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Anthropogenic Ecological Impacts of 17th and 18th Century Chickasaw Through a Study of Faunal Remains

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ANTHROPOGENIC ECOLOGICAL IMPACTS OF 17TH AND 18TH CENTURY CHICKASAW THROUGH A STUDY OF FAUNAL REMAINS

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ABSTRACT

A diachronic analysis of five faunal assemblages from Chickasaw sites is carried out to evaluate their anthropogenic ecological impacts during the colonial time period (A.D. 1650-1750). Change in faunal exploitation, diversity measures and disturbance taxa frequencies are analyzed to gauge these impacts. A comparison with late Mississippian period faunal use provides a benchmark to examine how shifts in the cultural system initiated new ecological impacts. Results from the faunal analysis are also compared with reports of faunal utilization and landscape management practices in the historical record. These reports provide a basis for assessing change in prey preferences according to the social context of the colonial era which demonstrates that change in faunal utilization can be attributed to the implementation of a new social order. The presented evidence is used to further the goals of historical ecology and confront the ecologically noble savage slot by showing the Chickasaw impacted their environment in a multitude of ways and did so in a strategic effort that best contributed to their survival.

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CHAPTER ONE

INTRODUCTION

This study has been motivated by the desire to challenge the preconceived ecologically noble savage slot. The notion of a savage arose as travelers began to leave Europe and would report back about their encounters with people in other places (Austin-Broos 1998; Trouillot 1991). The non-European people they encountered became savages, or "the Other", and the places they lived were conceived as exotic utopias. The conception of an Other living in a faraway utopia served as a way for the Western world to reflect back on itself. Europe's reflected identity was one of controlled order allowing the utopia to offer either positive or negative possibilities in contrast to that order fueling colonization in an effort to create itself (Austin-Broos 1998; Trouillot 1991). Perceptions picked up from traveler's depictions became pervasive throughout the society driving the imagination of many fictional works only to find their way into structuring intellectual thought (Trouillot 1991). Trouillot (1991) recognizes that this pattern of colonial thought first gave rise to an anthropological discipline. The savage slot was used by early researchers to juxtapose native Others with Western society (Trouillot 1991). A critical reflection on the history of the discipline with a heightened awareness of the misguided emergence of the field allows current researchers to work to problematize the institutions that are perpetuating the slot (Trouillot 1991). Such an effort will be taken here to understand the emergence and perpetuation of a noble savage.

Trouillot explains “the savage can be noble, wise, barbarian, victim, or aggressor, depending on the debate and the aims of the interlocutors” (Trouillot 1991:33). A noble savage arose in the case of Christopher Columbus’ finding of the New World. In the familiar historical accounts, the Americas are posited as the discovered utopian world with Native Americans being the noble savages that were able to keep it that way. The earliest published accounts of this event enforced the binary opposition of colonizer and colonized; the Western world and the savage other (Trouillot 1991). This image of an ecological Indian living in the utopian America prior to European arrival is still widely prevalent in social discourse and media today. Many researchers have spoken out against the notion of the ecologically noble savage. Most notable is Shepard Krech’s “The Ecological Indian” which concludes that Native Americans were not as concerned about conservation, either prehistorically or historically, as early historical accounts have led the public to believe (Krech 1999). While there is debate surrounding what constitutes conservationists, these debates converge on the evidence that Native Americans had a deep understanding of their ecology and actively managed it to best meet their needs, which in some instances resulted in a depletion of natural resources (Hames 2007; Krech 1999). Providing evidence to complicate this antiquated perception then adds to a more holistic understanding of past and present Native Americans and their relationship with the environment.

The effort taken to challenge the ecologically noble savage is best approached through evidence of an area’s ecological history and the consideration of human impact on that ecology. Thus, the postulates that guide historical ecology research are a driving force in this study as well. Among these postulates is a recognition that a romanticized

image of a pristine environment does not exist and that humans are, and always have been, an integral part of ecological stability in the past (Balée 1998). Very few expanses of land, and arguably none within the United States, have not been touched or altered by the hands of humans. Any assessment of the environmental past that fails to include humans as actors in landscape formation and ecological systems fails to fully understand the environmental history of an area. Archaeology is then best suited to further this goal by assessing how Native Americans altered their landscapes to produce habitats that supported the important faunal and botanical resources they utilized.

Humans must not be simplistically seen as destroyers of the land but rather as one single part of an ecosystem, contributing to its diversity through their behavior (Balée 1998). In some instances a certain level of human disturbance could be beneficial for a given environment. This makes a full understanding of human participation in environment formation extremely important. In order to achieve a full understanding of human impacts the people themselves, including their behavior and their culture, must be examined closely. Since human behavior varies so widely, they will impact environments in different ways depending on their social and cultural systems (Balée 1998). A major goal for archaeologists is to discover "how human consciousness arises from, represents and acts on its ecology" (Whitehead 1998:32). Whitehead's statement emphasizes the synergetic relationship between humans and their ecology. What humans are drawing from their environments directly impacts the ways in which they interact with it, which can lead to the initiation of certain biological or environmental changes populations experience later on (Whitehead 1998). This also emphasizes not only studying human material culture to understand decision making but the ability to study the landscapes to

see how humans were situated in and shaped them. Therefore, while refuting this ecologically noble savage slot the goals of historical ecology are met in showing that humans have been shaping their landscapes, contributing to its diversity or depleting it, and doing so in a variety of different ways.

RESEARCH AREA AND SITE BACKGROUND

To accomplish this goal, my research focuses on changes in faunal utilization by the colonial Chickasaw who settled east of the Mississippi River and extended from the northern parts of Mississippi and Alabama up to the Ohio River (Figure 1.1). This study relies on previously collected zooarchaeological assemblages from five sites located in

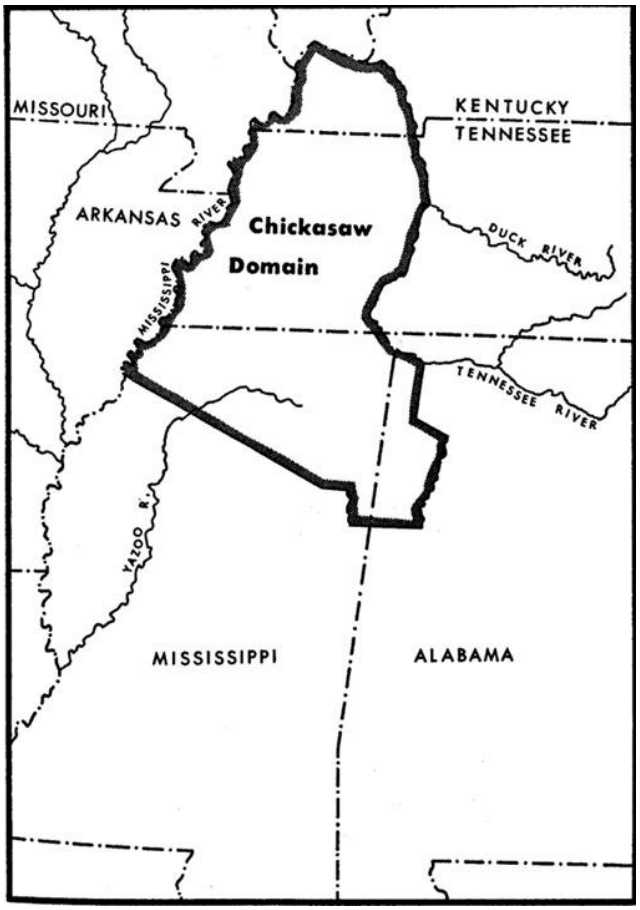

Figure 1.1. Ancient Chickasaw Domain (Gibson 1971b)

northeastern Mississippi around the present-day city of Tupelo. These sites range in occupation from A.D. 1650 to 1750. Because this is a time of great social, cultural, and economic change for the Chickasaw, a focus on the colonial time period will help to demonstrate the importance of understanding ecological history in the context of human history and how understanding culture change is imperative in understanding ecological change. Zooarchaeological data is the primary method used in this study to assess anthropogenic changes to the environment due to the faunal record's ability to communicate changes in both the natural and cultural world. The five sites examined in this report have provided a number of well preserved faunal remains which was a contributing factor to their use as evidence for landscape change. Botanical remains from these sites and this time period have yet to be heavily investigated or recovered but it is likely that they will become good resources to supplement this data in future studies.

The zooarchaeological assemblages used in this report include four sites that are part of the National Park Service collections (MLE 112, MLE 18, MLE 14, and MLE 90) (Figure 1.2); a result of WPA projects in the 1930s. Materials from these excavations were previously investigated by Jay Johnson and colleagues back in 2004 (Johnson et al. 2004). H. Edwin Jackson and Susan Scott contributed the faunal analysis to the report and discussed diachronic changes that were accessible with the newly developed fine grain chronology. The fifth site, the Daub Ridge site (22Po755), was collected during the 2012 excavations conducted by the University of South Carolina in collaboration with members of the Chickasaw Nation and local volunteers. Primary faunal analysis was completed by PhD candidate Diane Wallman at the University of South Carolina. The gap in collection dates between the Park Service collections and Daub Ridge does

introduce some discrepancies in the data which has been noted and will be addressed in detail in Chapter 4. However, all five sites were included to get the most robust interpretation possible since each contributed well-preserved faunal material within the colonial time period.

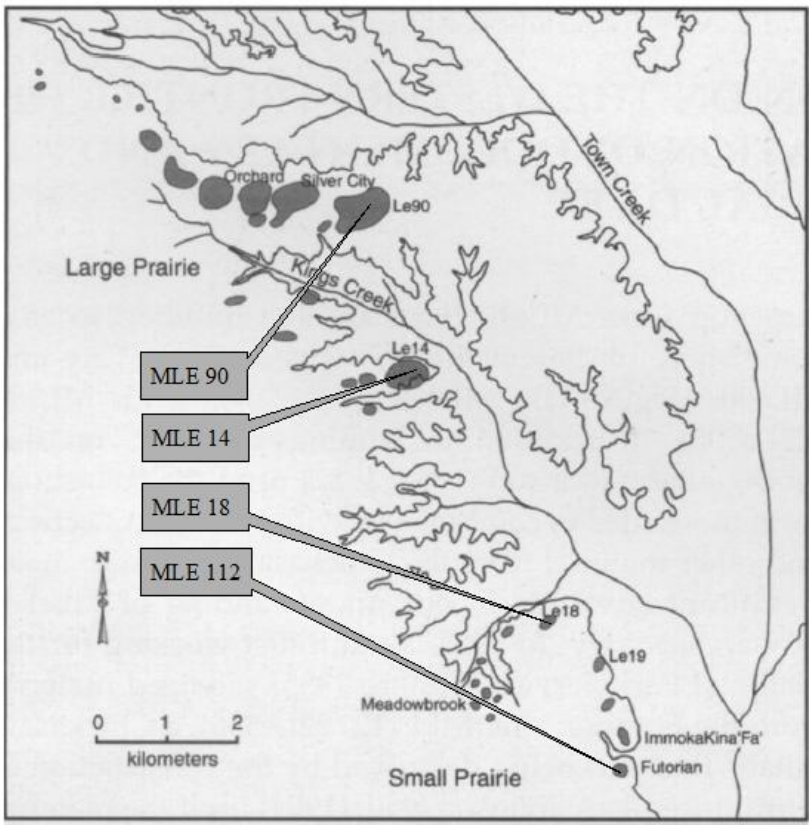

Figure 1.2. Seventeenth and eighteenth-century Chickasaw settlements (Johnson et al. 2008) highlighting referenced study sites.

Jackson and Scott‘s initial investigation of the Park Service collections in 2004 (Johnson et al. 2004) focused on Chickasaw adaptations to colonization in conjunction with differences between the red/white moieties or Small/Large Prairie settlements. I hope to take this analysis further by looking at what their data suggests about environmental change and if the faunal material can provide any additional information about these changes. The most significant ecological alteration evident in their analysis is

the intensification of deer hunting. Historical documents report that the Chickasaw were heavily involved in the fur trade beginning in the late 17th century (Adair 1775; Nairne 1988). Jackson and Scott's analysis shows a large initial increase in deer bones at 17th century Chickasaw sites (Johnson et al. 2004, 2008). Age profiles also show a decrease in older specimens later in the 18th century which, as they point out, is likely a result of overhunting and a decline in the deer population thus limiting their lifespan (Johnson et al. 2004, 2008). Jackson and Scott also noted additional changes in faunal use when compared with two late Mississippian sites (A.D 1350-1500) (Johnson et al. 2004, 2008). These early sites show heavy use of rabbit and squirrel which declines in the colonial period in favor of smaller fur-bearing mammals whose furs would have also been profitable in the trade (Johnson et al. 2004, 2008). This data has inspired questions about whether any additional anthropogenic changes were made to the environment to foster better habitats for deer and other fur-bearing animals.

Bears and bison as well as some Old World species also become more ubiquitous in the assemblages later in time (Johnson et al. 2004, 2008). Higher ubiquity of bear and bison populations would imply ecological change if significant numbers of these species were removed from the ecological system. The introduction of Old World domesticates, such as pig and horse, would impart new pressure on the environment which had never been previously experienced. Each of these colonial changes addressed by Jackson and Scott indicate drastic social as well as subsistence change. They also suggest impacts on the faunal populations but refrain from going into a deep discussion of how these changes would affect the ecology or explore what other, less evident, anthropogenic changes to the environment might be occurring. Therefore, I wish to present a coarse-grain analysis

of the Park Service assemblages with the addition of the recently excavated Daub Ridge site, to discover what trends in the faunal record suggest about changing anthropogenic interactions with the environment.

THE BLACK PRAIRIE

Investigation into anthropogenic impacts to the environment was also of interest with the Chickasaw due to their unique environmental setting. The Black Prairie in northeastern Mississippi is an environment unique to the southeastern United States. These prairies formed on top of limestone formations and include cretaceous deposits leftover from earlier coastlines (Peacock and Schauwecker 2003). Intermixed with the open prairies are chalk outcroppings and forest coverage (Brown 2003). This mosaic habitat has made the Black Prairie a prime location for a diverse number of plant and animal species. The fertile alkaline soils also made this area a locus of human habitation with the Chickasaw among them. Continual human occupation has subjected the land to a number of anthropogenic disturbances including controlled burning, agricultural intensification, introduction of non-native species and animal husbandry. Early explorer Thomas Nairne described the area as "pleasant open forests of oak chestnuts and hickory so intermixt with savannas as if it were a made landscape" (Peacock and Schauwecker 2003:3). Nairne's reference to a "made landscape" suggests a beauty that may only rival those of carefully planned intent. What he did not realize, however, is that the landscape he looked upon was actually the result of human intent just perhaps not for the same reasons he was appreciating. This mosaic habitat may not have appeared with the mixture of prairie and forest if not for the Native American anthropogenic fires. The fact that the prairies today show a decrease in size further supports that they were maintained by

anthropogenic clearing that has since decreased (Peacock and Schauwecker 2003). Cultural activities of humans living on the prairie have the potential to magnify aspects of the land, such as diverse flora, fauna and mosaic habitats, or they can over-exploit them. While the prairie has a long history of anthropogenic environmental changes, these practices changed drastically upon the arrival of Europeans. Thus, it is important to see what changes were initiated during this time and the social and cultural reasons behind them that would impact the prairie environment well into the future.

