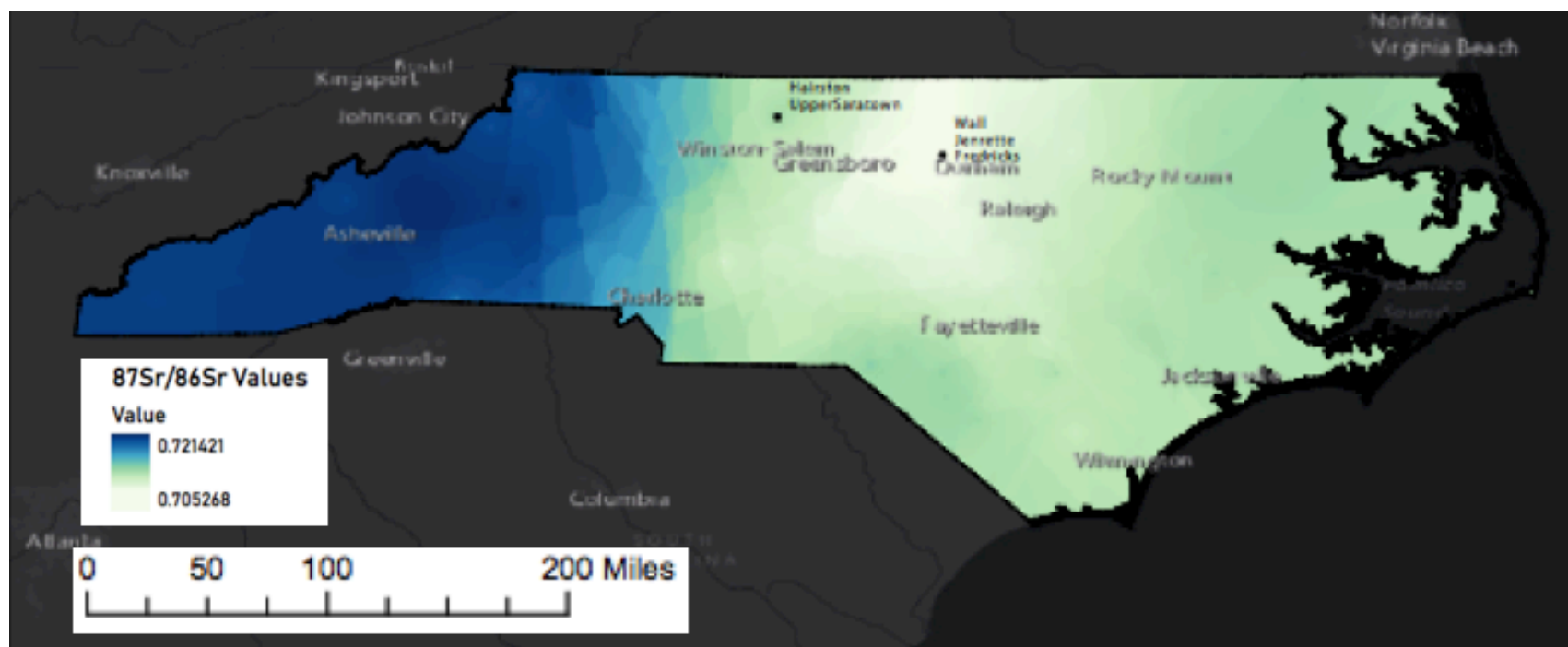


Figure 5. Approximate Sr isoscape of North Carolina based on values drawn from Cary 2018, Crenshaw 2019, and Watts et al. 2019

CHAPTER 5: RESULTS

General Trends in $^{87}\text{Sr}/^{86}\text{Sr}$ Composition

Analysis of Sr from deer enamel produced 69 values from 61 individuals. Because of the distinct Sr compositions of the geological terrains in North Carolina, variation in the third decimal place is sufficient to establish geological provenience and values discussed here have been rounded to the fourth decimal place. The $^{87}\text{Sr}/^{86}\text{Sr}$ values derived from the deer samples range from 0.7048 to 0.7217 (Table 2; Figure 6) and clearly reflect multiple geological terranes (Table 1, Figure 6). Sample derived from multiple teeth in the same mandible (i.e. Individuals 12, 27, 30, 40, and 42) exhibit minimal $^{87}\text{Sr}/^{86}\text{Sr}$ variation (Table 2, Figure 6). The $^{87}\text{Sr}/^{86}\text{Sr}$ values for sets of molars from these individuals have internal standard deviations ranging from 0.00006 to 0.0003 supporting ethological studies showing that deer inhabit geographically small home ranges. The Sr data were analyzed in the following sections using histograms and two statistical tests, Levene's test for homogeneity of variance and Welch's ANOVA, the latter of which was selected because it does not assume equality of variance. For those individuals that were tested multiple times (Individual 12, 27, 30, 40, and 42), only the third molar was used in statistical analyses, except in the case of Individual 40. The second molar represents individual 40, due to the failure of the third molar. Discussion of these values will also focus on the third molar for these individuals.

Additionally, analysis of Sr from rodent teeth from the Eno and Dan River assemblages produced five values that function as site-specific baselines (Table 1, Figure 8). The Eno River rodent sample produced a value of 0.7055 whereas the Dan River rodents produced site baseline

values of 0.7147, 0.7150, and 0.7133. These values match the geological and surface water samples collected in the areas immediately surrounding the site, which range from 0.7120 to 0.7150 for the Dan River (Crenshaw 2019) and 0.7040 to 0.7100 for the Eno River (Watts et al. 2019:13-15). Although the rodents analyzed in this study were recovered during archaeological excavation, it is unknown whether they were anthropogenically deposited in antiquity or through subsequent burrowing. Therefore, the rodent samples are noted to be of unknown chronological provenience and function only as site-level baselines to be compared to the analyzed deer specimens and function to confirm that the geology of the sites is consistent with the North Carolina isoscape derived from geological and hydrological samples (Cary 2018, Crenshaw 2019, Watts et al. 2019).

Table 2. $^{87}\text{Sr}/^{86}\text{Sr}$ Values from Eno and Dan River Individuals					
Site	Period	Sample	$^{87}\text{Sr}/^{86}\text{Sr}$	Species	Individual #
Wall	AD 1500-1600	31OR11.1	0.7066	Deer	1
Wall	AD 1500-1600	31OR11.2	0.7097	Deer	2
Wall	AD 1500-1600	31OR11.3	0.7079	Deer	3
Wall	AD 1500-1600	31OR11.4	0.7068	Deer	4
Wall	AD 1500-1600	31OR11.5	0.7074	Deer	5
Wall	AD 1500-1600	31OR11.6	0.7070	Deer	6
Wall	AD 1500-1600	31OR11.7	0.7073	Deer	7
Wall	AD 1500-1600	31OR11.8	0.7048	Deer	8
Wall	AD 1500-1600	31OR11.9	0.7064	Deer	9
Wall	AD 1500-1600	31OR11.10	0.7066	Deer	10
Wall	AD 1500-1600	31OR11.11	0.7092	Deer	11
Wall	AD 1500-1600	31OR11.12	0.7066	Deer	12 (Molar 3)
Wall	AD 1500-1600	31OR11.13	0.7066	Deer	12 (Molar 2)
Wall	AD 1500-1600	31OR11.14	0.7065	Deer	12 (Molar 1)
Jenrette	AD 1650-1680	31OR231A.1	0.7059	Deer	13
Jenrette	AD 1650-1680	31OR231A.2	0.7074	Deer	14
Jenrette	AD 1650-1680	31OR231A.3	0.7062	Deer	15
Jenrette	AD 1650-1680	31OR231A.4	0.7052	Deer	16
Jenrette	AD 1650-1680	31OR231A.5	0.7059	Deer	17
Jenrette	AD 1650-1680	31OR231A.6	0.7065	Deer	18
Jenrette	AD 1650-1680	31OR231A.7	0.7088	Deer	19
Jenrette	AD 1650-1680	31OR231A.8	0.7084	Deer	20
Jenrette	AD 1650-1680	31OR231A.9	0.7058	Deer	21
Jenrette	AD 1650-1680	31OR231A.10	0.7066	Deer	22
Jenrette	AD 1650-1680	31OR231A.11	0.7066	Deer	23
Jenrette	AD 1650-1680	31OR231A.12	0.7056	Deer	24
Jenrette	AD 1650-1680	31OR231A.13	0.7072	Deer	25
Jenrette	AD 1650-1680	31OR231A.14	0.7061	Deer	26
Fredricks	AD 1680-1710	31OR231.1	0.7062	Deer	27 (Molar 1)
Fredricks	AD 1680-1710	31OR231.2	0.7067	Deer	27 (Molar 2)
Fredricks	AD 1680-1710	31OR231.3	0.7068	Deer	27 (Molar 3)
Fredricks	AD 1680-1710	31OR231.4	0.7078	Deer	28

Fredricks	AD 1680-1710	31OR231.5	0.7068	Deer	29
Fredricks	AD 1680-1710	31OR231.6	0.7078	Deer	30 (Molar 1)
Fredricks	AD 1680-1710	31OR231.7	0.7075	Deer	30 (Molar 2)
Fredricks	AD 1680-1710	31OR231.8	0.7072	Deer	30 (Molar 3)
Fredricks	AD 1680-1710	31OR231.9	0.7081	Deer	31
Fredricks	AD 1680-1710	31OR231.10	0.7061	Deer	32
Fredricks	AD 1680-1710	31OR231.11	0.7080	Deer	33
Fredricks	AD 1680-1710	31OR231.12	0.7064	Deer	34
Fredricks	AD 1680-1710	31OR231.13	0.7073	Deer	35
Fredricks	AD 1680-1710	31OR231.14	0.7069	Deer	36
Hairston	AD 1450-1620	SK1.1	0.7161	Deer	37
Hairston	AD 1450-1620	SK1.2	0.7173	Deer	38
Hairston	AD 1450-1620	SK1.3	0.7161	Deer	39
Hairston	AD 1450-1620	SK1.4	Failed	Deer	40 (Molar 3)
Hairston	AD 1450-1620	SK1.5	0.7160	Deer	40 (Molar 1)
Hairston	AD 1450-1620	SK1.6	0.7158	Deer	40 (Molar 2)
Upper Saratown	AD 1650-1670	SK1A.1	0.7174	Deer	41
Upper Saratown	AD 1650-1670	SK1A.2	0.7096	Deer	42 (Molar 3)
Upper Saratown	AD 1650-1670	SK1A.3	0.7094	Deer	42 (Molar 2)
Upper Saratown	AD 1650-1670	SK1A.4	0.7092	Deer	42 (Molar 1)
Upper Saratown	AD 1650-1670	SK1A.5	0.7150	Deer	43
Upper Saratown	AD 1650-1670	SK1A.6	0.7164	Deer	44
Upper Saratown	AD 1650-1670	SK1A.7	0.7148	Deer	45
Upper Saratown	AD 1650-1670	SK1A.8	Failed	Deer	46
Upper Saratown	AD 1650-1670	SK1A.9	0.7174	Deer	47
Upper Saratown	AD 1670-1710	SK1A.10	0.7200	Deer	48
Upper Saratown	AD 1670-1710	SK1A.11	0.7128	Deer	49
Upper Saratown	AD 1670-1710	SK1A.12	0.7151	Deer	50
Upper Saratown	AD 1670-1710	SK1A.13	0.7130	Deer	51
Upper Saratown	AD 1670-1710	SK1A.14	0.7165	Deer	52
Upper Saratown	AD 1670-1710	SK1A.15	0.7153	Deer	53
Upper Saratown	AD 1670-1710	SK1A.16	0.7217	Deer	54
Upper Saratown	AD 1670-1710	SK1A.17	0.7091	Deer	55
Upper Saratown	AD 1670-1710	SK1A.18	0.7130	Deer	56
Upper Saratown	AD 1670-1710	SK1A.19	0.7123	Deer	57

Upper Saratown	AD 1670-1710	SK1A.20	0.7158	Deer	58
Upper Saratown	AD 1670-1710	SK1A.21	0.7095	Deer	59
Upper Saratown	AD 1670-1710	SK1A.22	0.7082	Deer	60
Upper Saratown	AD 1670-1710	SK1A.23	0.7150	Deer	61
Jenrette	Unknown	31OR231A.15	0.7055	Rodent	62
Hairston	Unknown	SK1.7	0.7147	Rodent	63
Hairston	Unknown	SK1.8	0.7147	Rodent	64
Upper Saratown	Unknown	SK1A.24	0.7150	Rodent	65
Upper Saratown	Unknown	SK1A.25	0.7133	Rodent	66

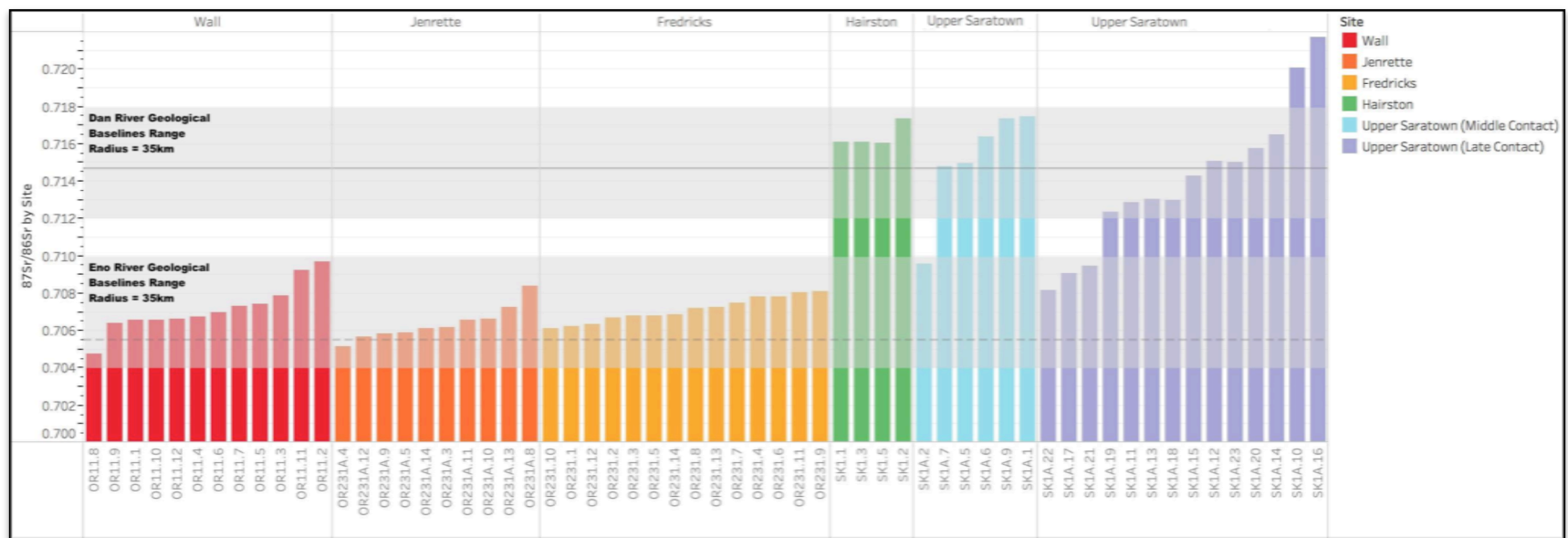


Figure 6. $^{87}\text{Sr}/^{86}\text{Sr}$ values of deer samples from the Eno and Dan River sites with baseline Sr values covering an area of 35km^2 (Baseline Sr values based on Cary 2018, Watts et al. 2019, Crenshaw 2019; logistical mobility distance value of 35km^2 drawn from average highest logical mobility values of North American hunter-gatherer communities referenced in Kelly 1983:298)

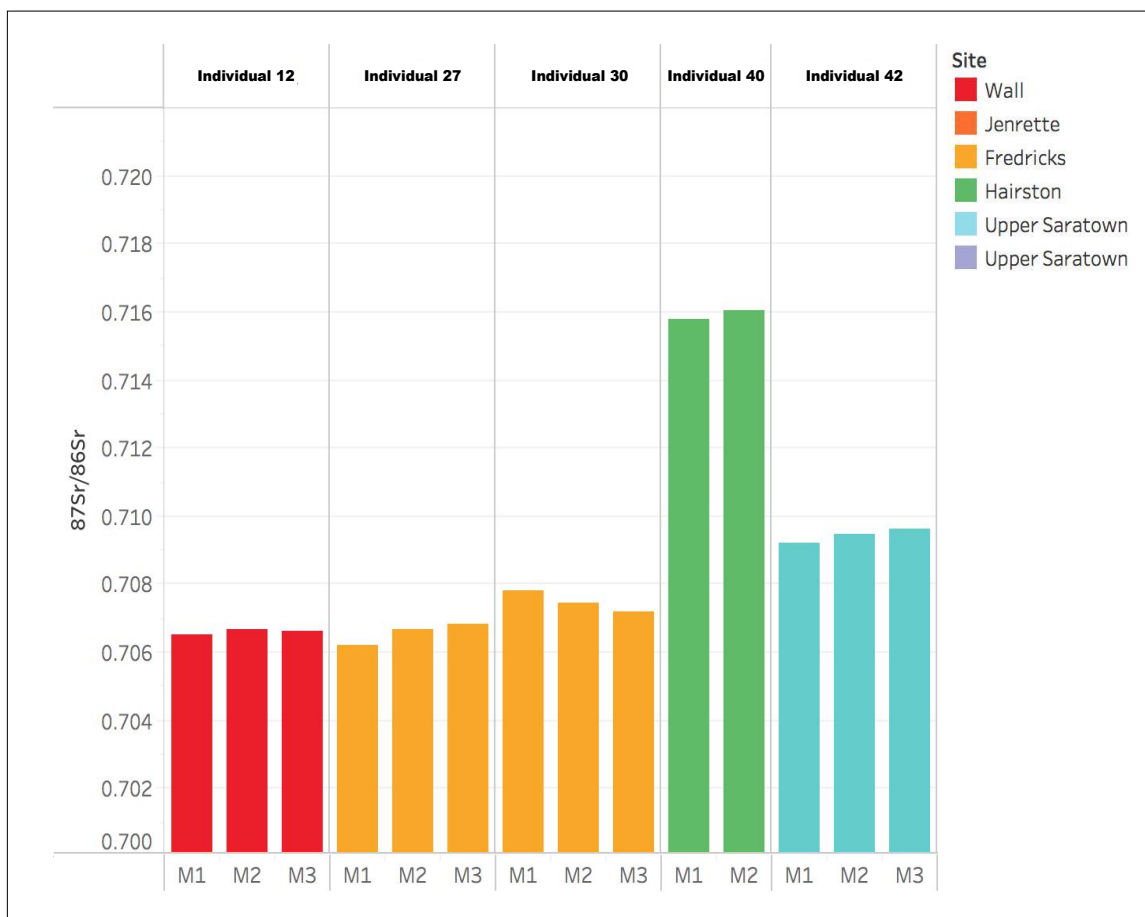


Figure 7. $^{87}\text{Sr}/^{86}\text{Sr}$ values derived from Molars 1, 2, and 3 from the same mandible