ZOOARCHAEOLOGY AND HISTORICAL ECOLOGY

Zooarchaeological analysis is chosen as a means to assess Chickasaw environmental impacts. The study of faunal remains has advanced rapidly and has been opened up to answering questions beyond those of diet and subsistence. This includes their incorporation into the study of environmental archaeology and even historical ecology to determine the environmental effects of past human actions (Landon 2005). Studies of the ecological history of archaeology sites attempt to address the diverse interrelationships that arise from the environment, technological systems, and social systems (Landon 2005). This becomes even more interesting when looking at these factors in light of colonization when groups with potentially conflicting interests converge (Landon 2005). As this is the situation the Chickasaw found themselves in throughout the 17th and 18th centuries, the faunal remains can act as proxy indicators for changing ecologies and environmental conditions. Measures of taxonomic representation, their richness, and degree of evenness can all suggest the occurrence of land clearing (either through burning or otherwise as the direct cause is inaccessible), prey preference, animal husbandry and overhunting. Since historical documents have suggested the use of

anthropogenic fires by the Chickasaw as well as an intense involvement in the fur trade, the faunal record presented itself as the best means of answering these questions and accessing their environmental past.

RESEARCH QUESTIONS

A review of Chickasaw history and what the faunal record can offer has brought to light some deeper questions that this study works to resolve. The first among these is an initial exploratory question: what do the patterns in the faunal assemblages suggest about anthropogenic disturbances? The analysis presented will investigate what the faunal remains communicate about possible anthropogenic fires or creation of edge environments, intensifying deer hunting and how other faunal resources were being utilized as the social climate changed. The second of these questions seeks to understand how the suggested anthropogenic disturbances changed from traditional impacts. This will include a comparison between the colonial period sites in this study and an earlier Mississippian assemblage to see how such drastic social change over a number of centuries parallels environmental change. The final question focuses on the effects of colonization by considering the issues of social and cultural change that may explain the changes in the faunal record. A comprehensive view of the factors that contributed to species acquisition will help to show the Chickasaw had a deep understanding of their environment and were knowledgeable about what would result from certain land altering practices. Subsequently, it will offer a better perspective on how they reevaluated their traditional strategies in order to adapt to the European market pressures and successfully navigate the changing socioeconomic climate. Such an endeavor will help to challenge static images of Native Americans prior to contact as well as the ecologically noble

savage by showing that they were affecting ecological systems and creating a multitude of impacts but in an effort that best served their survival needs.

CHAPTER SUMMARY

The persistence and adaptability of the Chickasaw during the colonial period, along with their unique environmental setting, provides archaeological remains well-suited for interesting historical ecology research. Previous analysis of the Park Service samples has also noticed the richness and historical importance of the material but has failed to explore the topic of anthropogenic environmental change. This is what I hope to add. The chapters that follow will build a layered understanding of Chickasaw history and Native American relationships with their environments. Chapter 2 discusses the broad historical perspective of the Chickasaw from their Mississippian ancestors, to settlement in northeastern Mississippi and into colonization and removal. This presents a trajectory of Chickasaw cultural change with heavy attention paid to their evolving interactions with the environment. Chapter 3 will introduce past studies of Native Americans and their historical ecology. Since the Chickasaw have yet to be investigated in light of these activities, past studies presented on other southeastern tribes will suggest what the research has to offer in terms of Native American response to colonialism and how they resulted in varying ecological impacts. Some studies serve as a guideline for this one while others show how much variation exists during the colonial period. Chapter 4 will then present the results of this study and apply relevant ecological models discussed in Chapter 3. The final chapter will work to bring all these layers together to discuss how the Chickasaw impacted the local ecology, the context of colonization that they operated under, and what this means for the ecologically noble savage.

CHAPTER TWO

HISTORICAL BACKGROUND

> The Indians have an old tradition, that when they left their own native land, they brought with them a sanctified rod by order of an oracle, which they fixed every night in the ground; and were to remove from place to place on the continent towards the sun-rising, till it budded in one night's time; that they obeyed the sacred mandate, and the miracle took place after they arrived to this side of the Mississippi, on the present land they possess.
>
> James Adair 1775:162-163

The traditional Chickasaw migration story of the oracle rod chronicles their ancestral journey to settle their homelands in Mississippi. The story is shared with the Choctaw as it is believed they were once unified only to divide after a disagreement about the way the rod was leaning, causing them to settle in different regions of the state (Gibson 1971a). While the oral tradition may lack the amount of detail about past life desired by archaeologists or historians, it provides a framework for suggesting lines of inquiry or finding parallels with other sources. The Chickasaw's ancestral connection to the Choctaw, for instance, is one that has been suggested through their oral history, is written in historical documents, and is displayed in the archaeological record. This has led to the belief that the traditional Native American tribes of the Southeast emerged from the Mississippian World just prior to European arrival; which is where this historical account will begin. As was mentioned in the previous chapter, in order to best understand the ecological history of an area, it is important to understand past interactions with the environment as they give rise to those in the present (Whitehead 1998). Therefore, in

order to understand the state of the Chickasaw's environment in the 17th century, the period prior to their arrival must be examined.

This chapter looks back at what is known about the use of faunal and botanical resources from Mississippian period archaeological sites as a benchmark for comparing Chickasaw assemblages. Historical documentation will then be examined to understand traditional Chickasaw use of natural resources and the Euro-American settlers' awareness of these interactions. This will also include a discussion of European perspectives on southeastern Native Americans and the Chickasaw to evaluate how they were perceived upon contact and how the ecologically noble savage slot is pervasive within these accounts. Finally, colonial impacts will be assessed to understand what pressures the Chickasaw faced that may have impacted their traditional practices.

MISSISSIPPIAN CULTURE HISTORY

Historical accounts of the De Soto expedition suggest that the first encounter with Native American populations in Mississippi was during the late Mississippian period in A.D. 1540 (Ethridge 2010). This was prior to the division of the modern day nations that include the Chickasaw, Choctaw, Cherokee, Creek, and Catawba, which likely separated soon after the collapse of Mississippian culture. These populations were socially organized into chiefdoms and are best known for their built earthen pyramidal mounds. Among the chiefdoms was Chicaza which was located in present-day Mississippi (Ethridge 2010). This is the chiefdom De Soto is said to have come in contact, the location of which is believed to be near the 17th century Chickasaw settlements (Ethridge 2010). It seems likely that the Chickasaw are the descendants of those at Chicaza, although historical and archaeological evidence from the time between De Soto's

expedition and the 1650s is sparse and thus unable to prove a direct link at the present date. Due to the fact that these populations inhabited the northern Mississippi area prior to Chickasaw settlement and the notion that they are their ancestral population, one late Mississippian archaeological site will be investigated to understand faunal and botanical use and suggestions for 16th century environmental anthropogenic impacts.

The Yarborough site, a late Mississippian farmstead (1400-1540 A.D.), has been chosen as a benchmark for Chickasaw subsistence practices since it is located on the Black Prairie in the Tombigbee River valley (Figure 2.1), close to present day Lee County (Jackson and Scott 1995). Excavations at the site revealed a single domestic structure associated with a refuse dump that included upwards of 26,000 bones (Jackson and Scott 1995; Peacock and Reese 2003). It is likely that the environmental circumstances faced at Yarborough are similar to those faced by colonial Chickasaw communities in the 17th century due to their close proximity. Some environmental variability is present between the sites due to the fact that Yarborough is located in a river valley while the colonial Chickasaw sites are all located on upland ridges. This may cause some discrepancy in the assemblages and particularly with aquatic species but based on present archaeological data available from Black Prairie sites, Yarborough presents itself as the best match for providing a prehistoric point of reference.

What the archaeological record at Yarborough holds in terms of ecofacts becomes an important factor in understanding how ancestral populations managed the land prior to Chickasaw use and how practices may have changed or carried on into the 17th century. Excavations at the Yarborough site revealed a single structure occupied by a single household displaying hunting, gathering and horticulture subsistence which is typical of

farmstead settlements (Jackson and Scott 1995). Ethnobotanical results from Yarborough show evidence of maize agriculture (Jackson and Scott 1995; Peacock and Reese 2003). The large presence of disturbance species and small mammals in the faunal record suggest some degree of land clearing which likely accommodated the maize agriculture subsistence strategy (Hogue 2003). However, it is believe that most of the surrounding area was still largely wooded based on pollen, land snail and microvertebrate analysis (Jackson and Scott 1995) which suggests that land clearing activity for agriculture occurred but was not extensive. A closer look at specific species appearances can provide additional detail about the level of this disturbance.

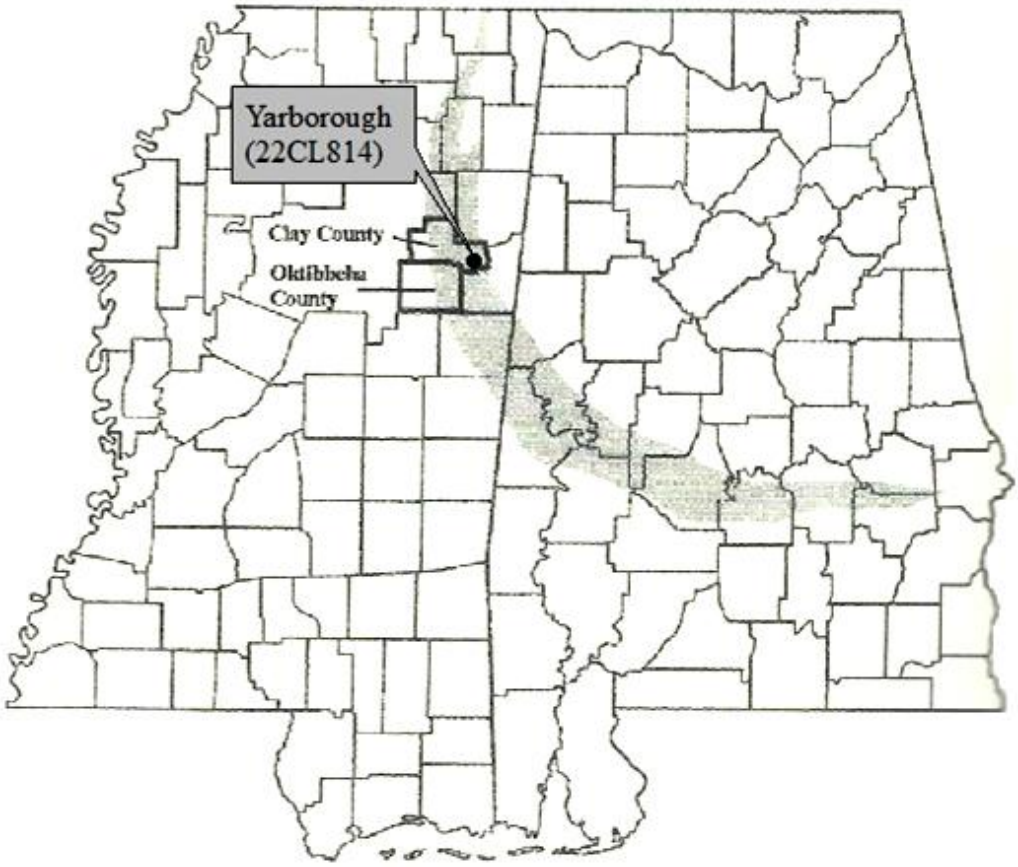

Figure 2.1. Yarborough Site on the Mississippi Black Prairie (Peacock and Schauwecker 2003).

Archaeobotanical data suggest a deciduous forest setting for the Yarborough site including oak and hickory coverage (Peacock and Reese 2003). Botanical species including persimmon (*Dispyros virginiana*), plum (*Prunus* sp.), chenopods (*Chenopodium* sp.), cocklebur (*Xanthium strumarium*), maypop (*Passiflora incarnata*) and nightshade (*Solanum* sp.) are abundant at the site (Peacock and Reese 2003). Each of these plant species are known to favor disturbed areas and thus their presence can be indicative of land clearing for agricultural fields.

A similar pattern is also seen within the faunal remains. What has been labeled "disturbance species" at Yarborough include the hispid cotton rat (*Sigmodon hispidus*), marsh rice rat (*Oryzomys palustris*), and striped skunk (*Mephitis mephitis*) (Hogue 2003). The high frequencies of eastern cottontail (*Syvilagus floidanus*) and rodents as well as the small carnivores that feed on these species provides further evidence for land clearing practices (Hogue 2003:60-61). While Yarborough faunal remains show a high frequency of disturbance species for its settlement type, when compared with an earlier village site (Lubbub Creek) the evidence for land clearing appears less extensive. This pattern is likely attributed to the small size of the farmstead (single household) when compared with a village site (multiple households). Diets at Yarborough were able to be more generalized due to the smaller population it had to support, allowing for a mixed reliance on maize agriculture and wild food sources (Hogue 2003). In this case, Yarborough would require less extensive land clearance to accommodate agricultural fields and housing than a larger village site would need.

The archaeobotanical and zooarcheological data from the Yarborough site provides evidence for anthropogenic land clearing on the Black Prairie around the late

15th century. If we accept the Yarborough community as predecessors to the Chickasaw, land clearing practices would have likely been passed down as an important strategy for maintaining food sources and establishing settlements. In addition, since Chickasaw settlements would have been similar to a village site, it is predicted that the level of disturbance should be equal or more extensive than at Yarborough. WPA excavation reports are missing many of the excavation plans which results in a fragmented understanding of total site size (Johnson et al. 2004). Reports from MLE 14 provide the only measurable basis available for site size comparison with Yarborough. Total site acreage for MLE 14 is reported as 50 acres, 25,000 square feet of which underwent excavation (Johnson et al. 2004). In contrast, Yarborough is known to have only existed of a single domestic structure and an adjacent midden pit. A survey of late-Mississippian period structures indicates the largest structures are just over 1,000 square feet (Hally and Kelly 1998). Thus, total site area for the single structure and refuse pit at Yarborough does not seem to come close to the acreage needed for a Chickasaw village. In terms of the ecologically noble savage, no evidence indicates any detrimental impacts at Yarborough such as decreased diversity or over-exploitation of resources. However, high frequencies of faunal and botanical disturbance species does indicate active landscape management through field clearing activity which furthers the goals of historical ecology by demonstrating that humans have long been shaping their environments for their benefit and according to their cultural systems.

CHICKASAW ETHNOHISTORY

It was nearly 140 years after the De Soto expedition, in the mid-17th century, when the Chickasaw came in contact with the Europeans once again. At this point in

time, historic documents from early settlers become important resources in examining the past. Many provide insight into Chickasaw customs and the natural environment as well as how each was perceived by the Europeans. One of the most extensive accounts is given by James Adair, an Irish trader who lived with the Chickasaw in the 1700s, in his book "*The History of the American Indians"* (1775). This account discusses the cultural traditions of tribes in the southeastern United States including the Catawba, Cherokee, Creek, Choctaw and Chickasaw. Adair's close relationships with the Chickasaw and his many years spent documenting and understanding their culture make this work a reputable source of information. However, Adair was no exception to having a personal agenda that influences the validity of his reports. Part of his motivation in writing the book, and a topic many of his chapters are dedicated to, is proving his belief that these southeastern tribes were part of the Lost Tribes of Israel. Evidence used to support this belief should then be interpreted with careful consideration. Other 18th and 19th century settlers and traders including H.B. Cushman and Thomas Nairne have produced extensive works recounting their time with the Chickasaw and their observations of traditional customs. Twentieth century anthropologists then complied detailed histories based off these early accounts to create a comprehensive view of Chickasaw life, with John R. Swanton, Arrell Gibson and James Malone among the most notable. The reports of each of these men have been investigated to see what the historic record relays about Chickasaw use of natural resources and landscape management which will later be compared with the archaeological record from the Park Service collections and the Daub Ridge site.