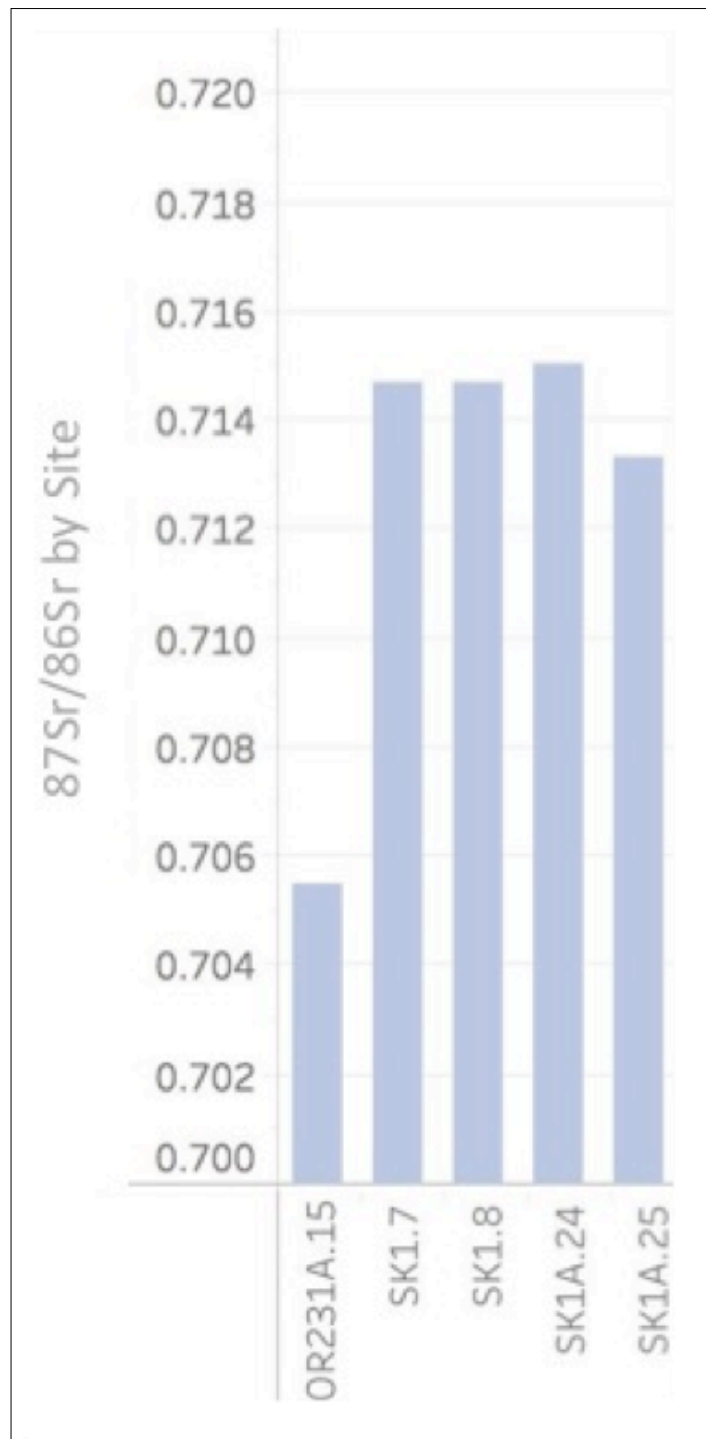


Figure 8. $^{87}\text{Sr}/^{86}\text{Sr}$ values of archaeological rodent samples

$^{87}\text{Sr}/^{86}\text{Sr}$ Compositions of Eno River Individuals

The $^{87}\text{Sr}/^{86}\text{Sr}$ baseline of the Wall, Jenrette, and Fredricks sites, based on 1 rodent sample, is measured at 0.7055 (Table 2). This is consistent with groundwater and surface water samples from the Eno River Basin, which range from 0.704 to 0.710 (Watts et al. 2018:13-15). Deer analyzed from the Eno River sites have $^{87}\text{Sr}/^{86}\text{Sr}$ values ranging from 0.7048 to 0.7097 and thus all fall within the range of variation expected within the Neuse and Cape Fear River Basins that surround the Eno River (Table 2). Most of the Sr values cluster between 0.7061 to 0.7080 (Figure 6; Figure 9), particularly during the Precontact Wall and the Late Contact Fredricks sites, but this pattern is also noticeable for the Jenrette site suggesting that most deer were harvested from a limited geographic area.

Twelve individuals were sampled from the Wall site, with $^{87}\text{Sr}/^{86}\text{Sr}$ values ranging from 0.7048 to 0.7097 (Table 2, Figure 6). The majority of the Sr values cluster between 0.7064 and 0.7079, while three individuals fall outside of this range, measuring 0.7048, 0.7093, and 0.7097, respectively (Figure 6). Fourteen individuals were sampled from the Jenrette site, with $^{87}\text{Sr}/^{86}\text{Sr}$ values ranging from 0.7052 to 0.7088 (Figure 6). When compared to the Wall site individuals, the Jenrette individuals exhibit a slightly smaller range of Sr values. Ten individuals were sampled from the Fredricks site, with $^{87}\text{Sr}/^{86}\text{Sr}$ ranging from 0.7061 to 0.7080 (Figure 6). $^{87}\text{Sr}/^{86}\text{Sr}$ values from the Fredricks site deer cluster even more tightly than those of either of the previous two settlements.

The Sr values of individual deer were analyzed using several statistical tests. Histograms visually indicate three patterns at the Wall, Jenrette, and Fredricks sites (Figure 9). At the Wall site, the data form three distinct clusters. At the Jenrette site, the data form two clusters. At the Fredricks site, the data form a single cluster. Despite these cluster differences, however, the Sr values from all three Eno River sites show a notably consistency in their range. Levene's test for

homogeneity of variance confirms that the sample populations have equal variance at a significance level of 0.05 ($p=0.41$), while Welch's ANOVA also indicates that the populations are not statistically different ($p=0.27$).

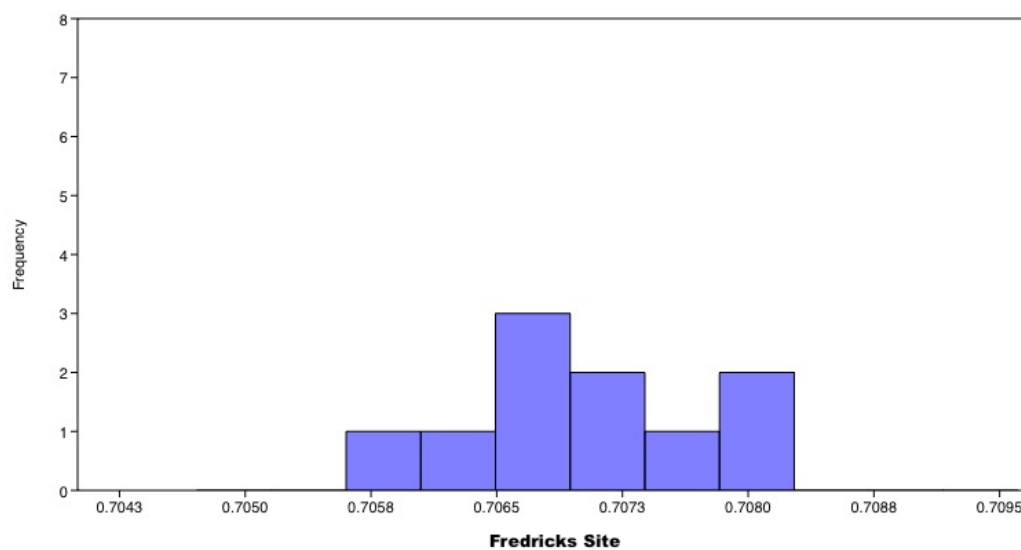
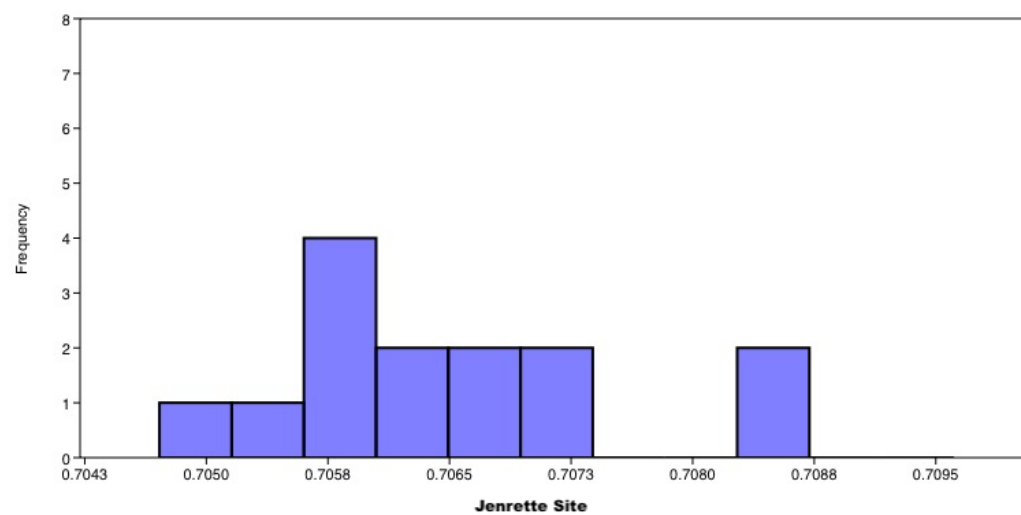
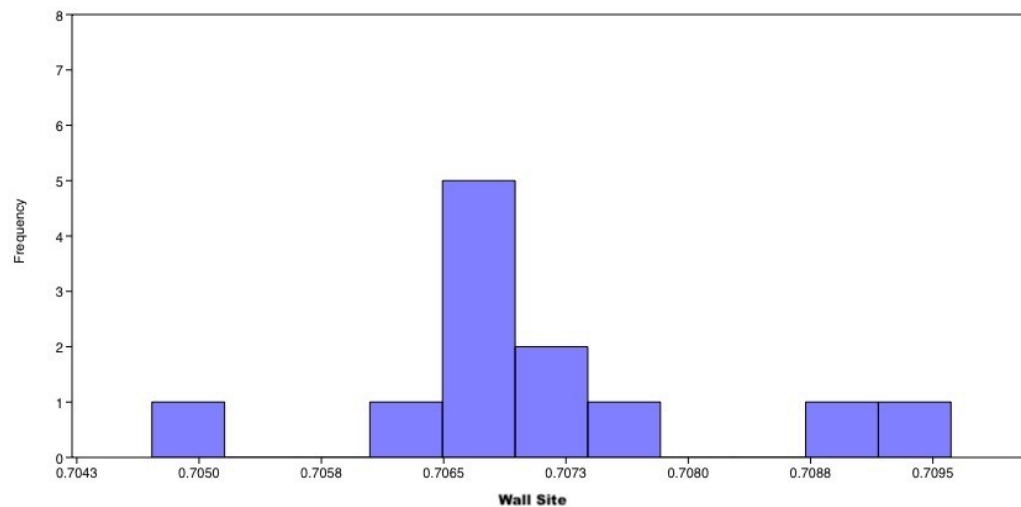


Figure 9. Histogram of $^{87}\text{Sr}/^{86}\text{Sr}$ Values from the Eno River Individuals

$^{87}\text{Sr}/^{86}\text{Sr}$ Values of Dan River Individuals

The $^{87}\text{Sr}/^{86}\text{Sr}$ baseline of the Hairston and Upper Saratown sites, based on four rodent samples, ranges between 0.7133 to 0.7150, which is consistent with geological samples from the Dan River Basin, which range from 0.7128 to 0.7150 (Crenshaw 2019). The Dan River deer have $^{87}\text{Sr}/^{86}\text{Sr}$ values ranging from 0.7081 to 0.7217 (Table 2; Figure 6). Most of the values cluster between 0.7123 and 0.7174 (Figure 11), which is consistent with the geological terranes within a 35km radius (Crenshaw 2019) and the rodent samples analyzed in this study.

Four individuals were sampled from the Hairston site, with $^{87}\text{Sr}/^{86}\text{Sr}$ values ranging from 0.7160 to 0.7173 (Table 2; Figure 6). The individuals analyzed from Upper Saratown are divided into two phases based on occupation period. Individuals from both periods display a wider range of values than those from the Hairston site. The six individuals sampled from the Middle Contact Period have $^{87}\text{Sr}/^{86}\text{Sr}$ values ranging from 0.70960 to 0.7174, while the thirteen individuals sampled from the Late Contact Period have an even wider range extending from 0.7082 to 0.7217 (Table 2; Figure 6). The range of values from the Late Contact Period of the Upper Saratown site is noticeably larger than that of both the Middle Contact Period at Upper Saratown and the Hairston site.

Histograms visually indicate three modes at the Dan River sites (Figure 10). At the Hairston site, where the sample size is only four individuals, values form a single cluster. At the Middle Contact Period of the Upper Saratown site, values form two clusters, the first of which is consistent with the cluster formed by the Hairston site data. Finally, at the Late Contact Period of the Upper Saratown site, the data exhibit the largest spread of any site in this study and form four clusters. Levene's test for homogeneity of variance indicates that there is equal variance across the sample populations at a significance level of 0.05 ($p=0.12$) and Welch's ANOVA also

suggests that the populations are not statistically different at a significance level of 0.05 ($p=0.14$).

However, these results are impacted by the small sample sizes of the Hairston and Middle

Contact Upper Saratown samples.

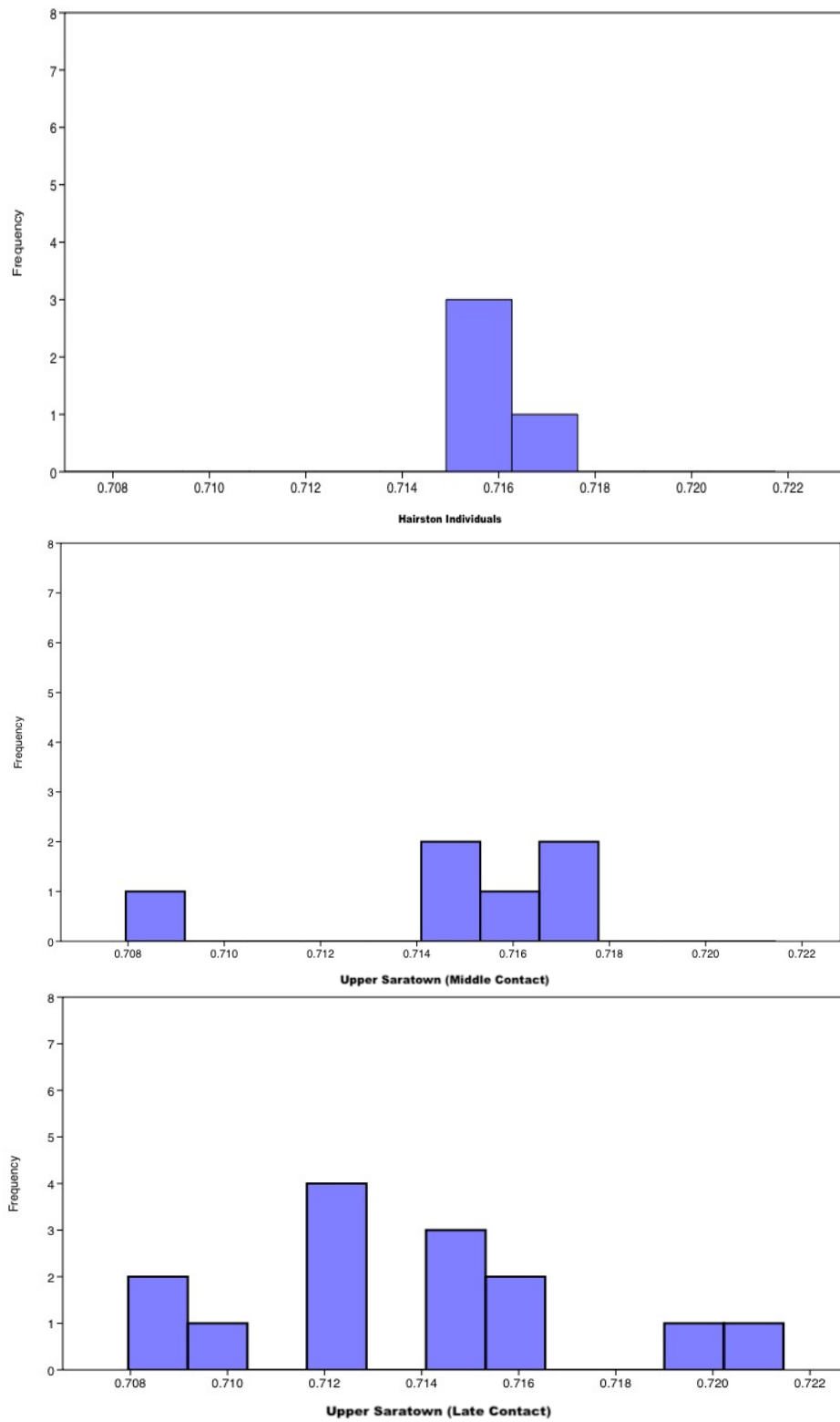


Figure 10. Histogram of $^{87}\text{Sr}/^{86}\text{Sr}$ Values from the Dan River Individuals

Comparison of Eno and Dan River Individuals

Visually, the histograms indicate two distinct patterns at the Eno and Dan River sites (Figure 11). Whereas Eno River individuals form a single cluster, Dan River individuals form three distinct clusters. Additionally, 1 of the Dan River clusters overlaps with the Eno River Sr values. The histograms visually emphasize that the variance is much higher amongst the Dan River individuals, than amongst those of the Eno River. Levene's test for homogeneity of variance also indicates that the variances of all individuals from the Eno and Dan River sites are statistically different at a significance level of 0.05 ($p=0.000026$). Furthermore, Welch's ANOVA test indicates that the differences between the Eno and Dan River samples are statistically significant at a significance level of 0.05 ($p<0.001$), confirming the visual patterns suggested by the histograms. Finally, Welch's ANOVA indicates that all populations of the same period are statistically different at a significance level of 0.05 (Table 3), while Levene's test for homogeneity of variance is slightly more ambiguous between sites of the same period (Table 4). According to Levene's test, only the populations of the Jenrette and Middle Contact Upper Saratown sites are statistically different at a confidence level of 0.05 ($p = 0.0036$), while comparison of the Wall and Fredricks sites to the Hairston and Late Contact Upper Saratown sites, respectively, produce p-values indicating that these populations are not statistically different at a confidence level of 0.05.