The historic record gives great insight into which plant and animal resources contributed to the Chickasaw diet. Understanding what the Chickasaw consumed is of paramount importance in understanding environmental anthropogenic impacts because it is a principle factor that would increase or decrease disturbances in order to maintain accustomed food sources. Sources discuss the Chickasaw exhibiting a relatively equal reliance on hunting, gathering, and agriculture, which allowed for a diverse diet of meat and plant resources as well as cultivated and wild crops (Gibson 1971a). The division of labor within the tribe left men to carry out much of the hunting and fishing activities. Meat contributions consisted of deer as the primary resource followed by bear, bison, smaller game and fish. Catfish, drum, perch, bass and suckers are all said to have been available, consumed, and at times were more popular than terrestrial meats (Gibson 1971a). Agricultural duties were typically carried out by women or slaves and were just as important to Chickasaw subsistence as hunting. Much like the Mississippian communities before them, maize was the central cultivar supplemented by squashes, gourds, legumes, melons, pumpkins, sunflowers, beans, peas and tobacco. In addition to hunting and agriculture, gathering wild plants like grapes, wild onions, plums, persimmons, mulberries, strawberries and blackberries remained an important contribution to the varied diet. Mast yields of walnuts, chestnuts, pecans, acorns and hickory nuts were also part of the gathered resources (Gibson 1971a). Adair adds that "hazelnuts are plenty, but the Indians seldom eat them" (Adair 1775:361).

The Chickasaw also utilized their natural resources in a variety of different ways beyond diet. Clothing was produced from many of the hunted game. Deerskins were the major source of clothing but bear furs were also made into robes and their hides into

moccasins. Bear claws were often attached to necklaces and used as ornaments (Gibson 1971a). Certain species were also utilized in more ceremonial settings. Eagle, hawk, and swan feathers contributed to warrior mantles (Gibson 1971a) and dried terrapin shells were attached to the knee during ceremonial dances (Speck 1907). Weapons and tools were often produced from faunal remains as well. Deer contributed antler tips for arrow points while their sinew and entrails made good bow string and thread for sewing and weaving fishing nets (Gibson 1971a). Bear gut was also utilized for bow string. However, it was the oil produced from bear fat that made it the second most useful species. The oil was used in cooking, as a nutritive to hair and as a body rub (Gibson 1971a). Bear oil is mentioned as being a valuable trade item by both Adair (1775) and Swanton (1946). This added value expands the species usefulness for the Chickasaw as it also allows them to obtain additional goods through trade (Gibson 1971a).

While deer and bear were largely productive for clothing and weapon material, botanical species were utilized for important non-subsistence activities as well. Larger trees were hollowed out for canoes, while pine and hickory contributed to house frames and roofing material (Gibson 1971a). Hickory is said to have been used for arrow shafts and bows, containers and as a pestle and mortar. Cane was also widely available and woven into baskets and mats, fish traps, and fences. Sassafras roots and sumac proved useful for coloring cloth and deerskin (Gibson 1971a).

Documentation of natural resource use, and especially of the botanical resources, gives great insight into activities that are often not preserved or accessible through the archaeological record. While these narratives may hold particular biases due to the perspective of the writer, it is believed that most of what is documented about the natural

world would be of little use to manipulate for personal agendas and thus is generally regarded as reliable information. One caveat to this trust is wrongful interpretation on part of the observer, or misuse of nomenclature, if their categorization of the natural world differed from how the natural world is categorized today (Gremillion 2002). Unfortunately, there is no way of correcting for this possibility and thus while it has been noted, it is believed that a majority of the recognized plants and animals were familiar to the settlers and accurately documented.

When examining the cultural use of animals, it is also important to consider any taboos attributed to certain species since it can help to understand patterns of use or disuse appearing in the archaeological record. Adair was well attuned to Chickasaw taboos and recorded many traditional beliefs associated with particular animals. One primary belief that cross-cuts many species is the idea that consuming an animal would affect a person in the same manner, whether it be the inherent qualities of that animal or contracting a disease it carried. Therefore, the Chickasaw avoided anything that died of natural causes (Adair 1775). Adair mentions an intense aversion to moles for fear of hurting their eyesight and chiefs avoiding anything with heavy motion of body, bear being cited in particular (Adair 1775). This belief also adds to their favoritism of deer because it is light and quick in motion. Birds of prey including eagles, ravens, crows, buzzards, swallows and owls were said to be unclean and not consumed (Adair 1775). Since eagle feathers are mentioned as being utilized for warrior ceremonial dress, one can assume that they were only utilized for ceremonial purposes and it can be concluded that they were not being consumed if they appear in an archaeological context. Similar to the birds of prey taboo, carnivorous mammals or those that ate “nasty foods” were deemed

unclean (Adair 1775). Adair placed hogs, wolves, panthers, foxes, cats, mice, rats, and amphibious quadrupeds within this category with bear being the major exception to the rule (1775). He added "none eat beaver except those who kill them" (Adair 1775:132). This policy becomes particularly interesting with the rise of the fur trade since beaver pelts were highly profitable and traded by the Chickasaw. Thus, beaver appearing in the archaeological record may suggest that the Chickasaw participated in the trade but it is possible that only the hunters engaged in consumption of the animal in order to not waste the meat and allow the rest of the populations to observe the taboo. Since this policy applied to beavers, it could be argued to hold for other creatures that were typically avoided due to superstition, although this is speculative. These noted taboos give insight into Chickasaw belief systems that may help when interpreting faunal assemblages and thus should be considered when analyzing their presence in the zooarchaeological record.

In documenting their observations about the natural environment, European settlers did make references to Native American management of the landscape, or lack thereof, which provides information about both ongoing anthropogenic environmental disturbance and perceptions of these behaviors by the Europeans. As has been discussed, agricultural fields were common and a regular alteration to the landscape since the Mississippian period. To make room for these, Adair mentioned a "difficult method of deadening the trees, and clearing the woods" to get convenient fields (1775:405). In addition, Thomas Nairne (1988) documented their use of fire for hunting deer. Fire rings were created to gather deer, trapping them and giving them no choice but to jump from the center and into the hunter's line of shot (Nairne 1988; Swanton 1946). Both uses of fire, for clearing and hunting, document the Chickasaw using anthropogenic fires for

landscape management. It also documents that settlers, or at least those that spent ample time documenting their customs, recognized the Chickasaw impacted the environment to accomplish different tasks. However, the use of fire is also a more evident impact while others were often subtle and remained undocumented. Many European settlers failed to notice selected fruit or nut trees had been organized into orchards near the settlements. Rather these were interpreted and recorded as convenient, naturally occurring groves (Gremillion 2002). Therefore, while some impacts have been documented that suggest some areas of investigation in the archaeological record, it is probable that many impacts were not recognized and remained silenced in the historical record. This silencing is a factor that contributed to the ecologically noble notion, leaving archaeological investigation to bring these changes to light.

REFLECTIONS OF THE SAVAGE

Narratives from early settlers not only provide information about the Chickasaw cultural and natural environment but provide insight into how the Europeans perceived them as well. This becomes important when discussing the perception of the ecologically noble savage and its dissemination through the historical record. Of the 18th and 19th century narratives, all utilize "savage" when referring to native peoples (Adair 1775; Cushman 1899; Nairne 1988). This is prevalent throughout the early historical narratives and continues to be used as it appears in the later works by Swanton (1946) and Malone (1922). This sustained use shows how early perceptions were passed down and maintained for centuries only to make corrective measures that much more difficult. Beyond the direct labels placed upon native populations, thoughts and opinions that made their way into the narratives give a deeper understanding on how southeastern Native

American culture was interpreted by the Europeans. Specific attention is given here to the accounts of James Adair and H. B. Cushman to see how they conceived of the savage. James Malone's later 20th century work (1922) is then looked at to see how perceptions continued as he was documenting Chickasaw history through the use of Adair and Cushman's records. Throughout their descriptions, references to a primitive lifestyle will arise but also the conception of noble living in contrast to the corrupted Western culture.

Beyond the deliberate use of "savage," these documents include passages that convey a primitive perception about the Chickasaw. Cushman is chief among them in emphasizing the primitive nature of indigenous populations by mentioning "they had never left their secluded and quiet homes amid nature's forest groves to expose themselves to the contaminations of the cives (to them unknown) of the civilized (so-called) world of traffic and trade." (Cushman 1899:4). Cushman viewed them as forever having been in the same condition in which he came upon them, unchanged due to the lack of contact with the outside world. His mention of them living "amid nature's forest groves" also conjures up images of living within nature's confines which suggests Native Americans were passive recipients of their environment. This is also juxtaposed with a civilized world that contaminated their more natural way of life. He made an interesting note to the "so-called" civility of the western world. This hints at a notion of doubt in the trueness of Western civility and perhaps that the Chickasaw may have been better off without such interactions; a thought that is present with the other authors as well.

Malone compares Chickasaw lifeways to those he witnessed with indigenous populations in Alaska noting, "that country and its inhabitant were then very much in the same condition as at the creation's dawn" (Malone 1922:204). This is in reference to the

Native's lack of desire to search for gold which was in stark contrast to the European mindset moving west. Malone believes the Chickasaw displayed the same feelings towards acquiring wealth. Seeing them as being in the same condition as "at the creation's dawn" reflects a belief in the static notion of native civilization and the European advancement beyond that. However, this way of life was not seen as being detrimental, but rather to be admired for its simplicity and unchanging nature. This leads into a belief that the Europeans corrupted Chickasaw nobleness which was hinted at in Cushman's passage. Malone considers: "We are told in our sacred writing that the love of money is the root of all evil; wherefore should we not admire the primitive Indian, who, before his contamination by contact with the white man, was free from this vice?" (1922:203). He criticizes the Western desire for capital and casts the Native's way of life in a more favorable light. Adair's work is also wrought with discussions on how the Chickasaw were "ruin(ed) by our left-handed policy, and the natives were corrupted by the liberality of our dim-sighted politicians" (Adair 1775:230). Adair later adds, "the French very justly say, the English spoil the savages, wherever their trade extends among them" (1775:286). Again, not only referring to the savage but believing they have been "spoiled" by European goods and thus changed from a previously unspoiled state.

Each of these statements conveys a notion that European contact corrupted the Chickasaw and perhaps they may have been better off independently, which may not be far from the truth. However, while noting the downfalls of their Western societies the authors still perpetuate a noble savage slot in believing that before European arrival Native Americans were living harmoniously in nature, unchanged since creation, only to become corrupted and ruined post-contact.

COLONIAL IMPACTS AND CHICKASAW REMOVAL

Once European settlement began to encroach on the Chickasaw territory a number of unfamiliar pressures were placed upon them forcing them to quickly adapt or fall victim to colonial force. The Chickasaw began channeling their energy into being successful traders. Their settlements on the Black Prairie made them a vital link in trade relations since it placed them in the center of the Mississippi River System and the Upper Trade Path (Johnson et al. 2008; St. Jean 2003). This also made them important allies and ones the British were quick to take advantage of. Allying with the British and entering into wars against the French and their Choctaw allies required additional labor and time commitments, leaving less to attend to hunting and farming practices. General James Oglethorpe reflected on the changing cultural system, stating: "Whilst [the Chickasaws] lose their hunting & corn season for our defense, we are forced to give them food, Arms, Ammunition & some Clothing, which they wod [sic] otherwise buy with Skins which they got from hunting" (St. Jean 2003:765). With less time to hunt for themselves and less energy spent on processing foodstuffs, trade became less of a choice and more of a necessity. Their market involvement rose with the slave trade but switched to deerskins soon after the Yamasee War in 1715 (Johnson et al. 2008). The deerskin market was highly lucrative for the Chickasaw who already had a history of dependence on the species. However, with the change from hunting deer for personal consumption to hunting for market distribution, their ecological impact also changed. This high demand for deerskin caused increased pressure on the deer populations along with pressure on the Chickasaw to devise strategies to keep up production (Johnson et al. 2008). The results of

the deerskin trade, as will be displayed through the archaeological evidence here, proved to be less ecologically noble than their traditional subsistence hunting.

Colonization initiated a period of great social change which would eventually lead to the Chickasaw being pushed from their homelands. The Chickasaw engaged in a number of wars and conflicts throughout the 18th century with the French and the neighboring Choctaw (Ethridge 2010). The Chickasaw became dependent on the trade for guns and ammunition during this period and established a strong trade alliance with the English. This dependence grew throughout the 18th and 19th century with the slave trade and later deerskin trade, making it more difficult for the Chickasaw to extricate themselves from the imposed social order with each passing year. Old World diseases and violence gave fuel to the savage image, justifying European superiority (Ethridge 2010). Throughout the early 19th century the Chickasaw saw their homelands drastically reduced by a number of treaties as appeals for their relocation westward were passed through Congress (Gibson 1971b). By the 1830s much of the Chickasaw nation had begun moving west to Indian Territory as the situation in Mississippi became unbearable (Ethridge 2010). Despite their long held resistance, negotiations to cede their homelands were completed by 1837 pushing them to settle land in Oklahoma where they remain today (Gibson 1971b). The image of a noble savage continued to influence social policy into the 20th and 21st century. Conservationists used the image of an ecological Indian and native peoples as an exemplary population to further their goals (Hames 2007). Today the situation has only become more complex with the dissemination of evidence confirming environmental damage associated with Native Americans (Hames 2007). Instead of such evidence leading to more cooperation between Native Americans and policy makers, it

has continued to push the divide. Native peoples are seen as an obstacle in many conservation efforts and as something to be removed or relocated to ensure conservation (Hames 2007). As we look toward the future, ecological nobility seems to exist in the hands of conservationists with a question as to where Native Americans fit into conservation efforts. Continuing to view native populations as a problem or obstacle will only perpetuate the savage slot and an essentialized image of Native Americans. Archaeology can then lend itself to battling homogenized images of past native populations and their ecological impacts. This can contribute to more nuanced consultations between policy makers and Native groups today through an understanding of the particular impacts an environment has been subjected to, what social motives were driving those impacts, and how the two have been intrinsically entwined.

CHAPTER SUMMARY

A look back at what is known about late Mississippian environmental impacts and Chickasaw interactions with the natural world through historical documents has provided a broad understanding of what may be expected from the 17th century Chickasaw archaeological record. The late Mississippian farmstead Yarborough displays evidence from flora and fauna remains that suggests a moderate level of disturbance and land clearing behavior. The ethnohistoric record has suggested a number of species that were utilized by the Chickasaw in terms of diet, clothing, weaponry, and shelter. It has also described taboos about the consumption of certain animals that should be kept in mind when looking at their appearance in the archaeological record. Agricultural land clearing seen at Yarborough seems to have continued with the Chickasaw along with the use of fire rings to capture deer. The historic record also displays a pervasive perspective of

Natives as noble savages that were corrupted by the European system. Finally, additional pressures faced by the Chickasaw, including entrance into a trade market economy and introduction to ammunition, triggered drastic social changes throughout the century which need to be considered when interpreting changing ecological impacts.

CHAPTER THREE

SOUTHEASTERN NATIVE AMERICAN HISTORICAL ECOLOGY

Zooarchaeological research has recently opened up its lines of inquiry to go beyond answering traditional questions of diet and subsistence to explore environmental consequences of past human actions. The colonial time period is ripe for this kind of analysis as it is a period of rapid environmental and social change. Past researchers have demonstrated environmental management and change through the use of the faunal record among other Southeastern tribes, which will be the focus of this chapter (Braund 1993; Clinton and Peres 2011; Hogue 2003; Laphman 2005; O'Steen 2007; Pavao-Zuckerman 2007; Thomas 2008). Attention will be given to discussing initial change as a selective act rather than unidirectional acculturation, which allowed new cultural dynamics to emerge between native groups and colonists. Responses to the encroaching colonial world not only varied between groups but within them as well. The resulting actions also initiated varying degrees of environmental change which should be understood in accord with their differing social values, engagements and motives. Precedents set by these past studies offers guidance for interpreting the colonial Chickasaw faunal analysis. They also act as warnings against over-generalizing Native American relationships with their environments and highlight the importance of taking nuanced cultural differences and the historical milieu into account.

ALTERNATIVES TO ACCULTURATION

The field of historical ecology complicates perceptions of past peoples by acknowledging that humans impact their environments in different ways depending on their social and cultural systems (Balée 1998). Southeastern Native Americans are extremely diverse in their cultural systems as were the groups of Europeans with whom they came in contact. This dynamic fostered unique actions and reactions from all parties. Acknowledging the multifarious colonial experience means challenging former acculturation perspectives which arose early in the development of historical archaeology. These interpretations were often a result of both the biases of the researchers and a failure to correct for the biases in the historic narratives they utilized (Rubertone 2000). This created a unidirectional discussion of the impact Europeans had on the Native Americans and how acculturation into the dominant European society led to the eventual disappearance of traditional lifeways (Rubertone 2000). Intensifying archaeological research and a more refined reading of the historical record allowed more clues about the dynamic interrelationships of the colonial period to be uncovered which led many to question the acculturation theories.

Today, with regard to changing subsistence and environmental management practices, the discussion has taken Richard White's direction of seeing contact not as a battle of which side could survive but rather a time for something new to appear (Lapham 2005; White 1991). The early adoption of Old World crops exemplifies this by showing that many Southeastern Natives exercised agency when coming in contact with foreign botanical resources; making selective changes to subsistence rather than systemic ones (Gremillion 2002). Prior to permanent European settlement, there is evidence that

Southeastern Natives were utilizing Old World crops in the absence of coercive pressure (Gremillion 2002). These crops must have exhibited some characteristics that they saw as worthy to incorporate into their traditional systems. The most important characteristic among them is the minimization of risk if the crop failed (Gremillion 2002). Cultivation labor costs and ease of transition would all need to be assessed in order to minimize risk. Some crops naturally exhibit characteristics that cause them to spread widely and more easily (Gremillion 2002). These plants, with watermelon and peach among the earliest of introductions, required little cultivation and were likely utilized for convenience as they quickly became another dietary option. Other adopted crops exhibit characteristics that were similar to New World crops already present in Indigenous subsistence systems and thus were less costly to incorporate into their fields (Gremillion 2002). These included fruit or nut trees as well as legumes. The peach tree is among those that fall within both criteria, which explains its widespread adoption in the Southeast (Gremillion 2002). These characteristics help to explain why certain Old World crops were utilized and places importance not only on the nature of the crops but also the traditional subsistence systems in which they entered. Therefore, in order to fully comprehend why certain crops were incorporated into Native subsistence systems and why others were not, all scales of influence should be assessed including the greater historical context, the cultural system of the selectors, and the functional issues of the crops themselves.

Attention to all scales of influence should also be applied when drawing conclusions from the faunal record. The development of the deerskin trade altered traditional hunting behavior as it brought about a shift in the cultural system. Native Americans were now making selective choices based on market value (Lapham 2005); a

concern that had not previously impacted their prey choices. Hunters began targeting prime aged males both before and after molting season which diverged from their traditional opportunistic strategy that was more varied in the age and sex of the prey and the seasonality of the hunt (Lapham 2005). Demands of the deerskin trade and market value required the Native Americans to adjust their prey preference in favor of deer with characteristics that were desirable according to colonial demands. This switch in prey preference and increasing acquisition of deer would be accompanied by additional alterations in subsistence behaviors including devoting more time to processing skins, decreasing time spent on acquiring secondary food sources, and a decrease in dietary richness (Johnson et al. 2004, 2008). The switch in prey preference and reorganization of subsistence activities to accommodate the change displays a response to economic pressures and demonstrates that Natives willfully manipulated their strategies (or did so as much as possible under the imposed system) to remain competitive in the trade market.

Colonization brought with it many introductions including Old World plants and animals and a market system. These introductions posed challenges to traditional subsistence and trade systems; however, Natives did not simply submit to these pressures. Instead, the archaeological record has shown that informed and strategic decision making took place which resulted in a dynamic interaction of altered traditional practices to incorporate parts of the Western world that would allow them to persevere in the developing social climate.

ECOLOGICAL IMPACT MODELS

After a protracted period of interaction with Europeans, Indigenous subsistence systems began to show more drastic changes to hunting, processing, and cultivation

techniques (Gremillion 2002; Laphman 2005; O'Steen 2007; Pavao-Zuckerman 2007). As mentioned, the deerskin trade was one paramount factor driving changes to hunting and processing activities among native southeastern populations. This heavy involvement began with the opening of the Upper Path in 1698 which allowed goods from the inland to easily travel to the coastal trading port of Charleston, South Carolina (Johnson et al. 2004, 2008). Assemblages that post-date the opening of the trade route reflect a more intensive hunting strategy and bear evidence for the ecological impact the trade market had on white-tail deer populations.

A new trade market brought new demands by colonists that Native American hunters tried to satisfy in order to be successful. Market demand called for large and heavy skins, those from adult males, and those higher in quality (although the criteria for "quality" is not clearly defined) (Lapham 2005:12).This initiated the switch to a selective strategy to obtain the most profitable hides (Lapham 2005). While this selective strategy is evident in the faunal record among those involved in the fur trade, it was only maintained in the early years of the trade. Studies show that later in the 18th century, more individuals outside of this prime age category occur in higher frequencies (Braund 1993; Lapham 2005; Pavao-Zuckerman 2007). The heightened demand for skins and the hunter's response to this demand caused the depletion of deer herds across the Southeast, prompting competition among Native American groups for good hunting grounds (Lapham 2005). The increased competition and declining deer population made an opportunistic strategy, or hunting any individual that made themselves available, more effective regardless of market value (Johnson et al. 2004; Lapham 2005; Pavao-Zuckerman 2007). Native American hunters no longer had the luxury of being selective

and hide quality became less of a concern. These changes in the faunal record illuminate prior anthropogenic pressures placed on the local ecology which resulted in over-hunting; an ecological impact that was not quite so noble. This provides good evidence that Indigenous populations were less concerned about conserving animal populations than they were with surviving in a tense social atmosphere and rapidly expanding European market.

Assessing the combination of species within an assemblage can also hint at anthropogenic changes to ecologies by working as proxy indicators for environmental conditions. A number of species, as was briefly discussed with the Yarborough site, have been labeled as "disturbance species". These animals prefer environments other than deciduous forests including secondary growth, forest-edges, cleared and old fields, grassy, scrub or brush cover (Clinton and Peres 2011; Hogue 2003). A list of the disturbance species likely to be found on Black Prairie sites can be seen in Table 3.1. This list includes Hogue's expansion of taxa to include more carnivores (i.e. bobcat, long-tailed weasel, and gray fox) that feed on rabbits and rodents associated with disturbed habitats as it is believed that they would have a concurrent increase. Any claim that an environment was subjected to disturbance would be greatly strengthened by the botanical record but these animals species have worked as good proxies in past studies. Analysis of disturbance species has been utilized more heavily within prehistoric contexts including those at Yarborough and other Mississippian settlements (Clinton and Peres 2011; Hogue 2003). These have effectively demonstrated the presence of land clearing practices, particularly in association with agriculture, through the abundance of the disturbance species in the assemblages. However, this approach has been underutilized

with respect to protohistoric and historic period Native American settlements in the Southeast. Such an emphasis deserves more attention since the impacts may be drastically different than in prehistory due to the new Old World introductions and changing social, cultural and economic systems.

Table 3.1. Disturbance Species (adapted from Clinton and Peres 2011 and Hogue 2003).

Common name	Scientific name
Opossum	*Didelphis virginiana*
Striped Skunk	*Mephitis mephitis*
Raccoon	*Procyon lotor*
Elk/Wapati	*Cervus canadensis*
White-tailed Deer	*Odocoileus virginianus*
Eastern Gray Squirrel	*Sciurus carolinensis*
Eastern Fox Squirrel	*Sciurus niger*
Eastern Chipmunk	*Tamias striatus*
Eastern Cottontail	*Sylvilagus floridanus*
Flying Squirrel	*Glaucomys volans*
Red Fox	*Vulpes vulpes*
Armadillo	*Dasypus novemcinetus*
Woodchuck	*Marmota monax*
Hispid Cotton Rat	*Sigmodeon hispidus*
Least Shrew	*Cryptotis parva*
Harvest Mouse	*Reithrodontomys humulis*
Marsh Rice Rat	*Oryzomys palustris*
Long-tailed Weasel	*Mustela frenata*
Bobcat	*Lynx rufus*
Canada Goose	*Branta canadensis*
Bobwhite Quail	*Colinus virginianus*
Wild Turkey	*Meleagris gallopava*
Common Crow	*Corvus brachyrhynchos*
Passenger Pigeon	*Ectopistes migratorius*

OPTIMAL FORAGING THEORY

Optimal foraging theory has provided a quantitative, testable way to understand forager decision making. A number of models fall under the broad theoretical approach, but all propose systematic ways to quantify the rate of return acquired from a pursuit while operating under the assumption that a forager will behave in a manner to maximize those returns (Pyke et al. 1977; Thomas 2008a). These returns, or currency, are most commonly discussed as energy intake. Models differ depending on the forager decision of interest (prey choice, patch choice, time allocation, patterns of movement) since each will result in some energetic cost (Pyke et al. 1977; Thomas 2008a; Winterhalder 1981). The prey choice, or diet-breadth, model is of particular interest for this study to understand why certain prey was chosen over others.

The prey choice model is applied to predict which foods a forager should harvest from all resources available (Thomas 2008a). Costs of the pursuit are understood as the sum total of search and capture/handling costs with caloric intake being the measure of currency. Thus, the return rate of each prey species is calculated according to the following formula:

$$\text{Return Rate} = \frac{\text{Total food energy proved by the individual (kcal)}}{\text{Total handling time (per hr)}}$$

where total handling time is the sum total of search and capture/handling costs (Thomas 2008a). Therefore, if a forager is to optimize their caloric intake they should prioritize species that provide a higher net return rate above those with lower return rates.

An extensive study has been carried out by archaeologists on St. Catherine's Island to estimate the return rates provided by fauna occurring in the zooarchaeological record. The faunal record from St. Catherine's Island, located just off the coast of

mainland Georgia, demonstrates the use of many important faunal resources that were also utilized by the Chickasaw, including white-tailed deer, black bear, raccoon and opossum (Thomas 2008a). Experimental and ethnoarchaeological investigations were conducted to estimate the net return rates of prey available on St. Catherine's Island during the mission period (A.D. 1650), a period generally concurrent with the colonial era Chickasaw (Thomas 2008a). Because these experiments were carried out with extant species of fauna, researchers also adjusted the calculated return rate estimates to more accurately reflect past circumstances. These adjustments take into account shifting species weights and assume that foragers held expert knowledge when calculating pursuit and processing time (Thomas 2008a). The resulting return rate estimates and subsequent rankings (Table 3.2) are then believed to be an adequate estimation of return rates that can be applied to faunal resources available to the Chickasaw. Based on the species ranking, and operating under an optimal foraging theory, it is predicted that the black bear would be the highest ranking prey available to the Chickasaw in terms of the amount of energy gained after searching and handling.

This prey ranking uses, as mentioned, caloric return as a measure of currency. However, there are many alternative forms of currency that can be used to rank prey and measure optimal returns. These include, but are not limited to, nutrition, technological investment, social capital, signal value and other non-food payoffs (Erlandson 1989; Thomas 2008b). Differing returns become a major factor to consider during the colonial period and especially among foragers involved in trade networks. No longer can we apply optimal foraging strategy simply in terms of energy provided per individual but must

begin to consider foraging behavior within the social context (Hildebrandt and McGuire 2002:232; Thomas 2008b).

Table 3.2. Estimated Post-Encounter Return Rate (Thomas 2008a)

Species	Post-encounter Return Rate (kcal/hr)
Black Bear	37,352-61,434
White-tailed Deer	12,096-19,895
Raccoon	9408-13,569
Canada Goose	6762-12,522
Wild Turkey	7765-11,200
Opossum	6540-12,111
Swamp Rabbit	2942-5248
Small Turtles	2182-2758
Duck	1230-2278
Eastern Gray Squirrel	672-1244

When considering the social context of the Chickasaw, market value and technological investment become two very important forms of currency that would affect forager decision making. The trade market provided a larger payoff for deer and fur-bearing animals because their skins and pelts were valuable trade items. These fur-bearing individuals are now not only providing a caloric return but non-food pay offs as well. Additionally, Chickasaw hunters saw a drastic change in technology with the introduction of firearms which would have altered search and handling costs of larger animals.

Ranking prey according to caloric return (Table 3.2) is a good place to start when understanding forager decision making since hunting remained a primary form of subsistence. However, the social context of the trade and change in technology should be

kept in mind when assessing shifting prey rank through time. This could help explain why patterns of hunting animals with high search or handling costs are occurring with more frequency or being chosen over other widely available resources. Changing frequencies must also be understood both in terms of the declining importance of one species and the rising importance of others (Thomas 2008b). However, abundance indices will not be able to distinguish between the two, which makes it the researcher's responsibility to take the ecological and cultural context into account.

BATTLING HOMOGENIZATION

Archaeological and historical research has substantiated the existence of vastly different colonial experiences between groups of Native Americans as they faced different challenges and negotiated them in distinct ways. The zooarchaeological record has been able to further this understanding in the case of southeastern Native Americans. The Muskogean Creek assemblages provide an interesting example of two different reactions to colonial introductions. This is particularly interesting since many early settlers and researchers (Adair 1775; Swanton 1946) failed to document cultural difference among the Creeks thus leading to a very homogenized view of their culture. However, archaeological research has been able to bring more cultural variation to light. In terms of colonial influences, Upper and Lower Creek sites along the Alabama and Georgia border have shown varying receptivity to both the involvement in the deerskin trade and the introduction of Old World domesticates. Zooarchaeological assemblages at Upper Creek sites show high proportions of deer remains displaying butchery marks characteristic of hide processing on the bone (Pavao-Zuckerman 2007). While the Creek were processing hides for household consumption prior to the trade, the dramatic increase

in these remains demonstrate a heavy involvement in the deerskin trade throughout the 18th century which is also supported in the historical record (Pavao-Zuckerman 2007). However, remains from Lower Creek sites exhibit less involvement with the trade, lacking the same proportional rise in deer remains (O'Steen 2007). Knowing that the deerskin trade often resulted in overhunting (White 1991), there is good reason to believe that the differing involvement between the two groups also led to different impacts on their local ecologies.