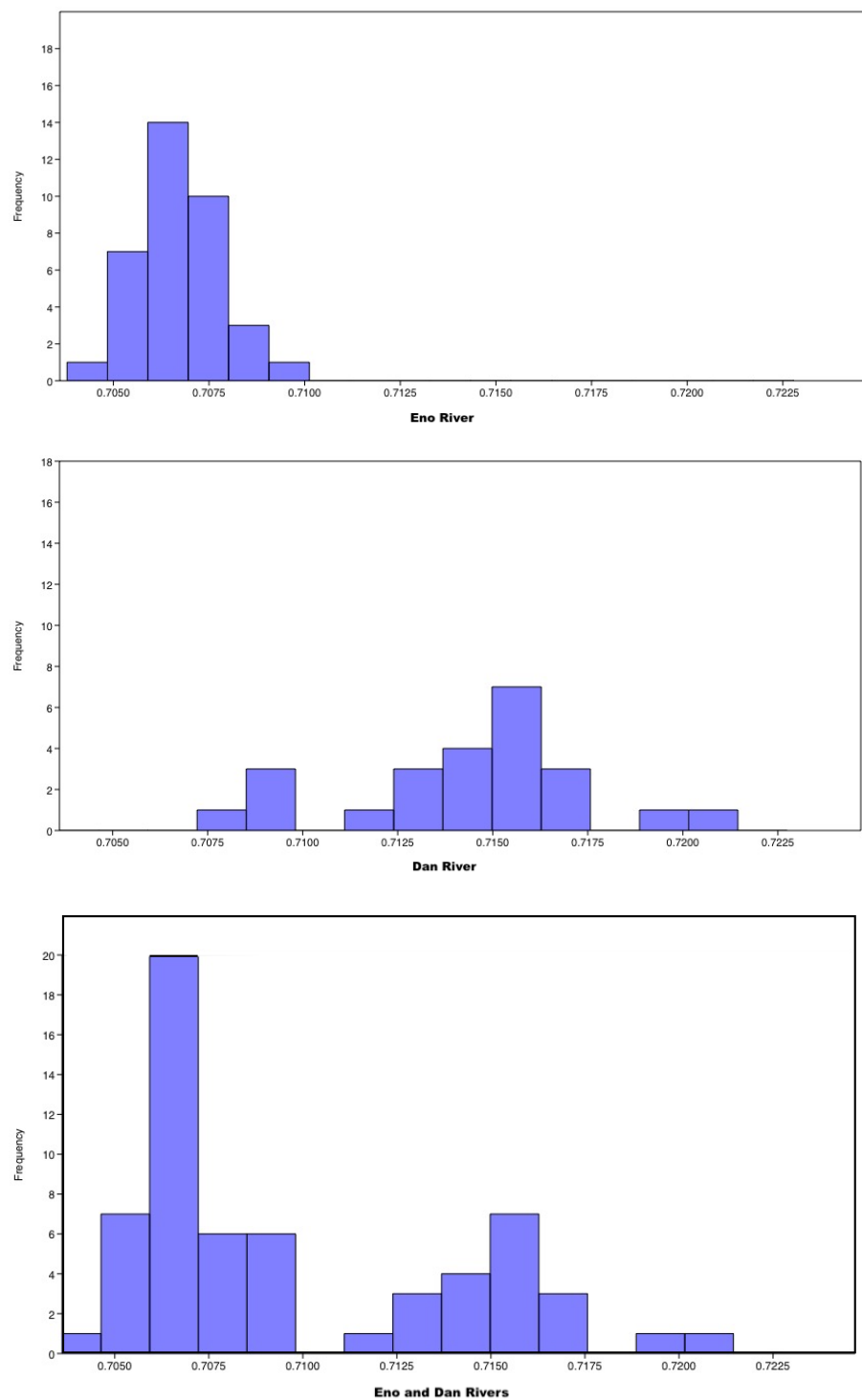


Figure 11. Histograms of $^{87}\text{Sr}/^{86}\text{Sr}$ Values from the Eno and Dan River Individuals

Table 3. Levene's Test p-values: Contemporary Sites			
	Wall (Precontact)	Jenrette (Middle Contact)	Fredricks (Late Contact)
Hairston (Precontact)	0.35	-	-
Upper Saratown (Middle Contact)	-	0.0036	-
Upper Saratown (Late Contact)	-	-	0.053

Table 4. Welch's t-test p-values: Contemporary Sites			
	Wall (Precontact)	Jenrette (Middle Contact)	Fredricks (Late Contact)
Hairston (Precontact)	2.06×10^{-9}	-	-
Upper Saratown (Middle Contact)	-	0.000011	-
Upper Saratown (Late Contact)	-	-	0.00061

CHAPTER 6: DISCUSSION

General Trends

The Sr data produced in this study indicate three general trends in regards to deer exploitation and settlement provisioning within the Eno and Dan River drainages. Firstly, the five deer individuals that were sampled multiple times exhibit internal standard deviations that are less than the analytical uncertainty, ranging between 0.00006 and 0.0003 for a given individual, confirming ecological models of deer home ranges. These data confirm the assertion that the variation in $^{87}\text{Sr}/^{86}\text{Sr}$ between different individual deer is the result of habitation in different geological terranes, rather than extensive movements by individual deer. This confirms that analysis of deer tooth enamel is an effective way to identify the exploitation territories used by Native hunters and suggests that variation in Sr values in deer teeth is not driven by migratory behavior.

Secondly, the Sr values generated by this study clearly correlate to predictable values from geological terranes in the regions surrounding the Eno and Dan River drainages. This demonstrates the strength of the method, which generated Sr values of clearly identifiable geological provenience from surrounding geological terranes. Because these values are drawn only from those individuals that were recovered from the village sites themselves, they specifically represent those deer that were exploited in order to provision the settlement and provide a conservative estimate of the territories regularly exploited by Native communities in the Eno and Dan River drainages.

Thirdly, statistical and graphical analyses of these data demonstrate that the Sr values of

the Eno and Dan River individuals are statistically different when viewed as two distinct assemblages, with a highly significant p-value of 0.000026. This is visually evident in the histograms of each site (Figure 11), where the values form distinct patterns and the distributions are visually different, with the Dan River individuals exhibiting a much wider range. The Dan River individuals were likely procured from three distinct geological zones, as evidenced by the clustering visible in the histogram and comparisons to geological samples (Figure 11; Crenshaw 2019), while the Eno River individuals appear to have been procured from a single geological zone (Figure 11; Watts et al. 2019). These trends demonstrate not only that Eno and Dan River communities exploited different hunting territories from one another, as would be expected given the distance between the communities (approx. 96 km), but also that the hunting strategies of Native Piedmont communities were regionally specific (Figure 12).

Diachronic Trends from the Eno River

The Sr values from the Eno River individuals suggest that the Native communities occupying the Wall, Jenrette, and Fredricks sites all exploited locally available deer, with Sr values ranging between 0.7048 to 0.7097 (Table 2). These data fall within the expected range of values for the Eno River Basin and the area immediately surrounding it, which range from 0.704 to 0.710 (Watts et al. 2019). These data also match the Sr value of the archaeological rodent sampled from the Jenrette site in this study, which measured 0.7055.

$^{87}\text{Sr}/^{86}\text{Sr}$ values from the Wall site individuals are consistent with local exploitation, though the range of 0.7048 to 0.7097 (Table 2, Figure 6) is slightly larger than the ranges of Sr values from subsequent settlements. This may indicate that the Precontact Wall site community exploited different areas around the Neuse and Cape Fear River Basins, though all deer appear to

have been exploited within this general region. $^{87}\text{Sr}/^{86}\text{Sr}$ values from the Jenrette site individuals show a similar pattern, with values ranging from 0.7052 to 0.7088 (Figure 6), while graphical representations of the data illustrate a slight shift towards lower values during this period (Figure 9). These data indicate the continued exploitation of local deer from the adjacent Basins, while possibly indicating an increased focus on a particular local hunting area. $^{87}\text{Sr}/^{86}\text{Sr}$ values from the Fredricks site individuals, however, range from 0.7061 to 0.7080 and show a distribution more similar to that for the Wall site than Jenrette (Table 2, Figure 6). Additionally, none of the deer from the Fredricks site have Sr values lower than 0.706, again suggesting a focus on a particular hunting territory in the region. These values may suggest that the community at the Fredricks site was not exploiting environments around the headwaters of the Neuse River, where $^{87}\text{Sr}/^{86}\text{Sr}$ values trend between 0.7040 and 0.7060 (Watts et al. 2019:13-15). Rather, this range of values suggests that hunters from the Fredricks site were focusing on environments to the southeast of the headwaters. This slight difference in exploitation zone makes sense given that the inhabitants of the Fredricks site are believed to be newcomers to the area and probably were not continuing an exploitation tradition consistent with those of the inhabitants of the Wall and Jenrette sites.