Deer acquisition is not the only divergence in the faunal remains between the Upper and Lower Creek sites. Both also show different receptivity to domesticate utilization. Frequencies of domesticates, including chicken, pig and cattle, taken from assemblages at the Upper Creek site of Fusihatchee show that they were not a primary source of meat until later in the 18th and early 19th century (Pavao-Zuckerman 2007). The reason behind the continuity in wild subsistence is believed to be a result of choosing to invest resources in hunting and processing deerskins over that of animal husbandry (Pavao-Zuckerman 2007). The explanation for doing so is similar to Gremillion's notion of transitional ease and minimizing cost (Gremillion 2002). It was likely easier to become involved in the deerskin trade over that of a newly introduced domesticated subsistence strategy given the Creek's existing reliance on deer hunting and unfamiliarity with raising Old World domestic species. In contrast, Lower Creek sites exhibit a greater incorporation of domestic species into their diet by the middle of the 18th century, many decades before that of Upper Creeks (O'Steen 2007). Reasons for the difference are currently speculative but may be attributed to Lower Creeks being less involved in the deerskin trade as it would have given them more time and labor to contribute to raising

livestock (O'Steen 2007). They may have also seen the benefits of readily available meat and mammal products and found it to be a more worthwhile investment (O'Steen 2007). Whatever the reason, it is clear that the choice of entering the deerskin trade or engaging in animal husbandry arose with colonization and these sites provide evidence for the different responses. This evidence then helps to correct assumptions of homogenized Native American cultures and acknowledges the variety that was silenced in the historic record.

A similar dynamic in deerskin trade involvement has been noticed among the Chickasaw. As previously mentioned, the Chickasaw were heavily involved in the deerskin trade beginning in the 18th century; however, the zooarchaeological record suggests that Large and Small Prairie sites differed in their involvement (Johnson et al. 2004). Large Prairie site assemblages display larger numbers of young deer being taken than those at Small Prairie sites. Since young deer were the targeted age category for marketable hides, the remains suggest that Large Prairie hunters were more concerned with acquiring hides suitable for distribution than were the Small Prairie hunters (Johnson et. al 2004).

These studies show that in any instance where there are social divisions within a tribe it is likely that their behaviors will differ as well. This would then lead to differing ecological impacts when certain activities involve the alteration of the natural world. Generalizing environmental effects to the Native American community as a whole, or even for all Chickasaw villages, then becomes dangerously close to perpetuating a homogenized image when the reality, in fact, may include more nuanced differences. Uncovering all of the detailed differences of past behavior may remain outside the realm

of possibility but continuing research in the area and added attention to nuanced cultural differences within and between groups as well as the larger historical circumstance they were operating under will help to complicate the picture of Native Americans responses to colonialism.

CHAPTER SUMMARY

These past studies aid to show what is known about Southeastern Native American responses to colonialism with respect to their changing interactions with the natural world. Perspectives now shy away from acculturation theories in favor of supporting and acknowledging the informed decision making practiced by the Natives that allowed them to retain traditional strategies, utilize their deep knowledge of their natural environment, and blend them with new introductions. Old World crop utilization demonstrates a decision to diversify their diet while the selective strategy of deer hunting was an informed choice carried out in order to be the most successful in the burgeoning trade market. In making these changes, the zooarchaeological record also suggests that some Native American communities were less concerned with being ecologically noble since change in behaviors occasionally resulted in detrimental effects like over-hunting. Rather than preserving mammal populations, they acted in a way that allowed their communities to persist under harsh social conditions. Finally, the diversified involvement in the deerskin trade and acquisition of Old World domesticates act as a reminder that not all of the responses to colonization were the same, nor did they result in the same environmental impacts. Thus, future zooarchaeological studies need to continue to work against the homogenization of Native American groups and their interactions with the

environment by showing the multitude of factors that can affect these interactions and how they come together in unique ways throughout the colonial period.

CHAPTER FOUR

METHODOLOGY AND RESULTS

The ethnographic record has indicated that the Chickasaw were altering their environments throughout the colonial period to make it the most productive in terms of the faunal and botanical resources they utilized (Adair 1930; Gibson 1971a; Gremillion 2002; Nairne 1988). Additional archaeological studies of other Southeastern Native American groups corroborate these reports and show new environmental interactions that differed from traditional practices (Laphman 2005; O'Steen 2007; Pavao-Zuckerman 2007; Thomas 2008). It is evident that the new social order imposed by European settlement was a driving force in the altered subsistence practices. Cognizant that the Chickasaw were among those heavily impacted by colonial pressures, it is believed that they too began revising their faunal utilization and land management practices. Due to the current lack of botanical samples from Chickasaw colonial sites, only the faunal material from five sites, ranging from A.D. 1650-1750, were analyzed. Analysis was carried out to discover how their behaviors vary from those seen at the Mississippian Yarborough site (A.D. 1400-1540) and what diachronic change occurred within the century of colonial interaction.

Zooarchaeological remains were predicted to show both changes in faunal exploitation and landscape alteration through their use as proxies for environmental conditions. Change in faunal exploitation was expected to be seen specifically with the utilization of deer and possibly other fur-bearing animals due to the rise of the deerskin

and fur trade and the Chickasaw's involvement in each (Gibson 1971a; Johnson et al. 2004, 2008). Assemblage diversity measures and the representation of disturbance species were utilized as proxies for anthropogenic clearing. Disturbed environments would foster larger populations of deer which would be most beneficial during this time period. While disturbed environments are typically associated with higher diversity measures (Wagner 2010), a decrease in diversity was predicted to occur among the assemblages with the assumption that Chickasaw utilization of fauna would become more heavily focused on white-tailed deer and these would occur in higher frequencies in the archaeological record than would other, less valuable taxa present in the local ecology. Higher frequencies of disturbance species in archaeological assemblages can be indicative of disturbed environments and have been utilized as such in past studies (Clinton and Peres 2011; Hogue 2003). A similar approach was taken here in regards to the presence and absence and changing utilization of disturbance species according to the small-mammal model (Hogue 2003). An increase in disturbance species was predicted to occur in observance of the fact that deer and many fur-bearing animals prefer edge environments making them more likely to be maintained through anthropogenic clearing throughout the peak years of the trade.

SITE COLLECTION

The data used in this analysis come from both early excavations (1930s-1950s) including those carried out as WPA projects and the more recently excavated Chickasaw site of Daub Ridge (2012). All sites are located near the current city of Tupelo, Mississippi and are upland prairie sites. The early assemblages are part of the Park Service collections and include MLE 112, MLE 18, MLE 14, and MLE 90 (Johnson et al.

2004, 2008). The earliest site, MLE 112 or The Futorian site has a date range from pre-1650-1680s and was excavated in 1955 by Francis Elmore. MLE 18 which dates to pre-1650-1720s was excavated in the 1940s by Albert Spalding and is represented by specimens from a total of seven large daub pits. MLE 14, also known as the "Chickasaw Village" was excavated in 1939 first by Moreau Chambers followed by additional excavations by Jesse Jennings a few years later. This assemblage includes specimens from eleven large daub pits that range from pre-1650-1740s. Finally, MLE 90 was excavated by Spalding and includes six large daub pits ranging in date from 1730-1760s. No screening was carried out on these projects and thus, collections likely favor larger, more interesting specimens (Johnson et al. 2004, 2008). Analysis of these specimens was completed by H. Edwin Jackson and Susan Scott in 2004. Primary data classes provided by this study include number of identified specimens (NISP), weight and charring. A total percentage of carnivore and rodent gnawing was also provided for each assemblage.

One additional assemblage from the Daub Ridge site (22Po755) is included in this study. This was collected from the 2012 excavations conducted by the University of South Carolina in collaboration with members of the Chickasaw Nation and local volunteers. All specimens from this site came from a single midden pit that dates to A.D. 1680-1730. All material was window screened, which may produce a more accurate representation of species. The faunal materials from this midden pit were analyzed by Diane Wallman, a Ph.D. candidate at the University of South Carolina. Additional primary data classes were provided for this assemblage but for consistency NISP, weight and charring are included here. Biomass was also calculated for all of the assemblages based on the provided weights.

NISP AND BIOMASS

NISP and biomass are the primary analytical measurements used in this study to make comparisons across assemblages. These measurements are useful for quantifying abundance but are subject to some caveats which should be discussed. NISP is simply the total count of specimen representation. This makes the measure sensitive to bone fragmentation which can lead to overrepresentation of a species whose elements are easily identifiable or less sensitive to depositional processes (Reitz and Wing 2008). It can also overemphasize those animals brought back to the site intact versus those butchered in the field (Reitz and Wing 2008). Field butchering often results in a loss of elements for larger species that are difficult to transport since many of the less desirable elements remain undiscovered at the kill site. This tendency to over-represent certain elements can make it difficult to interpret NISP as a measure of abundance and thus it is often paired with other analytic measures.

Biomass was used in this study to better represent the proportion of meat contributed by each species and to correct for overrepresentation by NISP. Biomass refers to the quantity of tissue that a specified taxon might have supplied. Predictions of biomass are based on the allometric principle that the proportions of body mass, skeletal mass, and skeletal dimensions change with increasing body size. The relationship between body weight and skeletal weight is described by the allometric equation:

$$Y = aX^b$$

(Simpson, Roe, and Lewontin 1960:397). In this equation, X is specimen weight, Y is the biomass, b is the constant of allometry (the slope of the line), and a is the Y intercept for a log-log plot using the method of least squares regression and the best-fit line

(Casteel 1978; Reitz and Cordier 1983; Reitz et al.1987; Wing and Brown 1979). Biological phenomena often show allometry described by this formula (Gould 1966, 1971) so that a given quantity of skeletal material represents a predictable amount of tissue or body length due to the effects of allometric growth. Values for a and b are derived from calculations based on data at the Florida Museum of Natural History, University of Florida, and the University of Georgia Museum of Natural History. Biomass was only calculated for the most specific taxonomic identifications. This gives preference to those at the lowest level within a systematic hierarchy since those identified to a higher category may belong to the lower taxon (Reitz and Wing 2008). Due to this specificity, species included in the NISP comparisons include only those for which biomass was calculated.

MNI, or the minimum number of individuals, is also a commonly used zooarchaeological quantification method which measures the smallest number of individuals necessary to account for all specimens of a particular species found at a site according (Reitz and Wing 2008). Most simply, this is calculated according to skeletal symmetry and the abundance of left and right elements while taking into account sex, age and size when possible (Reitz and Wing 2008). However, this measurement was not utilized in this report due to its omission for the Park Service collections nor was it able to be calculated from the data since representation of skeletal elements was not provided. Due to the nature of this analysis and focus on trends over time, it is believed that the absence of this measure does not severely alter the interpretation of the trends. MNI will often correlate with NISP (Casteel 1977; Grayson 1984; Shotwell 1958; Reitz and Wing 2008) and zooarchaeological studies that include all measures of NISP, MNI and biomass

show that they often reflect similar trends in the data. (Thomas 2008b). Thus, anything missed in MNI is believed to appear through either the NISP or biomass results.

TAPHONOMIC BIASES

Each of the assemblages also underwent a number of taphomonic processes that need attention to better understand the preservation and representation of the bone. One preservation bias that affects all samples is their provenience within large pits that were filled with secondary refuse. These are what the Chickasaw refer to as okaakinafa' meaning "sunken place" (Johnson et al. 2004; Lieb 2008). These pits were dug by the Chickasaw to extract daub for building material. After extracting the daub, they were then filled in with daily refuse. The process of re-depositing refuse may have an effect on the skeletal representation as it favors the preservation of slightly larger specimens.

Additional taphonomic concerns come from site recovery and disparities across the assemblages. As mentioned, none of the Park Service collections were screened. This also favors the preservation of larger specimens while increasing the likelihood of omitting smaller fish, bird or reptile specimens. In contrast, the Daub Ridge collection was window screened which allowed for the recovery of many smaller specimens. However, primary analysis of this collection does not show a disproportionate recovery of smaller specimens when compared to those at the colonial sites. It should be kept in mind that the Daub Ridge assemblage was collected from a single okaakinafa' pit while the other collections came from multiple pits within a site. As it is currently believed that the features reflect discard of a single household, it is possible that the Daub Ridge collection may reflect a more specific deposition pattern than the other site assemblages.

Again though, looking at the species lists and representation across sites, the Daub Ridge collection reflects similar deposits as the others so this does not present a major concern.

TAXONOMIC REPRESENTATION

General trends in assemblage characteristics and taxonomic representations were assessed first. The following analysis keeps each site in chronological order based on end occupation date to enhance the recognition of diachronic trends. The total samples sizes for each assemblage can be seen in Table 4.1 along with the total biomass and number of species (NISP) included in the analysis. These totals show a fluctuation in sample size and biomass throughout the samples. To be sure that none of the abundance calculations to follow were affected by the sample size, each has been normalized according to these totals.

Table 4.1. Summary of Sample Totals.

	MLE 112	MLE 18	22Po755	MLE 14	MLE 90
Total Sample Size (NISP)	301	1,386	605	966	239
Total Biomass (kg)	40.516	107.625	51.656	136.103	33.649
# of Species	21	20	17	15	11

To compare the species distribution across site, the contribution of each taxonomic class by both NISP and biomass was calculated. Knowing that white-tailed deer (*Odocoileus virginianus*) makes up a majority of the mammal population in all assemblages, it was separated out from the other mammals. This was also done to see how the importance of deer fluctuated over time. Similarly, turtle specimens were separated out from the other reptiles as they made up a majority of this taxonomic class. The resulting breakdown can be seen in Figures 4.1 and 4.2. Note that each has been

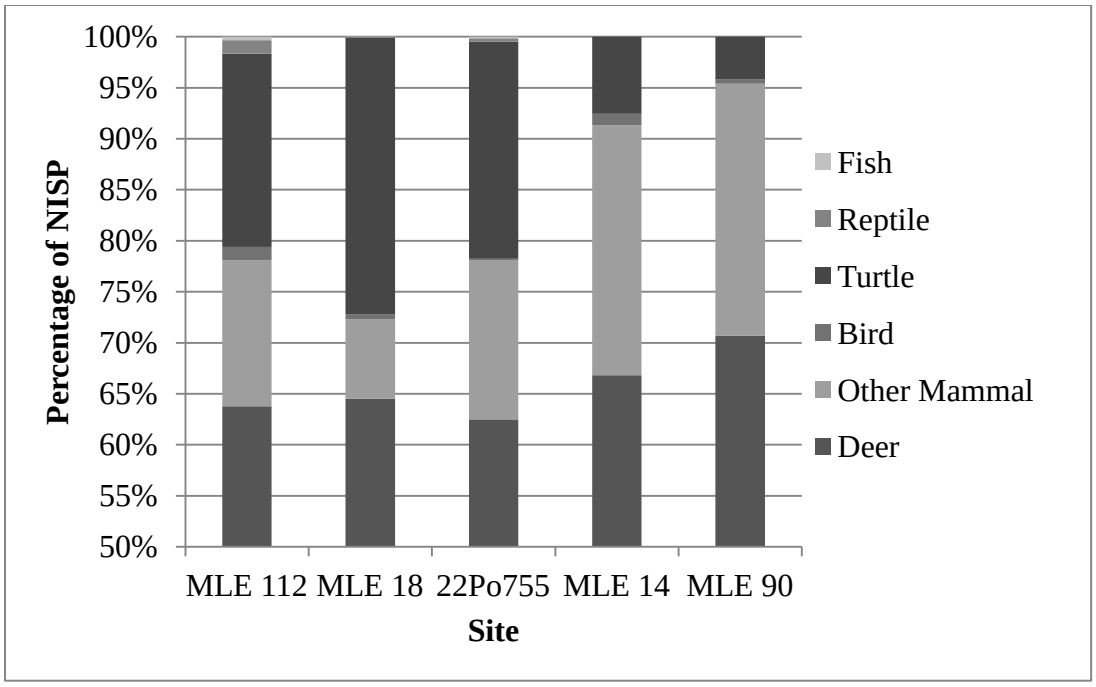

Figure 4.1. Percentage of Contributed Specimens for each Taxonomic Class.