Overall, the $^{87}\text{Sr}/^{86}\text{Sr}$ values from individuals recovered from all three Eno River sites are remarkably consistent with one another, suggesting that deer exploitation practices remained fairly uniform across all three periods, with subtle shifts in hunting territories between periods. These data indicate that both Pre- and Post-Contact communities exploited environments located in the Neuse and Cape Fear River Basins. Minimum zones of exploitation for each site are visually represented in Figure 13, highlighting both the consistency of hunting territories across the occupation periods, as well as more subtle shifts that may be reflected in these data.

Diachronic Trends from the Dan River

The Dan River individuals exhibit much more variation than those from the Eno River sites, with values ranging from 0.7081 to 0.7217, which correspond to the archaeological rodent samples from the Hairston and Upper Saratown sites, which range from 0.713 to 0.715 (Table 2; Figure 6). Though the majority of the deer values fall within the expected range for the Dan River Basin and the area immediately surrounding it, which ranges from 0.712 to 0.718 (Crenshaw 2019), six individuals have Sr values that are inconsistent with local exploitation. This is further evidenced by the archaeological rodent samples from the Hairston and Upper Saratown sites, which range from 0.713 to 0.715 (Table 2). Four of the outliers match the Sr value of the archaeological rodent sampled from the Jenrette site in this study, which measured 0.7055, while the remaining two measure 0.720 and above (Table 2; Figure 6).

Like their Precontact counterparts at the Wall site, the $^{87}\text{Sr}/^{86}\text{Sr}$ values from the Hairston individuals are consistent with local exploitation, ranging from 0.7158 to 0.7173 (Table 2, Figure 6). However, the sample size is small due to assemblage limitations, including only four individuals. While this pattern of local exploitation continues during the Middle Contact Period of the Upper Saratown site, with most values ranging from 0.7148 to 0.7174, one individual has a non-local value of 0.7096 (Table 2, Figure 6). This value likely corresponds to the Neuse or Cape Fear River Basin to the east, and potentially overlaps with areas used by the Eno River communities. It also suggests an eastward territorial expansion into new hunting territories. This trend continues in the Late Contact Period occupation of the Upper Saratown site, when most values fall within the local range between 0.7128 and 0.7165, but five individuals fall outside of this expected local range (Table 2, Figure 6; Crenshaw 2019). Three of these individuals also appear to correspond to the Neuse or Cape Fear River Basin (Watts et al. 2019), while two

(Sk1a.10 and Sk1a.16) correspond to geological values in the Blue Ridge Mountains (Crenshaw 2019), indicating an expansion of hunting territories to the west (Figure 14). These data demonstrate that these communities exploited the immediate surrounding area of the Roanoke River Basin during all periods of occupation, while significant expansions into the Blue Ridge Mountains and Neuse or Cape Fear River Basins took place during the Late Contact Period.

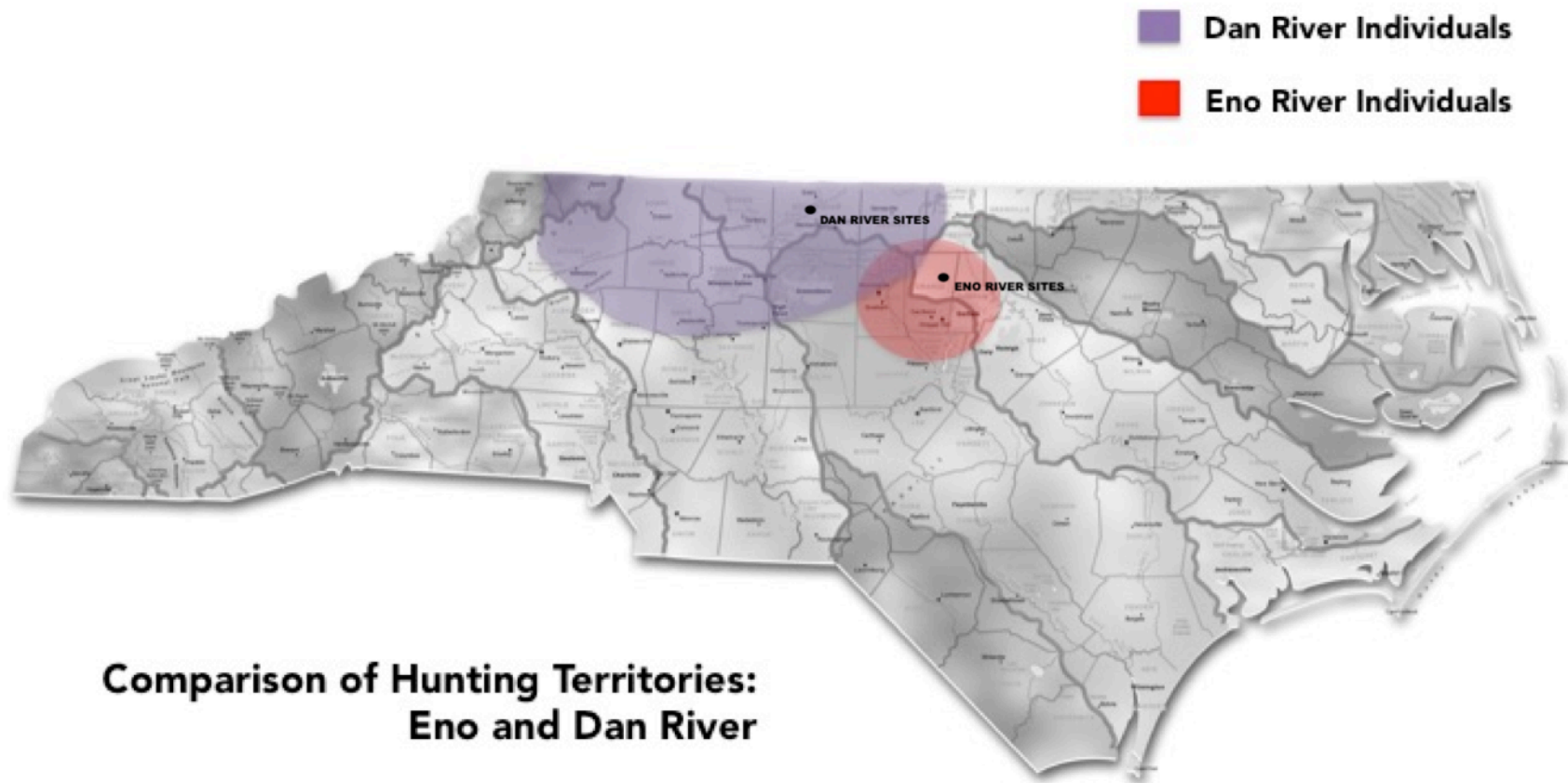


Figure 12. Parameters of minimum estimated hunting territory used by Eno and Dan River communities based on Sr values (map sourced from NC Wildlife Resource Commission 2019)