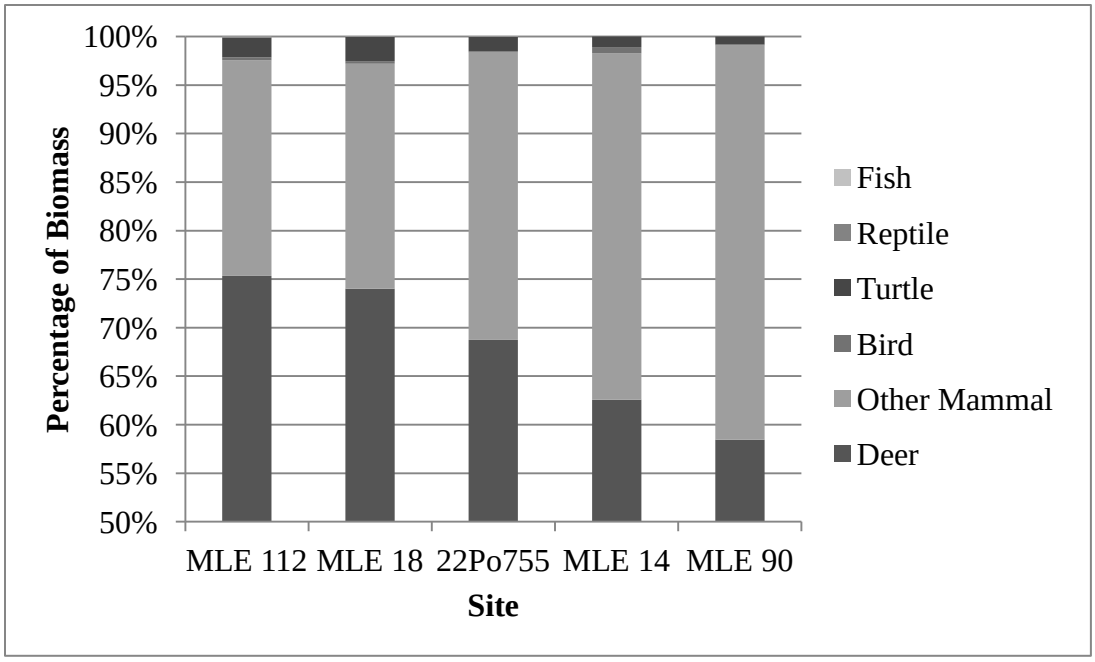

Figure 4.2. Percentage of Contributed Biomass for each Taxonomic Class.

scaled with a minimum of 50 percent since deer continuously make up over 50 percent of the assemblage and this allowed changes with other taxonomic classes to be seen more clearly. Both figures show turtles, mammals, and deer as the biggest contributors with fish, birds, and other reptiles contributing one percent or less. Both also show a trend toward decreasing turtle use and an increase in mammal contribution. The figures diverge when comparing trends in other mammal species and white-tailed deer. NISP shows an increase in other mammal use with white-tailed deer remaining within a 10 percent range of use and possibly a slight increase towards the end of the century. Biomass contributions, however, show a near 15 percent decrease in the deer contribution and a steadily increasing "other mammal" contribution. Thus while deer specimen count may be increasing, the contributing weight of other mammals is increasing which may also equate to an increase in "other mammal" meat consumption.

In order to better understand what species are contributing to the "other mammal" increase, the species lists were re-visited. NISP and biomass numbers show black bear (*Ursus americanus*) as the other major contributor among mammals consistently appearing in each of the assemblages. Changes in the frequency of bear contributions can be seen in Table 4.2. This shows a steady increase for bear in both NISP and biomass with it making up of a quarter of the contributed biomass by the end of the 18th century.

Table 4.2. Percentage of Bear Contribution

	MLE 112	MLE 18	22Po755	MLE 14	MLE 90
NISP	4.65%	3.82%	9.90%	16.65%	15.06%
Biomass	9.30%	12.81%	22.94%	22.87%	27.61%

Thus, taxonomic class and species distributions indicate an increasing reliance on mammals throughout the 18th century. This comes at the expense of other taxonomic classes with a great decrease in the use of turtle species in particular. Deer remains the chief contributor of meat throughout the centuries but shows a slight decrease by the end of the century as bear begins to gain importance.

DIVERSITY INDICES

Richness, diversity, and equitability measures were also assessed to determine the distribution of taxa in relation to one another. While assessing these measures, it is important to keep in mind that the diversity of the assemblage is reflective of the cultural use and does not equate to the ecological population (Reitz and Wing 2008). Therefore, assessing the richness of the assemblage would reflect how diverse the Chickasaw were in their use of faunal species-not necessarily the richness present in the local ecology. That being said, it is possible for natural restrictions or abundances in resources to affect Chickasaw utilization of species. Additionally, taphonomic processes mentioned earlier in the chapter must also be kept in mind as they likely affected the result of assemblage diversity. The fact that all assemblages display similar results in representation does help normalize some of this bias.

First, richness, or the number of species in the assemblage, was assessed. This can be seen in the assemblage summary in Table 4.1. Counts show a decrease in the richness of the samples over time from 21 to 11 by the end of the century. However, as the total NISP and biomass are fluctuating, this does not seem to be a result of the sample size which allows for more confident conclusions drawn from the decreasing richness. This

again communicates a less rich mix of species utilization by the Chickasaw which may or may not be a result of changing ecological circumstances.

The diversity or "the amount of uncertainty in predicting the identity of an individual picked at random from the community" (Reitz and Wing 2008:111) was assessed next. This method communicates the heterogeneity of the assemblage. To measure diversity the Shannon-Weaver Index was used. The formula for the index is:

$$H' = - \Sigma p_i \log_e p_i$$

where $\underline{p_i}$ is the number of species, divided by the sample size (Pielou 1966; Shannon and Weaver 1949:14). The index is interpreted on a scale of 0-4.99 with 4.99 being the highest achievable diversity. Diversity will increase as both the number of species and the evenness, or frequency of representation (Leonard and Jones 1989), of species increases. Thus, a sample with many species identified and in which the number of individuals slowly declines from most abundant to least abundant will be high in diversity. Diversity can be increased by adding a new taxon to the list, but if another individual of an already present taxon is added, diversity is decreased. A low diversity can be obtained either by having a few species or by having a low equitability, where one species is considerably more abundant than others.

Finally, the equitability, or evenness, of the assemblages was calculated, which scales the calculated heterogeneity of the assemblage to a theoretical maximum. Equitability is calculated using the formula:

$$E = H'/\text{Log } S$$

where $\underline{H}^1$ is the Diversity Index and $\underline{\text{Log } S}$ is the natural log of the number of observed species (Pielou 1966; Sheldon 1969). The equitability index is interpreted on a scale of 0-

1, with 1 representing the most even distribution. A low equitability value indicates that one species was more heavily used than other species in the sample. A high equitability index indicates an even distribution of species in the sample following a normal pattern where there are a few abundant species, a moderate number of common ones, and many rare ones (Reitz and Wing 2008). Both diversity and equitability were calculated based on biomass as it would give a more accurate representation of species utilization than that of NISP.

The results for each site's calculated biomass diversity and equitability can be seen in Table 4.3 and Figure 4.3. Overall, the diversity index remains low throughout the century ranging from about 0.9 to 1.17. This indicates that the Chickasaw stayed fairly consistent in exploiting a single species throughout time. While these numbers do not indicate high levels of diversity, a small increase of 0.29 is seen over time. Also note that the number of contributing species continues to decrease. A decrease in the number of species typically leads to a decreased diversity index (Reitz and Wing 2008) but since the opposite is occurring here it may indicate that other species are contributing larger amount of biomass than they were previously. This is further supported by the rise in equitability over time. While again, these numbers remain low throughout the time period (only approaching 0.5 by the end of the century) they do show a slight increase from 0.3-0.5. This indicates that those 11 taxa in MLE 90 are contributing more equal amounts of biomass than the 21 in MLE 112, which is likely representative of a large number of one species (white-tailed deer) with many rare ones. These results are also consistent with the previously discovered rise in bear biomass which seems to be the cause for the increasing evenness.

Table 4.3. Summarized Results for Biomass Diversity and Equitability

	MLE 112	MLE 18	22Po755	MLE 14	MLE 90
Biomass Diversity	0.902	1.0120848	0.9398874	1.117	1.1720
# of Species	21	20	17	15	11
LN # Spp.	3.0445224	2.9957323	2.8332133	2.7080502	2.397895
Biomass Equitability	0.2962698	0.3378422	0.331739	0.41247389	0.488762

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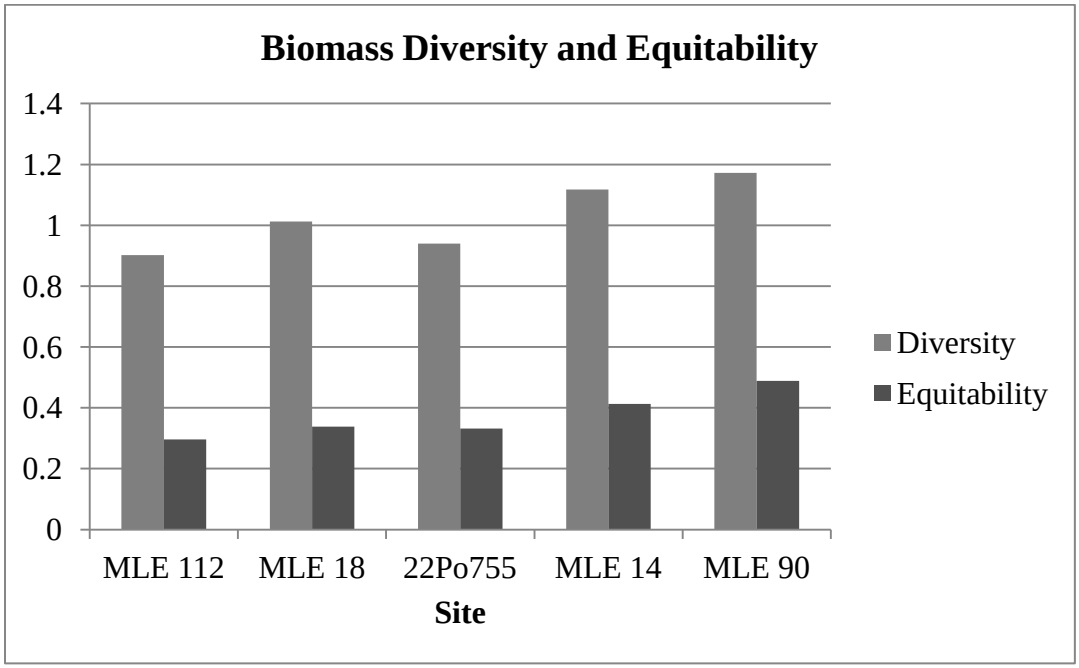

Figure 4.3. Changes in Biomass and Equitability over Time.

DISTURBANCE SPECIES

The presence of disturbance species was assessed in an effort to realize any changes in environmental conditions. As was mentioned in chapter three, these species prefer disturbed or edge environments (Clinton and Peres 2011; Hogue 2003). The Black Prairie is known to have been subjected to numbers of anthropogenic field clearing activities in order to maintain agricultural fields. In addition, many deer and many fur-

bearing mammals are noted as disturbance species which may make the maintenance of edge environments even more imperative for the Chickasaw during the colonial period. Thus, changes in the abundance of disturbance species was analyzed to see if colonial changes may have increased or decreased the maintenance of edge environments.

A total of 14 disturbance species were identified at the sites (Table 4.4). These species include carnivorous mammals like fox (*Urocyon/Vulpes* sp.), bobcat (*Lynx rufus*) and wolf (*Canis lupus/niger*) following the belief that an increase in their food sources (the rodents and rabbits that thrive in these habitats) would increase causing a subsequent increase in carnivore representation (Hogue 2003). The presence of disturbance species was the primary concern here over how many of each was represented which is why total contributions are calculated according to the number of taxa present in the assemblage rather than NISP. This is because the variety of species occurring would provide a better reflection of what was available in the local ecology rather than how much a single disturbance species was utilized by the Chickasaw. The presence of each of these species can be seen in Table 4.4 with the total number of species present provided at the bottom. This total was then divided by the total number of species present in the assemblage to normalize the data for comparison across sites. The total contribution of disturbance species within the assemblages seems to remain fairly steady, hovering between 40 to50 percent. A decreasing trend could be interpreted from MLE 18 to MLE 90 with a total decrease of 4.5 percent. However, because the decrease is so minimal and all assemblages remain within eight percent of each other, it does not present itself as a reliable trend on which to base interpretations. It should be noted, however, that disturbance species continue to contribute a major proportion of taxa to the assemblage.

Table 4.4. Presence and Absence of Disturbance Taxa.

	MLE 112	**MLE 18**	**22Po755**	**MLE 14**	**MLE 90**
Opossum	x	x	x	x	x
Striped Skunk	x		x		
Raccoon	x	x	x	x	x
Elk		x			
White-tailed Deer	x	x	x	x	x
Gray Squirrel		x	x		
Fox Squirrel		x	x		
Eastern Cottontail	x	x		x	x
Wild Turkey	x	x	x	x	
Cotton Rat	x				
Fox	x		x	x	
Bobcat		x		x	
Wolf		x			x
TOTAL	9	10	8	7	5
Total # Species	21	20	17	15	11
Total Contribution	42.9%	50.0%	47.1%	46.7%	45.5%

In addition to the total number of contributing species, Scott (1982) shows that frequencies of cottontail rabbit and rodents including the hispid cotton rat (*Sigmodon hispidus*) and marsh rice rat (*Oryzomys palustris*) are higher in environments that have been subjected to agricultural clearing when compared to pre-agricultural sites. Hogue (2003) again adds that carnivore frequencies can be added to this analysis. Thus, a comparison of these species NISP contributions was compared across sites (Figure 4.4). Results show low contributions of these small mammals (< 4 percent) for the assemblage total NISP. MLE 112 contains the highest amount of these disturbance associated mammals with subsequent diminishing contributions, although the increase in MLE 90 disrupts the trend.