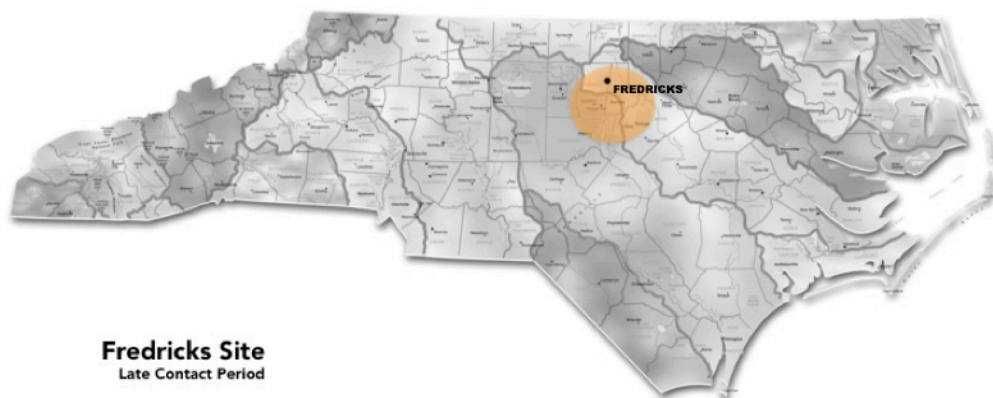
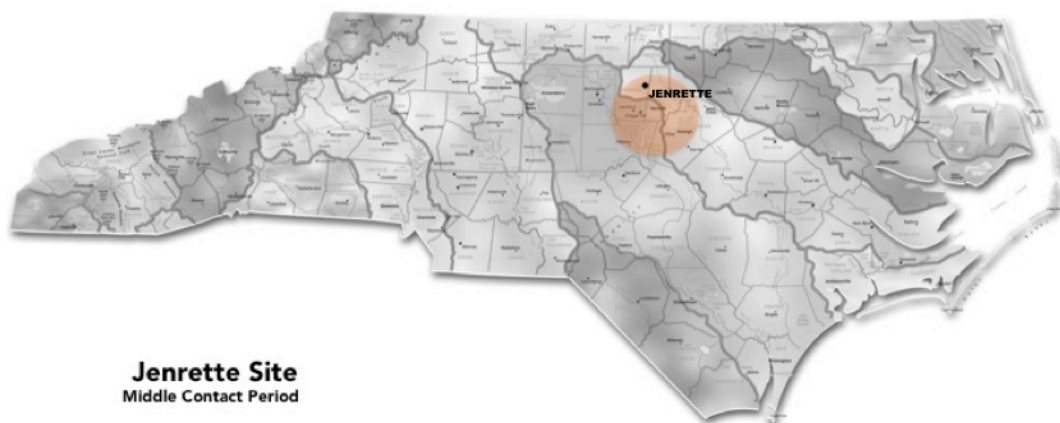
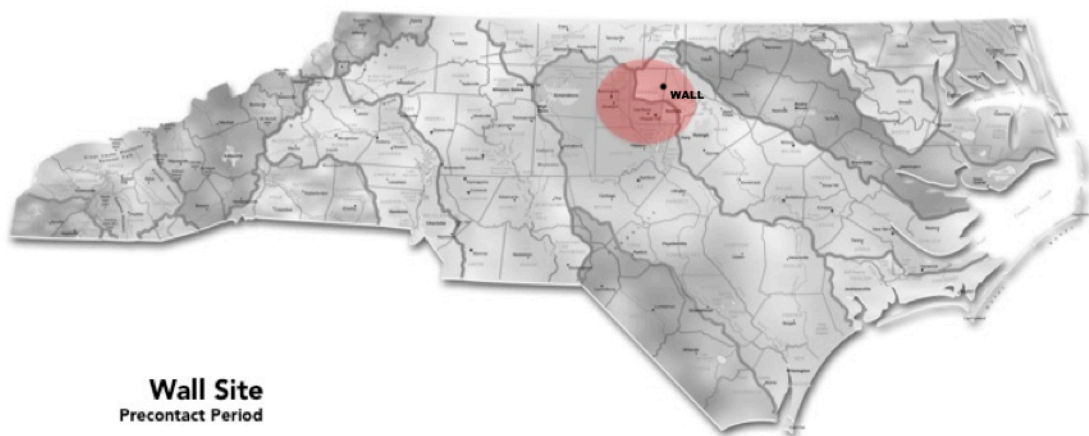


Figure 13. Parameters of minimum estimated hunting territory used by Eno River communities based on Sr values (map sourced from NC Wildlife Resource Commission 2019)

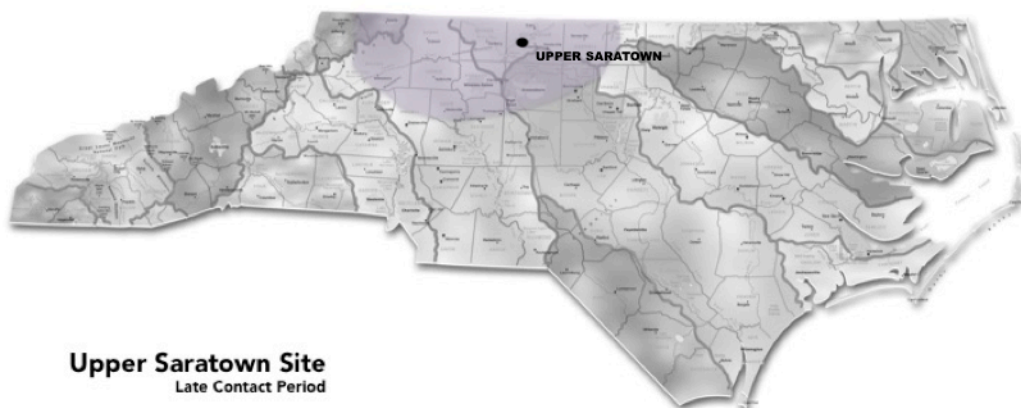
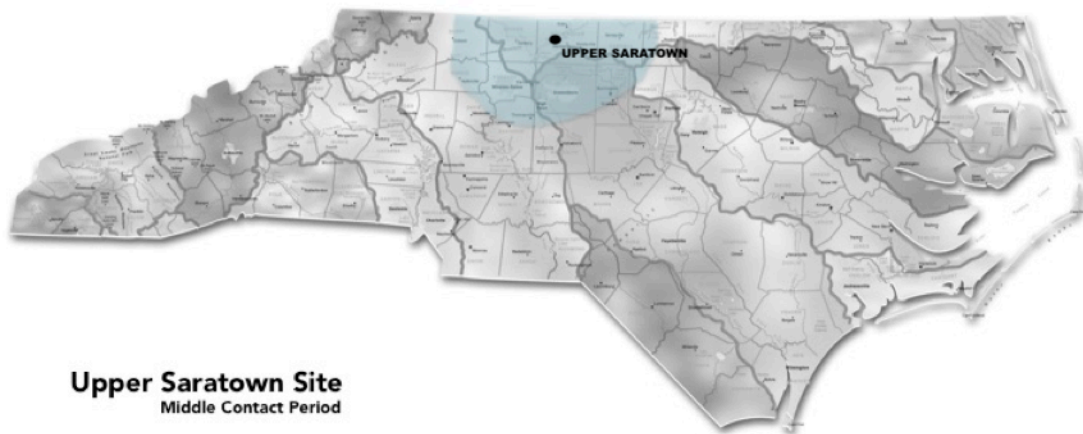
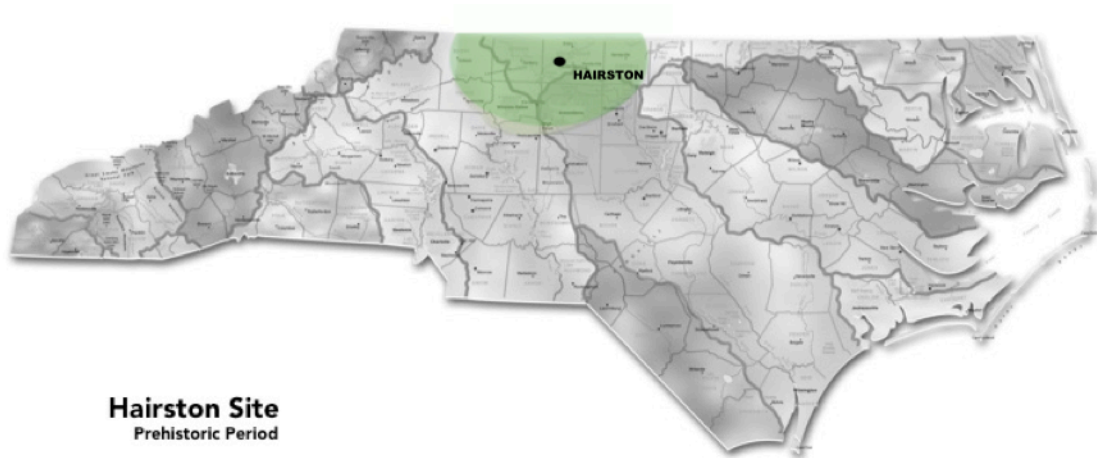


Figure 14. Parameters of minimum estimated hunting territory used by Dan River communities based on Sr values (map sourced from NC Wildlife Resource Commission 2019)

Continuity and Change: Deer Exploitation in the Post-Contact Period

This study confirms that Native communities exploited locally available deer during both the Pre- and Post-Contact Periods, while communities in the Dan River either intensified their exploitation of more distant hunting territories during the Post-Contact Period or expanded their territories into new areas. These data confirm that exploitation strategies were regionally specific and changed over time in response to local conditions, resources, and opportunities. Considered within the broader cultural context of the period, this study provides two examples of Post-Contact Native communities responding to and actively engaging with the changing political, economic, and natural landscapes of the period in regionally distinct ways.

Although other factors likely also affected the selection of hunting territories during the Post-Contact Period, I suggest that the development and maintenance of the deerskin trade is of central importance for understanding changes in the spatial distribution of deer hunting between periods. While the development of the deerskin trade had many negative consequences for Native communities in the Piedmont, such as the rapid spread of epidemic disease, the exacerbation of existing political tensions, and the increasing prevalence of slave-raiding (Ward and Davis 2005:139), Lapham (2005:150) demonstrates that successful deer exploitation and maintenance of trade relationships also had beneficial results for Native individuals and communities. In particular, the burial goods of young men at the Protohistoric Trigg (44MY3) site in Virginia, indicating that successful deer exploitation and participation in the deerskin market could result in increased prestige and status, the trappings of which may not have otherwise been available in earlier periods (Lapham 2005:18-19; 136-137). Though the most elaborate burials at the Fredricks and Upper Saratown sites belong to women and children (Ward and Davis 1999), rather than young men, Lapham's (2005) framework emphasizes Native

agency and decision-making in understanding the development of the deerskin market and may help contextualize the two patterns of Post-Contact exploitation evidenced by this study. The Sr data presented in this study further suggest that Native exploitation practices were neither homogeneous nor inevitable, but rather involved individual- and community-driven decisions.