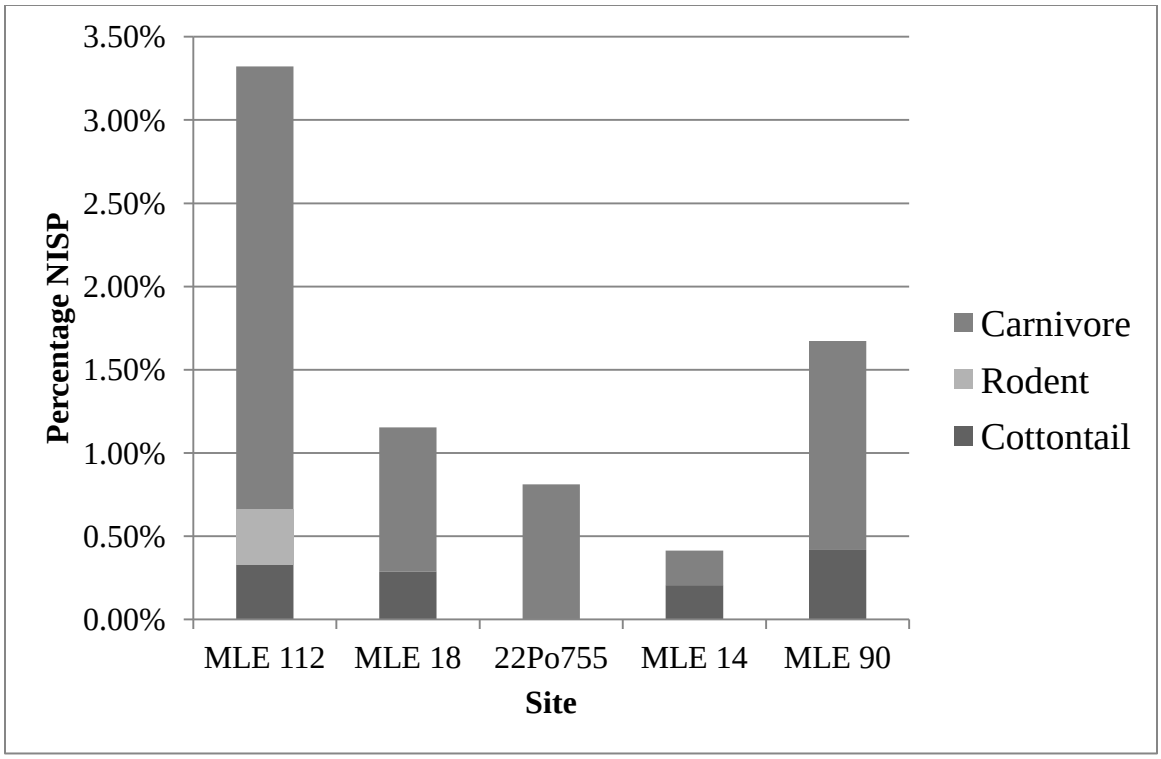

Figure 4.4. Disturbance Associated Small Mammal Frequencies

CHAPTER SUMMARY

This secondary data analysis has illuminated some trends in the faunal record which will help to interpret how the Chickasaw altered their faunal utilization and land management practices while dealing with new colonial engagements. Taxonomic class representation shows an increase in mammal contribution over time at the expense of all other taxonomic classes with turtle species seeing the most substantial decrease. The mammal contributions also display a decreased reliance on deer over time which means that other mammals must be causing the increase. Bear is noted as the second highest contributor to both NISP and biomass within each of the assemblages and experiences a consistent increase over time. Diversity measures indicate a decreasing richness, largely a result of the mammal increase, and an increasing evenness, explained by a more even use

of the mammal species. Finally, disturbance species continue to make up a steady amount of assemblage taxa throughout the colonial period.

CHAPTER FIVE

DISCUSSION AND CONCLUSIONS

Results from this study discovered new trends in the 2004 analysis of National Park Service faunal collections (Johnson et al. 2004) but confirmed many of the central interpretations as well. These results can all be interpreted in light of a changing ecology. The discussion to follow will interpret these results within the context of environmental circumstances, changing social and cultural systems, and in conjunction with information provided from the historic record. First, the data will be interpreted in light of anthropogenic impacts to the ecology considering how faunal utilization is changing within the colonial period as well as what trends communicate about intensification or reduction of disturbance activities. These changes will then be compared to what is known about anthropogenic disturbances and faunal utilization during the late Mississippian period. And finally, as it is difficult to separate ecological factors from their social and cultural underpinnings, changes occurring within the greater context of colonialism will be discussed which suggests alternate explanations for changes in the zooarchaeological record.

ANTHROPOGENIC IMPACTS TO THE ECOLOGY

Trends in taxonomic class utilization as well as the frequencies of species conclusively point to changing ecological impacts. Trends in white-tailed deer and turtle

contributions suggest over-exploitation of these resources. The depletion of deer herds was first reported by Jackson and Scott (Johnson et al. 2004, 2008) and is attributed to the heightened exploitation for the deerskin trade. In their report, Jackson and Scott used age profiles to suggest the decrease in herd populations and also noticed the slight decrease in deer bone later in the 18th century (Johnson et al. 2004, 2008). The decreasing trend is apparent in this analysis through the biomass contribution. White-tailed deer frequencies from Daub Ridge also fit nicely into the chronological trend, adding strength to this conclusion. Thus, the biomass frequencies reported here supplements existing knowledge about increasing pressures on deer populations but also demonstrates a detrimental ecological impact.

In a similar fashion, turtle exhibits a decrease in both NISP and biomass contributions throughout the colonial period. Ecological explanations for this trend are attributed to the prehistoric utilization of the species, rather than heightened pressures from colonial changes. This is because turtles appear as a highly exploited resource by many prehistoric southeastern Native Americans because they appear with in higher frequencies in zooarchaeological assemblages (Clinton and Peres 2011; Jackson and Scott 2003; Pavao-Zuckerman 2000). They are also never noted as having exhibited any characteristics that would make them valuable trade items in the historical record. Their decrease could then be attributed to decreasing population numbers from over-exploitation early on creating a long-lasting ecological impact. If this were the case, lower abundance of box turtle may have caused the Chickasaw to explore alternate food sources. Mammals would then be the most attractive alternative during this time due to their marketable furs, which would explain the increase in mammalian contributions.

However, unlike deer, age profiles are not refined enough to provide supplemental evidence for population pressure on turtles. Therefore, it remains uncertain if this trend exhibits an ecological restriction or the result of a cultural shift away from turtle.

Beyond the direct impacts on faunal populations, the zooarchaeological data was used as proxy measures for anthropogenic clearing in an attempt discover changes in Chickasaw landscape management. Zooarchaeological research in past studies have shown clearing activities for agricultural fields (Clinton and Peres 2011; Hogue 2003) and historic documents suggest the use of fire for maintaining habitats (Adair 1775; Nairne 1988; Swanton 1946). Additionally, anthropogenic fire rings that were intended for hunting would have also cleared underbrush (O'Steen 2007). Areas subjected to regular clearing help to maintain edge environments which are associated with high levels of diversity. According to the Shannon-Weaver Index, high levels of diversity would fall in the 3 to 4 range of the diversity index (Reitz and Wing 2008). However, since this index is affected by both richness and evenness, some conflation can occur. Therefore, assessing richness and evenness separately helps gain a better idea of what species are contributing to the assemblage and how. Edge environments would then be associated with both a high richness and a high evenness (Wagner 2010). If using these measures as a reflection of the local ecology, one must assume that what the environment is providing affects what appears in the zooarchaeological record. Therefore, if richness increases, there is reason to believe that it is because of a richer environment offering a greater diversity of choices. This then requires any other factors affecting prey choice to hold constant. We know that especially within a cultural context this is hardly ever the case and it is certainly not the case throughout the colonial period. Therefore, these

numbers work well in suggesting the possibility of changing landscapes but it is best to supplement these interpretations with additional data sets.

Keeping this caveat in mind, we can turn to the diversity measure to see what they suggest about the faunal make-up and environmental state. The diversity measure for the colonial Chickasaw sites shows an increase (0.9-1.2) with a decreasing richness (21-11). This is then explained by the increase in equitability which is driving the increase in the diversity index. Thus, more mammal species are contributing more evenly to the assemblages by the end of the century but see a drop in the number of species utilized. Since evenness is directly tied to how the Chickasaw were utilizing the species, richness presents itself as the best measure for understanding what the local ecology offered. A decrease in richness is also more reliable in this interpretation because we know that the Chickasaw exhibited an early preference for a wider variety of animals. Therefore, something is occurring that is causing them to decrease their faunal variety which may be an environmental factor. Knowing that edge environments produce richer ecological systems (Foster and Bonhage-Freund 2007; Wagner 2010), it is possible that maintenance of edge environments is decreasing. But as mentioned, additional data should be consulted to strengthen this argument which is why an assessment of disturbance species and the small-mammal model was carried out.

An assessment of the total disturbance species present in the assemblages show steady utilization across sites. Disturbance species taxa consistently make up around 40 to 50 percent of the total taxa present. These high frequency levels suggest that edge environments were maintained fairly steadily throughout the period and do not show the decrease in disturbance that the richness measure suggests.

The more refined small-mammal model was then analyzed to better evaluate clearing activities. This model developed by Scott (1982) and refined by Hogue (2003) utilizes a limited number of disturbance species that are common across assemblages as proxies for disturbance levels. This is believed to be a stronger assessment of clearing activity because results have been supported in past studies through the assessment of botanical remains. According to the small-mammal model, high frequencies of cottontail rabbit, cotton rat and the carnivores that feed on them are all associated with agricultural clearing (Hogue 2003). Total NISP contributions for the combined species show minute contributions across the board (< 4 percent). Small decreases occur from MLE 112 to MLE 14 with a subsequent increase in MLE 90. Much like the frequencies of total disturbance species taxa, this does not display a strong trend that would indicate an alteration in clearing activities. Thus, both assessments of disturbance species conflict with the decreasing richness. The results remain ambiguous as to whether the Chickasaw altered their land clearing behaviors as a strategy to increase their acquisition of valuable fur-trade animals. Archaeobotanical remains then present the best avenue for future research to achieve better indications of anthropogenic land clearing as they are more susceptible to and display better evidence for anthropogenic fires and cultivation.

CHANGES FROM TRADITIONAL FAUNAL UTILIZATION

When comparing the results of this analysis with faunal remains from the earlier Yarborough site, change in faunal utilization, and thus ecological impact, is much more evident. A substantial decrease is seen in the presence of small mammals when compared to the colonial period sites (Figure 5.1). This decrease in small mammal utilization is indicative of a couple of changes. The largest is hunting behavior. The colonial

assemblages exhibit less of an emphasis on utilizing small bodied mammals. As Jackson and Scott pointed out (Johnson et al. 2004, 2008), this is likely due to a focus on acquiring and processing deerskins. There was likely a subsequent decrease in casual hunting of small rabbit and squirrel species by women and children that needed to devote more time and energy into processing hides for the trade. Additionally, with extra meat from the increase in deer hunting there was likely less of a need to supplement the diet with small bodied game (Johnson et al. 2004, 2008).

The high amount of small-bodied mammals at the Yarborough site is also believed to be indicative of agricultural clearing activity. Small rabbit, rodent and carnivore

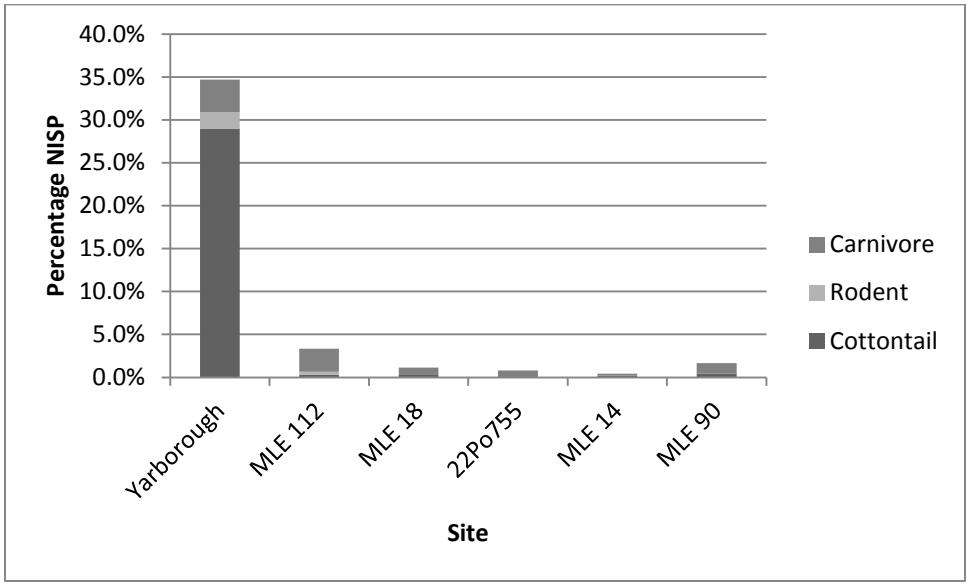

Figure 5.1. Small Mammal Frequency Comparison with Yarborough.

mammals associated with cleared fields and landscape alterations are over 30 percent more ubiquitous at Yarborough when compared to the colonial Chickasaw sites. The colonial sites were predicted to exhibit a more extensive or equal disturbance pattern than the Yarborough site based on the assumption that they would require more extensive land

clearing for a village site to accommodate more space for housing and fields than would be necessary at a farmstead site. The results here counter that assumption showing a decrease in disturbance according to the small-mammal model. This may suggest that less land clearing activity was occurring during the colonial period than in the late Mississippian period. Yet, the decrease may still be attributed to the focus on deer acquisition during the colonial period which diminished the need to supplement the diet with small mammals (Johnson et al. 2004, 2008). The Yarborough Site has also produced a high number of botanical remains that are associated with land altering behavior (Peacock and Reese 2003) which strengthens the confidence in the small mammal model. The ability to evaluate the level of disturbance through the botanical record at the colonial period sites may again be able to substantiate the apparent decrease in clearing practices.

OPTIMAL FORAGING WITHIN THE CONTEXT OF COLONIALISM

Thus far, the discussion has remained focused around what diachronic trends in the colonial faunal assemblages suggest about changing anthropogenic impacts to the environment and some noticeable changes in Chickasaw prey preferences. The fur and deerskin trade has been the largest social factor to consider in interpretation and has been used to explain the increase in mammals and larger fur-bearing species replacing the smaller rodent and rabbit species. I wish to elaborate on these and some additional social and cultural factors that should be considered and feel they could best be explained through an optimal foraging logic while considering other forms of currency beyond energy return. As discussed in chapter 3, the diet breadth model is used to understand why certain species were obtained from all resources available by basing decision making

on search and pursuit/handling costs (Thomas 2008a). In this case, foragers should pursue animals that will yield the greatest net return in food energy relative to time spent foraging and processing. According to the net return rate provided by species available to the Chickasaw (Table 3.2), bear and deer should be ranked highest with smaller animals such as rabbits, turtles and squirrels being more costly. Many of the higher ranked species (black bear, white-tailed deer, raccoon, and opossum) appear to be key parts of the diet which correlates with their provided energy return. However, there are patterns in the data that are not easily explained by assessing prey rank according to energy return. Questions such as: why was bear not as heavily exploited in the 17th century and utilized more heavily at the end of the 18th century? and why is the exploitation of turtle decreasing? Such questions may be best addressed by understanding prey rank with alternative currencies.

The major alternative currency to consider is market value. With the introduction of the trade market, hunting gained an additional purpose. Hunting could now be used as a means to acquire currency that could result in an additional payoff beyond nutrients and food energy. Animals that were able to provide both sustenance and an additional non-food payoff would increase their return rate and thus their prey rank even if they required additional searching or processing costs. The rise in mammals can then be best explained through market value as a form of currency since many being acquired (white-tailed deer, beaver, raccoon, fox, bobcat, cougar, mink, wolf, and bear) would have had an additional payoff which would then increase their prey rank. White-tailed deer would seem to hold the highest rank under these circumstances considering that they were already a valued food resource and had the highest demand within the trade. More energy would be

allowed to be spent on searching for and processing deer which would then make time spent hunting auxiliary animals more costly. Therefore, the rising importance of deer causes a subsequent decrease in rank for smaller bodied animals like rabbits, rodents, squirrels and turtles, since they provided no additional returns and searching and handling costs would be higher.