Following Lapham's (2005) emphasis on Native agency as a key factor in the development and maintenance of the deerskin trade, these Sr data suggest that the Sara of the Dan River Basin may have strategically expanded their hunting territories in order to more effectively engage in the deerskin trade of the seventeenth- and eighteenth-centuries. Though the Sara were geographically more isolated from the developing trade routes of the Post-Contact Period than the Native communities of the Eno River, the territorial expansion evidenced by the Sr values in this study may be related to the procurement and production of hides for the market. This hypothesis has also been suggested based on traditional faunal data, which indicate an intensification of deer exploitation at the Upper Saratown site (Longo 2018:106). Longo (2018:106) suggests that this intensification may have related to hide procurement strategies, in order to more actively engage in the deerskin market. The deerskins procured and produced by the Upper Saratown community could have made their way into the European market through either direct contact with European traders or indirect contact with Native intermediaries. Either way, this scenario sees the Sara as active contributors to the deerskin market and the more than 2 million hides that were exported from the Virginia and Carolina territories during this period (Crane 1928:328).

Furthermore, the Sr data provide a conservative window into the spatial distribution of deer hunting territories utilized by the Upper Saratown community because faunal data from residential villages are expected to capture only a portion of the spatially dispersed deer

exploitation system. It is expected that deer taken in nonlocal hunting territories were likely field processed at kill sites of nearby short term camps, leaving behind elements of low meat-utility and perhaps only taking hides and small portions of meat in order to provision the trip (Smith 1910:cvii). It is expected that the skeletal and dental remains of the majority of animals procured from nonlocal hunting territories did not make their way back to village sites for final deposition.

The revelation that 25% of the Dan River deer in this study were identified as deriving from nonlocal sources requires an explanation as to why mandibles from deer exploited in distant territories, were recovered from the Upper Saratown site. Mandibles have low meat-utility and are of limited value for other products and are often seen as butchery waste in models of carcass processing (Binford 1978; though see Bunn et al. 1988 and by O'Connell et al. 1988 for critiques of this model using ethnographic comparison). The presence of these nonlocal deer mandibles does not fit models of carcass transport, particularly in regards to large game, for which it is generally assumed that high transportation costs result in field processing and limited transportation of 'low-utility' elements including heads. These individuals may have been transported over land by human porters or by canoe, the latter of which would have reduced transportation costs though it would have required traveling upstream.

I suggest four possible explanations for the unexpected occurrence of nonlocal deer mandibles at the Upper Saratown settlement. First, a limited number of cranial and mandibular elements may have been brought back to the village in order to be used in the construction of hunting decoys. John Lawson (Lefler 1967:23) and John Smith (Smith 2010:70-71) document the use of decoy deer, constructed from deerskins and crania, in the stalking of deer. This may have involved the transport of hides with heads attached, thus reducing transport costs. However, it seems more likely that locally procured animals would be used for this purpose. Second, a

limited number of crania with attached mandibles may have been transported back to the village in order to use brain tissue in the production of hides. Hides were often soaked and coated in brain tissue in order to soften the pelt during the leather production process, although ethnographic sources suggest that brains were processed into dried patties at the time of carcass processing (Lefler 1967:208). Third, complete carcasses, perhaps dressed to reduce weight and address preservation issues, may have occasionally been transported back to villages by multiple human porters in order to provide the entire range of edible and nonedible resources available from a deer. This type of bulk transport may have been related to provisioning for prestigious feasting events and may even relate to gift exchanges with neighboring communities. Finally, it is also possible that nonlocal deer represent animals that recently migrated from distant home territories to territories closer to the Upper Saratown settlement. Although ethological data and strontium values from multiple molar tooth rows suggest that deer inhabit predictably small home ranges such mobility in response to hunting pressure or other ecological or demographic perturbations is possible if not likely. Although it is unclear exactly what combination of mechanisms resulted in the deposition of mandibles of deer from distant territories, the Sr values presented in this study provide the first evidence that Upper Saratown hunters, at least occasionally, transported deer remains over distances of more than 35 kilometers back to the permanent settlement.

In contrast to the situation in the Dan River basin, communities occupying the Eno River sites during the Pre- and Post-Contact Periods, the latter of which include the Shakori and Occaneechi, maintained consistent deer hunting territories from approximately AD 1500 – 1710. These Sr values do not disprove the use of distant hunting camps, but rather indicate that if hunting camps were being used, mandibles were not being transported back to the permanent

settlements. Furthermore, the geological terrane in this area of the Piedmont is generally more homogenous, particularly to the north and south of the Eno River sites (Figures 4 and 5). Therefore, the Sr values from the Eno River site could also represent the use of more distant hunting territories to the north and south, though the more conservative interpretation suggests the continued use of local (<35km) territories. Combining this conservative interpretation, the overall consistency of Sr values between periods, and textual evidence of mounting tensions with other Native communities and European colonists to the east may suggest that the Eno River communities were unable to expand their hunting territories during this period. Increased slave raiding and warfare in regions to the north and east of these communities may have served as motivating factors to continue exploiting nearby territories rather than venturing into new and potential dangerous areas. Melton (2018:215, 217) has argued, based on archaeobotanical evidence, that inhabitants of the Jenrette site adopted risk-averse subsistence strategies for this very reason. Furthermore, as groups such as the Sara in the Northwest Piedmont began exploiting environments to the west of the Eno River sites, as evidenced in this study, the Shakori and Occaneechi may have been further limited in their ability to expand their hunting territories to the west. This may also explain the possible eastward shift of Late Contact hunting territories away from the headwaters of the Neuse River, as groups such as the Sara began exploiting nearby environments.

Despite these patterns, the large amounts of European trade goods present at the Fredricks site also indicate that occupants of this village were closely tied into exchange networks with European colonists and settlements. It is possible that rather than focusing on hide procurement from more distant hunting territories, the Occaneechi may have exploited their strategic location along the Indian Trading Path by acting as Native intermediaries. However, it

is also important to remember that the Sr data described here reflect those deer exploited for village provisioning and not necessarily the additional use of logistical hunting camps far from residential settlements. Therefore, Eno communities such as those at Wall, Jenrette, and Fredricks may have exploited more distant hunting territories, but not transported deer heads containing mandibular teeth from those territories back to their village settlements. In contrast to the Dan sites, where even village provisioning shows evidence of the use of distant hunting territories and long distant transport of carcasses, the Sr values presented in this study indicate the Eno River communities did not incorporate more distant hunting territories into village provisioning systems. This fits with Post-Contact faunal assemblages, which show evidence of an increasingly localized animal economy (Longo 2018:111).

CHAPTER 7: CONCLUSION

This study provides new evidence for understanding deer exploitation practices in the North Carolina Piedmont. As the first analysis of deer Sr in the Piedmont, this study confirms both the use of local and distant hunting territories by Native communities in the Eno and Dan River basins, as well as regionally specific patterns of exploitation and diachronic change. I suggest that the historically specific context of the Post-Contact Period, in particular, resulted in a diversification of hunting practices on a regional level. While the Sr values from deer from the Eno River settlements suggest the continued use of local (<35km) hunting territories located within one days walk from village sites, those from the Dan River indicate the use of more distant hunting territories to the east and west during the Post-Contact Period. This difference is likely related to the historical context of the deerskin trade in the two regions of the North Carolina Piedmont.

I suggest that the hunting territories of the Eno River communities remained relatively consistent before and after European colonization, as well as following historically documented Native population shifts, including the settlement of the Occaneechi at the Fredricks site during the Late Contact Period. I propose that this consistency may be the result of these communities taking advantage of their position on the Indian Trading Path, as the Occaneechi had done previously from their island in the Roanoke River. This strategy would have provided these communities with the social and economic benefits associated with the deerskin trade, while also perhaps providing a relative sense of security from dangers to the north and east. On the other hand, the Dan River communities expanded their hunting territories during the Post-Contact

Period, particularly during the Late Contact Period. I suggest that this change is the result of the Upper Saratown community adapting their hunting strategies to the deerskin market in order to procure more hides and potentially larger hides in more mountainous locales, as suggested by Lapham's (2005) "hunting for hides" model. Furthermore, these Sr data also indicate that the Post-Contact Period is also characterized by distinct carcass processing strategies, in which low-utility elements such as mandibles, in the case of this study, were sometimes transported long distances despite their limited caloric value. This particular phenomenon is worth further investigation, as it goes against expected models of large game exploitation.

Through the analysis of Sr isotopes in archaeological deer teeth, this study has demonstrated that Native communities and individuals did not uniformly react to external colonial forces, but rather actively shaped the historical contexts in which they lived – in this case, through exploitation and carcass transport decisions that were community-specific. Future research on these faunal assemblages, including the construction of survivorship profiles and body part representation, will serve to further clarify deer exploitation and transport practices at both a site and regional level, while the identification and excavation of hunting camps from the periods in question would also provide much-needed context to the study of deer hunting in the Piedmont. Despite the need for continued research, this study has provided the first evidence of the spatial dimensions of deer hunting and carcass transport within the North Carolina Piedmont, providing valuable insights into one of the central features of Native Piedmont economies.

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