Overhunting of white-tailed deer toward the end of the century may have also initiated an adjustment in costs. A decrease in the population would cause a rise in search costs of deer as it becomes more time expensive, even with an opportunistic strategy. The deerskin trade also began to wane in 1770 (O'Steen 2007). This decreased demand for skins would lower their market value and further contribute to the rising cost of energy expended on hunting deer. Therefore, other mammals may present themselves as better targets. While bear would have offered furs for the trade, it is believed that Chickasaw were much more heavily involved in the deerskin trade as it was a more lucrative business for them (Ethridge 2010).This may explain why they were not as heavily exploited during the peak of the deerskin trade. However, as the demand for deerskins dwindled and deer populations decreased, bear begins to regain its higher ranking. Bear still produced a number of products including oil and skins that were profitable trade items (Gibson 1971a). Additionally, the costs of pursuing bear would have also seen a decrease during this time period with the introduction of firearms (Johnson et al. 2004, 2008). Thus, technological advancement would have altered capture costs. Because of these additional returns and the concurrent rise in deer foraging costs, bear likely became one of the highest ranked species which explains its increased utilization throughout the colonial period.

The second factor that should be considered in assessing prey rank is traveling costs. Any aquatic turtles or fish would experience an increased cost for Chickasaw living on ridge tops than they would have possessed at river valley sites like Yarborough. More energy would be expended to acquire these species causing an increase in search costs. Traveling costs also rise with heightened states of social conflict. Traveling longer distance to acquire food becomes more costly as it exposes one to the treat of attack. This should be considered in the case of the Chickasaw throughout the 18th century since they engaged in a number of battles with French colonialists (Ethridge 2010; Johnson et al. 2004, 2008; St. Jean 2003). This time of heightened conflict may have made it more dangerous to travel far from their towns. Thus, subsistence activities that required farther travel and being away for extended periods of time, like fishing, would have an added cost. This would then contribute to the decrease in aquatic turtle and fish use. However, it is likely that fish are underrepresented within these assemblages since they were not screened. Further analysis of flotation samples from Chickasaw sites should produce better representation of fish specimens and would help to determine if the decreases are reflective of heightened traveling costs.

The final factor that needs to be taken into account to fully understand costs of pursuing animals is their traditional significance. An animal held in particularly high regard may possess more costs in hunting or possibly more gains according to social signaling (Thomas 2008b). Adair made reference to a number of species that held dietary taboos. For example, Adair mentions the taboos surrounding the consumption of any animals that were "unclean" and thus unfit to eat (Adair 1775:132). One would then assume that intentional pursuit of these species would be costly to ones social reputation

since they are not to be consumed. These species include carnivorous cats, wolves, foxes and beaver, all of which are present within these assemblages. It is possible that societal factors may have led to a re-evaluation of these beliefs or made them a secondary priority which would decrease social costs. Since many of these unclean animals are also fur-bearing animals, it is possible that the net gains received from their acquisition trumped the observance of dietary taboos. This conclusion assumes that if the Chickasaw were hunting these animals for their furs, they were consuming them as well. Adair's report of hunters consuming beaver supports that individuals did engage in consumption of unclean animals if they were hunted and did not die of natural causes (Adair 1775). If the Chickasaw were doing this with these fur-bearing species, it may be seen as an act of deemphasizing traditional dietary taboos in favor of economic benefits.

However, a careful reading of the historical record must be considered in interpreting changing taboos. Adair does state elsewhere, and in direction association with the Chickasaw, that they were wasteful with buffalo kills. They would only utilize their tongues, skin, and bone marrow and leave the rest to rot (Adair 1775). No taboo related to buffalo consumption is mentioned by Adair and thus the behavior cannot be explained according to a traditional belief system. If the Chickasaw exhibited wasteful behavior with large animals and ones which they had no traditional aversion to, the possibility exists that they did not consume the fur-bearing animals and only utilized their profitable parts.

Since Adair was writing accounts of Southeastern Native values in general, it is possible that such taboos did not specifically hold for the Chickasaw. In addition, the mention of abstaining from unclean species is included under Adair's argument that

Native Americans were of Jewish decent (1775). This is then one instance where his personal agenda may have entered the record and thus remains a questionable characteristic on which to base conclusions. A closer look at butchering patterns and skeletal part representation may reveal more about consumption behavior and help to settle this inquiry. However, they have yet to be investigated since this detailed data was not provided for the Park Service collections. However, if these fur-bearing animals were not being consumed, the data here would reflect a diet heavily weighted on bear and deer meat which is highly unlikely considering the diversity of the diet in the late Mississippian period and the diets of neighboring Southeastern Native Americans.

CONCLUSIONS

Diachronic changes in Chickasaw faunal use witnessed here have brought to light interesting conclusions about ecological impacts from culture change in the colonial period. The assessment of ecological impacts can be grouped into both faunal utilization and indications of landscape management. Throughout the colonial period, deer shows clear change in faunal utilization with a decrease in contributed biomass lending weight to the conclusion of over-exploitation of the white-tailed deer population. Turtle remains also show a drastic decrease in use which may be due to continuing pressure on the population from pre-colonial times. Assessments of diversity indices and disturbance species show mixed results of anthropogenic impacts on the ecology. A decreasing richness lends itself to an argument of less landscape management and maintenance of edge environments. In contrast, disturbance species appear in similar frequencies throughout the period. Because these frequencies remain fairly high (nearly 50% of the taxonomic contribution), they suggest steady maintenance of edge environments.

Change in landscape management becomes more evident through a comparison with late Mississippian sites. Disturbance species show a drastic reduction (over 30 percent of the total NISP) from Yarborough to the colonial period sites. Lower frequencies of disturbance species suggests a decrease in clearing activities, edge environments and biodiversity occurred from the Mississippian period to the colonial era.

However, all of the changes interpreted as resulting from landscape change may just be the result of change in faunal utilization due to a reassessment of prey preference. Market value is likely driving the increase in mammals since they provided an additional non-food payoff for hunting efforts. This also explains the decrease in turtles as they provided no additional pay-offs from the trade. Many of the disturbance species seen in the colonial period assemblages are also fur-bearing animals which likely contributed to their steady utilization. The focus on hunting deer and fur-bearing mammals may have decreased the need to supplement the diet with smaller animals like rabbits, rodents and squirrels which would explain the decrease in these species utilization from those seen at the Yarborough site. Therefore, change is apparent with regards to the taxonomic make-up of the faunal assemblages at colonial Chickasaw sites, although, it remains uncertain if these are due to changes in the landscape that are altering species availability or an alteration of Chickasaw prey preference.

Despite the ambiguity in circumstances contributing to the faunal changes, it is evident that the motives behind either a change in clearing behavior or prey preference are resulting from imposed colonial alterations to social and cultural systems. This knowledge can be used to demonstrate that an image of ecological nobility applied to encompass any human group's relationship with the environment is harmful. Any

assessment of human roles in ecological systems must be mindful to not essentialize people into a single positive or negative impact.

The historical context of the ecologically noble savage shows how it has perpetuated the "othering" of Native American people. It appears in the historical record as a positive contrast to the greed-driven Western world as documenters praised the Indian's ability to live in harmony with the land and envied their simple way of life (Adair 1775; Cushman 1899; Malone 1922). This ascribed a simplistic homogenized image to all Native Americans that they suffered with for the coming centuries. The belief continued to subjugate them as it was used to justify Native removal from their homelands and the establishment of reservations. Keeping Native Americans "othered" allowed them to be used as a pawn for policy makers leading into the 20th century when conservationists were able to utilize the ecologically noble Indian image to further their goals (Hames 2007). Today, we are at an impasse where Native Americans pose a problem for conservation efforts in the battle for land use rights and thus a battle of "us" versus "them", the Western world and the savage Other, remains. It seems that if Native Americans cannot be seen as ecologically noble they must be the opposite. This polarizing view ignores the multiplicity of effects that humans in their totality create.

A one dimensional view of any people's impact on the landscape then becomes an ineffective way to conceptualize anthropogenic impacts as I feel the presented results demonstrate. The Chickasaw show change in faunal utilization with a mixed impact of over-exploitation and maintenance of edge environments to foster diversity. However, these changes are operating under a new colonial social system imposed by European settlement. Impacts initiated through the trade market, new technologies, and heightened

states of conflict cannot be seen as “native impacts” or “European impacts” because they result from the combination of social systems and have been inscribed with new motives. Thus, there has been no uni-directional influence resulting in Native Americans having the same ecological impacts as colonists or vice versa. There are no marked boundaries between groups or their ecological impacts as they have all been influenced by similar motives.

In order to avoid inscribing identities of ecologically noble or detrimental, the field may be best suited to examine the systems motivating human behavior and whether the results they are producing have positive or adverse impacts on ecological systems. This takes historical ecology’s recognition that humans will impact their environments differently according to their social and cultural systems and makes these social and cultural systems the focus of critique. These systems can include political organization, economies, conflict, technologies, and social signaling behavior. Each can motivate changes that will cross-cut social boundaries. Thus there needs to be an understanding of not just how people fit into ecological systems but how social systems are entangled with ecological systems. In understanding the initial conditions of the environment we also need to understand the initial conditions of the society and how these continue to interact and evolve as they move into the present and position directions for the future.

This view on the study of ecological histories still focuses on the interactions of complex systems and relies heavily on the human component but it provides a way to better discern motives of ecological change while not essentializng a culture or society’s impact as positive or negative. In doing so it deteriorates any preconceived notion of how a society will impact their landscape and allows archaeology to assist in this endeavor. In

moving forward, researchers must highlight the diverse array of impacts a community has on the environment and assess them carefully to connect them back to their driving motives within the social system rather than just ascribing them to the people themselves. Policy makers or conservation groups utilizing this knowledge of the past should then be better attuned to what motivated past behavior and how it has evolved. When people are no longer stereotyped as protectors or destroyers of the environment more productive and informed negotiations can take place to target key issues that are of primary ecological concern.

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Appendix A. Species Lists

MLE 112: Species List

Taxa	NISP	Charred	Weight, g	Biomass, kg.
Didelphis virginianus Opossum	1		3.7	0.085
Sylvilagus floridanus Cottontail rabbit	1		1.1	0.029
Sigmodon hispidus Cotton rat	1		0.3	0.009
Microtus sp Pine Vole	1		0.1	0.003
Procyon lotor Raccoon	5		4.4	0.1
Mephitis mephitis Striped Skunk	1		0.3	0.009
Urocyon/Vulpes sp. Fox	7		2	0.049
Ursus americanus Black Bear	14	1	248.7	3.768
Sus scrofa Pig	6		20.2	0.393
Odocoileus virginianus White-tailed Deer	192	13	2542.8	30.535
Bison bison Bison	5		304.2	4.517
Bos taurus Cow	1		1.1	0.029
Meleagris gallopava Turkey	2		5.1	0.09
Gallus gallus Chicken	1		1.9	0.037
Passeriformes Songbird	1		0.1	0.003
Chelydridae Snapping Turtle	2		2.8	0.063

MLE 112: Species List

Taxa	NISP	Charred	Weight, g	Biomass, kg.
Trionychidae Softshell Turtle	6		10.1	0.149
Terrapene carolina Box Turtle	47		66.6	0.527
Emydidae Aquatic Emydid	2		3.3	0.07
Viperidae Viper	4		3.1	0.043
Amia calva Bowfin	1		0.2	0.008
TOTAL	301		3222.1	40.516

MLE 18: Species List

Taxa	NISP	Charred	Weight, g	Biomass, kg.
Didelphis virginianus Opossum	11		18.8	0.369
Sylvilagus floridanus Cottontail rabbit	4		3.7	0.085
Sciurus carolinensis Gray Squirrel	1		5.4	0.12
Sciurus niger Fox Squirrel	1		0.9	0.024
Castor canadensis Beaver	6		36.8	0.675
Procyon lotor Raccoon	18	2	45.9	0.823
Canis lupus/niger Wolf	3		73.4	1.256
Lynx rufus Bobcat	1		3.6	0.083
Felis concolor Cougar	8		228.2	3.487
Ursus americanus Bear	53		1051	13.787
Odocoileus virginianus Whitetail Deer	895	103	7382	79.684
Cervus elaphus Elk	1		4.3	0.098
Equus caballus Horse	1		275.3	4.129
Branta/Chen sp. Goose	1		1	0.02
Anas sp. Small Duck	1		0.8	0.017
Meleagris gallopava Turkey	5		17.6	0.278
Kinosternidae Mud/Musk Turtle	3		2.2	0.054
Terrapene carolina Box Turtle	365	1	634.6	2.386
Emydidae Aquatic Emydid	8		21.8	0.249
UD Fish	1		0.8	0.025
TOTAL	1387		9808.1	107.649

22Po755: Species List

Taxa	NISP	Charred	Weight, g	Biomass, kg.
Didelphis virginiana Opossum	4		5.74	0.127
Castor canadensis Beaver	11	1	49.84	0.887
Sciurus carolineanis Eastern Grey Squirrel	1		0.2	0.006
Sciurus niger Fox Squirrel	1		1	0.026
Procyon lotor Raccoon	3		8.1	0.173
Mustela vison Mink	3		2.43	0.058
Mustela sp. Mustelid	4		2.44	0.059
Mephitis mephitis Striped Skunk	1		0.9	0.024
Urocyon cinereoargenteus Gray Fox	4		6.4	0.140
Ursus americanus Black Bear	61	5	889.36	11.863
Odocoileus virginianus White-tailed deer	385	28	3010.06	35.541
Bison bison Bison	3	2	119.8	1.953
Maleagris gallopavo Turkey	1		4.4	0.079
Tarrapene carolina Box Turtle	123	1	106.4	0.721
Emydidae Aquatic Emydid	8		1.3	0.038
Family Colubridae UD Snake	2		1.1	0.015
UD Fish	1		0.01	0.001
TOTAL	616		4209.48	51.710

MLE 14: Species List

Taxa	NISP	Charred	Weight, g	Biomass, kg.
Didelphis virginianus Opossum	8		25.7	0.489
Sylvilagus floridanus Cottontail rabbit	2	2	3.1	0.073
Castor canadensis Beaver	5		26.3	0.499
Procyon lotor Raccoon	13	1	47.1	0.843
Urocyon/Vulpes sp. Fox	1		4	0.092
Lynx rufus Bobcat	1		6.7	0.146
Felis concolor Cougar	1		24.6	0.47
Ursus americanus Bear	161	3	2597.3	31.123
Sus scrofa Pig	8		171.8	2.701
Odocoileus virginianus Deer	646	14	7950.2	85.183
Bison bison Bison	37		913.8	12.156
Meleagris gallopava Turkey	10	1	57.3	0.813
Buteo sp. Hawk	1		1.2	0.024
Terrapene carolina Box Turtle	70		270.9	1.349
Emydidae Aquatic Emydid	3		9.6	0.144
TOTAL	967		12109.6	136.105

MLE 90: Species List

Taxa	NISP	Charred	Weight, g	Biomass, kg.
Didelphis virginianus Opossum	1		1.5	0.038
Sylvilagus floridanus Cottontail rabbit	1		0.7	0.019
Procyon lotor Raccoon	4		15.9	0.317
Canis lupus/niger Wolf	2		19.2	0.376
Ursus americanus Bear	36	1	677.8	9.29
Sus scrofa Pig	4		34	0.629
Odocoileus virginianus Whitetail Deer	169	8	1560	19.671
Bison bison Bison	6		86	1.449
Equus caballus Horse	5		93.1	1.556
Anas sp. Medium Duck	1		1.2	0.024
Terrapene carolina Box Turtle	10		26	0.281
TOTAL	239		2515.4	33.650